Chinese Birds 2011, 2(4):174–182
DOI 10.5122/cbirds.2011.0029

ORIGINAL ARTICLE

Status of and threats to the Black-winged Lovebird (*Agapornis taranta*) in Entoto Natural Park and Bole Sub-City, Addis Ababa, Ethiopia

Wondimagegnehu TEKALIGN [1, ✉], **Afework BEKELE** [2]

[1] Department of Biology, Wolaita Sodo University, P. O. Box 138, Wolaita Sodo, Ethiopia
[2] Department of Biology, Addis Ababa University, P. O. Box 1176, Addis Ababa, Ethiopia

Abstract A study of the population status of and threats to the Black-winged Lovebird (*Agapornis taranta*) was carried out from September 2008 to February 2009 in Entoto Natural Park (ENP) and in Bole Sub-City, Addis Ababa, Ethiopia. A point transect count technique was employed to examine the status of the lovebirds. An average total of 58 birds was recorded of which 46 were counted in Bole Sub-City and 12 in Entoto Natural Park areas. The maximum number recorded during our census was 57 in the dry season and 15 in the wet season in Bole Sub-City and Entoto Natural Park, respectively. The ratio of adult males to adult females in Entoto Natural Park was 1:0.71 and 1:0.60, and 1:0.76 and 1:0.78 in Bole Sub-City during both wet and dry seasons, respectively. The seasonal variation and difference in sex ratios between males and females was not significant ($p > 0.05$) at either of the study sites. The threat for the Black-winged Lovebird or other birds in Entoto Natural Park is due to the fragmentation of natural habitats, thus decreasing food sources, owing to the domination of eucalyptus (*Eucalyptus globulus*) trees in the area. Grazing by livestock, intensive farming practices and deforestation by the local community have contributed greatly to the degradation of the land resulting in erosion, thus devastating the habitat of the Natural Park. The vegetation cover of Entoto Natural Park and urban gardens should be managed effectively for the survival of the avian fauna of the area.

Keywords abundance, *Agapornis taranta*, *Eucalyptus globulus*

Introduction

In terms of its avian fauna, Ethiopia is one of the most significant countries in Africa (WCMC, 1991). Its avifauna represents a mixture of East and West African, Palearctic and some strikingly unusual endemic birds (Urban and Brown, 1971). The Black-winged Lovebird, also known as the Abyssinian Lovebird (*Agapornis taranta*), is a small green bird of the parrot family (Psittacidae) and the largest of the lovebird genus on the Ethiopian plateau with a wing span of 95–110 mm (Urban, 1980; Alderton, 2003). It is widely found up to 3800 m asl in the northwestern and southeastern highlands and along the Rift Valley, from southern Eritrea to Harar, in forests and woodlands of *Hagenia*, *Juniper*, *Podocarpus*, Olive, *Acacia*, "Candelabra tree (*Candelabra euphorbia*)", *Combretum* and fig trees (Viverpol, 2001). The lovebirds commonly visit gardens, especially those with seed trees, in Addis Ababa. Lovebirds fly in noisy flocks, which number usually from five to ten individuals, although as many as 50–80 individuals may be present in large flocks. Both sexes have a large bright red bill. The adult male is distinguished by its red forehead and a ring of red feathers around the orbits. Adult females and immature birds are distinguished by their green head

Received 29 April 2011; accepted 4 November 2011

✉ Author for correspondence (Wondimagegnehu Tekalign)
E-mail: wondimagegnehubeyene@gmail.com

cover (Kenny, 1998; BirdLife International, 2006).

Natural habitat modification due to the growth and expansion of cities can result in local extinction as a result of range restriction (Vale and Vale, 1976; McKinney, 2002). Urbanization ranks highest among the causes of endangering species and its impact is increasing (Bolen and Robinson, 2003). However, in most cities, limited native vegetation is still available either as remnants or as suburban gardens (Germaine et al., 1998). This helps a number of bird species to survive in urban habitats. Gardens are a characteristic feature of suburban areas and the presence of different bird species may be related to both the floristic and structure of these areas (Green, 1984; Germaine et al., 1998). In Ethiopia, various ecosystems of great biological importance are threatened and need strong conservation action supported by legislation. Threats include habitat destruction, human population growth, encroachment by undesirable plant species, expansion of seasonal cultivation and negative attitudes on the part of people (Viverpol, 2001). The conservation status of many birds in Ethiopia is poor because of increasing levels of human activity and habitat loss. Recent information to quantify the likely trend of human impact in the area is lacking (EWNHS, 1996; Stattersfield et al., 1998; Borghesio and Laiolo, 2004). Effective conservation relies on detailed knowledge of the ecological requirements of the species (Whittingham et al., 2000).

