

***ECO-ETHOLOGICAL AND CONSERVATION SURVEY OF
N. BALD IBISES WINTERING IN THE NORTHERN SHAWA
(ETHIOPIA) DURING 2008-09***



FINAL REPORT

IUCN West Asia/DGCS TRUST FUND PILOT PROJECT

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INDEX

1. Background	3
2. Study area and methods	3
3. Results	5
3.1 Ecological conditions	5
3.2 Home range, feeding habitats and daily time allocation.....	6
3.3 Foraging behaviour and feeding sites sampling.....	6
3.4 Roosting.....	7
3.5 Interactions with humans and other behaviour	7
3.6 Threats.....	7
3.7 Search on the Ethiopian highlands and on Djibouti coast.....	8
4. Discussion.....	8
5. Recommendations	10
6. Acknowledgements	11
7. References.....	11
ANNEX 1 - Figures and legends	14
ANNEX 2 - Bird checklist	20

1. Background

A relict breeding colony of the eastern population of Northern Bald Ibis (NBI) (*Geronticus eremita*) was unexpectedly discovered in 2002 in the central Syrian desert (Serra et al. 2003). Until then, the eastern NBI population was thought to have become extinct from the whole Eurasia by 1989, with the extinction of the colony of Birecik, Turkey. Until 2002, the only wild bald ibises known were those still surviving as resident in Morocco (Bowden et al. 2003).

As the Syrian colony showed to be migratory and to spend about 7 months outside the breeding grounds – this being the typical behaviour of the NBI eastern population which differentiates it from the western one - it was soon realized that sound protection at breeding grounds was not sufficient to ensure its survival.

After three failed attempts (2003-05), successful tagging of 3 breeding adult NBIs took place in Syria in 2006 (Serra and Peske, 2006, Lindsell et al., in print), with the aim of getting key information about the rest of the NBI distribution range. Subsequent satellite tracking enabled to unveil the migratory route and the wintering grounds of the NBI relict colony. After a stop-over of about 18-19 days in coastal western Yemen, the tagged birds reached a location on the Ethiopian highlands, about 75 Km NE of Addis Ababa, on 19 August 2006.

A first survey was organized in November 2006 which enabled to collect the first preliminary information about eco-ethology and conservation of these extremely rare birds at their wintering grounds (Serra et al. 2007). Ibises showed to use always the same tree as a roost and a quite restricted area of 3x4 = 12 Km² for feeding, as observed during the survey taken place in November 2006.

This observation was confirmed by satellite locations analysis during the period preceding the survey (September-October 2006) and during the period following the survey (December 2006 –January 2007). Feeding sites used daily by the ibises were few, usually only 2-4. Feeding habitats used by ibises were freshly cut hay fields and overgrazed dry pastures. Neither disturbance nor negative interaction was observed between the birds and the local community.

The same exact area have been used by birds during winter 2007-2008 as shown by satellite data and also by a survey organized by EWNHS (Wondafrash and Dellelegn 2007). A third expedition was discussed with EWNHS, after the approval of an IUCN/DGCS project in 2007, aimed at enriching and completing the eco-ethological and conservation observations made in 2006 and 2007, and also at carrying out a preliminary socio-economic and cultural survey of the local community living in the area.

A review of literature revealed that bald ibises have been sighted in several sites of the Ethiopian highlands during the past centuries (Welch and Welch 2004). Most likely it is not by chance that the most recent sighting (Ash 1977) was from the same area where the last surviving birds have been discovered to winter (ca. 35 Km). Moreover, a young ibis have been photographed by a party of birdwatchers in January 2008 along the coast of Djibouti (Fig. 16). Based on all this past and recent information, search at historical ibis sighting sites in Ethiopia and at the recent ibis sighting site on the Djibouti coast was included in the program.

2. Study area and methods

The study area - Ibis Wintering Site (IWS) - is located at about 2600-2700 m asl in the northern Shawa, in Ethiopia, about 75 KM NE in a beeline from Addis Ababa. From an administrative point of view, the

study area lies in the Oromia Regional State, in its eastern part, at the border with the Amhara Regional State. In particular, the IWS is comprised between the Farmer Associations of Doyo-Dawee and Anno-Akabdo.

Reaching IWS requires off road driving from the closest District Town (Mendida), for a total of about 3 hours and 35 Km, if and when the soil is dry. In fact, when the soil is wet, the site is virtually unreachable by car. For instance, in early October 2006 and during first half of November 2008, when the soil was not sufficiently dry yet, reaching the IWS by vehicle proved to be extremely challenging.

There are two rainy seasons on Ethiopian highlands, a long and a short one: the long rainy season takes place between July and September while the short one usually between February and April.

