BIRD POPULATIONS

A journal of global avian demography and biogeography

Volume 13 2014

Published annually by The Institute for Bird Populations

BIRD POPULATIONS

A journal of global avian demography and biogeography

Published by
The Institute for Bird Populations

Editor: **DAVID G. AINLEY**, H.T. Harvey & Associates, 983 University Avenue, Bldg D, Los Gatos, CA 95032; 415-272-9499; dainley@penguinscience.com

Managing Editor: **DAVID F. DESANTE**, The Institute for Bird Populations, P.O. Box 1346, Point Reyes Station, CA 94956-1346; 415-663-2052; 415-663-9482 fax; ddesante@birdpop.org

Spanish Translation of Abstracts: BORJA MILA, Museo Nacional de Ciencias Naturales, CSIC, José Gutiérrez Abascal 2, Madrid 28006, Spain; bmila@mncn.csic.es

Layout and Typesetting: PRISCILLA YOCOM, 5018 Albridal Way, San Ramon, CA 94582

THE INSTITUTE FOR BIRD POPULATIONS

A tax-exempt California nonprofit corporation established in 1989 and dedicated to fostering a global approach to research and the dissemination of information on changes in bird populations.

President: DAVID F. DESANTE , P.O. Box 1346, Point Reyes Station, CA 94956

Secretary-Treasurer: STEPHEN M. ALLAN, 962 Mistletoe Loop N, Keizer, OR 97303

Directors: CORDELL GREEN, IVAN SAMUELS, RODNEY B. SIEGEL, and DAN TOMPKINS

All persons interested in birds are invited to join The Institute for Bird Populations. Individual membership dues are $35 per year. Institutional memberships are $50 per year; student and senior memberships are $15 per year. Please send check or money order (in U.S. dollars) payable to The Institute for Bird Populations, along with complete name, address, and email address to: The Institute for Bird Populations, P.O. Box 1346, Point Reyes Station, CA 94956-1346. All memberships and donations are fully tax-deductible as provided by law.

BIRD POPULATIONS (ISSN 1074-1755) is an entirely electronic journal published annually by The Institute for Bird Populations.

BIRD POPULATIONS

A journal of global avian biogeography

Volume 13 2014

Bird Populations 13:1-5

TEMPORAL VARIATION OF COLONIAL NESTING WATERBIRDS IN EASTERN UGANDA[1]

SARAH NACHUHA[2] AND IMRAN EJOTRE

Islamic University in Uganda
Department of Environmental Science
P.O. Box, 2555, Mbale, Uganda

Abstract. The aim of this study was to investigate temporal variations in the populations of tree nesting colonial waterbirds in eastern Uganda. Counts of breeding pairs were made during a six year period: 2005 and 2008 to 2012. Eight waterbird species namely, Cattle Egret *Bubulcus ibis*, Pink-backed Pelican *Pelecanus carbo*, Sacred Ibis *Threskiornis aethiopica*, Yellow-billed Stork *Mycteria ibis*, African Spoonbill *Platalea alba*, Long-tailed Cormorant *Phalacrocorax africanus*, Little Egret *Egretta garzetta* and the Black-headed Heron *Ardea melanocephala*, were recorded breeding. There was a decline in the number of nesting sites and breeding pairs over time. The possible cause of this decline is the cutting down of nesting trees by man, particularly because most waterbirds chose to nest on the Mvule tree *Milicia excelsa* that is also a very good source of timber for the local communities. Except *Pelicanus carbo*, all the other waterbird species recorded breeding seem to have adapted to this habitat loss by nesting on other tree species like Cassia *Cassia spectabilis* and Mango *Mangifera indica* L. It is therefore desirable to find out how *Pelicanus carbo* is coping with this habitat loss.

Key words: breeding, colonial birds, Uganda, temporal, waterbirds, *Milicia excelsa*

VARIACIÓN TEMPORAL EN AVES ACUÁTICAS NIDIFICANTES DEL ESTE DE UGANDA

Resumen. El objetivo de este estudio fue investigar la variación temporal en las poblaciones de tres aves acuáticas coloniales en el este de Uganda. Se llevaron a cabo conteos de parejas reproductoras durante un periodo de seis años, 2005 y de 2008 a 2012. Las ocho especies reproductoras fueron la garcilla bueyera *Bubulcus ibis*, Pelícano rosado *Pelecanus carbo*, ibis sagrado *Threskiornis aethiopicus*, tántalo africano *Mycteria ibis*, espátula africana *Platalea alba*, cormorán africano *Phalacrocorax africanus*, garceta común *Egretta garzetta* y garza cabecinegra *Ardea melanocephala*. Hubo un declive en el número de lugares de anidación y parejas

[1]Received 24 Oct 2013; accepted 23 Dec 2013

[2]Corresponding author, email: snachuha@yahoo.com

reproductoras. La causa probable de este declive es la tala de árboles de anidación por parte del hombre, ya que la mayoría de las aves eligen para anidar el árbol Mvule *Milicia excelsa* utilizado para leña en las comunidades locales. Exceptuando *Pelecanus carbo*, las demás especies parecen haberse adaptado a esta pérdida de hábitat anidando en otras especies, como *Cassia spectabilis* o *Mangifera indica*. Sería conveniente determinar si *Pelecanus carbo* es capaz de lidiar con esta pérdida de hábitat.

Palabras clave: reproducción, aves coloniales, Uganda, temporal, aves acuáticas, *Milicia excelsa*

INTRODUCTION

Many factors including the activities of humans transform habitats and this may change the patterns of resource availability thus influencing the way in which organisms use such habitats. The distribution and size of waterbird colonies are commonly governed by the availability of suitable nesting sites (Kelly et al. 1993) and habitat composition around nesting sites (Beaver et al. 1980, Gibbs et al. 1987, Fasola and Alieri 1992). Fluctuations and trends in the population of colonial nesting waterbirds has been found to be caused by both natural and human induced events (Schogolev 1996). Earlier studies in eastern Uganda have showed that the size and location of waterbird breeding colonies is determined mainly by the number of trees available (Nachuha 2006, Nachuha and Ejotre 2011, Nachuha and Quinn 2012). The objective of this study was therefore to investigate temporal variations in the abundance of tree nesting colonial waterbirds in eastern Uganda.

MATERIALS AND METHODS

DATA COLLECTION

Tree-by-tree direct nest counts were made from the ground with the aid of a telescope. Visibility was good because most colonies were in well-spaced trees, most of which had lost some or all of their leaves. Nest counts were made in the morning when many birds were active and visible (usually between 07:00-09:00h) and all nests were recorded. Data were collected between February and August in all six years of survey. Nesting trees at the colonies were identified to species level and counted.

DATA ANALYSIS

Tree and nest abundance were calculated for each year and the results were tabulated. Considering that waterbird species are affected differently by changing environmental conditions, we also calculated the number of nests per individual species to establish the interspecies variations across the years.

RESULTS

Results indicate that the number of breeding sites reduced from 18 in 2005 to eight in 2008-2012 resulting in the reduction in the number of total nests from 2152 nests to 1648 (Table 1). A total of eight waterbird species, namely, Yellow-billed Stork *Mycteria ibis*, Sacred Ibis *Threskiornis aethiopica*, Pink-backed Pelican *Pelicanus carbo*, Long-tailed Cormorant *Phalacrocorax africanus*,

TABLE 1. Variation in the overall abundance of nests across the six years.

Year	No. of colonies	No. of bird species	Total nests
2005	18	6	2152
2008	8	8	1235
2009	8	8	1388
2010	8	8	1245
2011	8	8	1087
2012	8	8	1648

Little Egret *Egretta garzetta*, Cattle Egret *Bubulcus ibis*, Black-headed Heron *Ardea melanocephala* and the African Spoonbill *Platalea alba*, were recorded breeding over the six year period. However, the Little Egret and Long-tailed Cormorant were not recorded in 2005 (Figure 1). These waterbirds bred on six different tree species across the colonies, namely, Cassia *Cassia spectabilis*, Jambula *Syzygium guineense*, Mango *Mangifera indica L*, Musambya *Markhamia lutea*, Mvule *Milicia excelsea* and Fig *Ficus sycomoru*. Results indicate that there was a decline in the usage of Mvule trees and an increase in that of other tree species over time (Table 2). The abundance of each species varied across the years, with highest numbers being recorded in 2005. Waterbirds such as the Pink-backed Pelican showed a consistent decline during the study period, the Yellow-billed Stork and the Sacred Ibis showed stable populations while the African Spoonbill, Black-headed Heron and Cattle Egret showed a minimal fluctuating pattern. Having been first recorded in 2008, the Little Egret also showed a stable population while the abundance of the Long-tailed Cormorant increased over time (See also Figure 2).

DISCUSSION

The number of breeding colonies and nests reduced over time. This decline is attributed to human disturbance (personal observation, also see Nachuha 2006; Nachuha and Ejotre 2011, Nachuha and Quinn 2012). Considering that

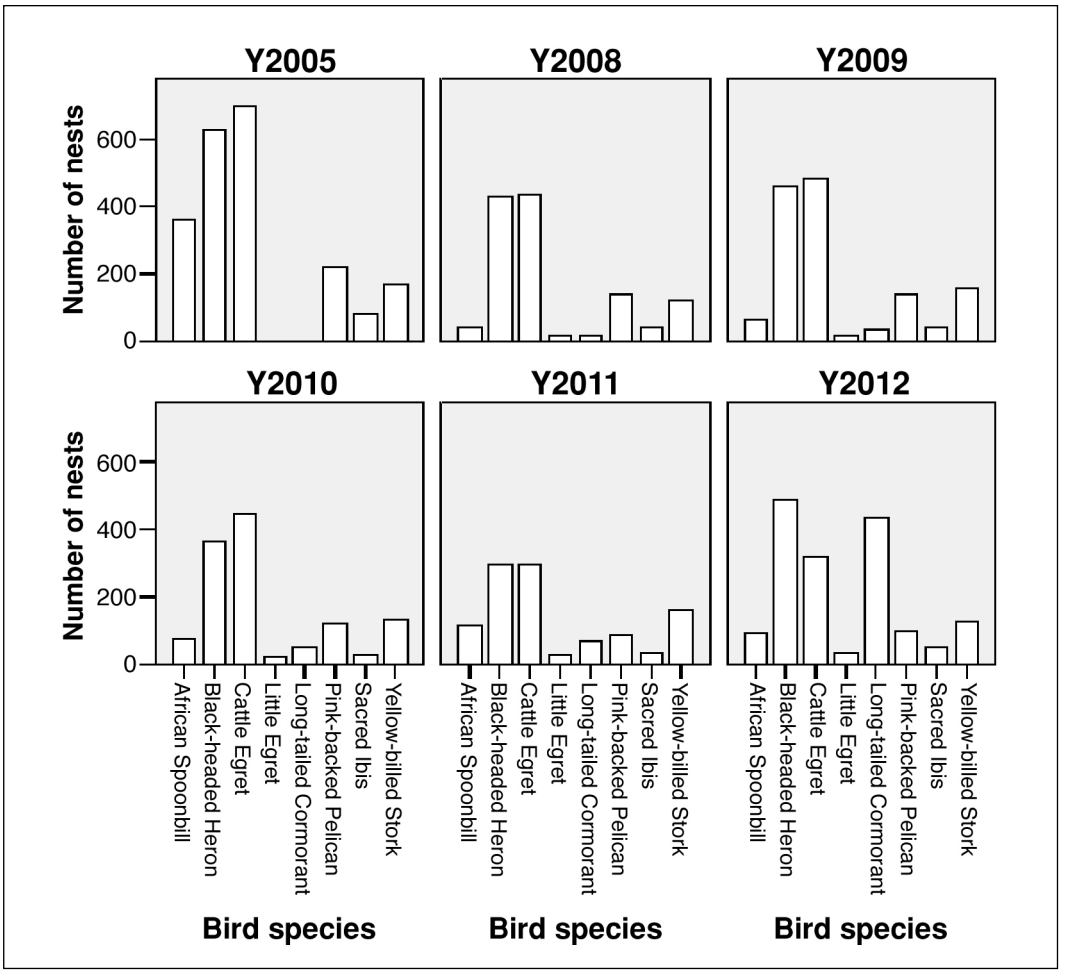

FIGURE 1. Temporal variation in species composition. Y =Year

Table 2. Variation in the number of nests and tree stands across the years

Tree type (common name)	Number of nests and tree stands					
	2005	2008	2009	2010	2011	2012
Cassia	305 (2)	101 (1)	111 (2)	105 (4)	123 (4)	86 (4)
Jambula	38 (1)	56 (0)	77 (2)	80 (3)	127 (3)	327 (3)
Mango	82 (1)	69 (1)	61 (2)	120 (4)	219 (4)	307 (3)
Musambya	0 (0)	0 (1)	11 (1)	11 (1)	8 (1)	00 (1)
Fig	103 (2)	38 (1)	38 (1)	33 (2)	36 (2)	31 (2)
Mvule	1624 (16)	964 (10)	1090 (10)	896 (8)	574 (8)	897 (8)

Note: Numbers in bracket indicate the tree stands per species on which waterbird nests were recorded

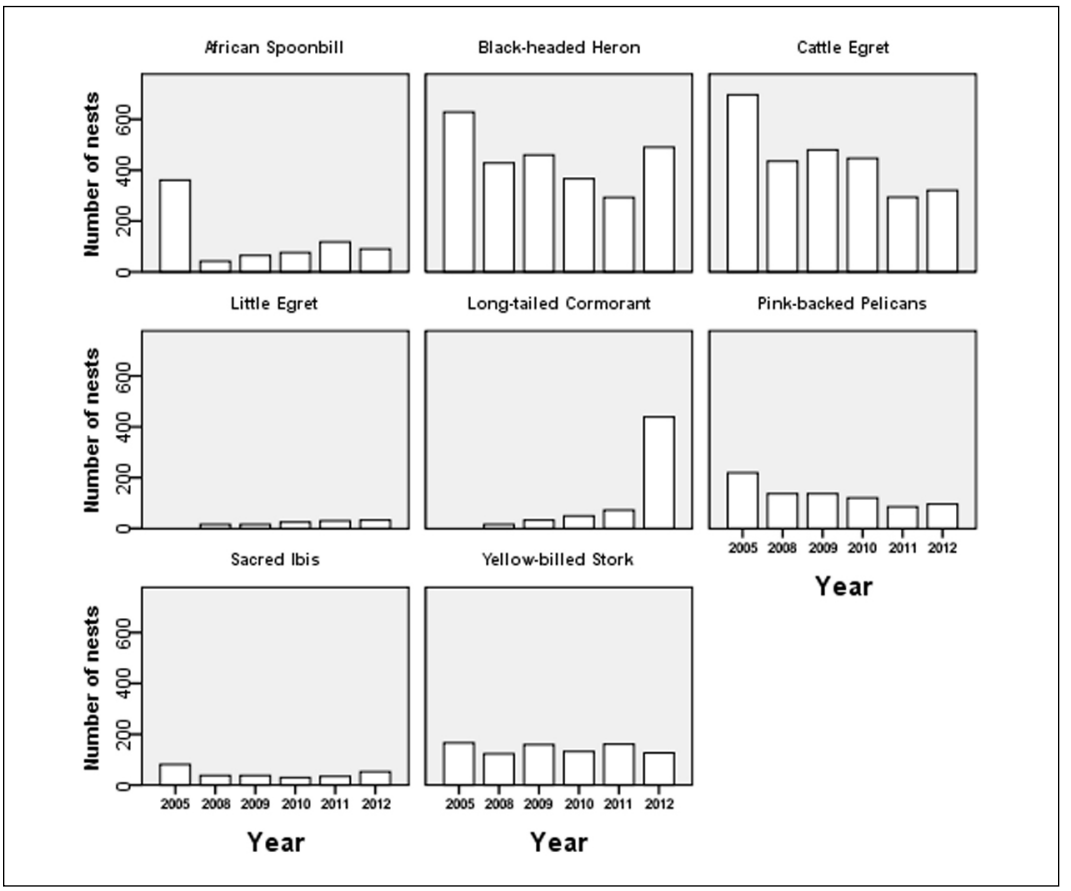

FIGURE 2. Temporal variation in nest abundance of each species.

Milicia excelsa is a hardwood tree species, it provides one of the best timbers and therefore the local community in this area cut them down for this purpose. In addition, most of the breeding sites were located within a few meters of human settlements, including towns, similar to what has been observed in India (Subramanya 1996) and Pakistan (Roberts 1991). This distribution makes these trees very vulnerable as the towns and the human populations in these

towns expand. This is likely to be a general problem in Africa as evidenced from another study by Skinner et al. (1987) in the Niger Delta, where the population of breeding Ciconiiformes and Pelicaniformes declined when the woodlands they were nesting in were cleared to provide land for rice cultivation.

The Pink-backed Pelican nested exclusively on the Mvule trees; therefore the decline in their breeding population was as a result of loss of the nesting trees. The minor population fluctuations of the Cattle Egrets and Black-headed Herons is presumably because they are generalists and can adapt to changing environments (Fasola 1994). For example, they have opted to place their nests on other tree species present at the colony. The increase in the population size of the Long-tailed Cormorant could be attributed to the seasonal floods that are becoming common whenever the rains start. These floods come along with aquatic organisms such as fish, frogs and insects that serve as food for the cormorant. It is clear from these results that the waterbird breeding population in eastern Uganda is highly threatened mainly due to habitat loss. If this trend continues, then the Pink-backed Pelican would be challenged to find an alternative site considering that there are hardly any Mvule trees left in the eastern Uganda landscape, and if there are any, they may not be located in strategic places that will enable quick and easy access to food. The other bird species seem to be coping by nesting on alternative tree species although there is no guarantee that these will not be the next to be logged. We have, however, engaged the local authorities to prevent further loss of these trees.

ACKNOWLEDGEMENTS

The study is part of the monitoring efforts by *Nature*Uganda, the Birdlife International partner in Uganda. We thank the local authorities of Mbale and Butaleja districts for providing protection to the remaining nesting trees especially the Mvule. Comments from Derek Pomeroy greatly improved the manuscript.

REFERENCES

BEAVER, D. L., R G. OSBORN, AND T. W. CUSTER. 1980. Nest-Site and Colony Characteristics of Wading Birds in Selected Atlantic Coast Colonies. Wilson Bulletin 92:200-220.

FASOLA, M. 1994. Opportunistic use of foraging resources by heron communities in Southern Europe. Ecography 17:113-123.

FASOLA, M., AND R. ALIERI. 1992. Conservation of heronry sites in North Italian agricultural landscapes. Biological Conservation 62:219-228.

KELLY J. P., H. M. PRATT, AND P. L. GREENE. 1993. The distribution, reproductive success, and habitat characteristics of heron and Egret breeding colonies in the San Francisco Bay area. Colonial Waterbirds 16:18-27.

NACHUHA, S. 2006. Explaining distribution patterns of waterbirds on rice paddies and other wetlands in eastern Uganda. Ph.D. thesis, Oxford University, Oxford, U.K.

NACHUHA, S., AND J. QUINN. 2012. The Distribution of Colonial Waterbirds in relation to a Ugandan rice scheme. Waterbirds 35:590-598.

NACHUHA, S., AND I. EJOTRE. 2011. The Conservation potential of the Mvule tree as a breeding habitat for waterbirds in Eastern Uganda. P. 10-13 *In*: Skeen, R., D. Pomeroy, M. Opige, and A. Byaruhanga (eds), Proceedings of the 1st *Nature*-Uganda Conservation Conference, 2009, Vol. 1, Series no. 8. Kampala, Uganda.

ROBERTS, T. J. 1991. The birds of Pakistan. Vol. 1. Oxford University Press, Oxford, U.K.