The biology of common endemic birds in Ethiopia is not well known. Underlying factors, past and present, restricting the abundance and viability of the endemic birds of Ethiopia have yet to be determined. The ecology, behavior and breeding biology of any of the endemic bird species have not been fully documented. A remarkable 69 Important Bird Areas (IBAs), including Entoto Natural Park, have been identified by the Ethiopian Wildlife and Natural History Society as Important Bird Areas (Fishpool and Evans, 2001). The Entoto Natural Park area and its surroundings are at high elevations with a diverse flora and fauna. Over the years, this diversity has been affected by various natural and anthropogenic threats (Davison, 2009). This increases the threat to avian species as well as the future biodiversity of the area. The objective of this study was to assess the status of and threats to the endemic Black-winged Lovebird in Entoto Natural Park and Bole Sub-city, Addis Ababa. These two areas were selected due to the presence of a large number of Ethiopian highland biome species, including the very attractive and endemic Black-winged Lovebird, in a range of habitats. The present study provides information on the status of and the threat to the endemic Black-winged Lovebird of the Ethiopian plateau and suggests urgent conservation measures.

Study area and methods

Study area

The study was carried out in Entoto Natural Park (ENP) which covers 1300 ha on the southeast facing slopes of Mount Entoto and in Addis Ababa Bole Sub-city (Kebele 14/15 Administration) covering 52.5 ha. Among the ten sub-cities under the Addis Ababa Administrative Region, Bole Sub-city is one of the largest. Entoto Natural Park lies between the northern limit of the city of Addis Ababa (Fig. 1) at around 2600 m asl. The track along the ridge of the mountain rises to over 3100 m asl. ENP is located between latitudes of 09°04′N to 09°06′N and longitudes of 38°44′E to 38°49′E (Gebremariam and Biru, 1998).

The natural vegetation of ENP is an Afro-montane forest type with woodland and open meadows (BirdLife International, 2008). At present, most of the Entoto Mountain range is covered by introduced eucalyptus (*Eucalyptus globulus*) plantations, which are widely used for fuel (Davison, 2009). ENP has bimodal rainfall: a short rainy season from February or March to April or May and a long rainy season from July to October (EWNHS, 1996; BirdLife International, 2008). The average annual temperature at the apex of Entoto is about 14°C with a rainfall of about 1400 mm.

Addis Ababa is situated at the high plateaux of central Ethiopia in north-south oriented mountain systems neighboring the Rift-Valley. It is located at latitude 09° 02′N and longitude 38°44′E. Despite its proximity to the equator, Addis Ababa enjoys a mild, Afro-Alpine temperate climate. The annual temperature range is between 16–24°C with an annual rainfall of 1255 mm. The city lies at the foot of Mount Entoto. From its lowest point, around Bole International Airport, at 2300–2500 m asl in the southern periphery, the city rises to over 3000 m along the Entoto Mountains to the north. Over 200 species of birds are known to occur in Addis Ababa and adjacent areas (Atkins, 1996). Of these, 115 species have been recorded at Entoto Natural Park, of which 33 are highland biome species.

Methods

A stratified random sampling technique, with line transects, was used to select the sites for sampling (Sutherland, 1996; Bibby et al., 1998). The study areas were stratified according to habitat type and sampling units within the habitats were determined and assigned on the basis of area cover and vegetation type. Around 25% of the Bole Sub-