The IWS environment is a typical agro-pastoral one (Fig. 1, 2, 6), inhabited by settled communities living in scattered villages made up of thatched huts locally known as “*tuguls*”. Cultivated fields (mainly *teff*, wheat, barley, oat) alternate with pastures, while the natural vegetation cover has been almost totally wiped out (Fig. 1) – except for some scattered *Acacia* trees and some scrubs in the fringes around villages. Exotic *Eucalyptus* trees dominate the slow-rolling hilly landscape intersected by several streams.

The IWS seems quite wet in comparison with other visited areas of the Ethiopian highlands, at the same altitude. This is probably the reason for the presence of abundant pastures balancing the presence of crops. Hay fields are typically occurring along the streams, in the lower levels of the drainages, while the cultivated fields typically lie along the intermediate and higher slopes of the drainages, adjacent to villages which are typically on top of the hills. Dry flat ridges connecting villages are also quite common which are kept as dry pastures to be used during the rainy seasons.

Logistical, technical and scientific details of the expedition were discussed at length with Mr Mengistu Wondafrash, the Conservation Officer at EWNHS (meanwhile become Executive Director). It was decided to split the expedition in 3 components:

- surveys at the IWS (combining eco-ethological / ornithological/ conservation data with socio-economic/cultural data), both in November 2008 and in January 2009
- search at old ibis sighting sites on Ethiopia highlands (southern and central sections)
- search at a recent ibis sighting site on the Djibouti coast.

At the same time an agreement was made and signed between IUCN West Asia and EWNHS aimed at clearly assigning roles in order to successfully and smoothly implement the expedition. EWNHS, as agreed, proposed a qualified and experienced national candidate, Mr Abdurahiman Kubsa, to carry out the socio-economic and cultural survey. After reviewing his CV this expert was selected and hired for the duty. Field surveys were scheduled and implemented in the following way:

- November surveys at IWS: 8-19 November 2008 (12 dd)
- 7-day search on the south eastern highlands (Dodola and Bale National Park): 8-14 January 2009
- 5-day search on Djibouti coast: 16-21 January 2009
- January survey at IWS: 23-28 January 2009 (6 dd)
- 3-day search at central highlands (Sululta, Mertule Mariam, Debre Marcos): 29-31 January 2009.

After acquired food supplies and camping equipment, we started the trip to reach the IWS, both in November 2008 and in January 2009. An encampment was established in the IWS core area, within the land of the chair of the Doyo-Dawee peasant association, Mr Salomon Feyisaa, a few hundred meters away from the ibis roost. Once arrived, the EWNHS 4x4 vehicle was parked and left there for the whole duration of the surveys.

Surveying was conducted on foot and using binoculars. In order to detect the birds on feeding sites during the day two strategies were used: i) searching in all suitable habitats of the IWS known to be used in the past and especially in those sites shown to be preferred during November 2006 survey; ii) carefully observing the direction of flight and disappearance over the horizon soon after birds abandoned the roost at dawn.

Once detected, birds were observed by means of binoculars, focusing the attention on their behaviour and any interaction with other animals and especially with humans. Observations were made being very discreet with the locals and without disclosing our specific interest for the ibises – explaining that we were carrying out a general bird monitoring survey.

A special attention was paid to the preys that ibises were looking for on the terrain. One day during the January 2009 survey they were followed from dawn to sunset, recording every 10 minutes the behaviour, as it had already been done during the November 2006 survey. Actual feeding sites were sampled for potential preys in both periods. Transect of 100 meters were walked in each feeding site scanning the soil surface for macro-invertebrate and small vertebrate, and wherever suitable, opportunistically, the soil was dug up to 10 cm underground.

The climate was sunny and very cold during the first survey at IWS in November 2008. Temperature dropped below zero during the night. We arrived just at the time when the long rainy season terminated (a rainy season longer than usual). Reaching the site was particularly challenging during November survey, due to extreme wetness of soil. The vehicle got stuck in proximity to destination and it took a whole day of efforts to get it unstuck, thanks to the skills and determination of EWNHS's driver Mr Endale Wolde Tensai and the invaluable help of the local community (Fig. 17).

The soil was very wet, vegetation was luxuriant and the *Hinae* pond, to the north-east of the IWS, was full of water. Hay fields were under cutting, in a quite advanced stage. During the survey at the end of January 2009 the weather was variable, mostly cloudy and temperature was milder than in November. There were frequent showers and also some storms, especially at the beginning of the survey. The soil however was drier than the first survey in November. The hay fields had been already cut and were dry.

A desk review of specific literature have been undertaken before the survey aimed at identifying name of locations where ibis had been sighted by reliable observers in the past centuries on Ethiopian highlands - the main reference being the review by Welch and Welch 2004. Once identified the location on a geographical and road map it was reached by car and searched for suitable NBI habitats: pastures and cut hay fields. Presence of known co-occurring species such as Wattled Ibises and Cattle Egrets was used to highlight the most promising sites. The suitable habitats and most promising sites were then scanned by means of binoculars and telescope.