SKINNER, J., J.P. WALLACE, A. WIBE, AND B. FOFANA. 1987. The status of heron colonies in the Inner Niger Delta Mali. Malimbus 9:65-83.

SUBRAMANYA, S. 1996. Distribution, status and conservation of Indian herons. Journal of Bombay Natural History Society 93:459-486.

SCHOGOLEV, I.V. 1996. Fluctuations and trends in breeding populations of colonial waterbirds in the Dnester Delta, Ukraine, Black Sea. Colonial Waterbirds 19 (Special publications 1):91-97.

Bird Populations 13:6-9

SEASONAL MIGRATION OF GREAT HORNBILL *BUCEROS BICORNIS* IN THE HIGH FOREST AREAS OF NAMERI NATIONAL PARK[1]

NIRANJAN DAS[2]
Department of Business Administration
Tezpur University
Napaam-784028, Tezpur
Sonitpur-Assam, India

Abstract. An important area for the Great Hornbill *Buceros bicornis*, placed as Near Threatened on the IUCN Red List, is Nameri National Park, India, within the Eastern Himalayan Mega Biodiversity Hotspot. The species in this area migrates to the lower forest for nesting, needing cavities in large, old growth trees; after nesting it returns to the high forest. Conservation of this species requires the protection of mature forests from logging and actions to substitute feathers and casques from captive bred birds for use in artisanal rituals.
Key words. Great Hornbill, India, logging, Nameri National Park

MIGRACIÓN ESTACIONAL DEL CALAO *BUCEROS BICORNIS* EN LAS ÁREAS DE BOSQUE ALTO DEL PARQUE NACIONAL NAMERI

Resumen. Una importante área para el calao bicorne Buceros bicornis, especie clasificada como casi amenazada en la Lista Roja de la IUCN, es el Parque Nacional Nameri, India, dentro del Punto Caliente de Biodiversidad del Himalaya Oriental. La especie en este área migra a los bosques bajos para anidar, ya que requiere de cavidades en árboles grandes y viejos; después de anidar regresa a los bosques altos. La conservación de esta especie requiere la protección de bosques maduros y acciones para sustituir plumas y cuernos de aves en cautividad para su uso en rituales artesanales.
Palabras clave: calao bicorne, India, tala, Parque Nacional Nameri

The home of the Great Hornbill *Buceros bicornis*, also known as Great Indian Hornbill or Great Pied Hornbill, occurs within the Eastern Himalayan Mega Biodiversity Hotspot, including Nameri National Park. It is one of the richest areas in the world in terms of plant functional type and complexity. Nameri National Park lies between 26º50′ N to 27º03′ N and 92º39′E to 92º59′E and covers an area of 200 km^2 in the northern bank of the mighty river Brahmaputra in Assam. Most parts of the park are covered by Moist Mixed, Deciduous Forests that provide shelter to > 600 species of plants. The Tropical Evergreen and Semi-Evergreen Forests mingle here with the Moist Deciduous Forests. The other forest types like cane and bamboo brakes and narrow strips of open grassland can also be found in this park.

The Great Hornbill, is one of the larger members of the hornbill family and is found in the forests of Nepal, India, mainland Southeast Asia and Sumatra, Indonesia. The species was

[1]Received 5 Dec 2013; accepted 31 March 2014
[2]E-mail: niranjannameri@gmail.com, das_niranjan2002@yahoo.com

formerly broken into the subspecies *cavatus* from the Western Ghats in India, with the nominate form from the sub-Himalayan forest, sometimes named as subspecies *homrai*. The subspecies from Sumatra has sometimes been considered as *cristatus*. The variation across populations is mainly in size, with Himalayan birds being larger than from further south. The species is now usually considered monotypic. The status of the Great Hornbill as per the IUCN Red List is Near Threatened (NT).

This species frequents wet evergreen and mixed deciduous forests, ranging out into open deciduous areas to visit fruit trees; it ascends slopes to at least 1,560 m (Mudappa and Raman 2009). The abundance of this species tends to be correlated with the density of large trees, and it is therefore most common in unlogged forest; indeed, recent work has shown a significant nesting preference for larger trees, usually in old-growth forest (James and Kannan 2009). Within these habitats, the species is usually seen in small parties with larger groups sometimes aggregating at fruit trees. A congregation of 150 to 200 birds has been recorded in Eagle Nest Wildlife Sanctuary in Arunachal Pradesh, which is aerially close to Nameri National Park (Datta 1998).

The Great Hornbill is large, 95–130 cm (37–51 in) long, with a 152 cm (60 in) wingspan and a weight of 2.15-4 kg (4.7-8.8 lbs). Its most prominent feature is the bright yellow and black casque on top of its massive bill. The casque appears U-shaped when viewed from the front and the top is concave with two ridges along the sides that form points in the front, to which reference is made in the Latin species epithet *bicornis*.

Females are smaller than males and have bluish-white instead of red eyes although the orbital skin is pinkish. Like other hornbills, they have prominent 'eyelashes.' The back of the casque is reddish in females while the underside of the front and back of the casque is black in males. The male spreads the preen gland secretion, which is yellow, onto the primaries and bill to give them a bright yellow colour. The commissure of the beak is black and has a serrated and worn edge with age. The wing beats are heavy and the sound produced by birds in flight can be heard from a distance (James 2009). They are sometimes known to fly at great height over forests. Male hornbills have been known to indulge in aerial casque butting, with birds striking each other in flight.

In the wild, the Great Hornbill's diet consists mainly of fruit. Figs are particularly important as a food sources. They also forage on lipid-rich fruits of the *Lauraceae* and *Myristicaceae* families such as *Persea, Alseodaphne* and *Myristica* found in the park. They obtain water entirely from their diet of fruits. The *Ficus, Bischofia, Prema, Amoora, Terminalia,* and *Castanopsis* etc. seed bearing trees are available for the Hornbill and therefore the species migrates seasonally from Pakhui and Eagle Nest wildlife sanctuaries during fruiting season. They are important dispersers of many forest tree species. They also eat small mammals, birds, small reptiles and insects. It has been observed in Nameri National park that Assamese macaques forage alongside these hornbills. A rare squirrel, the Himalayan flying squirrel has been noted in the diet of the species while Collared Scops Owl *Otus bakkamoena*, Jungle Owlet *Glaucidium radiatum* and Grey-fronted Green Pigeon *Treron pompadora* have been noted as prey birds in the Nameri National Park (Datta et al. 2003).

MIGRATION OF GREAT HORNBILLS

The current study was conducted in Pakhui Tiger Reserve (862 km^2, 92°36′–93°09′E and 26°54′–27°16′N) in East-Kameng district of western Arunachal Pradesh and adjacent Nameri Nameri National Park of Assam. The park is surrounded by contiguous forests and delineated by rivers in the east, west and north. Numerous small rivers and perennial streams drain the area. The forests are multistoreyed and rich in epiphytic flora, woody lianas and climbers. A total of 343 woody species of flowering plants (angiosperms) have been recorded from the foothill areas of both the park, with a high representation of species from the Euphorbiaceae and Lauraceae families (Datta and Goyal 1997, Datta 2001). The study area was located in the south-eastern part of the park near the Arunachal Pradesh–Assam border (150–600 m).

As hornbills depend on tree cavities for nesting, an intensive search for nest cavities was carried out during the breeding season, after

which they migrated to high forest area of adjacent Nameri National Park. Cavities of trees being actively used by hornbills were identified by following breeding pairs or breeding males carrying food to the nest, as well as by examining midden deposits of seeds below the nest cavity. Of a total of 18 active nests located in one year, 10 were selected for monitoring.

The nesting season lasted for three months, from March to June. The hornbills started to prepare themselves for breeding in early December, when such pre-nesting behaviour as nest-cavity searching, mating and courtship feeding were exhibited. Both male and female hornbills were noticed peeping into tree cavities, one after the other, and this often continued until the female entering into the nest cavity. The male hornbill feeding the female hornbill was recorded, where the female sat near the nest cavity or perched in a tree, giving loud calls until the male arrived and offered her food. This was also recorded in fruiting trees during migration in the high forest areas of Nameri National Park, where *Syzygium fruticosum, Kayea assamica, Ficus, Bischofia, Prema, Amoora, Terminalia*, and *Castanopsis* are abundant. In the study area, females entered their cavity in the first week of March and some late nests were also recorded in April. All 18 active nests identified were in live trees. All nest trees were in stream/riverine habitats. The majority of the nests were in *Melia dubia* (8) followed by *Syzygium cumini* (4) *Albizia odoratissima* (2), *Mangifera indica* (2), *Terminalia arjuna* (1) and *Terminalia bellirica* (1). Selectivity index indicated that the most preferred nest tree species was *Melia dubia*.

FINAL THOUGHTS

Their impressive size and colour have made hornbills important in many tribal cultures and rituals (Bingham 1897). Therefore, tribal peoples threaten the Great Indian Hornbills with their desire for its various parts, including beaks and heads used in charms, and the flesh as being medicinal. The squabs are considered a delicacy. Tribesmen in parts of northeastern India, particularly Arunachal Pradesh, use their feathers for head-dresses, and their skulls are often worn as decorations. Their flesh is considered unfit for eating by the Nishi tribe with the belief that they produce sores on their feet as in the bird. When dancing with the feathers of the hornbill, the tribesmen avoid eating vegetables as it is also believed to produce the same sores on the feet. Conservation programmes have attempted to provide tribes with feathers from captive hornbills and ceramic casques to substitute natural ones (Poonswad 1994).

Logging is likely to have negatively impacted this species throughout its range, particularly as it shows a preference for forest areas with large trees that may be targeted by loggers (Sethi 2009). Forest clearance for agriculture is also likely to have contributed to population declines. Hornbills are particularly susceptible to hunting pressure as they are large and visit predictable feeding sites (such as fruiting trees), and its casques are kept or sold as trophies. It is also probably impacted by the pet trade.

REFERENCES

Bingham, C. T. 1897. "The great Indian hornbill in the wild state". Journal of the Bombay Natural History Society 11:308–310.

Das, N. 2010. The Birds of Nameri National Park, Assam-India: An Annotated Checklist. Bird Populations 10:37-55.

Datta, A. 1998. Hornbill abundance in unlogged forest, selectively logged forest and a forest plantation in Arunachal Pradesh, India. Oryx 32:285–294.

Datta, A., and G. S. Rawat. 2003. Foraging Patterns of Sympatric Hornbills during the Nonbreeding Season in Arunachal Pradesh, Northeast India. Biotropica 35: 208–218.

Dymond, N. 1998. List of Birds seen in Nameri National Park: 25–27 November 1998. Unpublished Trip Report, Nameri National Park.

Hendriks, H. 1998. Birds seen in North-Eastern India. Unpublished Trip Report, Nameri National Park.

James, D. A., and R. Kannan. 2009. Nesting habitat of the Great Hornbill (*Buceros bicornis*) in the Anaimalai Hills of southern India. Wilson Bulletin 121:485–492.

Kannan, R., and J. Douglas. 1997. Breeding biology of the Great Pied Hornbill (Buceros bicornis) in the Anaimalai Hills of southern India. Journal of the Bombay Natural History Society 94:451–465.

Mudappa, D., and T. R. Shankar Rahman. 2009. A conservation status survey of hornbills (Bucerotidae) in the Western Ghats, India. Indian Birds 5:90-102.

Poonswad, P., and A. Tsuji. 1994. Ranges of males of

the Great Hornbill *Buceros bicornis*, Brown Hornbill *Ptilolaemus tickelli*, and Wreathed Hornbill *Rhyticeros undulatus* in Khao Yai National Park, Thailand. Conservation Biology 8:79–86.

SETHI, P., AND H. HOWE. 2009. Recruitment of Hornbill-Dispersed Trees in Hunted and Logged Forests of the Indian Eastern Himalaya. Conservation Biology 23:710–718.

Great Hornbill in Nameri National Park

Traditional use of Hornbill Casque

Hornbill in *Bischofia javanica* tree in High Forest Area

Great Hornbill in *Tetrameles nudiflora* Tree

Hornbill Soaring in High Forest Area in the Park

Bird Populations 13:10-16

IS THE FULVOUS WHISTLING-DUCK A THREAT TO THE RICE CROP AT KIBIMBA SCHEME, EASTERN UGANDA?[1]

POLYCARP M. MWIMA[2]
Makerere University
Department of Environmental Science
P.O Box, 7062
Kampala, Uganda

SARAH NACHUHA AND IMRAN EJOTRE
Islamic University in Uganda
Department of Environmental Science
P.O Box, 2555
Mbale, Uganda

Abstract. The effect of the Fulvous Whistling-Duck (*Dendrocygna bicolour*; FWD) on the crop at Kibimba rice scheme, eastern Uganda, was investigated using both field methods and diet composition. Data were collected from 31 plots of 4ha each established on newly-seeded fields. Three, 3x3m exclosures (experimental treatment) and non-enclosures (control treatment) were placed randomly in each plot. We counted the number of rice seeds and the number of FWDs in the plot on three consecutive days after seeding. The number of rice plants in the experimental treatments was then counted six weeks later. A significant difference in the number of FWDs existed across the three days which was not the case for the number of rice seeds. The number of rice plants did not vary between treatments. Rice (*Oryza sativa*) and grass weeds (*echinochloa* spp) contributed 50.5% and 16.3% of the overall diet in dry weight, respectively. Results of this study indicate that FWDs appear not to be a threat to the rice crop at Kibimba. On the other hand, the presence of weed seeds in the FWD diet suggests that these birds may perform an ecosystem service of controlling weeds on rice farms.
Key words: Fulvous Whistling-Duck, rice, Kibimba rice scheme, Uganda.

ES EL SUIRIRÍ BICOLOR UNA AMENAZA PARA LOS ARROZALES DEL PROGRAMA KIBIMBA EN UGANDA DEL ESTE?

Resumen. El efecto del suirirí bicolor (*Dendrocygna bicolor*) en los arrozales del Programa Kibimba, en el este de Uganda, fue investigado utilizando métodos de campo y estudios de la composición de la dieta. Los datos se colectaron en 31 parcelas de 4 ha cada una establecidas en campos recién sembrados. Tres recintos de exclusión de 3x3 m (tratamiento experimental) y recintos no-excluyentes (tratamiento de control) fueron situados aleatoriamente en cada parcela. Contamos el número de granos de arroz y el número de suiririís en la parcela durante tres días consecutivos tras la siembra. El número de plantas de arroz en los tratamientos experimentales fue contado seis semanas después. Encontramos una diferencia significativa en el número de suiririís entre los tres días, pero no así en el número de granos de arroz. El número de plantas de arroz no varió entre tratamientos. Granos de arroz (*Oryza sativa*) y semillas de malas hierbas (*Echinochloa spp.*)

[1]Received 13 March 2014; accepted 7 April 2014
[2]E-mail: pmwima@gmail.com

contribuyeron un 50.5% y 16.3% del peso seco total de la dieta, respectivamente. Los resultados de este Granos de arroz (*Oryza sativa*) y semillas de malas hierbas (Echinochloa spp.) contribuyeron un 50.5% y 16.3% del peso seco total de la dieta, respectivamente. Los resultados de este estudio indican que los suiririrís no parecen constituir una amenaza para el cultivo de arroz en Kibimba. Por otro lado, la presencia de semillas de hierbas en la dieta de los suiririrís sugiere que estas aves pueden realizar un servicio ambiental controlando las malas hierbas en arrozales.

Palabras clave: suiririrí bicolor, arroz, programa arrozales Kibimba, Uganda.

INTRODUCTION

Rice growing creates a mosaic of wetland habitats that have led to benefits for waterbirds in Uganda and elsewhere (Nachuha 2006). For example the Fulvous Whistling-Duck *Dendrocygna bicolour* (hereafter: FWD) during the past several decades extended its range and population size in close association to rice growing (Lynch 1943, Bolen and Rylander 1983, Carrol 1932, Meanley and Meanley 1959, Palmer 1976). As a result, this species is now considered a serious pest by farmers (Bomford 1988, Dallmier 1991, Bruzual and Bruzual 1983). However, opinions vary widely as reflected by the counter claim that FWDs benefit farmers by consuming weeds (Singleton 1951).

There is also contradictory evidence about the most vulnerable stage of the rice crop. Hasbrouck (1944) reported that FWDs were exceedingly injurious to rice when the broadcast planting method was used, and that they never touched the sprouted rice or the growing crop. Most damage occurred 3-5 days prior to germination (Currey 1984). However, levels of depredation from ducks vary and are often widespread, and this variability compounds the problems associated with distinguishing losses attributed to ducks and other predators. In light of these difficulties, detailed studies of duck depredations are still required to elucidate and determine the amount of damage caused. As agricultural damage by FWDs is a major concern, not only for farmers but for conservationists as well, the purpose of this study was to assess the effect of this species on the rice crop at the Kibimba Rice Scheme.

Rice also has been found to be the most important item in the diet of FWDs when they use rice paddies as feeding sites (Turnbull et al. 1989, Bruzual and Bruzual 1983, Dallmier 1991). Seeds of various rice field weed species occur in FWD diet as well (Hasbrouck 1944, Meanley and Meanley 1959, Landers and Johnson 1976). In Africa, the diet of FWDs has been documented in the context of a larger study on the damage caused by waterfowl generally to rice in the Senegal Delta (Treca 1986), and some aspects of FWD feeding behaviour have been studied in a flooded farm in South Africa (Clark 1978), at Lonchivar in Zambia (Douthwaite 1977) and at Lake Chilwa, Malawi (Schulten 1974). However, no such study exists in Uganda except for a distribution and abundance study (Arinaitwe 1992).

STUDY AREA AND METHODS

This study was conducted at Kibimba Rice Scheme, the larger of the two commercial growing areas in Uganda, and the only one where the broadcast method is used in the paddies. Kibimba Rice Scheme is located in eastern Uganda and is one of the Important Bird Areas supporting a high number of birds, particularly the FWD (Arinaitwe 1992). The FWD has been persecuted by the management of this scheme claiming that the species causes a lot of damage to the crop at different stages of its growth, but most especially after the broadcasting of the rice grains. Kibimba Rice Scheme is divided into blocks of varying sizes that are subdivided into plots of approximately 4ha by earth levees. Rice growing at this scheme involves broadcasting seeds on flooded fields (water depth ~ 6-10 cm) by a small agricultural aircraft. The fields are then gradually drained over a period of 3-4 days approximately.

The aim of this study was achieved by using both direct and indirect measures. The direct measure of FWD effect involved counting the number of rice seeds on three consecutive days after broadcasting while the indirect one involved counting the number of rice plants six weeks later.

From the onset, thirty-one 4ha plots that were ready for broadcasting were identified, upon which on the evening/morning of broadcasting we set up in each: three, 3x3 m exclosures that prevented consumption of rice seeds by birds (the experimental treatments), and three 3x3 m non-enclosures that allowed use (control). These exclosures were constructed using expanded metal with a mesh size of 1x1 cm supported by four pieces of wood (4x4 cm thick, 1.5 m tall). Four similar sized pieces of wood were used to demarcate the non-enclosures. We placed these experimental treatments randomly within the rice fields.

After setting up the experimental plots we estimated the number of rice seeds in the 4ha plots over the three days after broadcasting. To do this, we used a 0.25 m^2 metal frame that we threw 30 times daily in each plot, counting the number of rice seeds. This was to establish whether there was a decline in the number of rice seeds on the subsequent days after broadcasting. Counting of rice seeds was slightly obscured on the first day since the seeds were still under water (about 5 cm), but this was not a problem on the second and third day, as the plots were progressively drained.

Following the seeding, a total count of all FWDs using the plots, and the number foraging, was done for three consecutive days. Bird counts were done between 06:30-07:00 hrs for about 5-10 minutes depending on numbers. The birds were counted individually or in groups of five or ten if flocks were large. Water depth measurements were also taken at four randomly located points within each plot.