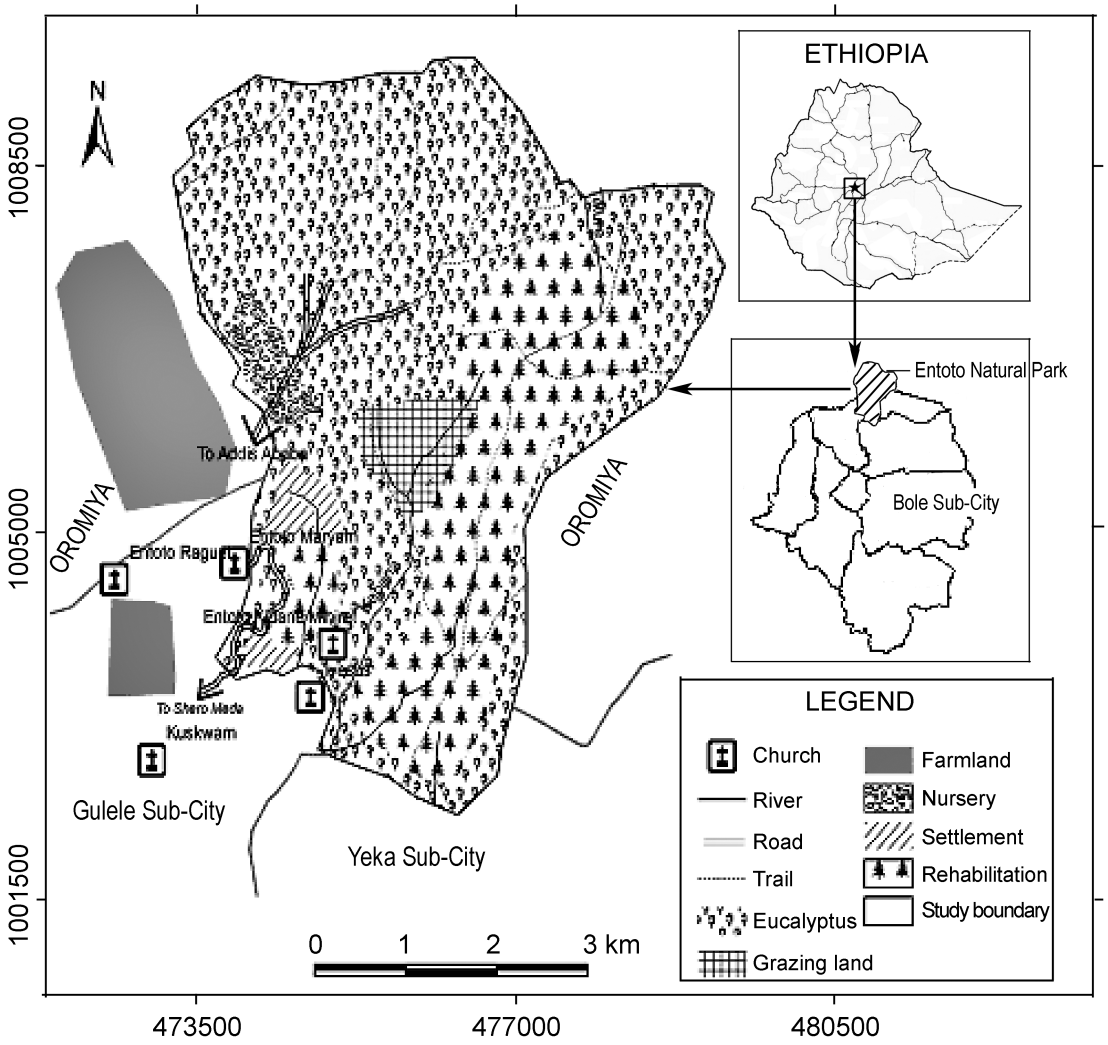

Fig. 1 Location of Entoto Natural Park, Ethiopia

city study site and 35% of the Entonto Natural Park habitat areas were covered by sampling. A point transect count technique was used to examine the status of the lovebirds (Sutherland, 1996). A total of 86 points were identified with 150–250 m gap between census points. A fixed radius point transect count was conducted standing at a particular point for a specified time (5–7 min), with a 25 m radius in the forest and 50 m in the open habitats using direct observations (Bibby et al., 2000).

Precautions were taken not to alter the behavior of the birds or to repeat observations on the same individual (Niemuth et al., 2006). To minimize disturbance during the study, movements were silent and 3–5 minutes were allowed to settle down from any disturbance (Bibby et al., 2000; Sutherland, 1996; Hosteler and Main, 2001). Data were collected early in the morning (6:30 to 10:00 a.m.) and in the afternoon (4:00 to 6:00 p.m.) when the lovebirds were active (Williams and Alrott, 1980; Buskirk and McDonald, 1995). The study was carried out from September 2008 to February 2009.

Interviews were conducted by focusing only on the ENP area, to gather information on the threats to Black-winged Lovebirds and other bird species in the area. It was designed mainly to check the knowledge and attitude of people towards birds and to understand the threats to their abundance in the area. The questionnaire included both open-ended and fixed response questions (Appendix 1). The questionnaire survey was conducted randomly

with members of the local communities, park workers, elderly people and regular visitors of the area. About 25% of the local communities were selected randomly based on the distance from the Natural Park boundary during the study period. Local people and Natural Park workers were also involved in the research to facilitate data collection. The respondents were of various age-groups, religious denominations, occupations and educational backgrounds. The questionnaires were individually administered (single interviews were conducted), primarily with the head of the household, most of which were male. The exception was where they were absent during the household visit. In many cases, other family members also participated to form a collective response. The questions explained to the respondents with the help of colored illustrations of the animals. The data collected were organized and analyzed using SPSS version 15. Chi-square tests and descriptive statistics were used to discover significant differences in population, sex ratios and age classes between the two study areas and seasonal variations during the wet and dry seasons. This data was also used to analyze the questions in the questionnaire survey.