3. Results

3.1 Ecological conditions

In November 2008, the local conditions were extremely wet, much more than in November 2006: actually the long rainy season had finished the day before we set to go to the wintering site. As a consequence, while in November 2008 we found the *Hinae* pond abundant in water, the same pond was dried up in November 2006. Also, while we faced major challenges in reaching the IWS in November 2008 due to soil wetness, we did not encounter any problem in November 2006.

The degree of wetness found in November 2008 seems comparable to that found in early October 2006 by a preliminary IWS by EWNHS (Wondafrash *pers. comm.*) - when major difficulties were faced to

reach IWS by vehicle. The hay fields were mature and intensely coloured in November 2008 and the IWS had a very green appearance (Fig. 2 and 8).

In January 2009 the ecological situation was much drier, despite some storms and showers have taken place during the survey itself, more or less equivalent to November 2006: in fact, like in Nov 2006, the *Hinae* pond was dried up in Jan 2009 and no problem was faced to reach the IWS by vehicle.

3.2 Home range, feeding habitats and daily time allocation

Four breeding adult ibises were found at *Hinae* pond on 9 November 2008 around 10 o'clock, the tagged females Zenobia and Salam, the tagged male Sultan and the untagged male Scheisch. The size of the home range used by ibises during Nov 2008 and January 2009 seemed to be the same as that shown in November 2006, around 12-15 Km².

Differently from November 2006 (Fig. 9), ibises, observed along a 10-day period, used only grazed pastures (Fig. 10) and ignored the cut hay fields in November 2008, despite the availability of the latter. Grazed pastures used by ibises were either the lower and greener ones, in proximity of streams or the higher and dry ones, at the same level of villages. The same behaviour was observed during 4-day survey taken place in January 2009. A total of 25 different feeding sites on pastures were identified during the 2 surveys (15 in November and 10 in January).

The other relevant difference between November 2006 *versus* 2008 is the time allocated by ibises for resting which was only a few tens of minutes a day in November 2006 while it was several hours a day in November 2008. In fact birds, typically, would spend 2-3 hours feeding early morning, and then at around 9-10 o'clock would move to *Hinae* pond (Fig. 3) where they would remain until the early afternoon (14-15 o'clock). Afterwards, they would resume feeding until they return to the roost around 17:45-18:00.

Similarly to Nov 2006, birds allocated a quite short amount of daily time to resting (in the order of tens of minutes a day) in January 2009, in contrast with what has been observed 2 months before.

3.3 Foraging behaviour and feeding sites sampling

As already observed in 2006, the four ibises roosted all together and also stayed together while feeding, resting and flying during day time. The untagged male Scheisch was on average more independent and isolated than the others while feeding, although always at sight distance from the rest of the flock – the same as it had been also observed in October 2007 by Wondafrash and Dellelegn (2007).

At times they would share the feeding sites with Wattled Ibises, Cattle Egrets and crows – but mostly with the Wattled ibises. The rock outcrop used as a perch during resting, on the side of the *Hinae* pond, was sometimes shared with a range of other water birds such as ducks, goose, spoonbills, herons, sacred ibises, cattle egrets etc.

In both periods, a careful observation of foraging birds revealed that most of their preys were taken from underground, through sticking the bill in cracks and holes, probing and then struggling by moving and rotating the bill and the whole head and body to extract the prey from underground. The sampling of 25 feeding sites revealed the presence of a range of invertebrates on the soil surface, under the stones and underground.

The most abundant and conspicuous preys found underground in November 2008 was a caterpillar of a nocturnal moth (most likely an *Hepialidae*) (Fig. 11) while in January 2009 it was a cricket (Fig. 12).

Ants, a few beetle species and grasshoppers were typically detected on the soil surface. Ants and their eggs, spiders, some small beetle and even, at times, frogs were found under stones or underground.

In November 2008 and January 2009 they used only pastures, of two kinds: the wet pastures, in proximity to streams, and the flat and dry higher pastures. It was observed that they focused on the drier patches of the higher pastures, which is explainable by the fact that they need cracks to probe underground for larvae and crickets.

3.4 Roosting

In November 2008, ibises were found to be roosting on the same exact *Eucalyptus* tree used in November 2006 (Fig. 13) while in January 2009 they were found to be roosting on another *Eucalyptus* tree part of a group traditionally used by a large flock of Wattled Ibises (and also some Cattle Egrets and Sacred Ibises), some 80 m NE from the original roost, within the same village hill (Fig. 14). The roost of Wattled ibises was the same recorded in November 2006.

Satellite locations evidenced that during the period between the 2 surveys (Nov 2006 - Nov 2008) the birds have most likely used the same village hill to roost.