Data on the number of rice plants in the two treatments was collected after six weeks from the time of broadcasting. Using a 0.25 m^2 metal frame that we placed in a random location within each treatment, we counted the number of rice plants. This gave us three data points per treatment per plot and 93 data points for each treatment for the 31 plots. The entire data collection lasted a period of three months from December 2010 to February 2011.

COLLECTION OF DIET SAMPLES

Stomach contents analyses must be done before conclusions are reached concerning the economic importance of FWDs to agriculture (Rylander and Bolen 1980). To obtain information on the diet of the FWDs, we collected crop and gizzard contents from dead birds. Twenty-two birds were bought from hunters (local people) encountered in the field and supplemented by 31 birds killed after hitting power lines. The contents of 53 gizzards and 28 crops were each separately emptied into sample bottles containing 80% ethyl alcohol (Swanson and Bartonek 1970) for further analysis in the laboratory. During the laboratory analysis, the contents were rinsed over a 250µm mesh sieve and subsequently placed in clear water in a petri dish. With the aid of a microscope the contents were searched for food items. Food and grit were separated and placed on small filter papers. The materials were next oven dried to a constant weight at 65°C, left to cool and then weighed to obtain the dry weight (Swanson et al. 1974). The food was separated into the plant and animal foods for easier comparison with other studies in which foods were analyzed from gizzard and crop samples. Plant materials were easily identifiable to species level, which was not the case for animal material.

DATA ANALYSIS

Two separate analyses were done to determine if the number of rice seeds and FWDs varied across the three days after broadcasting. Numbers of rice seeds conformed to the normal distribution (One-Sample Klomogorov-Smirnov Test: $Z = 0.736$, $P = 0.650$, $n = 93$); therefore, these differences were tested using General Linear Mixed Models (GLMM) in Genstat version 3.0 (VSN Intl. 2003). Day was used as a fixed effect and the abundance of FWDs was used as a covariate in the analysis in which the number of rice seeds was used as the response variable. Plot was used as a random effect in all the analyses to control for pseudoreplication (Hulbert 1984). The numbers of rice plants in the experimental and control treatments also conformed to the normal distribution ($Z = 0.942$, $P = 0.338$, $n = 186$). A t-test for independent samples was used to compare the number of rice plants between treatments.

DIET COMPOSITION

Data on each item found in the crop, gizzard, and the total of both the crop and gizzard were expressed in two ways: 1) average % of dry weight = $\sum W_i/N$, where W_i = weight of the i^{th}

food item expressed as a percentage of the weight of all food items in the sample, and N = total weight of all food samples (Swanson *et al*. 1974); and 2) the occurrence of the food item i.e. in how many gizzards and crops the food item was found present.

RESULTS

VARIATION ACROSS THE THREE DAYS BEFORE GERMINATION

The abundance of FWDs on the rice scheme ranged from 0-556 individuals with an average of 84.9 ±107.2 SD birds. There was a significant relationship between the abundance of rice seeds and the total number of FWDs after controlling for differences in Day (Table 1). The number of FWDs increased with increasing numbers of rice seeds (Table 2). However, despite this relationship, the abundance of rice seeds did not vary significantly across the three days following broadcasting (Tables 1, 2). Although the number of rice seeds did not vary across the three days, the abundance of FWDs decreased significantly (Table 2, Figure 1). The student *t*-test results revealed that the number of rice plants did not vary between treatments six weeks later ($t_{(184)} = 0.824$, $P = 0.411$).

DIET COMPOSITION

A total of 53 adult birds were collected, 31 (57%) of which were from power line kills and 22 (43%) from hunters. The diet of these FWDs was composed of plant and animal matter. The percent dry weight of the food contents show that FWDs ate mostly plant material, with animal materials present in the diet of only a few individuals. Rice constituted almost half of the total dry weight (57.4%) of the diet, and was present in all the gizzards (Table 3). Seeds of *Echinochloa* spp were the most abundant in the diet (Table 3). Other plant seeds included sorghum (*Sorghum* spp.), which was present in very small quantities. No other plant structures other than seeds were found in the gizzards or crops, although some studies have shown that FWDs feed on plant shoots and leaves. Animal

TABLE 1. General Linear Mixed Models of number of rice seeds and FWDs across the three days before germination. Two separate models are given.

Response variable	Explanatory variables			
	Model	Wald statistic	df	Chi^2 probability
1. Number of rice seeds	Fixed term			
	Day	0.24	2	0.775
	Total of FWDs in the plot	8.10	1	0.045
2. Number of FWDs	Fixed term			
	Day	135.72	2	<0.001
	Water depth	0.73	1	0.392

TABLE 2. Mean ± SD of abundance of rice seeds, FWDs and water depth on the three subsequent days after broadcasting.

	Days after broadcasting			
	Overall Mean ± SD	Day 1 Mean ± SD	Day 2 Mean ± SD	Day 3 Mean ± SD
Rice seeds	60.4 ± 24.6	60.9 ± 24.7	60.2 ± 25.0	60.1 ± 23.9
Total FWDs in the plot	83.8 ± 106.4	195.5 ± 113.7	58.1 ± 42.0	1.0 ± 1.83
Water depth (cm)	4.3 ± 2.3	6.4 ± 1.1	4.9 ± 0.8	1.5 ± 0.5

Sample size was 30 throws in 31 plots = 930 throws.

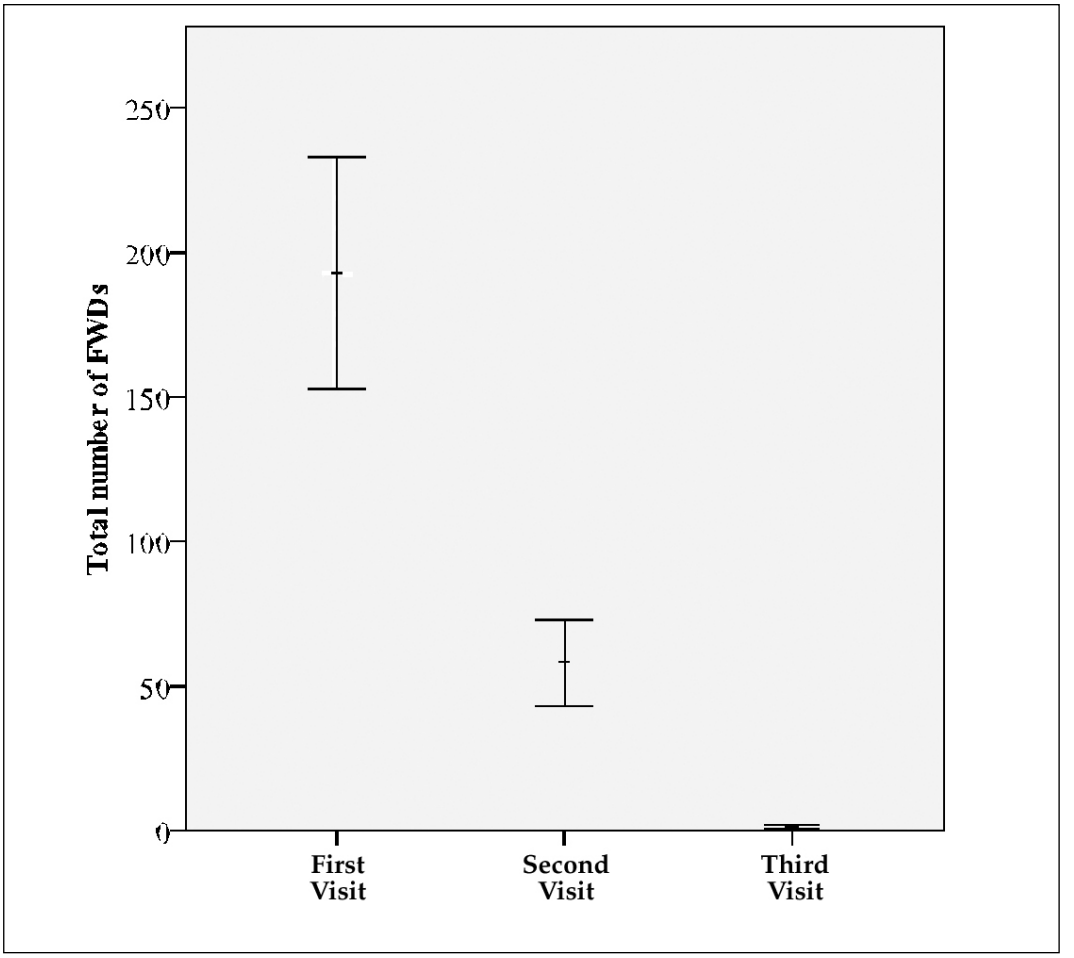

FIGURE 1. Variation in mean ± SE of FWDs across the three days after broadcasting.

TABLE 3. Percentage of plant and animal items found in the gizzard and crops of 53 FWDs.

	Gizzard (53)			Crop (28)			Total (crop+gizzard)		Occurrence	
Type of food	Total weight (g)	%	n	Total weight (g)	%	n	Total Weight (g)	%	Gizzards	Crops
Rice seeds	60.4	24.6	60.9	24.7	60.2	25.0	60.1	23.9	60.1	23.9
Echinochloa spp	24.7	16.3	53	13.1	23.1	53	37.8	18.2	44	25
Nymphae spp	0.5	0.3	3	0.2	0.4	1	0.7	0.3	3	1
Sorghum	0.4	0.3	6	0.6	1.2	3	1.0	0.5	4	3
Animal	0.1	0.1	4	0.1	0.2	2	0.2	0.1	6	3
Grit	49.5	32.5	53			0	49.5	23.7	53	0
Total (N)	151.9	100		56.7	100		208.6	100		

n = number of samples
N= as defined in the methods section.
Numbers in brackets show the number of gizzards and crops from which diet samples were collected

matter, composed of molluscs and insects, occurred in very small proportions.

DISCUSSION

VARIATION ACROSS THE THREE DAYS AFTER SEEDING

The number of rice seeds did not vary across the three days prior to germination. This indicates that FWDs do not have any effect on the rice crop at Kibimba Rice Scheme. However, there was a decline in the abundance of FWDs across the three days after rice broadcast and this decline is probably attributed to the declining water levels. The positive relationship between the number of rice seeds and the total number of FWDs implies that FWDS are attracted to the rice fields because of the presence of rice seeds. These results indicate that the presence of water was a primary cue in habitat use by FWDs, a finding in agreement with Bruzual and Bruzual (1983). No matter how abundant seeds were, they only became available when there was sufficient water to facilitate their consumption by FWDs.

FWDs were observed feeding in the whole plot including the control plots (non-enclosed areas). The lack of variation in the number of rice seeds across the three days before germination and rice plants between treatment effects could be probably attributed to the fact that the number of FWDs is small compared to the amount of rice broadcast to cause any significant effects.

RICE IN THE DIET OF FWDS

Although earlier results indicated that FWDs do not seem to have an impact on the rice crop, rice seeds dominated their diet (57.2%). There is a possibility that some specimens, especially those obtained from hunters, may have had bait (poisoned rice) in their gizzards/crops, which contributed to this relatively high proportion of rice in the diet.

WEEDS IN THE DIET OF FWDS

The presence of *Nymphae* spp in the diet of the birds indicates some foraging in natural wetland habitat. *Echinochloa* spp grass seeds were also abundant in the diet of ducks, although second to rice. *Echinochloa* spp are considered the most serious and widespread weeds at Kibimba Rice Scheme (Ishwar Singh, Plant breeder, Kibimba Rice Scheme, pers. comm.). The importance of this weed in the diet of FWDs in the different regions of the world indicates that FWDs may play a significant role in the control of this weed on rice schemes (Singleton 1951, Meanley and Meanley 1959, Bruzual and Bruzual 1983, Lynch 1943).

CONCLUSIONS

Although there was no significant evidence from this study that FWDs cause damage to the rice crop, the presence of rice in their diet indicates that FWDs may have a slight negative impact on the rice crop if their population is very high. The predation on economically important weeds, such as *Echinochloa* spp. by FWDs, can have a positive impact on the control of these undesirable weeds. Therefore, once farmers learn about this information, the persecution of these ducks may become less.

ACKNOWLEDGEMENTS

This study was sponsored by the Islamic University in Uganda to whom we are indebted. Many thanks to the managing director of Kibimba rice scheme for granting us access to their land and *Nature*Uganda, the BirdLife International Partner in Uganda for lending us some of their equipment. Comments from Professor Derek Pomeroy greatly improved this manuscript.

REFERENCES

ARINAITWE, J. 1992. Effects of wetland drainage on wildlife with special reference to birds. MSc. Thesis, Makerere University.

GENSTAT [8.1]. (VSN Intl.2003) VSN International Ltd, Oxford.

BOLEN, E. G., AND M. K. RYLANDER. 1983. Whistling-ducks: zoogeography, ecology, anatomy adaptations in four species of whistling ducks *Dendrocygna*. Museum Special Publication Texas Tech University, Lubbock TX 20:67.

BOMFORD, M.1988. Effects of wild ducks on rice production. CSIRO, Melbourne, Australia.

BRUZUAL, J. J., AND I. B. BRUZUAL. 1983. Feeding habits of whistling ducks in the Calobozo rice fields, Venezuela, during the on-reproductive period. Wildfowl 34:20-26.

CARROL, J. J. 1932. A change in the distribution of the fulvous tree duck (*Dendrocygna bicolor helva*) in Texas. Auk 49:343-344.

CLARK, A. 1978. Some aspects of the behaviour of whistling ducks in South Africa. Ostrich 49:31-39.

CURREY, A. 1984. Rice growing in New South Wales. Dept of Agriculture New South Wales and Rice Research Committee. New South Wales, Sydney.

DALLMIER, F. G. 1991. Whistling ducks as a manageable and sustainable resource in Venezuela: balancing economic costs and benefits. University of Chicago Press, Chicago, IL.

DOUTHWAITE, R. J. 1977. The Filter-feeding ducks on the Kafue flats, Zambia 1971-1973. Ibis 119:44-46.

HASBROUCK, E. M. 1944. Fulvous tree-ducks in Louisiana rice fields. Auk 61:305-306.

HULBERT, S. H. 1984. Pseudoreplication and the design of field experiments. Ecological Monograph 54:187-211.

LANDERS, J. L., AND A. S. JOHNSON. 1976. Foods of Fulvous-whistling ducks coastal South Carolina. Wilson Bulletin 88:659-660.

LYNCH, J. J. 1943. Fulvous tree duck in Louisiana. Auk 60:100-102.

MEANLEY, B., AND M. A. MEANLEY. 1959. Observations on fulvous tree duck in Louisiana. Wilson Bulletin 71:33-45.

NACHUHA, S. 2006. Explaining distribution pattern of waterbirds on rice paddies and other wetlands in eastern Uganda, PhD Thesis, Oxford University, UK

PALMER, R. S. 1976. Handbook of North American birds. Yale University Press, New Haven, CT.

RYLANDER, M. K. AND E. G. BOLEN. 1980. The ecology of whistling ducks in the tropics. Pp. 309-314 *in* J. L. Furtado (ed.) Tropical Ecology and Development (Proceedings of the Vth International Symposium of Tropical Ecology, 16–21 April 1979, Kuala Lumpur, Malaysia), Vol. 1. Department of Zoology, University of Malaya, Kuala Lumpur, Malaysia.

SCHULTEN, G. G. M. 1974. The food of some duck species occurring at Lake Chilwa, Malawi. Ostrich 45:224-226.

SINGLETON, J. R. 1951. Production and utilisation of waterfowl food plants on the east Texas gulf coast. Journal of Wildlife Management 15:46-56.

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.

SWANSON, G. A., G. L. KRAPU, J. C. BARTONEK, J. R. SERIE AND D. H. JOHNSON. 1974. Advantages in mathematically weighing waterfowl food habitat data. Wildlife Management 38:302-307.

TRECA, B. 1986. Le regime alimentaire du Dendrocigna fauve (*Dendrocygna bicolor*) dans le delta du Senegal; comparison avec la Sarcalle d'ete (*Anas querquedula*) et al Dendrocygne veuf (*D. viduata*). L'Oiseau 56:59-68.

TURNBULL, R. E., F. A. JOHNSON AND D. H. BRAKHAGE. 1989. Status, distribution, and foods of Fulvous Whistling Ducks in South Florida. Journal of Wildlife Management 53:1046-1051.

Bird Populations 13:17-27

BIRD MONITORING AT ZACKENBERG, NORTHEAST GREENLAND, 2011[1,2]

JANNIK HANSEN[3], LARS HOLST HANSEN, LARS O. MORTENSEN,
LINE ANKER KYHN AND NIELS MARTIN SCHMIDT
Department of Bioscience
Aarhus University
P.O. Box 358
DK-4000 Roskilde, Denmark

JEROEN RENEERKENS
Animal Ecology Group
Centre for Ecological and Evolutionary Studies
University of Groningen
PO Box 14
9750 AA Haren, The Netherlands

Abstract. The densities of common breeding birds in the Zackenberg valley, Greenland, such as Sanderling *Calidris alba* and Dunlin *C. alpina*, were relatively high compared to previous years. Breeding Long-tailed Skuas *Stercorarius longicaudus*, however, were again found in low numbers, most likely reflecting the observed low number of lemmings. Only two of the focal wader species (Sanderling and Ruddy Turnstone *Arenaria interpes*) initiated nests relatively early, while the dunlin was relatively late this season. Generally, the nest success of the wader species was low in 2011, though sanderlings were quite successful this season. The mean wader clutch size was 3.84, which is above average compared with previous seasons. For the Barnacle Geese *Branta leucopsis*, a record low number of three broods were observed. Despite the low lemming nest numbers found, breeding Arctic Fox *Vulpes lagopus* were observed in three breeding dens, with an estimated minimum number of only seven cubs. There was hardly any snowfall in winter. As a result, snow cover on flat areas was reduced to 50% on 31 May and melted off completely on 4 June. Ice broke up on major rivers on 7 June. In general the season was early, with a relatively wet and unstable summer.
Key words: Arctic, avian monitoring, climate, geese, Greenland, skuas, waders

MONITOREO DE AVES EN ZACKENBERG, NORESTE DE GROENLANDIA, 2011

Resumen. Las densidades de aves comunes reproductoras en el valle de Zackenberg, Groenlandia, como el correlimos tridáctilo *Calidris alba* y el correlimos común *Calidris alpina*, fueron relativamente altas comparadas con años anteriores. Sin embargo los números de págalos raberos *Stercorarius longicaudus* fueron bajos una vez más, seguramente debido a los bajos números de lemmings observados. Sólo dos de las especies focales de zancudas (correlimos tridáctilo y vuelvepiedras común *Arenaria interpes*) iniciaron la nidificación relativamente pronto, mientras que

[1]Received 7 April 2014; accepted 4 December 2014
[2]Adapted with permission from Aarhus University (2010)
[3]Corresponding author, email: jaha@dmu.dk

el correlimos común lo hizo relativamente tarde esta temporada. En general, el éxito de nidificación de las zancudas fue bajo en 2011, aunque los correlimos tridáctilos fueron bastante exitosos. La puesta media de las zancudas fue de 3.84, lo cual está por encima del promedio de temporadas anteriores. Para la barnacla cariblanca Branta leucopsis se registró un bajo número récord de tres pollos. A pesar del bajo número de lemmings, se observaron zorros árticos *Vulpes lagopus* en tres zorreras, con un número mínimo estimado de sólo siete cachorros. Casi no hubo nieve durante el invierno. Como resultado, la cobertura de nieve en las áreas planas se redujo al 50% el 31 de mayo y se fundió completamente el 4 de junio. El hielo se rompió en los principales ríos el 7 de junio. En general la temporada fue temprana, con un verano relativamente húmedo e inestable.