Results

An average total of 58 Black-winged Lovebirds, 46 from Bole Sub-City and 12 from Entoto Natural Park were recorded. The number of lovebirds recorded at Bole Sub-City was significantly larger than that at Entoto Natural Park ($\chi^2 = 19.931$, df = 1, $p < 0.05$). The maximum total record during the census was 57 lovebirds during the dry season and the minimum was 35 during the wet season from Bole Sub-City. The seasonal variation of lovebirds in Bole Sub-city was significantly different with more lovebirds during the dry season compared to the wet season ($\chi^2 = 5.261$, df = 1, $p < 0.05$). However, in Entoto Natural Park, the maximum total record during census was 15 during the wet season and the minimum nine during the dry season. The seasonal variations of lovebirds recorded in ENP were not significantly different ($\chi^2 = 1.500$, df = 1, $p > 0.05$). The age structure of the lovebird population at the Entoto Natural Park showed that adult males comprised 46.7% (wet season) and 55.6% (dry season) ($\chi^2 = 0.333$, df = 1, $p > 0.05$), adult females 33.3% (both wet and dry seasons each) ($\chi^2 = 0.500$, df = 1, $p > 0.05$) and young birds comprised 20% (wet season) and 11.1% (dry season) ($\chi^2 = 1.000$, df = 1, $p > 0.05$). In Bole Sub-City the population consisted for 48.6% of adult males (wet season) and 47.4% (dry season) ($\chi^2 = 2.273$, df = 1, $p > 0.05$), for 37.1% of adult females (wet season) and 36.8% (dry season) ($\chi^2 = 1.882$, df = 1, $p > 0.05$) and for 14.3% of young birds (wet season) and 15.8% (dry season) ($\chi^2 = 1.143$, df = 1, $p > 0.05$) (Fig. 2). These results indicate that the wet season age structures of lovebirds at the Entoto Natural Park and Bole Sub-City were not sig-

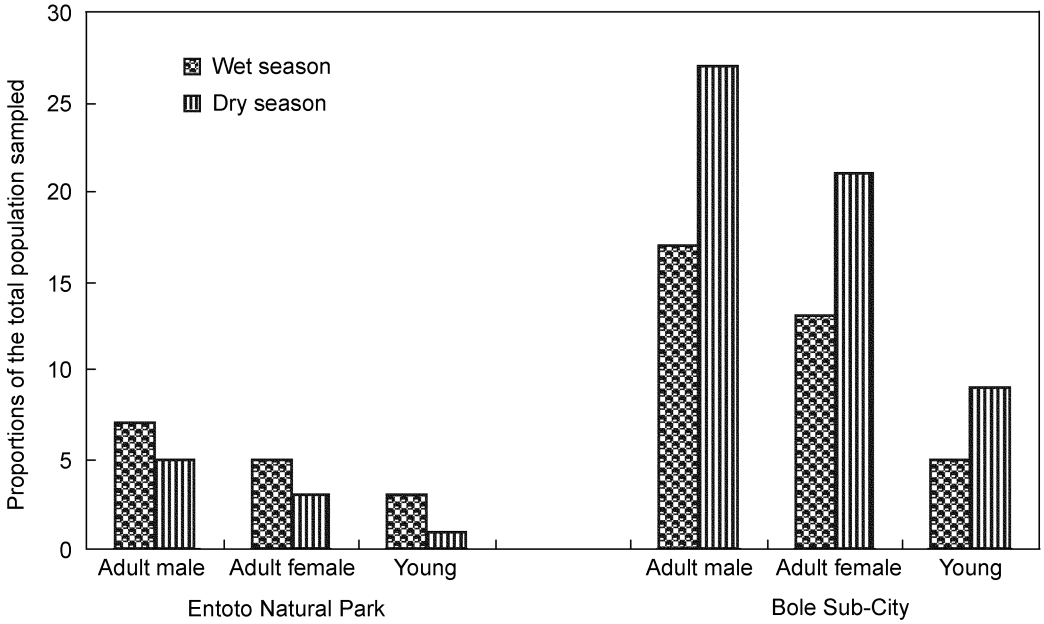

Fig. 2 Population status and structure of Black-winged Lovebirds in Entoto Natural Park and Bole Sub-City