Palabras clave: Groenlandia, monitoreo, Artico, zancudas, gansos, clima

INTRODUCTION

The monitoring programme, Zackenberg Basic, based at the Zackenberg Research Station in central Northeast Greenland (Figure 1), was conducted for the 17th season. For details of the previous years, please refer to Hansen et al. (2010a). This paper presents a summary of the bird monitoring part of the Biobasis programme from the 2011 season. The results presented here will also be available in the 17th ZERO Annual Report (Jensen 2012). Similar reports from previous seasons are available for all previous field seasons (see www.zackenberg.dk/publications.htm).

Details on Biobasis methodology are available at the home page of the research station (http://www.zackenberg.dk/monitoring/biobasis/), the current sampling protocol (Schmidt et al. 2011) is available through the authors, while the database is available online: http://www.zackenberg.dk/data/.

METHODS

A complete initial census was performed between 11 and 23 June, which is a relatively late last day of census. The weather prevented census work on several days in the period. The completion of the survey took 35 'man-hours,' which is near average. Almost the entire 15.8 km^2 census area was snow free, and the entire census was performed in good weather conditions.

In addition to the initial census, large parts of the census area were covered regularly during June, July and most of August, exceptions being the closed goose moulting area along the coast and the Aucellabjerg slopes above 350 m a.s.l. The latter were covered on only five occasions by the BioBasis staff, but by many visits by Reneerkens and colleagues, working on a sanderling breeding ecology project.

Compared with recent years, the total effort in June and July 2009 was average in June (135 hrs) and near average in July (70 hrs). The results of the initial census, supplemented with records from the rest of the season (see Schmidt et al. 2011), are presented in Table 1; and in Table 2, these are compared with the estimates of previous seasons.

RESULTS AND DISCUSSION

BREEDING POPULATIONS

The first Red-throated Diver *Gavia stellata* pair settled in a fen near the research station on day of year 152 (1 June), only a day after the first observation of the species. Three pairs attempted to breed within the census area and two nests were found. All fell victim to predation.

The number of Common Ringed Plover *Charadrius hiaticula* territories was a little below average.

Sanderling *Calidris alba* territories were recorded at comparatively high numbers (Table 2). After a few years with slightly falling numbers, 2011 saw a new rise. Dunlin *Calidris alpina* territories were found in high numbers again this year (cf. Hansen et al. 2012). In early years Dunlin territory numbers might have been underestimated (Meltofte 2006).

Ruddy Turnstone *Arenaria interpres* territories were found in numbers just above average, as were Red Knot *Calidris canutus* territory numbers (Tables 1, 2).

No phalarope nests (Red-necked Phalarope

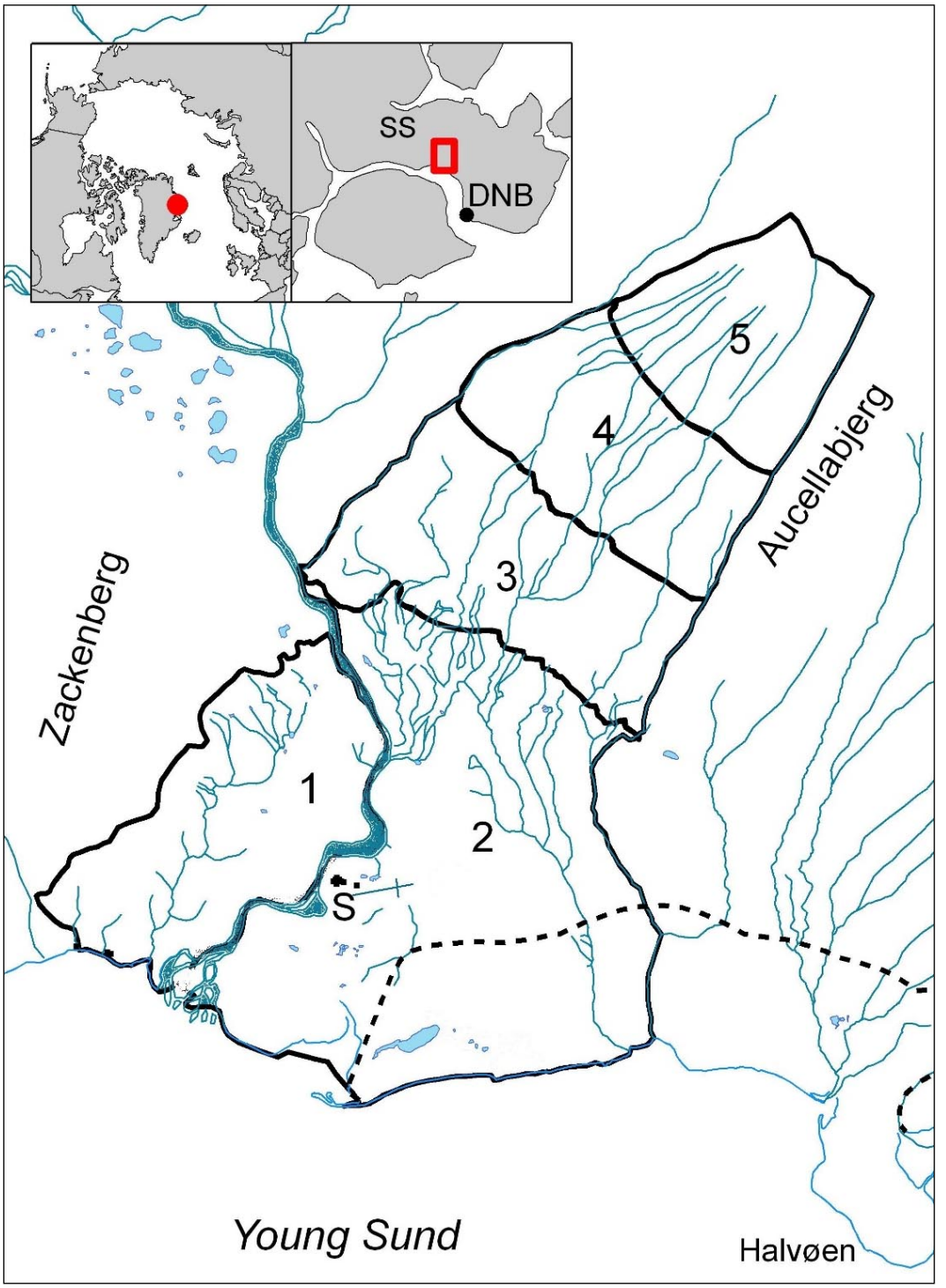

FIGURE 1. Map of the study area in Zackenberg, central Northeast Greenland, with sections 1-5 of the bird census area. Also shown, selected place names mentioned in the text, the research station (S) and the border of the closed goose moulting area, 1c (broken line).

TABLE 1. Estimated numbers of pairs/territories in four sectors of the 15.8 km² census area in Zackenberg, 2011.

Species	<50 m a.s.l. 7.77 km²	50-150 m a.s.l. 3.33 km²	150-300 m a.s.l. 2.51 km²	300-600 m a.s.l. 2.24 km²	Total
Red-throated Diver	3-4	0	0	0	3-4
King Eider	0	0	0	0	0
Long-tailed Duck	5-6	0	0	0	5-6
Rock Ptarmigan	0	1	1-2	0	2-3
Common Ringed Plover	8	3	5-6	8	24-25
Red Knot	9-13	21-22	1	0	31-35
Sanderling	32-33	6	18-20	6-7	62-66
Dunlin	74-80	22-23	0	0	96-103
Ruddy Turnstone	18-23	28-29	0	0	46-52
Red-necked Phalarope	0	0	0	0	0
Long-tailed Skua	8-10	5	2-3	0	15-18
Glaucous Gull	1	0	0	0	1
Arctic Redpoll	1-2	0	0	0	1-2
Snow Bunting	38	27	6	2	73

Phalaropus lobatus; Red Phalarope *P. fulicarius*) were found in 2011.

Long-tailed Skua *Stercorarius longicaudus* territories were found in numbers below average within the census area, although higher than the last few years (Table 2). Six pairs nested in the census area (see below). Another three nests were found in adjacent areas.

A Glaucous Gull *Larus hyperboreus* pair has had a nest on an islet in the same stretch of Zackenbergelven since at least 2004. 2011 was no exception. No chicks were seen, and the nest is thought to have fallen victim to surge flooding. This species was seen daily throughout the season and a very large flock of 43 were seen as early as day 131 (11 May). The species was still recorded in late September.

The number of Rock Ptarmigan *Lagopus muta* territories was average. Two broods were found – both on the slopes of Aucellabjerg – on day 192 (11 July).

Numbers of Snow Bunting *Plectrophenax nivalis* territories was the highest since 2005 (Table 2). Juveniles of Snow Bunting were seen both within the census area and in adjacent areas – in fair numbers. Fledgling success seemed quite high, although no systematic efforts were made. One to two Arctic Redpoll *Carduelis hornemanni* territories were recorded this year (Table 2).

It is likely that Lapland Bunting *Calcarius lapponicus* bred in the study area. One pair and another singing male were recorded this season. Zackenberg had the Northernmost breeding record on the east coast of Greenland in 2010 (Hansen et al. 2012b; cf. Boertmann 2008).

REPRODUCTIVE PHENOLOGY IN WADERS

Among wader nests, 7.7% were initiated before day 161 (10 June) and 61.5% before day 171 (20 June). 36.5% of the nests were initiated after day 171 (Table 3).

The snow cover on day 161 (6 June) was 78% and nest initiation was relatively late for dunlin compared with previous seasons, although slightly earlier than average for sanderling and ruddy turnstone (Table 4).

REPRODUCTIVE SUCCESS IN WADERS

The all-wader nest success was low in 2011 – among the lowest during the BioBasis programme. Using the modified Mayfield method (Johnson 1979), 14.4% of the wader nests were successful.

Dunlin nests were hit less hard than other wader species, with 21.1% nest success. However, this is the lowest success rate through the years of BioBasis. The Sanderling nest success was the highest since 2004 (Table 5). Two Red Knot nests were found in 2011, both suffered predation. The Ruddy Turnstone nests were generally unsuccessful; 2.9% success only.

TABLE 2. Estimated numbers of pairs/territories in the 15.8 km² census area in Zackenberg, 2011, compared with the 1996-2010 averages.

REGULAR BREEDERS

Species	No. of territories	Average min. and max no. territories 1996-2010	No. of nests found[1]	Comments
Red-throated Diver	3-4	2.4-2.8	0	
Common Eider	0	0.3-0.4	0	
King Eider	0	1.2-2	0	
Long-tailed Duck	5-6	5.3-6.3	1	
Rock Ptarmigan	2-3	2.5-3.5	0	
Common Ringed Plover	24-25	28.9-35.4	0	
Red Knot	31-35	24.7-31.5	3	
Sanderling	62-66	50.6-58.6	22	
Dunlin	96-103	74.9-84.9	13	
Ruddy Turnstone	46-52	40.9-46	8	
Red-necked Phalarope	0	0.8-1.6	0	
Long-tailed Skua	15-18	17.8-21.9		
Glaucous Gull	1	0.5	1	
Common Raven	2	-	-	Nests outside the census area.
Snow Bunting	73	42.4-47.3		Nests of passerines are only found opportunistically.

IRREGULAR BREEDERS

Species	No. of territories	Average min. and max no. territories 1996-2010	No. of nests found[1]	Comments
Pink-footed Goose	0	0.13	0	Min. 3324 immatures migrated northwards over the area
Eurasian Golden Plover	0	0.06	0	
Red Phalarope	0	0.6-0.75	0	
Snowy Owl	0	0.06	0	
Northern Wheatear	0	0.08-0.16	0	Nests of passerines are only found opportunistically.
Arctic Redpoll	1-2	0.6-1.0	0	Nests of passerines are only found opportunistically.
Lapland Bunting	1-2	0.06	0	Nests of passerines are only found opportunistically.

[1] Within the census area

TABLE 3. Median first egg dates for waders at Zackenberg, 2011, as estimated from incomplete clutches, egg floating, hatching dates, as well as weights and observed sizes of pulli.

Species	Median date	Range	N	Average 1996-2010
Common Ringed Plover	-	-	-	166.4
Red Knot	163	162-175	5	166.6
Sanderling	166	159-183	35	168.3
Dunlin	173	159-179	14	166.5
Ruddy Turnstone	162	157-179	11	164.6

TABLE 4. Snow cover on 10 June together with median first egg dates for waders at Zackenberg, 2011, and the previous five years. Data based on less than ten nests/broods are marked with asterisks, less than five are omitted. The snow cover is pooled (weighted means) from section 1, 2, 3 and 4 (Sigsgaard et al. 2011), from where the vast majority of the egg laying phenology data originate. For data prior to 2005, please consult Hansen et al. (2012).

Species	2005	2006	2007	2008	2009	2010	2011
Snow cover on 10 June	28	85	48	71	4	72	78
Sanderling	166*	181	166	169	167	163	166
Dunlin	163	178	166	169	162	165.5	173
Ruddy Turnstone	162	172*	158	170	154	165	162

TABLE 5. Mean nest success (%) 2005-2011 according to the modified Mayfield method (Johnson 1979). Poor data (below 125 nest days or five predations) are marked with asterisks. Data from species with below 50 nest days have been omitted. If no nest was found, it is indicated by "-". Nests with at least one pipped egg or one hatched young are considered successful. Also given are total numbers of adult foxes observed by the bird observer in the bird census area during June-July (away from the research station proper), along with the number of fox dens holding pups. For data from 1995-2004, please consult Hansen et al. (2012).

Species	2005	2006	2007	2008	2009	2010	2011	1996-2011
Common Ringed Plover	-	0*	-	2*	-		-	47-51
Red Knot	-	-	100*				3*	15.8
Sanderling		7*	3	5	7.5	3	17	16-17
Dunlin	43*	47	48	17	80*	62*	21.1*	54-58
Ruddy Turnstone			36	22*	27*	34*	2.9*	33-38
Red-necked Phalarope		-	-	-		-	-	1*
Red Phalarope	-	-	-	-		-	42*	
All waders	22	37	18	16	14	9	14.4	30-32
N nests	15	28	60	58	66	46	47	662
N nest days	104	332.2	532.7	423.5	508.5	306.5	349	5937
Fox encounters	18	22	23	20	11	9	20	
Fox dens with pups	0	2	3	5	3	3	3	

After years of low numbers of Arctic fox *Vulpes lagopus* encounters; 2011 had 20 encounters, which is close to average. Pups were recorded in three dens this season (Table 5). Three dens with pups combined with the low number of lemming winter nests (Table 6), could possibly be part of the reason for the high predation on wader eggs.

The mean wader clutch size was 3.84 in 2011; which is above the weighted mean for all years (Table 7). Nests containing fewer than four eggs were: Sanderling; two nests of two eggs – ruddy turnstone; one nest of three eggs – Dunlin; one nest of one egg.

Nests containing fewer than four eggs were: Sanderling, two nests of two eggs; Ruddy turnstone, one nest of three eggs; and Dunlin, one nest of one egg.

In July and early August, alarming parents – and later juveniles – were found in the fens and marshes (Dunlins, Sanderling), and on the slopes of Aucellabjerg and in the dry lowlands (Common Ringed Plovers, Red Knots, Sanderlings, Dunlins, Ruddy Turnstones).

Data on chick survival is almost negligible, and as early as day 179 (28 June), flocks of Long-tailed Skuas roamed the lower slopes of Aucellabjerg and the lowlands fens and heath. The largest flocks held 21 individuals.

REPRODUCTIVE PHENOLOGY AND SUCCESS IN LONG-TAILED SKUAS *STERCORARIUS LONGICAUDUS*

Three Long-tailed Skua nests were found initiated before the census period, the others during the census period (the average of preceding years; Table 8). No Northern Collared Lemming *Dicrostonyx groenlandicus* was observed

TABLE 6. Annual numbers of collared lemming winter nests recorded within the 1.06 km^2 census area in Zackenberg, 2005-2011, together with the numbers of animals encountered by one person with comparable effort each year within the 15.8 km^2 bird census area during June-July. For data 1995-2001, please consult Hansen et al. (2012).

Year	Winter nests	Animals seen
2005	98	1
2006	161	3
2007	251	1
2008	80	4
2009	55	0
2010	27	0
2011	27	0

TABLE 7. Mean clutch sizes in waders at Zackenberg, 2011, compared with data from the previous five years. Samples of fewer than five clutches are marked with asterisks. Data 1995-2004 can be found in Hansen et al. (2012).

Species	2005	2006	2007	2008	2009	2010	2011	mean
Common Ringed Plover		3.75*		3.75*		4.00*		3.77
Red Knot			4.00*	4.00*	4.00*	4.00*	4.00*	3.43
Sanderling	3.75	3.63	3.73	3.77	3.91	3.92	3.85	3.84
Dunlin	4	3.13	3.79	3.67	4	4.00	3.70	3.80
Ruddy Turnstone	3.86	3.00*	4.00*	3.71	3.78	3.92	3.90	3.79
Weighted mean	3.89	3.33	3.76	3.74	3.91	3.80	3.84	3.78

TABLE 8. Egg-laying phenology, breeding effort and success in Long-tailed Skuas at Zackenberg, 2005-2011. Median egg laying date is the date when half the supposed first clutches were laid. Number of clutches found includes replacement clutches. Mean hatching success according to the modified Mayfield method (Johnson 1979). Poor data (below 125 nest days or five predations) are marked with asterisks. Nests with at least one pipped egg or one hatched young are considered successful. The 1995-2004 was published in Hansen et al. (2012).

Long-tailed Skua breeding	2005	2006	2007	2008	2009	2010	2011
Median 1st egg date	159	170	163	164	168	172	165
No. of clutches found	8	2	15	9	2	1	6
No. of young hatched	6	1	11	3	1	0	0
Nest success % (Mayfield)	51.8*	100*	23	33	25.9	0	0
Estimated no. of young fledged	1	0	1	2	1	0	0

by the bird observer, reflecting another season with very low numbers of lemming winter nests found (Table 6). As mentioned above, roaming flocks were seen early this season.

One observation of a third calendar year bird – day 173 (22 June) – is the only observation of immatures this season.

BARNACLE GEESE *BRANTA LEUCOPSIS*

Activity was seen at the Barnacle Goose colony on the southern face of the mountain Zackenberg, with three individuals seen flying to and from the colony. For further recent details on the colony, see Hansen et al. (2009).

The first Barnacle Goslings in Zackenberg, were seen on day 197 (16 July), which is late. A record low three broods were seen this season (Table 9), and a maximum number of two goslings (in any one family) seen at any one time. That is the poorest number of Barnacle Goslings on record at Zackenberg.

Southward migrating Barnacle Geese were

TABLE 9. Average brood sizes of Barnacle Geese in Zackenberg during July and early August, 2005-2011, together with the total number of broods brought to the valley. Samples of fewer than ten broods are marked with asterisks. Average brood size data from autumn on the Isle of Islay in Scotland are given for comparison, including the percentage of juveniles in the population (M. Ogilvie pers. comm.). Data from 1995-2004 was published in Hansen et al. (2012).

Species	2005	2006	2007	2008	2009	2010	2011
Primo July	1.7*	2.0*	1.3	4*	1*	1.5*	0
Medio July	2.7	1.5*	1.5	1.6	1.33*	1.8*	1*
Ultimo July	2.2*	1.1*	3.3*	1.5*	1*	1.4*	0
Primo August		1.5*	-	1*	1.5*	1.6*	0
No. of broods	14	9	28	15	9	18	3
Scotland	1.67	1.15	2.14	1.9	1.9	2.26	2.1
Per cent juv.	6.3	3.23	9.8	8.2	3.8	11.2	11.2
Ruddy Turnstone	162	172*	158	170	154	165	162

seen from day 223 (August 11th), when 16 flew south. 192 Barnacle Geese were seen migrating southwards in 2011. The last Barnacle Goose was seen flying on day 275 (2 October).

The percentage of young in wintering flocks was relatively high on Isle of Islay, Western Scotland (Table 9; M. Ogilvie, pers. comm.).

Immature Barnacle Geese moulted in numbers far below average (1995-2010 average: 200; Table 10).

COMMON BIRDS, NOT BREEDING IN THE CENSUS AREA

Between day 162 (11 June) and day 189 (8 July), 3,324 individual immature Pink-footed Geese *Anser brachyrhynchus* were recorded (unsystematically) on their northbound moult migration. This is a quite high number compared with recent years, but as these data have been collected unsystematically, we are cautious about making any concrete comparisons.

With only 21 immature Pink-footed Geese found moulting in the Zackenberg area in 2011, the numbers are still low and the trend of Pink-footed Geese avoiding the Zackenberg valley seem to continue (Table 10). Immature Pink-footed Geese on southward migration were recorded from mid-July to day 247 (4 October). A total of 784 Pink-footed Geese were recorded (unsystematically) on southward migration.

Only few Common Eiders *Somateria mollissima* were recorded in the study area during the 2011 season. The first observation was on day 165 (14 June), when a pair was seen flying over the

TABLE 10. Numbers of immature Pink-footed Geese and Barnacle Geese moulting in the study area at Zackenberg, 2005-2011. The close area is zone 1c (see http://www.zackenberg.dk/fileadmin/Resources/DMU/GEM/Zackenberg/pdf/mapzoner_stor_opl.jpg). Refer to Hansen et al. (2012) for data from previous seasons.

	2005	2006	2007	2008	2009	2010	2011
Pink-footed Goose							
Closed moulting area and further east	17	27	0	0	1	10	17
Coast west of closed area	0	3	2	0	0	0	0
Upper Zackenberg	0	1	0	2	1	0	6
Pink-footed Goose total	17	31	2	2	2	10	23
Barnacle Goose							
Closed area at Lomsø and Kystkærene	87	148	66	106	70	80	48
Coast east of closed area	2	218	46	125	77	13	0
Coast west of closed area	29	29	106	65	34	0	66
Upper Zackenberg	25	30	6	41	51	0	0
Barnacle Goose total	143	425	224	337	232	93	114

lower slopes of Aucellabjerg. No Eider Ducklings were seen at or near Zackenberg in 2011. The first King Eiders *Somateria spectabilis* was a pair on day 156 (5 June). No nesting attempts were recorded, and no ducklings were seen in 2011. For both eider species, flocks were seen from June, and for king eiders until ultimo July. Common Eiders were seen in flocks (up to 35 individuals) into late August, except for a very late flock of 35 common eiders, seen as late as day 265 (22 September).

Long-tailed Ducks *Clangula hyemalis* were seen from day 155 (4 June), after which pairs were seen almost daily until mid-July. One nest was found (having suffered predation), and no ducklings were seen in 2011. In late July, August and September, only a few birds, often females, were recorded. The last two Long-tailed Ducks were seen day 248 (5 September) at Lomsø.

As in recent years, two Common Raven *Corvus corax* pairs each occupy their part of our census area, with home ranges well beyond our census area. Nesting is believed to take place outside our study area. The first three juvenile birds were seen as early as day 176 (25 June) at Sydkærene. The three young Ravens were recorded twice since then. The last day was 192 (11 July) on the lower slopes of Aucellabjerg. However, a flock of six were seen as late as day 260 (17 September).

VISITORS AND VAGRANTS

In Table 11, we present data on avian visitors and vagrants. On 27 and 28 May a Lesser Yellowlegs *Tringa flavipes* was seen at a pond near the research station. This is only the fourth record of Lesser Yellowlegs in Greenland, and the first one in east Greenland (D. Boertmann, pers. comm.). This was the only actual rarity in 2011.

Two observations of single Canada Geese *Branta canadensis* – both in flocks of either Barnacle Geese or Pink-footed Geese were seen this year. The latest observation was a small goose from the Canada Goose *Branta canadensis/B. hutchinsii* complex, as opposed to all other, large bodied Canada Geese having been observed at Zackenberg (Hansen et al. 2009; unpubl.).

VALIDATION OF SIGHTINGS

The Rarities Committee for Denmark, Faroe Islands and Greenland (under BirdLife Denmark) has officially recognised this season's observation of the Lesser Yellowlegs described above (Neergaard et al. 2013).

All submitted rarities from Zackenberg over the years are now officially recognised sightings.

ACKNOWLEDGEMENTS

Bird observations were made by Lars Holst Hansen 17 May – 16 June and 21 July – 7 November, Jannik Hansen 31 May - 4 August, Lars O. Mortensen 31 May – 14 July, Jeroen Reneerkens 14 June – 19 July and Line Anker Kyhn 16 June – 14 July. Other researchers and staff – not least JR's colleagues – provided much valued information throughout the season. Local site names can be found in Meltofte et al. 2009).

The BioBasis Programme at Zackenberg was carried out by the National Environmental Research Institute (NERI), Department of Arctic Environment, Aarhus University, Denmark. It is funded by the Danish Environmental Protection Agency as part of the environmental support program DANCEA – Danish Cooperation for Environment in the Arctic. Anthony C. Santore is thanked for proofreading the English text.

REFERENCES

Boertmann, D. 1994. An annotated checklist to the birds of Greenland. Meddelelser om Grønland. Bioscience 38. 63 pp.

Boertmann, D. 2008. Grønlands Rødliste – 2007. Danmarks Miljøundersøgelser, Aarhus Universitet, og Grønlands Hjemmestyre. 156 s. (In Danish).

Hansen, J., H. Meltofte, and N. M. Schmidt. 2009. Bird Monitoring at Zackenberg, Northwest Greenland, 2006. Bird Population 9:1-12.

Hansen, J., L. H. Hansen, N. M. Schmidt, and J. Reneerkens. 2010. Bird monitoring at Zackenberg, Northeast Greenland, 2008, with comparison to 1995-2007. Bird Populations 10:68-78.

Hansen, J., Hansen, L.H., Schmidt, N.M., and Reneerkens, J. 2012. Bird monitoring at Zackenberg, Northeast Greenland, 2010, with comparison with 1996-2009. Bird Populations 11:42-51

Jensen, L. M. (Ed.) 2012. Zackenberg Ecological Research Operations, 17th Annual Report, 2011. Danish Centre for Environment and Energy, Aarhus University, Denmark.

Johnson, D. H. 1979. Estimating nest success: The Mayfield method and an alternative. Auk 96:651-661.

TABLE 11. Numbers of individuals and observations of avian visitors and vagrants at Zackenberg, 2011, compared with the numbers of individuals observed in the preceding seasons, 1995-2010. Multiple observations reasonably believed to have been of the same individual have been reported as one individual. Refer to Hansen et al. (2012) for data from previous seasons

	Visitors and vagrants							
							2011	
Species	2005	2006	2007	2008	2009	2010	No. of individuals	No. of observations
Great Northern Diver	0	0	2	2	0	1	0	0
Wooper Swan	0	0	0	0	0	0	0	0
Greylag Goose	0	0	0	0	0	1	0	0
Snow Goose	0	0	1	0	0	0[a]	0	0
Canada Goose	0	4	3	0	1	0	2	2
Merlin	0	0	0	0	0	0	0	0
Gyr Falcon	2	0	3[b]	2[c]	4	3	3	2
Pintail Duck	0	0	3[d]	0	0	3	0	0
Common Teal	0	0	0	0	0	0	0	0
Eurasian Golden Plover	1	1	1	1	2	2	0	0
White-rumped Sandpiper	1	0	0	0	0	0	0	0
Pectoral Sandpiper	0	1	1	0	1	1	0	0
Purple Sandpiper	0	0	0	0	0	0	0	0
Red Phalarope	2[e]	11[e]	0	2	0	2	0	0
Common Snipe	0	0	1	0	0	0	0	0
Whimbrel	1	0	1	2	0	0	0	0
Eurasian Curlew	0	0	0	0	0	0	0	0
Redshank	0	0	0	1	0	0	0	0
Lesser Yellowlegs	0	0	0	0	0	0	1f	2
Pomarine Skua	0	0	0	0	0	0	0	0
Arctic Skua	0	1	0	0	0	0	0	0
Great Skua	0	0	0	0	0	0	0	0
Lesser Black-backed Gull	1	4	0	0	0	0	1	1
Iceland Gull	0	2	0	0	0	0	0	0
Great Black-backed Gull	0	0	0	0	0	0	0	0
Black-legged Kittiwake	0	0	0	0	0	0	0	0
Arctic Tern	0	0	0	57	0	0	0	0
Snowy Owl	0	0	1[b]	0	0	0	0	0
Meadow Pipit	1[d]	1[d]	0	0	0	0	0	0
White Wagtail	0	0	1	0	0	0	0	0
Northern Wheatear	2	1	4[b]	2	2	5[g]	1	1
Lapland Longspur	1	0	0	0	0	2[e]	3[e]	10

[a] Two outside census area
[b] See Hansen et al. 2010
[c] After regular season, 4 observations of 1-3 birds.
[d] Northernmost records in East Greenland (cf. Bortmann 1994)
[e] At least one territory, possible territory or breeding found
[f] 4th record in Greenland, first in N.E. Greenland
[g] Three juveniles, all from pair(s) outside the census area

MELTOFTE, H. 2006. Wader populations at Zackenberg, high-arctic Northeast Greenland, 1996-2005. Dansk Ornitologisk Forenings Tidsskrift 100:16-28.

NEERGAARD, R. S., FRISCH, A. S., KRISTENSEN, A. B., ORTVAD, T. E., PEDERSEN, K., SCHWALBE, M., AND STRACK, R. 2013. Sjældne fugle i Danmark og Grønland i 2011. Report no. 42 from the Rarities Committee. Fugleåret 2011: 97-122. Dansk Ornitologisk Forening (BirdLife Denmark), Copenhagen.

SCHMIDT, N. M., BERG, T. B., AND MELTOFTE, H. 2011. BioBasis, Conceptual design and sampling procedures at Zackenberg Basic. 14th edition. National Environmental Research Institute, Aarhus University, Roskilde.

SIGSGAARD, C., THORSØE, K., LUND, M., SKOV, K., LARSEN, M., PETERSEN, D., HANGAARD, P., FALK, J.M., HANSEN, B.U., MASTEPANOV, M., CHRISTENSEN, T.R. AND TAMSTORF, M.P. 2011. Zackenberg Basic: The ClimateBasis and GeoBasis programme. In Jensen, L.M. and Rasch, M. (eds.) Zackenberg Ecological Research Operations, 16th Annual Report, 2010. Aarhus University, Danish Centre for Environment and Energy. 114 pp.

Bird Populations 13:28-35

MASS MORTALITY OF WILDLIFE DUE TO HAILSTORMS IN MAHARASHTRA, INDIA[1]

SUJIT NARWADE[2]
Bombay Natural History Society-India
Shaheed Bhagat Singh Road
Mumbai, Maharashtra-India 400 001

MAHESH C. GAIKWAD
Baramati, Pune, Maharashtra, India

KAMLAKAR FARTADE
Model Multipurpose High School and Junior College
Malinagar, Solapur, Maharashtra, India

SHAHAJI PAWAR
Dainik Divya Marathi,
Latur, Maharashtra, India

MILIND SAWDEKAR
Birdwatcher, Washim, Maharashtra, India

PURUSHOTTAM INGALE
Bombay Natural History Society-India
Shaheed Bhagat Singh Road
Mumbai, Maharashtra-India 400 001

Abstract. Owing to unusual hailstorms, 35 species of birds and 9 species of mammals were found dead, totalling at least 62,000 birds and hundreds of mammals, in the Marathwada and Vidarbha regions of Maharashtra, India, during 2014. Hail stones were up to 5 cm in diameter. We observed mass mortality at 26 sites with especially high mortality in 14 areas. These extreme climate events occurred from the end of February into May 2014. Mortality was especially high among roosting birds such as Rosy Starling *Pastor roseus*, House Sparrow *Passer domesticus* and Rose-ringed Parakeet *Psittacula krameri*. Mammals residing in open areas were also killed.

Key words: extreme climate event, Deccan plateau, hailstorm, India, Maharashtra, wildlife mortality

[1]Received 10 September 2014; accepted 12 December 2014
[2]Corresponding author: sujitsnarwade@gmail.com

MORTALIDAD MASIVA DE LA VIDA SILVESTRE DEBIDO A TORMENTAS DE GRANIZO EN MAHARASHTRA, INDIA

Resumen. Debido a tormentas de granizo inusuales, un total de 62,000 aves de 35 especies y cientos de mamíferos de 9 especies fueron encontrados muertos en las regiones de Marathwada y Vidarbja de Maharashtra, India, durante 2014. Las bolas de granizo alcanzaron los 5 cm de diámetro. Observamos mortalidad masiva en 26 localidades, con mortalidad especialmente alta en 14 áreas. Estos acontecimientos climáticos extremos ocurrieron desde finales de febrero a mayo de 2014. La mortalidad fue especialmente alta en aves que se concentran en dormideros como el estornino rosado *Pastor roseus*, gorrión común *Passer domesticus* y cotorra de Kramer *Psittacula krameri*. Los mamíferos en áreas abiertas también sufrieron bajas.

Palabras clave: clima extremo, meseta Deccan, granizo, India, Maharashtra, mortalidad de vida silvestre

INTRODUCTION

A southern tropical thorn forest and associated habitats, rich in wildlife, exist in a portion of Vidarbha, Marathwada and the western part of Deccan plateau, Maharashtra, India (Fig. 1; see Champion and Seth 1978). During several months in 2014, from the end of February into May, a series of extreme weather events were reported across India, including this area but also Madhya Pradesh, Andhra Pradesh, and Punjab. According to the Indian Meteorological Department (IMD) these extreme weather events occurred due to western disturbances bringing an extra-tropical storm, originating in the Mediterranean, and characterized by sudden winter rain and snow.

Included in larger thunder storms that occurred during this unusual weather were a series of hail events. Major hailstorms occurred during 3 - 10 March 2014. Fruit orchards and cash crops, such as sugarcane, pomegranate and grapes, were destroyed. The severities of the hailstorms were so high that many domestic animals and a few humans died. Therefore, we decided to conduct a survey of wildlife impacts in hailstorm-affected areas and the results are discussed in this paper.

METHODS

Surveys were conducted immediately after hailstorms at Pune, Solapur, Osmanabad and Washim districts to get first-hand information about wildlife mortality, followed by detailed surveys during the second week of March 2014. A Bombay Natural History Society (BNHS) team also made ground searches in hailstorm-affected areas in the Marathwada and Vidarbha regions during 7-8 and 15-19 March, and 2-6 May (Fig. 1). Based on size of hailstones and damage that occurred to trees we surveyed sites where high bird mortality was reported (Table 1).

RESULTS

A series of hailstorms, associated with the larger thunder storms, occurred in parts of Deccan plateau, especially Vidarbha and Marathwada of Maharashtra, India, from February to May 2014. Major events occurred especially during 3-10 March, resulting in a huge loss to the wildlife and agriculture sector. Vidarbha and Marathwada regions of Maharashtra (2,00,000 km^2), which are rain-shadow areas, were the worst affected. Fruit orchards and cash crops including sugarcane, pomegranate and grapes were destroyed; many domestic animals and a few human lives were lost. Unseasonal rainfall, accompanied by hailstorms destroyed over 1.9 million hectares of standing crop causing distress among the farmers.

We found that wildlife was affected badly by hailstones, the hailstorms lasting for 20-30 minutes, especially within 25 km^2 blocks (3 km radius) surrounding 14 sites in Maharashtra (Fig. 1, Table 1). Hailstone size decreased outward from the center of the block. We also covered some sites having low mortality where hailstones were ~ 1-3 cm and the duration of the event was 4-5 minutes (Table 1). Hundreds of local people whom we interviewed provided useful information.

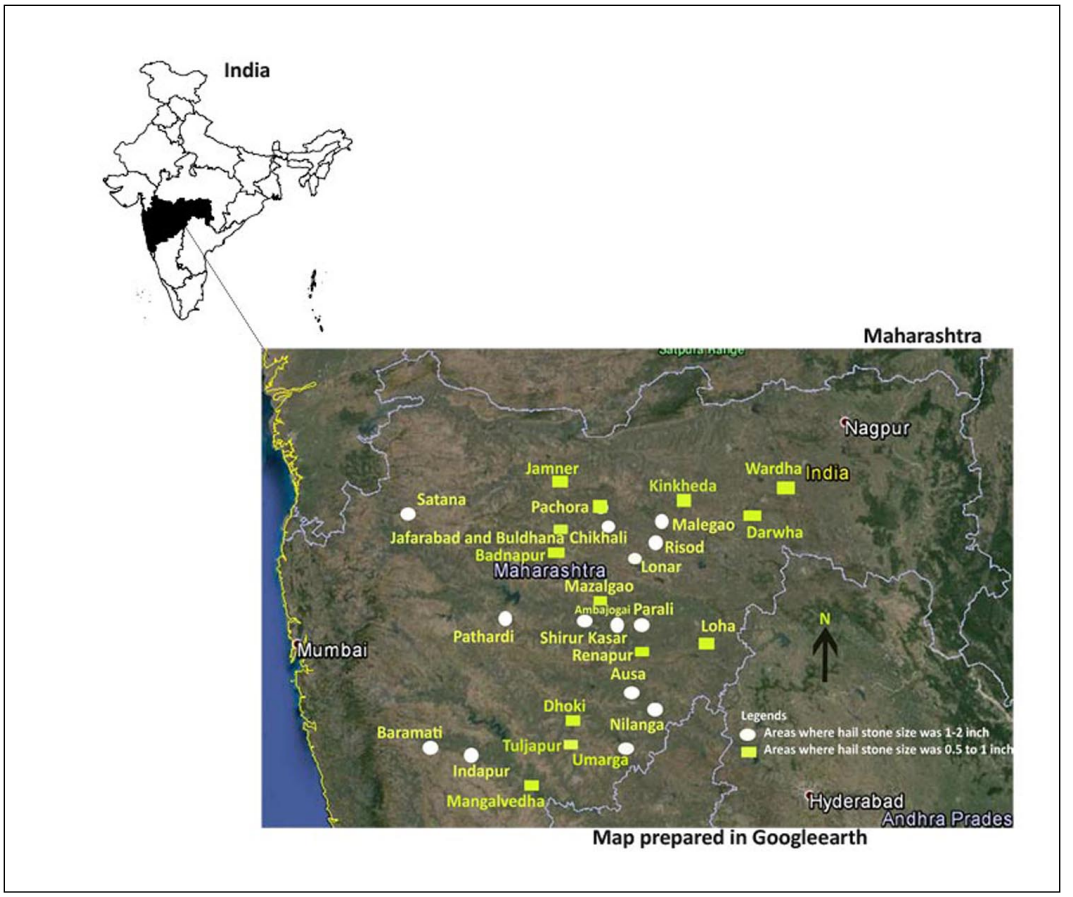

FIGURE 1. Study area in Maharashtra, India.

A total of 35 species of birds and the nine species of mammals were killed by the storm events (Figs. 2, 3). In total, about 62,250 birds and hundreds of mammals were reported dead, and several birds were reported to be injured.