nificantly different when compared to that of the dry season. The age structures of adult males ($\chi^2 = 18.286$, df = 1, $p < 0.05$), adult females ($\chi^2 = 16.095$, df = 1, $p < 0.05$) and young birds ($\chi^2 = 5.556$, df = 1, $p < 0.05$) were significantly different and considerably older in Bole Sub-City compared to that in Entoto Natural Park. A density estimate of Black-winged Lovebirds would therefore be around 0.91 and 0.10 lovebirds per ha at Bole Sub-city and ENP, respectively. There is no difference ($p > 0.05$) in the density estimates between Bole Sub-city (2.83 ± 0.19) and ENP (2.75 ± 0.43) in the study areas.

The ratio of adult male to adult female and adult female to young ratios were 1:0.71 and 1: 0.60 in the wet season and 1:0.60 and 1:0.33 in the dry season in Entoto Natural Park, while in Bole Sub-City, the ratio of adult male to adult female and adult female to young was 1:0.76 and 1:0.78 and 1: 0.38 and 1:0.43 in both wet and dry seasons, respectively (Table 1). The sex ratio was not significantly different in males compared to females in both Entoto Natural Park ($\chi^2 = 0.400$, df = 1, $p > 0.05$) and Bole Sub-City ($\chi^2 = 0.641$, df = 1, $p > 0.05$). Although the ratio between females and young was not significantly different in Entoto Natural Park ($\chi^2 = 0.400$, df = 1, $p > 0.05$), in Bole Sub-City this ratio was statistically significant ($\chi^2 = 4.167$, df = 1, $p < 0.05$).

Eighty four people at random were interviewed. Of these, 28 respondents were female and 56 male. There were significantly more male respondents compared to females ($\chi^2 = 9.333$, df = 1, $p < 0.05$). The age of respondents ranged from 18 to 64 years. Of the 84 questionnaire respondents from Entoto Natural Park, 44.0% responded that they had not observed Black-winged Lovebirds in Entoto Natural Park while 41.7% responded that they had observed lovebirds; the rest, 14.3%, responded as they do not know. Most of the respondents (70.3%) agreed that the birds are not common in the area. Among the respondents who observed lovebirds in the area, 13.5% observed the birds recently, in one month, 16.2% in six months, 21.6% in three years while 48.7% more than three years ago (Table 2).

Table 1 Sex and age structure ratio of Black-winged Lovebird in Entoto Natural Park and Bole Sub-City

Study area	Seasons	Sex and age structure ratio	
		AM:AF	AF:Young
ENP	Wet season	1:0.71	1:0.60
	Dry season	1:0.60	1:0.33
Bole-Sub City	Wet season	1:0.76	1:0.38
	Dry season	1:0.78	1:0.43

Note: AM, adult male; AF, adult female.

Most respondents (83.8%) remarked that the reason for the scarcity of the bird in the study area is due to the domination of eucalyptus trees and fragmentation of foraging habitats. Among the respondents, 67.5% observed the lovebirds in the mixed forest and shrub land areas. Most of the respondents (80.9%) think conserving birds makes a positive contribution and a majority (82.1%) responded that birds give recreational value and, as well, provide a tourist attraction and educational values.

Most of the respondents at Entoto Natural Park (77.4%) noted that they have received benefits from the park area, including firewood and grass for their own use and sale, free grazing land for their livestock and farming land for cultivating crops, mainly barley. People that are living in and around the Entoto Natural Park area were observed during the study visiting the area for firewood collection and farming and grazing their livestock inside the park. Almost all of the respondents are aware of the need to conserve birds due to the benefits they provide.

Discussion

In Bole Sub-City, the highest number of lovebirds was recorded during both the wet and dry seasons, compared to Entoto Natural Park. This is thought to be due to the adaptable nature of birds to live in human habitats and improved foraging access to the vegetation. According to Donnelly and Marzluff (2004), birds respond to spatial heterogeneity and distribution of vegetation. Evans et al. (2009) also stated that urban landscapes are highly heterogeneous, consisting of remnant pockets of, for example, woodland and rough grassland, embedded within a matrix of housing, residential gardens, roads and other man-made structures. The availability of different habitat types and their isolation and connectivity within the wider landscape is, therefore, likely to affect different species of birds in different ways. This indicates that population levels of lovebirds depend on the existence and conservation of foraging habitats. Lohmus (2003) also explained that with annual changes, the range of species expands and contracts and patterns of abundance shift. Ranges can expand when suitable new habitats become available or when population pressure forces migration to new areas. Verner (1985) described that numerous sources of bias are involved in counting birds and concluded that accurate estimation of bird densities is rarely possible. Bart and Schoultz (1984) have also stated biases caused by undercounting or misidentifying birds. We also believe that problems with small sample size might make it impossible to obtain accurate density estimates.