AVIAN MORTALITY: RESIDENT SPECIES

The highest number of deaths occurred among birds that resided in large roosts near human habitation, for example, House Sparrow *Passer domesticus*, and Rose-ringed Parakeet *Psittacula krameri* (Fig. 4). The birds such as Southern Coucal Centropus *(sinensis) parroti*, Red-vented Bulbul *Pycnonotus cafer* (Fig. 4), Black Drongo *Dicrurus macrocercus*, Rose-ringed Parakeet *Psittacula krameri*, Syke's Lark *Galerida deva*, Cattle Egret *Bubulcus ibis* and Little Green Beeeater *Merops orientalis* were found dead across the study area. We observed carcasses of more than 1,500 Rose-ringed Parakeets at Mandava village of Risod tehsil in Washim district (Fig. 4). These parakeets were roosting on a series of Teak *Tectona grandis* trees near a farmland, and after hailstorm their carcasses were seen lying over the area spread over one hectare.

Among water birds, egrets, cormorants, storks and ibises were the most affected species (Fig. 4). We visited a large heronry at Badalvadi village of Indapur tehsil, Pune district and found the understory full of broken eggs, dead chicks and juveniles and dead adults of Grey Heron *Ardea cinerea* and Little Cormorant *Microcarbo niger*. A group of bird-watchers from Indapur and Pune tried to rescue the birds and put the chicks back into the nests.

TABLE 1. Details of mass mortality of wildlife due to large hailstones reported in Maharashtra, India, during 2014 (data arranged in chronological order).

Sr. No.	Villages	Tehsil	District	Dates	Hailstone diameter (cm)	Coordinates of reference point
1.	Entire tehsil	Renapur	Latur	26 February	1-3	18°31'44.83"N 76°35'47.40"E
2.	Entire area	Shirur Kasar	Beed	3 March	2.5-5.0	18°57'28.34"N 75°39'27.41"E
3.	Pimpla Dhaiguda, Giruvali	Ambajogai	Beed	3 March	2.5-5.0	18°42'54.03"N 76°24'1.39"E
4.	Talegao, Kauthali, Sonpeth, Maralagwdi	Parali	Beed	3 March	2.5-5.0	18°51'25.55"N 76°30'44.27"E
5.	Nitur, Mugao, Shend, Muslga, Gaur, Valandi Dhobalewadi	Nilanga	Latur	3 March	2.5-5.0	18° 8'44.54"N 76°43'20.84"E
6.	Bhalgao, Kasalwadi, Midsangavi, Munguswadi, Kharwandi, Eknathwadi	Pathardi	Ahmednagar	3 March	2.5-5.0	19° 8'47.02"N 75°12'21.19"E
7.	Mangalvedha, Donaj, Talsangi	Mangalvedha	Solapur	3 March	1-3	17°30'43.35"N 75°27'1.05"E
8.	Kandhar	Loha	Nanded	3 March	1-3	18°56'50.59"N 77° 6'55.57"E
9.	Lamjana, Killari	Ausa	Latur	3 March	2.5-5.0	18°15'28.90"N 76°34'57.90"E
10.	Dahi, Irala, Malegao	Malegao	Washim	6-7 March	2.5-5.0	20°11'38.81"N 77°16'52.28"E
11.	Mandava, Kurha, Wadi Wakad, Borkhedi, Mozabandi	Risod	Washim	6-7 March	2.5-5.0	19°52'32.30"N 76°51'7.09"E
12.	Dhoki, Ter	Osmanabad	Osmanabad	6-7 March	1-3	18°20'3.28"N 76° 7'43.17"E
13.	Darvha, Arni, Painganga Wildlife Sanctuary	Arni, Digras	Yawatmal	6-7 March	1-3	20° 4'9.77"N 77°56'42.31"E
14.	Wardha town	Wardha	Wardha	6-7 March	1-3	20°43'8.14"N 78°36'1.97"E
15.	Shara, Dhavale	Lonar	Buldana	8 March	2.5-5.0	20° 0'40.10"N 76°31'59.15"E
16.	Sanjulnala	Jafarabad	Jalna	8 March	1-3	20°11'56.58"N 76° 3'15.31"E
17.	Anvi, Bhakarwadi	Badnapur	Jalna	8 March	1-3	19°55'32.28"N 75°46'59.33"E
18.	Bhamrud	Pachora	Jalgao	8 March	1-3	20°39'30.72"N 75°21'7.58"E
19.	Entire tehsil	Jamner	Jalgao	8 March	1-3	20°46'13.22"N 75°40'33.82"E
20.	Entire tehsil	Buldhana	Buldhana	8 March	1-3	20°27'21.95"N 76°21'49.42"E

TABLE 1. Continued.

Sr. No.	Villages	Tehsil	District	Dates	Hailstone diameter (cm)	Coordinates of reference point
21.	Bhokar, Godri, Khor, Bhalkhed	Chikhali	Buldana	8 March	2.5-5.0	20° 0'18.85"N 75°53'50.46"E
22.	Shripurwarde, Shirpurwade, Wagale, Bhatkheda, Gorana, Pofir, Avandane	Satana	Nashik	9 March	2.5-5.0	20°34'49.83"N 74°12'54.65"E
23.	Baramati, Murti, Katewadi,	Baramati	Pune	9-10 March	2.5-5.0	18°8'31.18"N 74°34'20.97"E
24.	Parts of Bhigvan, Nimgao, Bhadalwadi, Bori, Bhavani Nagar, Sansar	Indapur	Pune	9-10 March	2.5-5.0	18°15'41.00"N 74°48'7.93"E
25.	Entire tehsil	Tuljapur	Osmanabad	1 May	1-3	17°58'55.79"N 76° 3'38.78"E
26.	Motala	Umarga,	Osmanabad	4 May	2.5-5.0	17°51'16.45"N 76°37'0.56"E

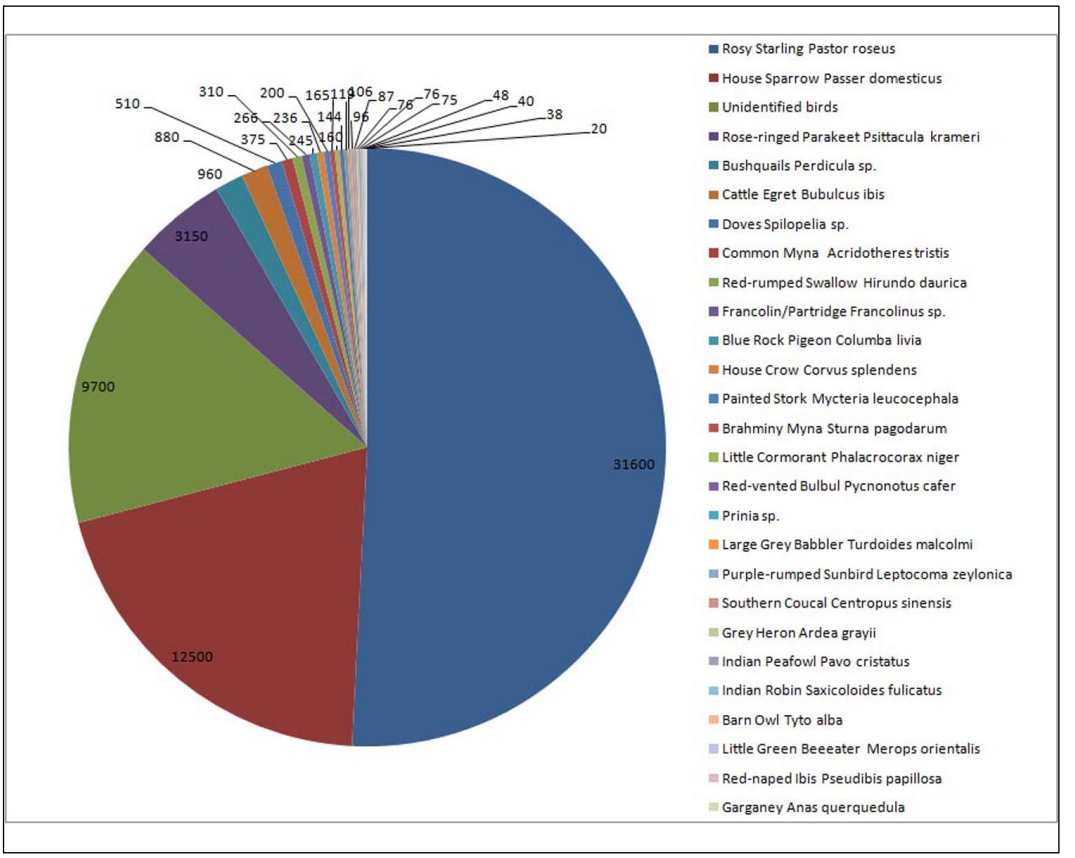

FIGURE 2. Summary of the mortality of birds observed in study area.

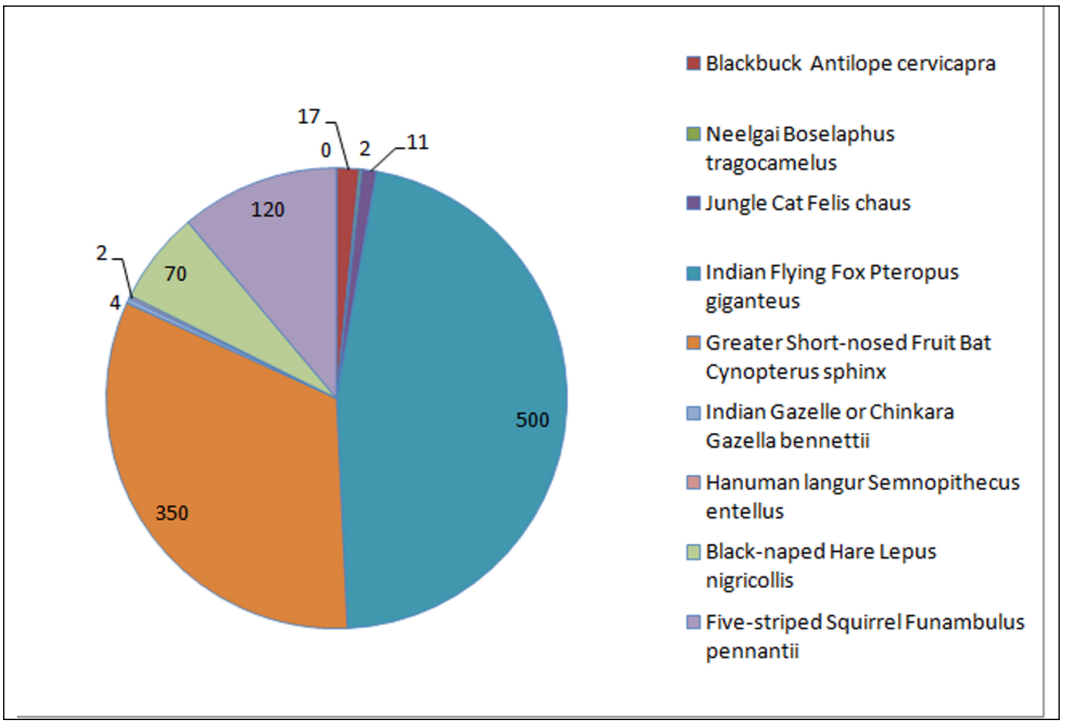

FIGURE 3. Summary of the mortality of mammals observed in study area.

AVIAN MORTALITY: THREATENED AND MIGRATORY SPECIES

Severe damage to many nests, and carcasses of a few chicks and juveniles of Painted Stork *Mycteria leucocephala*, and Black-headed Ibis *Threskiornis melanocephalus* – both Near Threatened species listed by International Union of Conservation of Nature (IUCN) – were observed in the study areas. We also observed mortality in Black-tailed Godwit *Limosa lmosa*, a migratory and near threatened species, at one of the sites. Another migratory species, Rosy Starling *Pastor roseus* also suffered high mortality (Fig.4). In fact the death of >30,000 of these birds at various roost sites amounted to 50% of the total avian mortality (Fig. 2).

An injured Greater Flamingo *Phoenicopterus roseus* was rescued by some bird-watchers of Baramati from the Bhigwan area, in the back-water area of Ujani Dam in Solapur, Maharashtra. The bird was treated and kept at Baramati for a week and later was shifted to Katraj Zoo, Pune, where it died within a few days. A few deaths and injuries among migratory ducks such as Ruddy Shelduck *Tadorna ferruginea*, Northern Shoveller *Anas clypeata*, Common Teal *Anas crecca* and Garganey *Anas querquedula* were reported from Ujani dam area.

MAMMALIAN MORTALITY

Based on the mortality at known bat roosts, we assumed that 50% of the population of tree dwelling bats including Flying Fox *Pteropus gingantius* and Short-nosed Fruit Bat *Cynopterus sphinx* was killed due to this hailstorm. Ungulates such as Chinkara *Gazella benne*, Indian Blackbuck *Antilope cervicapra* and Neelgai *Boselaphus tragocamelus* were found dead in some areas. In a couple of cases, these animals jumped into nearby water bodies or into the thick bushes to take shelter from the hailstones. Other smaller mammals such as Black-naped Hare *Lepus nigricollis*, Jungle Cat *Felis chaus*, and squirrels, were also found dead (Fig. 3). Stray dogs were seen eating the carcasses.

FIGURE 4. Carcasses of: top left, Rosy Starling found lying under many trees at Baramati Pune, 14 March 2014 (photo: Mahesh Gaikwad); top right, Rose-ringed Parakeets at Mandava, Risod, 4 March 2014 (photo: Santosh Gomase); bottom left, Red-vented Bulbul at Motala, Umarga, Osmanabad, 5 May 2014 (photo: Bhimashankar Waghmare); bottom right, ducks, terns, shorebirds and waders at Bhigvan, 4 March 2014 (photo: Sandeep Nagare).
.

DISCUSSION

HISTORICAL REPORTS OF MASS MORTALITY IN BIRDS DUE TO HAILSTORMS

Mortality of people and wildlife due to intense hailstorms is not a new phenomenon, though the incidence may be growing in new areas (http://en.wikipedia.org/wiki/List_of_costly_or_deadly_hailstorms). This website lists 46 events beginning in the 9th century up to the present (see also Orr 2004). As examples particularly involving birds, seven Sandhill Cranes *Grus canadensis*, 151 American White Pelicans *Pelecanus erythrorhynchos* (142 immature), plus individuals of 12 other species were found dead due to a hailstorm in September 1977 at Chase Lake National Wlidlife Refuge, South Dakota (Higggins and Johnson 1978). Sarasola et al. (2005) described mass mortality of 158 birds, including 113 Swainson's Hawks *Buteo swainsoni* due to a hailstorm in central Argentina in 2003. Mortality in night roosts of the Great-tailed Grackel *Quiscalus mexicanus* and European Starling *Sturnus vulgarus* was reported because of a 6-minute hailstorm at Austin, Texas in March 2005 (Hall and Harvey 2007). Between October 2009 and March 2010 Carnaby's Black Cockatoo *Calyptorhynchus latirostris* was exposed to severe localized hailstorms; 51 birds were killed and 24 were badly injured (Saunders et al. 2011).

REPORTED CASES OF MASS MORTALITY OF WILDLIFE DUE TO HAILSTORMS IN INDIA

About 2,000 water birds were found dead at the Diyala Jheel area of Karera Bustard Sanctuary in

Shivpuri district of Madhya Pradesh in February 1986 because of a hailstorm that lasted ~25 minutes. A Sarus Crane *Grus antigone*, Demoiselle Crane *Anthropoides virgo* and three White-rumped Vultures *Gyps bengalensis* were also found dead along with two individuals of Balckbuck *Antilope cervicapra* (D'Cunha and Akhtar 1987). As case of mortality of Barn Owl *Tyto alba* during a cyclone was reported for Pichavaram mangroves, South India (Thiyagesan and Nagarajan 1997).

CONCLUSION

According to IUCN classification of direct threats in section 11.4, entitled "storms and flooding," hailstorms are classified as threats arising from long-term climatic changes and other severe climatic/weather events that are outside of the natural range of variation, and potentially can wipe out a vulnerable species or a habitat (BirdLife International 2014). From the information collected during our surveys, we observed that the mass mortality was recorded much higher in the areas where data from a avid, experienced birdwatchers were verified. There could have been many more unreported cases. Though we learned about a number of rescue operations from many areas, because of lack of experience and technical guidance, only about 20% of the injured wildlife could be recovered. Documentation of the results from extreme climate events is important as we assess the implications of our changing climate.

ACKNOWLEDGEMENT

The project team is grateful to Asad Rahmani, Director, BNHS-India and Abhilash Khandekar, Senior Editor, Dainik Bhaskar Group newspaper, India for their kind support. We are very grateful to Sandeep Nagre of Bhigvan, Pune and Shivaji Bali, birdwatcher from Washim, Maharahstra, India for their valuable inputs. The team is thankful to each and every person who contributed by providing valuable information documented in this paper.

REFERENCES

BirdLife International. 2014. http://www.birdlife.org/datazone/info/spcthreat

Champion, H. G., and S. K. Seth. 1968. The forest types of India. Natraj Publishers, Dehradun, India.

D'Cunha, E. P. E., and A. Akhtar. 1987. Mortality from a hailstorm at the Karera Bustard sanctuary, Madhya Pradesh. Journal of the Bombay Natural History Society 83 (supplement): 218-219.

Hall, D. W., and T. M. Harvey. 2007. Mortality at a night roost of Great-tailed Grackles and European Starlings during a spring hail storm. Wilson Journal of Ornithology 119:309-312.

Higgins, K. F., and M. A. Johnson. 1978. Avian mortality caused by a September wind and hail storm. Prairie Naturalist 10:43–48.

Orr, D. 2004. "Telegraph news" London: Telegraph.co.uk. Retrieved 24 Nov 2013, http://www.telegraph.co.uk/news/worldnews/asia/india/1476074/Giant-hail-killed-more-than-200-in-Himalayas.html

Sarasola, J. H., J. J. Negro, V. Salvador, and J. J. Maceda. 2005. Hailstorms as a cause of mass mortality of Swainson's Hawks in their wintering grounds. Journal of Wildlife Diseases 41:643–646.

Saunders, D. A., and P. Mawson. 2011. The impact of two extreme weather events and other causes of death on Carnaby's Black Cockatoo: a promise of things to come for a threatened species? Pacific Conservation Biology 17:141–148.

Thiyagesan,K ., and R. Nagarajan (1997). Effects of a cyclone on water bird populations at the Pichavaram mangroves, southern India. Wader Study Group Bull. 84:47-51.

Bird Populations 13:36-48

AVIFAUNA OF KALATOP-KHAJJIAR WILDLIFE SANCTUARY AND ADJACENT AREAS, HIMACHAL PRADESH, INDIA[1]

ANIL KUMAR[2], RAHUL PALIWAL AND UTTAM SAIKIA[3]
High Altitude Regional Centre
Zoological Survey of India
Solan-173211, Himachal Pradesh, India

Abstract. Kalatop-Khajjiar Wildlife Sanctuary composed of a range of habitats from moist temperate forests to alpine moist pastures is located in the western Himachal Pradesh. For the documentation of avifauna, field surveys were undertaken during May 2010 to June 2012. Historically, 93 species has been listed so far from the area, based on present study and previously published data. A total of 74 species of birds belonging to 11 orders and 32 families were recorded in the present study including some interesting/new records; a few species remained unidentified due to inadequate observations. The most dominant family, Muscicapidae, represents 15 species followed by family Accipitridae and Corvidae, representing seven and six species, respectively. Some species of woodpeckers, raptors, thrushes, laughingthrushes, tits, warblers and wagtails have been recorded for the first time in the area.

Key words: India, Kalatop-Khajjiar Wildlife Sanctuary, avifauna, new distributional records

LA AVIFAUNA DEL SANTUARIO DE VIDA SILVESTRE DE KALATOP-KHAJJIAR Y ÁREAS ADYACENTES, HIMACHAL PRADESH, INDIA

Resumen. El Santuario de Vida Silvestre de Kalatop-Khajjiar está compuesto de diversos hábitats desde bosques templados húmedos a praderas alpinas húmedas y ubicado en el occidente de Himachal Pradesh. Para la documentación de la avifauna llevamos a cabo conteos de campo desde mayo de 2010 a junio de 2012. Se han registrado 93 especies en el área, en base a este estudio y datos publicados con anterioridad. En el presente estudio se registraron 74 especies de 11 órdenes y 32 familias, incluyendo varios registros interesantes; algunas especies quedaron sin identificar debido a observaciones insuficientes. La familia más dominante, Muscicapidae, representa 15 especies, seguida por Accipitridae y Corvidae, con siete y seis especies, respectivamente. Algunas especies de carpinteros, rapaces, zorzales, carboneritos y lavanderas han sido registradas por primera vez en el área.

Palabras clave: India, Santuario de Vida Silvestre de Kalatop-Khajjiar, avifauna, nuevos registros de distribución

INTRODUCTION

Kalatop-Khajjiar Wildlife Sanctuary (hereafter KKS) is located in the western Himachal Pradesh (32°02´ to 32°04´ N; 76°01´ to 76°06´E). When the study reported herein was undertaken, the sanctuary area was 69 km^2, which has now been reduced to 17.17 km^2 subsequent to rationalization by the State Government

[1]Received 23 July 2014; accepted 12 December 2014
[2]Corresponding author: Anil Kumar: anilsonta@gmail.com
[3]Present address: ZSI, Shillong- 793003, Meghalaya, India

(Notification No. FFE-B-F(6)11/2005-II/Kalatop-Khajjiar dated 7th June 2013). The study area mainly was composed of moist temperate mixed coniferous forest and sub-alpine/alpine moist pasture. The sanctuary is located in the catchment area of Ravi River, and is drained by a number of perennial tributaries of Ravi (Islam and Rahmani 2004). The Kalatop and surrounding area contains thick patches of Cedar *Cedrus deodara* followed by Ban Oak *Quercus incana* and Blue Pine *Pinus wallichiana*. Khajjiar is a small meadow surrounded by cedar. Some areas of the sanctuary are steep to very steep in terrain, with rocky cliffs. The area supports a fairly good number of faunal elements such as birds namely Kaleej Pheasant *Lophura leucomelanos*, Koklass Pheasant *Pucrasia macrolopha*, Cheer Pheasant *Catreus wallichii* and Himalayan Monal *Lophophorus impejanus* (Thakur et al. 2002), and mammals namely Goral *Nemorhaedus goral*, Serow *Nemorhaedus sumatraensis*, Asiatic Black Bear *Ursus thibetanus* and Indian Muntjac *Muntiacus muntjak* (Singh and Banyal 2012).

METHODS

Four field surveys were undertaken: 19 - 26 May and 14 - 20 September 2010; and 3 - 4 March and 12-16 June 2012. The first survey was conducted by just one of the authors (US), the second by two authors (AK, US), and the third and fourth surveys by all three authors. Four major tracks – Lakarmandi-Kalatop, Lakarmandi-Dainkund, Lakarmandi-Khajjiar and Lakarmandi-Dalhousie – were either walked on foot or covered by vehicle at slow speed, stopping to conduct point surveys at 300 to 1000 m intervals. Survey localities such as Khajjiar Lake and adjacent areas, Kalatop area, Dainkund area and one unnamed locality between Lakarmandi and Dalhousie were surveyed extensively (Fig. 1). During the field work, observations on birds were made every day starting from early morning to late evening (06:00 -18:00 with few exceptions), with the help of binocular (10x50) and digital camera, in different habitats such as thick patches of cedar forests, pine forests and meadows (Fig. 2). The presence of some nocturnal species was confirmed with the help of vocalizations. For this, vocal signals were recorded using a Marantz Digital Audio Tape Recorder PMD 670 and Audio-Technica unidirectional shotgun microphone. Avisoft SAS Lab Pro was used for the generation of spectrograms. For bio-acoustic analysis, spectrograms were calculated using the following setting of SAS Lab: 512 FFT-length, 100% Frame, Flat Top window and 75% time window overlap. In case of low frequency calls of Eurasian Eagle Owl *Bubo bubo*, the temporal resolution was increased to 87.5%.

Identification of species was carried out with the help of field guides: Kazmierczak and Ber van Perlo (2000) and Grimmett et al. (2011). In case of inadequate sightings, we tried to identify the taxa to genus or family level. We compared our records with a previously published study carried out by Thakur et al. (2002) and produced a comprehensive checklist of birds. The nomenclature and taxonomy of birds is based on the recent developments/updates in this field (Chesser et al. 2010, Gill and Donsker 2014). Currently, the taxonomy of raptors is being re-evaluated (Urquhart and Bowley 2002, Wink et al. 2002). The order Accipitriformes has been proposed to include diurnal raptors such as hawks, eagles, vultures and some others. However, recent studies revealed that falcons are not closely related to Accipitriformes, having affinities with parrots and passerines (Gill and Donsker 2014). Therefore, keeping this in view, in the present study we placed Falconidae (Order Falconiformes) after Picidae (parakeets). The abundance of the species is based on the number of sightings/individuals of each species observed during surveys. The number of individuals of a species <10 was treated as rare/uncommon, followed by 11 to 50 as common, and >50 as abundant. Notes on new distributional records are given in detail.

RESULTS AND DISCUSSION

A total 74 species of birds belonging to 11 orders and 32 families (Appendix 1) was recorded including some interesting new records; a few species seen could not be identified due to inadequate observations. The highest number of birds (46 spp.) was recorded in June 2012 compared to May 2010 (28 spp.). Probably the difference was at least partly due to increased survey efficacy as three observers took part in June 2012 survey compared to one in May 2010.

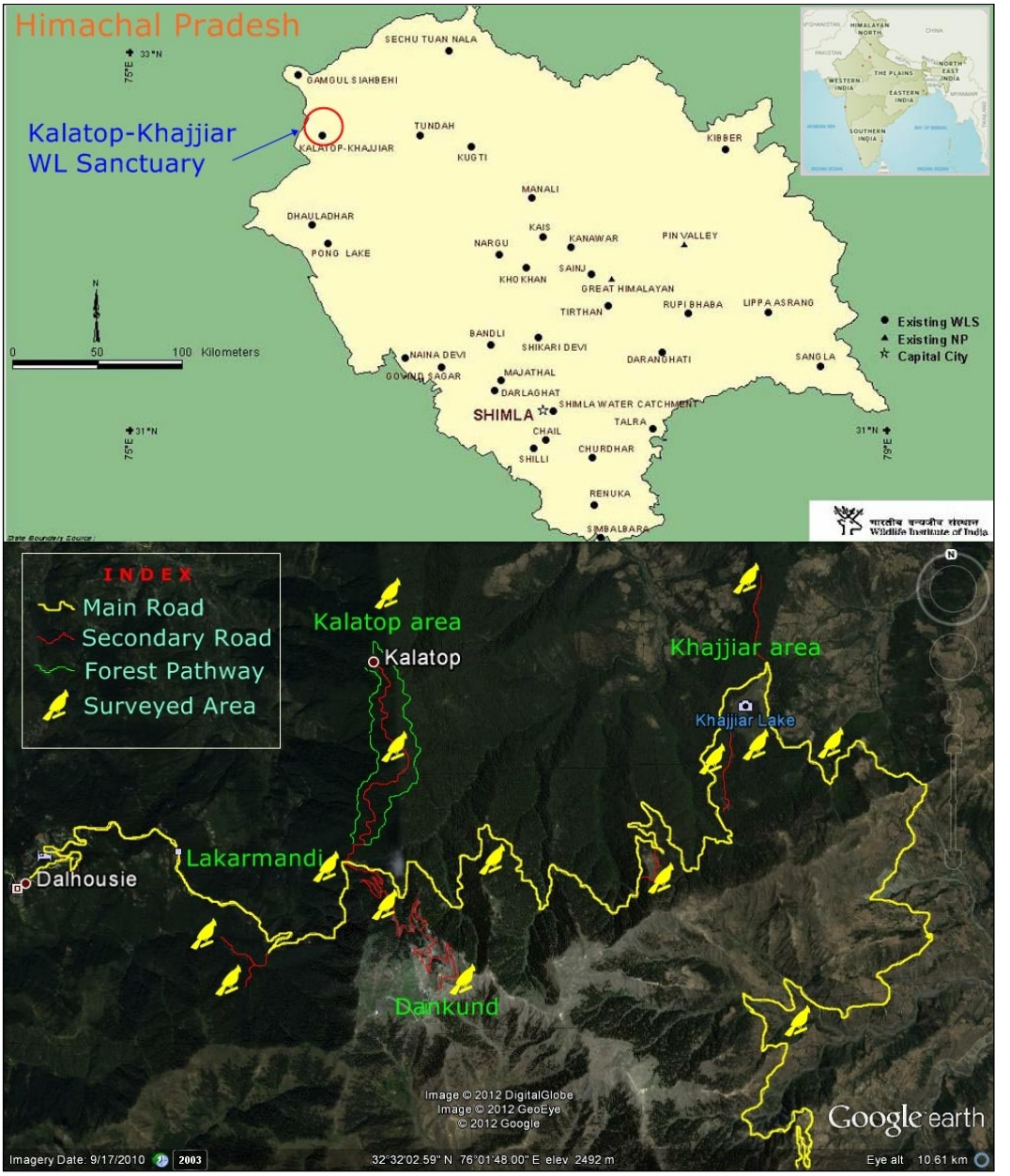

FIGURE 1. Top, the study area showing the location of Kalatop-Khajjiar Wildlife Sanctuary in India and, bottom, survey localities.

A total 93 species have been listed so far from the area, based on the present study and previously published data (Appendix 1). The most dominant family was Muscicapidae, representing 15 species, followed by Accipitridae and Corvidae, representing seven and six species, respectively (Fig. 3). Some species of woodpeckers, raptors, thrushes, laughing-thrushes, tits, warblers and wagtails were recorded for the first time in the area.

Previously, Thakur et al. (2002) recorded three species of pheasants, while we recorded only

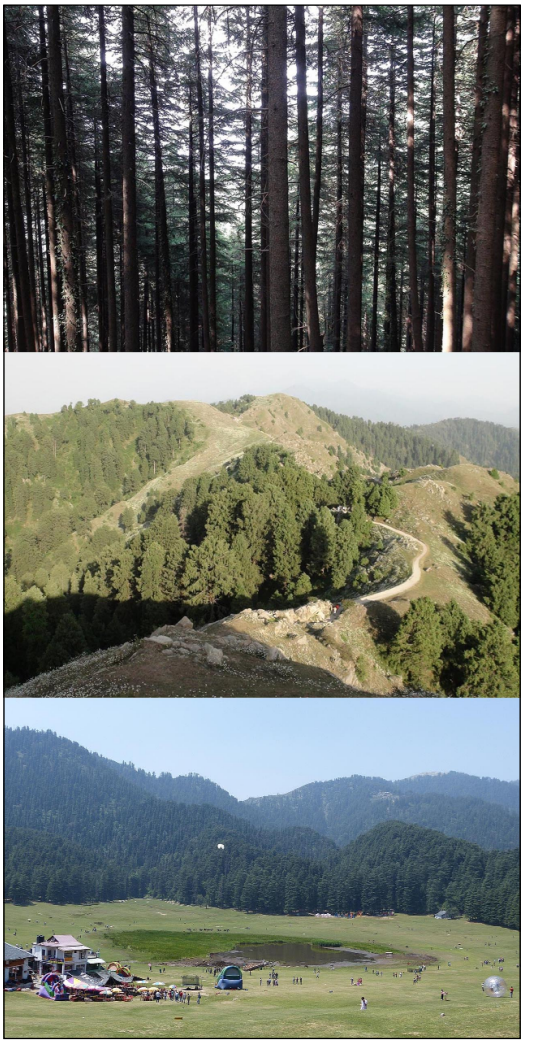

FIGURE 2. Different types of habitats in the study area: Top, thick forest of Cedar; middle, mixed alpine forest with meadows and, bottom, Khajjiar Lake.

two including a new record. Our observations revealed that Koklass Pheasant is a common resident. However, sightings were not frequent owing to the skulking behavior of the species, and its limited, fragmented population. Often, it exhibits its presence through species specific, loud advertisement calls. Three to four calls/min were produced. It was recorded on Kalatop-Lakarmandi-Dainkund trails.

Four species of woodpeckers were recorded. Occurrence of Eurasian Eagle Owl was confirmed with the help of calls. Collared Owlet was another rare owl species seen in the area. Among raptors, Himalayan Vulture was commonly seen, while Shikra and Black Eagle were rarely observed.

Five species of laughingthrushes, four species of tits, four species of flycatchers, three species of blackbirds, three species of redstarts and three species of *Phylloscopous* warblers proved to be striking features of the avifauna. We sighted Oriental Magpie Robin only once, ~15 km outside of the sanctuary area. Its identity could not be confirmed owing to the long distance at which it was seen. It could have been Blue-capped Redstart *Phoenicurus coeruleocephala*. Siberian Stonechat *Saxicola maurus* was recorded adjacent to the northern boundary of the sanctuary (Khajjiar area). It is a recently validated species and is supposed to have five to six sub-species. The Himalayan sub-species is *S. m. indicus*. Earlier, *S. maurus* was included in *S. torquatus*, known as Common Stonechat. Now, *S. torquatus* is assigned to African Stonechat, distributed across sub-Saharan Africa (Urquhart and Bowley 2002).

NEW AVIAN RECORDS

Twenty two avian species were sighted in the study area for the first time. The details of their occurrence are contained in Table 1.

COMPARISON WITH PREVIOUS WORK

A review of the literature revealed two studies that had been conducted on the avifauna of our study area. We recorded 47 out of the 66 species reported by Thakur et al. (2002). The species we missed were ones that frequented dense vegetation, were of low densities and most were shy or vagrant. We also came across a recently published study by Singh and Banyal (2013), which we found to have many errors. A few of these are as follows:

1. The title is misleading as the *Khajjiar Lake* in the centre of a meadow, is very small in area, even less than a small pond, and mostly crowded with tourists (Fig. 2). The area has not been found supporting any significant birdlife.

2. The area of KKS is stated as 20.69 km^2, which is not true. KKS since its establishment had an area of 69 km^2 which has recently been reduced to 17.17 km^2 after rationalization in June 2013.

3. Surprisingly, the methodology does not provide the details of the surveys undertaken

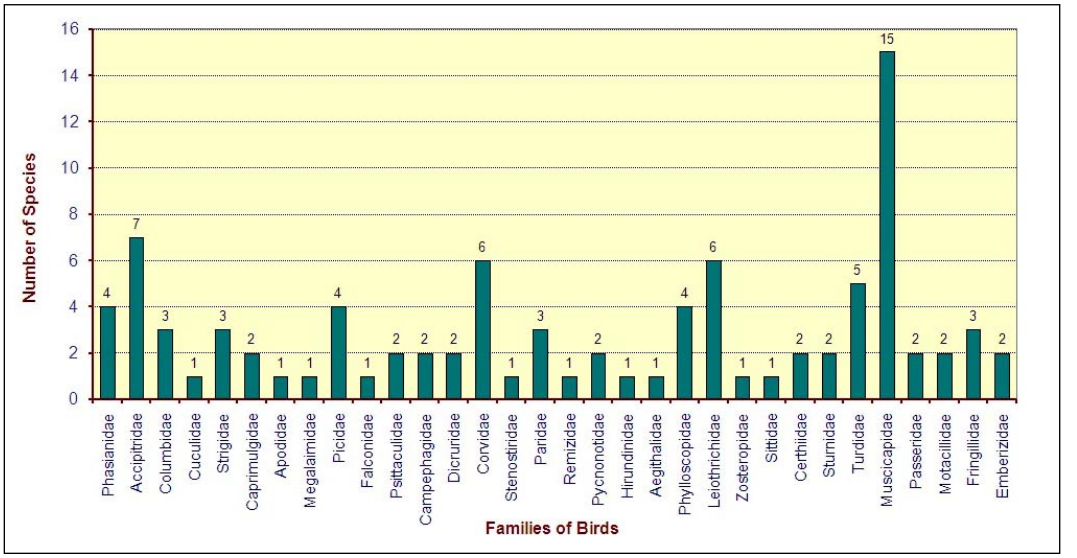

FIGURE 3. Number of species and families recorded in the study.

during the study, i.e. the year, period and frequency of survey.

4. The authors claimed to observe 77 species of birds at *Khajjiar Lake* (including 65 of 66 spp. reported by Thakur et al. (2002) from different habitats/areas of entire KKS), while we could record only 9 species at Khajjiar Lake and surrounding grassland/meadow. This difference is difficult to reconcile.

5. The authors claimed that family Muscicapidae represented by 22 species. Apparently not being familiar with recent advances in the taxonomy, species such as laughingthrushes (family Leiothrichidae), blackbirds (Turdidae) and *Phylloscopus* warblers (Phylloscopidae) were retained under Muscicapidae.

6. The authors observed 77 species at Khajjiar Lake, including many species (such as thrushes and laughingthrushes) that are skulking and very shy and always prefer bushes and dense vegetation. High mountain species such as Bearded Vulture would not visit an area like Khajjiar Lake.

CONCLUSION

Presented is the first consolidated account of the KKS avifauna, composed of a sizable number of species, including rare pheasants, raptors and passerines. Currently there are no major conservation threats, yet habitat degradation is apparent in peripheral areas due to expanding agricultural activities, unorganized settlements and natural resource extraction. Increasing tourism is also imposing direct/indirect impact on the sustainability of the KKS avifauna. For example, Khajjiar Lake and adjacent area have been converted into a picnic spot and owing to overcrowding and human activities (Fig. 2), this area is becoming unsuitable for a number of shy passerines. All such activities should be regularized and controlled for a healthy sustainable avifauna of this area.

ACKNOWLEDGEMENTS

Authors are grateful to Director, Zoological Survey of India, Kolkata, for his kind encouragement and thankful to Officer-in-Charge, HARC, ZSI, Solan, for departmental facilities. Special thanks are due to supporting staff of HARC, and for necessary permission and stay facilities to Forest department of Himachal Pradesh.

REFERENCES

CHESSER, R. T., R. C. BANKS, F. K. BARKER, C. CICERO, J. L. DUNN, A. W. KRATTER, I. J. LOVETTE, P. C. RASMUSSEN, J. V. JR. REMSEN, J. D. RISING, D. F. STOTZ, AND K. WINKER. 2010. Fifty-First supplement to the American Ornithologists' Union: Check-list of North American Birds. Auk 127:726-744.

TABLE 1. New avian records, along with remarks, compiled in the present study of Kalatop-Khajjiar Wildlife Sanctuary, 2010-2012.