Table 2 Questionnaire survey and interview responses of respondents

Interviews	Responses	Number of respondents	Percentage (%)
Did you know or observe lovebirds in the area?	Yes, they knew/observed	37	44
	No, they did not observe	35	41.7
	Did not know	12	14.3
Are the lovebirds rare or common in the area?	Common	11	29.7
	Not common or rare	26	70.3
How long since you observed the lovebirds?	Within one month	5	13.5
	Within six (2–6) months	6	16.2
	Within 1 to 3 years	8	21.6
	More than 3 years ago	18	48.7
Reasons for the scarcity of lovebirds in the area?	Habitat degradation and reduction of foraging vegetation	26	70.3
	Domination of eucalyptus trees	5	13.5
	Human disturbance	3	8.1
	Do not know	3	8.1
Where did you observe the lovebirds?	Around mixed forest area	16	43.2
	Around shrub land area	9	24.3
	Around the eucalyptus tree	3	8.2
	Around the grass land	4	10.8
	Do not remember	5	13.5
What benefits do you get from the Park area?	Fire wood and grass collection	36	42.9
	Livestock grazing land	21	25
	Farming land	8	9.5
	No benefit	19	22.6
Do you think conserving birds has a contribution?	Yes	68	80.9
	No	10	11.9
	Do not know	6	7.2
What values or benefits birds give?	Tourist attraction	20	23.8
	Recreational value	32	38.1
	Educational value	17	20.2
	To save biodiversity	11	13.1
	Do not know	4	4.8

Most of the questionnaire respondents (48.7%) from Entoto Natural Park responded that they observed that lovebirds were more common three years ago, but that lately they have become more rare. The recent low abundance of Black-winged Lovebirds in Entoto Natural Park indicates that the species might be negatively affected by modification of the habitat in that it reduces the quality and availability of food needed for their survival. Heywood (1995) described modification of the natural environment that affect negatively the abundance of species and in extreme cases, causes extinctions. As the habitat deteriorates, it is likely that birds shift their foraging range to nearby urban farmlands and garden areas. Many species, traditionally viewed as common, are showing dramatic decline in their numbers with the depletion of their habitat (Calme and Desrochers, 1999). Decline in the population of common species indicates a widespread deterioration of habitats. Sorley and Andersen (1994) explained that human caused habitat alteration through land-use changes can affect bird abundance through direct changes in habitat characteristics.

Since the survival of local people is closely tied to the natural habitat around them, various threats continue to affect the natural habitats of Entoto Natural Park. The most serious threat for the Black-winged Lovebird and other birds in Entoto Natural Park might be the fragmen-

tation of natural habitat that decreases the variety of food sources for birds and domination of eucalyptus trees observed in the area curbing the growth of indigenous plants in preferred habitats. A decline in the quality of habitat might be caused through grazing by livestock, intensive farming practices and deforestation, which exposes the land to soil erosion and severe degradation. In addition to this, many people visit the area to exploit its natural resources. This may also cause disturbance to the existing birds as we confirmed from the respondents during the questionnaire survey. According to Lafferty (2001), some bird species are more sensitive to disturbance than others and people can disturb birds if they approach too closely or too quickly. Disturbances cause birds to suspend feeding and/or expend energy in flight, movement or vigilance. Disturbance can also cause birds to abandon their habitat (Burger, 1986). Due to these threats, birds might shift from their natural habitat (Entoto Natural Park) to urban areas (Bole Sub-City) in search of farm crops and garden fruits for their foraging access. Since the habitat preference of birds depends on vegetation, the vegetation cover of Entoto Natural Park area should be managed and maintained to make the habitat a source of natural foods and suitable breeding places. Successful implementation of conservation measures will require the involvement of many concerned groups to act in a coordinated fashion to achieve natural habitat improvements. Community awareness and active participation programs should be fostered to protect the Natural Park for the survival of the avifauna of the area. The Ethiopian Heritage Trust is trying to restore the indigenous flora of Entoto Natural Park by uprooting eucalyptus trees. Alternative land use and reallocation of local farmers in and/or surrounding the park areas, should be settled by concerned bodies. Alternatives must also be found for the community that depends on the eucalyptus plantations for fuel; eucalyptus needs to be replaced by an alternative source of energy. Officials responsible for parks and recreation facilities should similarly be advised on habitat improvements of public lands within their cities for the lovebirds and other bird species. Urban dwellers in cooperation with museums, zoological and botanical gardens, nature clubs and other institutions should have urban habitat improvement programs in Addis Ababa. Baker et al. (2010) suggested that preservation of birds during the construction and expansion of urban areas will require careful incorporation of existing habitat patches within the urban matrix, to conserve native bird species, by managing urban garden vegetation. Similar attention should be given by the Addis Ababa City Administration Office during construction and expansion of roads and buildings in the city.

Acknowledgements We would like to thank Addis Ababa University for financial support. We also appreciate the help and cooperation provided by the Ethiopian Heritage Trust, the staff of Entoto Natural Park, Anteneh Shimelis, the Bole Sub-city land administration office, the Ethiopian Wildlife Conservation Authority and the Ethiopian Wildlife and Natural History Society.

References

Alderton D. 2003. The Ultimate Encyclopedia of Caged and Aviary Birds. Hermes House, London.

Atkins JD. 1996. The Birds of Entoto Natural Park: List of Records and Possible Species (unpublished document). Ethiopian Heritage Trust, Addis Ababa.

Baker PJ, Thomas RL, Newson SE, Thompson V, Paling NRD. 2010. Habitat associations and breeding bird community composition within the city of Bristol, UK. Bird Study, 57:183–196.

Bart J, Schoultz JD. 1984. Reliability of singing bird surveys: Changes in observer efficiency with avian density. Auk, 101:307–318.

Bibby CJ, Burgess ND, Hill DA, Mustoe SH. 2000. Bird Census Techniques. Academic Press, London.

Bibby CJ, Jones M, Marsden S. 1998. Expedition Field Techniques: Bird Surveys. Royal Geographical Society, London.

BirdLife International. 2006. Agapornis taranta. 2006. IUCN Red List of Threatened Species. Accessed 8 October 2008.

BirdLife International. 2008. BirdLife's online World Bird Database: the site for bird conservation. Version 2.1. Cambridge. http://www.birdlife.org. Accessed 12 October 2008.

Bolen EG, Robinson WL. 2003. Wildlife Ecology and Management. Pearson Education, New Jersey.

Borghesio L, Laiolo P. 2004. Seasonal foraging ecology in a forest avifauna of northern Kenya. J Trop Ecol, 20:145–155.

Burger J. 1986. The effect of human activity on shorebirds in two coastal bays in the northeastern United States. Environ Conserv, 13:123–130.

Buskirk WH, McDonald JL. 1995. Comparison of point count regimes for monitoring forest birds. For Serv Gen Rep, 149:25–34.

Calme S, Desrochers A. 1999. Nested birds and micro-habitat assemblages in a peat land archipelago. Oecologia, 118:361–370.

Davison W. 2009. Entoto Natural Park – an environmental success story in the making. Selamta, 26:50–52.

Donnelly R, Marzluff JM. 2004. Importance of reserve size and landscape context to urban bird conservation. Conserv Biol, 18:733–745.

Evans KL, Newson SE, Gaston KJ. 2009. Habitat influences on urban avian assemblages. Ibis, 151:19–39.

EWNHS (Ethiopian Wildlife and Natural History Society). 1996. Important Bird Areas of Ethiopia: A First Inventory. Ethiopian Wildlife and Natural History Society, Addis Ababa.