	Species	Remarks
1	Red Junglefowl *Gallus gallus*	Sighted on 20 May 2010, about one km west of Kalatop Guest House. It is a rare or most probably vagrant in the area, since it was not observed in subsequent surveys, and study site is quite far from its normal distributional range.
2	Shikra *Accipiter badius*	It is rarely seen in the study area. On 17 Sept 2010, one individual was seen between Lakarmandi and Khajjiar.
3	Eurasian Eagle Owl *Bubo bubo*	On the evening of 17 Sept 2010, we heard and recorded calls near Kalatop Guest House. Calls were simple, loud, stereotyped, resonating and monotonous, made up of three low frequency elements, produced at the rate of 1-2 calls/min.
4	Collared Owlet *Glaucidium brodiei*	It is rarely seen in the sanctuary area. On 13 June 2012, one individual (Fig. 4) was observed about 4 km from Khajjiar on Khajjiar-Lakarmandi track.
5	Indian Nightjar *Caprimulgus asiaticus*	On 31 March 2012, we heard only calls at dusk near Khajjiar. We tried to relocate the individual, but failed. It seems that it is vagrant in the area.
6	Brown-fronted Woodpecker *Dendrocopos auriceps*	On 1 April 2012, one individual was seen near Khajjiar. It is rare in the area, being observed only once in four surveys.
7	Common Kestrel *Falco tinnunculus*	On 31 March 2012 one individual (Fig. 4) was seen just outside the northern boundary check post of the sanctuary. During the June 2012 survey, it was again spotted in the same area.
8	Scarlet Minivet *Pericrocotus flammeus*	Often seen in the sanctuary area. On 1 April 2012, two individuals were seen about 2 km inside Cedar forest on Lakarmandi-Kalatop track.
9	Ashy Drongo *Dicrurus leucophaeus*	It is often seen in the sanctuary area. We spotted it first time on 15 Sept 2010 near Kalatop Guest House.
10	Grey-headed Canary Flycatcher *Culicicapa ceylonensis*	It is rarely seen in the sanctuary area. We saw it on 12 June 2012 near Khajjiar.
11	Fire-capped Tit *Cephalopyrus flammiceps*	Rarely seen in the sanctuary area. On 2 April 2012, we sighted one individual on Khajjiar-Lakarmandi track.
12	Grey-hooded Warbler *Phylloscopus xanthoschistos*	We sighted it for the first time on 17 Sept 2010, and recorded the song during June 2012. The song was composed of discrete melodious phrases. Rate of production was 5-6 calls/min.
13	White-throated Laughingthrush *Garrulax albogularis*	It is a common species of the sanctuary, sighted many times (Fig. 4) and often heard in song (resembles laugh of human being), comprised of a variety of modulated frequencies, complex call notes/ elements and phrases.
14	Striated Laughingthrush *Garrulax striatus*	Rarely seen in the sanctuary area. First time spotted on 22 May 2010 near Khajjiar. We recorded song during our third and fourth surveys, between Lakarmandi and Khajjiar. The song was composed of species-specific discrete melodious loud phrases. Six to seven phrases/min were produced.
15	Chestnut-crowned Laughingthrush *Trochalopteron erythrocephalum*	We observed (Fig. 4) and recorded it in Dainkund area on 13 June 2012. It produced stereotyped, loud calls at a very fast rate (about 100 - 120 calls/min.). Behavioural correlates revealed that these were alarm calls.
16	Eurasian Treecreeper *Certhia familiaris*	It is rarely seen in the sanctuary area. On 16 Sept 2010, one individual was seen near Kalatop.
17	Scaly Thrush *Zoothera dauma*	It is rarely seen in the sanctuary area. On 17 Sept 2010, one individual was seen under dense canopy cover near Khajjiar.

TABLE 1. Continued.

	Species	Remarks
18	Tibetan Blackbird *Turdus maximus*	It is rarely seen in the sanctuary area. We spotted it between Lakarmandi and Khajjiar at different locations.
19	Blue-fronted Redstart *Phoenicurus frontalis*	On 20 May 2010, one individual was seen near Kalatop.
20	White Wagtail *Motacilla alba*	It is often seen in the sanctuary area. We sighted it on 17 Sept 2010 near Khajjiar.
21	Grey Wagtail *Motacilla cinerea*	It is often seen in the sanctuary area. It was sighted first time on 22 May 2010 near Khajjiar (Fig. 4).
22	Spectacled Finch *Callacanthis burtoni*	Rarely seen in the sanctuary area. During April 2012, we sighted it at two distinct localities i.e. on 1 April 2012, about 3 km from Lakarmandi (Fig. 4) towards Kalatop, and on 2 April 2012 between Lakarmandi and Khajjiar.

FIGURE 4. Photographs of some new avian records. Left column, top to bottom: Collared Owlet *Glaucidium brodiei*, Common Kestrel *Falco tinnunculus*, White-throated Laughingthrush *Garrulax albogularis*; right column, Chestnut-crowned Laughingthrush *Trochalopteron erythrocephalum*, Spectacled Finch *Callacanthis burtoni* and Grey Wagtail *Motacilla cinerea*.

GILL, F., AND D. DONSKER (Eds). 2014. IOC World Bird List (v 4.2). (http://www.worldbirdnames.org).

GRIMMETT, R., C. INSKIPP, AND, T. INSKIPP. 2011. Birds of the Indian Subcontinent. 2nd edition, London: Oxford University Press & Christopher Helm, pp 528.

ISLAM, M. Z., AND A. R. RAHMANI. 2004. Important Bird Areas in India: Priority sites for conservation. Indian Bird Conservation Network: Bombay Natural History Society and BirdLife International (UK). Pp. xviii+1133.

KAZMIERCZAK, K., AND BER VAN PERLO. 2000. A field guide to the birds of India. Om Book Service, Dariya Ganj, New Delhi.

SINGH, V., AND H. S. BANYAL. 2012. Diversity and ecology of mammals in Kalatop-Khajjiar wildlife sanctuary, district Chamba (Himachal Pradesh), India. International Journal of Science and Nature 3:125-128.

SINGH, V., AND H. S. BANYAL. 2013. Avian fauna of Khajjiar Lake, district Chamba, Himachal Pradesh, India. Proceedings of the Zoological Society 66:130-136.

THAKUR, M. L., R. PALIWAL, P. C. TAK, H. S. MEHTA, AND, V. K. MATTU. 2002. Birds of Kalatop-Khajjiar Wildlife Sanctuary, Chamba district, Himachal Pradesh, India. Cheetal 41:29-36.

URQUHART, E., AND A. BOWLEY. 2002. Stonechats. A Guide to the Genus Saxicola. Christopher Helm, London.

WINK, M., H. SAUER-GÜRTH, AND, E. GWINNER. 2002. Evolutionary relationships of stonechats and related species inferred from mitochondrial-DNA sequences and genomic fingerprinting. British Birds 95:349-355.

APPENDIX 1. Systematic list of birds observed and identified in Kalatop-Khajjiar Wildlife Sanctuary and adjacent areas.

	Species	Previous records (Thakur et al. 2002)	Field Surveys				Abundance/ Remark
			May 2010	Sep. 2010	March 2012	June 2012	
		Order: Galliformes Family: Phasianidae					
1	Koklass Pheasant *Pucrasia macrolopha*	*	*	*	-	*	2
2	Himalayan Monal *Lophophorus impejanus*	*	-	-	-	-	
3	Red Junglefowl *Gallus gallus*	-	*	-	-	-	1/ NR
4	Kalij Pheasant *Lophura leucomelanos*	*					
		Order: Accipitriformes Family: Accipitridae					
5	Black Kite *Milvus migrans*	-	-	*	-	-	1
6	Bearded Vulture *Gypaetus barbatus*	*	-	-	-	-	
7	Egyptian Vulture *Neophron percnopterus*	*	-	-	-	-	
8	Himalayan Vulture *Gyps himalayensis*	*	*	*	*	*	3
9	Cinereous Vulture *Aegypius monachus*	*	-	-	-	-	
10	Shikra *Accipiter badius*	-	-	*	-	-	1/ NR
11	Black Eagle *Ictinaetus malayensis*	*	-	*	-	-	1

APPENDIX 1. Continued.

	Species	Previous records (Thakur et al. 2002)	Field Surveys				Abundance/ Remark
			May 2010	Sep. 2010	March 2012	June 2012	
		Order: Columbiformes Family: Columbidae					
12	Rock Dove *Columba livia*	-	*	*	-	-	2
13	Oriental Turtle Dove *Streptopelia orientalis*	*	*	*	*	*	3
14	Wedge-tailed Green Pigeon *Treron sphenurus*	*	-	-	-	-	
		Order: Cuculiformes Family: Cuculidae					
15	Common Cuckoo *Cuculus canorus*	*	-	-	-	*	2
		Order: Strigiformes Family: Strigidae					
16	Eurasian Eagle Owl *Bubo bubo*	-	-	* Calls	-	-	1/ NR
17	Asian Barred Owlet *Glaucidium cuculoides*	*	-	-	*	-	2
18	Collared Owlet *Glaucidium brodiei*	-	-	-	-	*	1/ NR
		Order: Caprimulgiformes Family: Caprimulgidae					
19	Large-tailed Nightjar *Caprimulgus macrurus*	*	-	-	-	-	
20	Indian Nightjar *Caprimulgus asiaticus*	-	-	-	*Calls	-	1/ NR
		Order: Apodiformes Family: Apodidae					
21	Little Swift *Apus affinis*	*	-	-	*	-	1/ ?
		Order: Piciformes Family: Megalaimidae					
22	Great Barbet *Megalaima virens*	*	*	*	*	*	3
		Family: Picidae					
23	Himalayan Woodpecker *Dendrocopos himalayensis*	*	*	*	-	*	3
24	Grey-headed Woodpecker *Picus canus*	*	-	*	*	*	3
25	Brown-fronted Woodpecker *Dendrocopos auriceps*	-	-	-	*	-	1/ NR
26	Scaly-bellied Woodpecker *Picus squamatus*	*	-	-	*	-	2
		Order: Falconiformes Family: Falconidae					
27	Common Kestrel *Falco tinnunculus*	-	-	-	*	*	1/ NR

APPENDIX 1. Continued.

	Species	Previous records (Thakur et al. 2002)	Field Surveys				Abundance/ Remark
			May 2010	Sep. 2010	March 2012	June 2012	
		Order: Psittaciformes Family: Psittaculidae					
28	Slaty-headed Parakeet *Psittacula himalayana*	*	-	-	*	*	3
29	Plum-headed Parakeet *Psittacula cyanocephala*	*	*	-	*	-	3
		Order: Passeriformes Family: Campephagidae					
30	Scarlet Minivet *Pericrocotus flammeus*	-	-	-	*	*	1/ NR
31	Long-tailed Minivet *Pericrocotus ethologus*	*	*	*	-	-	1
		Family: Dicruridae					
32	Black Drongo *Dicrurus macrocercus*	*	-	-	*	-	2
33	Ashy Drongo *Dicrurus leucophaeus*	-	-	*	-	*	1/ NR
		Family: Corvidae					
34	Eurasian Jay *Garrulus glandarius*	*	*	*	-	*	3
35	Black-headed Jay *Garrulus lanceolatus*	*	-	-	*	*	3
36	Yellow-billed Blue Magpie *Urocissa flavirostris*	*	*	*	*	*	3
37	Red-billed Blue Magpie *Urocissa erythrorhyncha*	*	-	-	-	-	
38	Grey Treepie *Dendrocitta formosae*	*	*	-	-	*	2
39	Large-billed Crow *Corvus macrorhynchos*	*	*	*	*	*	3
		Family: Stenostiridae					
40	Grey-headed Canary Flycatcher *Culicicapa ceylonensis*	-	-	-	-	*	1/ NR
		Family: Paridae					
41	Black-crested Tit *Parus melanolophus*	*	*	*	*	*	3
42	Great Tit *Parus major*	*	-	-	-	*	1
43	Green-backed Tit *Parus monticolus*	*	*	-	-	*	2
		Family: Remizidae					
44	Fire-capped Tit *Cephalopyrus flammiceps*	-	-	-	*	-	1/ NR
		Family: Pycnonotidae					
45	Himalayan Bulbul *Pycnonotus leucogenys*	*	-	*	*	*	3

APPENDIX 1. Continued.

	Species	Previous records (Thakur et al. 2002)	Field Surveys				Abundance/ Remark
			May 2010	Sep. 2010	March 2012	June 2012	
46	Black Bulbul *Hypsipetes leucocephalus*	*	*	*	-	*	3
	Family: Hirundinidae						
47	Red-rumped Swallow *Cecropis daurica*	*	-	-	-	*	1/ ?
	Family: Aegithalidae						
48	Black-throated Bushtit *Aegithalos concinnus*	*	-	-	*	*	3
	Family: Phylloscopidae						
49	Common Chiffchaff *Phylloscopus collybita*	*	-	-	-	*	1
50	Greenish Warbler *Phylloscopus trochiloides*	*	-	*	-	-	1
51	Green-crowned Warbler *Seicercus burkii*	*	-	-	-	-	
52	Grey-hooded Warbler *Phylloscopus xanthoschistos*	-	-	*	-	*	2/ NR
	Family: Leiothrichidae						
53	White-throated Laughingthrush *Garrulax albogularis*	-	*	*	-	*	3/ NR
54	Striated Laughingthrush *Garrulax striatus*	-	*	-	*	*	2/ NR
55	Streaked Laughingthrush *Trochalopteron lineatum*	*	-	*	-	*	2
56	Variegated Laughingthrush *Trochalopteron variegatum*	*	-	-	-	*	1
57	Chestnut-Crowned Laughingthrush *Trochalopteron erythrocephalum*	-	-	-	-	*	1/ NR
58	Rufous Sibia *Heterophasia capistrata*	*	-	-	*	*	2
	Family: Zosteropidae						
59	Oriental White-eye *Zosterops palpebrosus*	-	-	*	-	-	1
	Family: Sittidae						
60	White-cheeked Nuthatch *Sitta leucopsis*	*	-	*	-	*	2
	Family: Certhiidae						
61	Eurasian Treecreeper *Certhia familiaris*	-	-	*	-	-	1/ NR
62	Bar-tailed Treecreeper *Certhia himalayana*	*	-	*	*	*	3
	Family: Sturnidae						
63	Common Myna *Acridotheres tristis*	*	*	*	-	*	3
64	Jungle Myna *Acridotheres fuscus*	*	-	-	-	-	

APPENDIX 1. Continued.

	Species	Previous records (Thakur et al. 2002)	Field Surveys				Abundance/ Remark
			May 2010	Sep. 2010	March 2012	June 2012	
		Family: Turdidae					
65	Scaly Thrush *Zoothera dauma*	-	-	*	-		1/ NR
66	White-collared Blackbird *Turdus albocinctus*	*	-	-	-	-	
67	Grey-winged Blackbird *Turdus boulboul*	*	*	-	-	*	1
68	Tibetan Blackbird *Turdus maximus*	-	-	*	*	*	1/ NR
69	Mistle Thrush *Turdus viscivorus*	*	-	-	-	-	
		Family: Muscicapidae					
70	Blue-headed Rock Thrush *Monticola cinclorhynchus*	*	-	-	-	-	
71	Chestnut-bellied Rock Thrush *Monticola rufiventris*	*	-	*	-	-	1
72	Blue Whistling Thrush *Myophonus caeruleus*	*	-	*	*	*	3
73	Dark-sided Flycatcher *Muscicapa sibirica*	*	-	-	*	-	1
74	Little Pied Flycatcher *Ficedula westermanni*	*	-	-	-	-	
75	Ultramarine Flycatcher *Ficedula superciliaris*	*	*	*	*	*	3
76	Verditer Flycatcher *Eumyias thalassinus*	*	*	-	-	*	3
77	Oriental Magpie Robin *Copsychus saularis*	-	-	-	-	*	1/ ?
78	Rufous-bellied Niltava *Niltava sundara*	*	*	*	*	*	3
79	White-capped Redstart *Chaimarrornis leucocephalus*	*	-	-	-	-	
80	Plumbeous Water Redstart *Rhyacornis fuliginosa*	*	-	-	-	-	
81	Blue-fronted Redstart *Phoenicurus frontalis*	-	*	-	-	-	1/ NR
82	Spotted Forktail *Enicurus maculatus*	*	-	-	*	-	1
83	Siberian Stonechat *Saxicola maurus*	-	-	*	-	-	1
84	Grey Bushchat *Saxicola ferreus*	*	*	*	-	*	3
		Family: Passeridae					
85	House Sparrow *Passer domesticus*	*	*	-	-	-	1
86	Russet Sparrow *Passer rutilans*	*	*	-	*	*	3

APPENDIX 1. Continued.

	Species	Previous records (Thakur et al. 2002)	Field Surveys				Abundance/ Remark
			May 2010	Sep. 2010	March 2012	June 2012	
		Family: Motacillidae					
87	White Wagtail *Motacilla alba*	-	-	*	-	-	1/ NR
88	Grey Wagtail *Motacilla cinerea*	-	*	*	*	-	1/ NR
		Family: Fringillidae					
89	Yellow-breasted Greenfinch *Carduelis spinoides*	*	-	-	-	-	
90	Black-and-yellow Grosbeak *Mycerobas icterioides*	*	-	*	*	*	2
91	Spectacled Finch *Callacanthis burtoni*	-	-	-	*	-	1/ NR
		Family: Emberizidae					
92	Crested Bunting *Melophus lathami*	*	-	-	-	-	
93	Rock Bunting *Emberiza cia*	*	-	-	-	-	
Total Species		66	28	39	34	46	

* = present; - = absent; ? = doubtful record; 1= rare/uncommon; 2 = common, and 3 = abundant

Bird Populations is an entirely electronic annual journal of dynamic global avian demography and biogeography that publishes original research and review papers dealing with changes in the numbers, demographics, distributions, and ecological relationships of birds. Papers providing documentation of quantitative changes in bird populations or distributions are preferred, but papers providing baseline population or distribution information are also acceptable. Papers describing or evaluating field techniques or analytical methods for assessing population and distribution changes are also welcome. Contributions are encouraged from throughout the world from both well-known and little-studied avifaunas. *Bird Populations* is published in English with abstracts in Spanish. *Bird Populations* can be accessed free-of-charge at www.birdpop.org.

Authors should submit one complete, double-spaced, electronic copy of each manuscript, in English, to: David G. Ainley, Editor, *Bird Populations*, dainley@penguinscience.com. Please contact David G. Ainley at H.T. Harvey and Associates, 983 University Avenue, Bldg D, Los Gatos, CA 95032, if you are unable to submit an electronic copy. Guidelines for preparing and submitting papers to *Bird Populations*, including the format for literature citations, are similar to those of *The Condor* and *Studies in Avian Biology*. Authors are urged to examine a recent volume of *Bird Populations* and follow the niceties of the journal's style. All research papers and review articles submitted to *Bird Populations* are subject to peer review.

Bird Populations also publishes, reprints, and provides links to reports of major avian monitoring programs from around the world. These reports are an important focus of the journal which is intended to serve as a yearbook on the status of the Earth's birdlife by bringing together, under a single cover, information from many widespread localities on the annual and interim changes in the abundance, demographics, and distribution of birds. We believe that publishing, reprinting, and providing links to these reports will draw attention in a timely manner to short-term avian population fluctuations that may ultimately prove to be geographically widespread or that may signal the beginnings of longer-term trends. We hope that the dissemination of these reports will provide ornithologists with a global informational network for addressing avian population changes, will encourage an integrative global approach to avian monitoring studies, will stimulate the establishment of additional avian monitoring programs, and ultimately will aid in the conservation of global avian diversity.

Any agency or organization from anywhere in the world coordinating or conducting a long-term, standardized avian monitoring program is invited to submit an annual (or longer time period) report of that program to *Bird Populations* for publication or reprinting. All reports submitted for original publication will undergo peer review. Please submit one complete, double-spaced, electronic copy of any such report, in English, to David G. Ainley, Editor, *Bird Populations*, dainley@penguinscience.com. Already published reports submitted for reprinting will not be peer reviewed, but will be screened by the Editor when first submitted with regard to the scope and scientific merit of the monitoring program and the appropriateness of the methods and analyses. Please submit electronic copies of such reports, in English, to the Editor. *Bird Populations* also invites the authors of previously published annual or interim reports of standardized avian monitoring programs to request that we provide an electronic link to their reports. Reports to which *Bird Populations* will provide a link do not need to be in English, but we ask that the authors provide an English translation of the abstract or summary. Reports to which we provide links will not be peer reviewed, but will be screened by the Editor when first submitted with regard to the scope and scientific merit of the monitoring program and the appropriateness of the methods and analyses.

BIRD POPULATIONS

A journal of global avian demography and biogeography

Volume 13 2014

CONTENTS