Fishpool LDC, Evans MI. 2001. Important Bird Areas in Africa and

Associated Islands. BirdLife International, Cambridge.
Gebremariam B, Biru A. 1998. Bole 'Landafta'. Bole Sub-City, Addis Ababa, Ethiopia. Bole 1:2–4.
Germaine SS, Rosenstock SS, Schweinsburg RE, Richardson WS. 1998. Relationships among breeding birds, habitat, and residential development in greater Tuscon, Arizona. Ecol Appl, 8:680–691.
Green RJ. 1984. Native and exotic birds in a suburban habitat. Aust Wildl Res, 11:181–90.
Heywood VH. 1995. Global Biodiversity Assessment. Cambridge University Press, Cambridge.
Hosteler ME, Main MB. 2001. Florida Monitoring Program: Transect and Point Count Method for Surveying Birds. University of Florida Press, Florida.
Kenny LB. 1998. Lovebirds Are Getting Started. T.F.H. Publications, New York.
Lafferty KD. 2001. Birds at a Southern California beach: seasonality, habitat use and disturbance by human activity. Biodiv Conserv, 10:1949–1962.
Lohmus A. 2003. Are certain habitats better every year? A review and a case study on birds of prey. Ecography, 26:545–552.
McKinney ML. 2002. Urbanization, biodiversity and conservation. Bioscience, 52:883–90.
Niemuth ND, Estery ME, Reynolds RE, Leach CL, Meeks WA. 2006. Use of wetlands by spring-migrant shorebirds in agricultural landscapes of North Dakota's drift prairie. Wetlands, 26:30–39.
Sorley CS, Andersen DE. 1994. Raptor abundance in south-central Kenya in relation to land-use patterns. Afr J Ecol, 32:30–38.
Stattersfield AJ, Crosby MJ, Long AJ, Wege DC. 1998. Endemic Bird Areas of the World: Priorities for Biodiversity Conservation. BirdLife Conservation Series no. 7. BirdLife International, Cambridge.
Sutherland WG. 1996. Ecological Census Techniques. A Hand Book. Cambridge University Press, Cambridge.
Urban EK, Brown LM. 1971. A Checklist of the Birds of Ethiopia. Haile Sellassie I University, Addis Ababa.
Urban EK. 1980. Ethiopia's Endemic Birds. Ethiopian Tourism Commission, Artistic Printers, Addis Ababa.
Vale TR, Vale GR. 1976. Suburban bird populations in west-central California. J Biogeogr, 9:413–434.
Verner J. 1985. Assessment of counting methods. Curr Ornithol, 2:247–302.
Viverpol JL. 2001. A Guide to Endemic Birds of Ethiopia and Eritrea. Shama Books, Addis Ababa.
WCMC (World Conservation Monitoring Centre). 1991. Biodiversity Guide to Ethiopia. World Conservation Monitoring Center, Cambridge.
Whittingham MJ, Percival SM, Brown AF. 2000. Time budgets and foraging of breeding golden plover *Pluvialis apricaria*. J Appl Ecol, 37:632–646.
Williams JG, Alrott N. 1980. A Field Guide to the Birds of East and Central Africa. Collins, St. James's, London.

Appendix 1 Questions used in interviews to gather information on the threats to Black-winged Lovebirds and other bird species in the ENP area.

Questions used in the interview
Can you mention some of the birds that you know in the area?
Do you know these birds (showing the colored picture of Black-winged Love birds) in the area?
Are love birds are common or rare in the area?
How long it could be since you observed lovebirds?
If rare what do you think about the reasons? Please, list some of the factors or reasons that you assume.
Where did you observe the lovebirds?
What benefits do you get form the Natural Park area?
Do you think conserving birds in the area makes a contribution?
What values or benefits do birds provide?

埃塞俄比亚首都亚的斯亚贝巴Entoto自然公园和Bole Sub-City黑翅牡丹鹦鹉的种群和受胁状况

Wondimagegnehu TEKALIGN[1], Afework BEKELE[2]

（1 Department of Biology, Wolaita Sodo University, P. O. Box 138, Wolaita Sodo, Ethiopia; 2 Department of Biology, Addis Ababa University, P. O. Box 1176, Addis Ababa, Ethiopia）

摘要：2008 年 9 月至 2009 年 2 月，我们采用样点法调查了埃塞俄比亚首都亚的斯亚贝巴 Entoto 自然公园和 Bole Sub-City 两地黑翅牡丹鹦鹉（*Agapornis taranta*）的种群和受胁状况。两地平均共记录到 58 只黑翅牡丹鹦鹉，其中 Bole Sub-city 平均记录到 46 只，Entoto 自然公园则平均记录到 12 只。在 Bole Sub-City 记录最多的是其干季，

最多记录到 57 只鹦鹉，而在 Entoto 自然公园记录最多的是其湿季，最多记录到 15 只。在湿季和干季，Entoto 自然公园的成年鹦鹉雌雄性比分别为 1:0.71 和 1:0.60，而在 Bole Sub-City 该比例则分别为 1:0.76 和 1:0.78。对同一地点而言，干湿季之间的成年鹦鹉雌雄性比差异均不显著（$p > 0.05$）。Entoto 自然公园中影响黑翅牡丹鹦鹉以及其他鸟类现状的主要因素是自然栖息地的破碎化以及因公园内优势树种蓝桉（*Eucalyptus globulus*）导致的食物资源减少。当地居民的放牧、过度的农业生产以及森林采伐活动造成了土地退化，进而破坏了自然公园的栖息地环境。建议对 Entoto 自然公园及其他市区公园的植被加以有效地管理，为该地区的鸟类提供合适的生存环境。

关键词：丰富度，黑翅牡丹鹦鹉（*Agapornis taranta*），蓝桉（*Eucalyptus globulus*）