3.5 Interactions with humans and other behaviour

The ibises live in close contact with the local community both during day and during the night. The most common interaction with humans is a short flying in order to escape closeness with incoming herds of livestock and/or their shepherd. The observed ibis flying distance is about 80-150 m, depending on the speed and the smoothness of movements of approaching herds/shepherds. Most of the times this flight would be of short distance (tens of meters), in order to land at a different spot of the same feeding site, while at times the flight would be longer with birds changing the feeding site.

On the last day of January 2009 survey, we have found in the late afternoon 3 trees cut down by the locals that same day, from the same group of trees used by the ibises as roost (the second one). Actually, from a close analysis of the situation it was realized that the actual ibis roost was among the trees logged down (Fig. 15). This was confirmed by the observation of the behaviour of birds once they returned to the roost at sunset.

In fact, their behaviour appeared very unusual and different from the typical pattern recorded so far: they circled in flight around their roost more times than usual and, once realized "their tree" was not in place anymore, they split in 2 groups. Two returned back to the previous roost, while another 2 apparently picked a new tree among those used by the Wattled Ibises. One of the 2 latter birds also landed for 5 minutes not far from the ex-roost – behaviour never recorded before - and then joined the companion.

As already observed in November 2006, ibises were gaping carefully at the sky above them regularly, both while feeding and while relaxing, showing concern especially when large eagles were soaring at a certain distance. At times, the predator closeness would prompt the ibises to fly.

On 25 January courtship behaviour was recorded between Sultan (tagged male) and Zenobia (tagged female), an established pair: Sultan, during a moment of relax and resting at mid morning, started to move the head and bill up and down, in the known ritualized manner, in front of Zenobia.

3.6 Threats

The local community does not pay much attention to birds and they do not hunt by tradition. The fact that 2 similar ibis species are present – together with several other medium sized birds – give the chance to bald ibises to camouflage well among the other birds. The general impression was that most locals would not recognize them from Wattled Ibises.

At the same time we could witness how much damage a single “naughty” kid could produce to a bird: an adult Long-eared Owl was severely injured at the end of January 2009, using stones, by a kid, beside our camp for no apparent reason other than exhibitionism and possibly superstition against nocturnal bird of preys (Fig. 20).

It seems there is consensus among the local community that the land’s fertility is decreasing steadily (as recorded by socio-economist Mr Kubsa), although there is not consensus on what the causes are. On the medium- and long-term the main threat to ibises could be the plans stated by local authorities to convert pastures into crops as much as possible, as recorded by socio-economist, Mr Kubsa, and the will to use more chemicals (fertilizers and pesticides) to increase production. Both these plans, if implemented, will surely decrease the availability and quality of suitable feeding habitat for ibises.

3.7 Search on the Ethiopian highlands and on Djibouti coast

Both searches, on Ethiopian highlands and on Djibouti coast, were unsuccessful in detecting additional bald ibis flocks. The search on the Ethiopian highlands was useful in better understanding what the key ecological qualities of the IWS are compared to the rest of the highlands: namely, the degree of wetness and the consequent unsuitability for extensive agriculture and abundance of pastures compared to other areas.

This was confirmed by surveying the most important historical sites such as Sululta and lake Chelekleka, which showed similar characteristics to the present IWS. On the other hand, the surveying of highland sites at about same altitude but much drier (area of Mertule Mariam and Debre Marcos) was important to outline, by contrast, the key characteristics of IWS.

Visiting a forest community project in Dodola (Integrated Forest Management Project Adaba-Dodola), close to the Bale National Park, and discussing with locals and staff gave interesting insights about the potential for sustainability over time of conservation initiatives in the country. In fact the one visited had been once a long-term and quite large GTZ-funded conservation project. It seemed well designed and implemented until 2006, when it was handed over to the national and local authorities. The situation found on the ground, three years after the termination, was far from being ideal: we witnessed the illegal exploitation of the forest and the inability of the local community and authorities to prevent it.

The exact site of the sighting of a young ibis in January 2008 on the northern Djibouti coast was surveyed and monitored intensively for 5 days, together with the surrounding coast. Potential roosts in the area were also monitored at sunset. No ibis could be spotted. The habitat used by the young ibis in January 2008 is an intertidal sandy zone mixed with boulders and stones. During low tide several water birds such as whimbrels, herons, plovers were observed feeding on intertidal invertebrates. The site of sighting was in the middle of a quite densely populated village (Tadjoura), close to a known hotel resort by the beach.

4. Discussion

The behaviour of the 2 ibis pairs at their wintering grounds showed to be quite conservative across 3 wintering seasons (2006-07, 2007-08, 2008-09). The birds used 2 trees as roosts about 80 m apart (Wondafrash and Dellelegn (2007)). The most recent instance of roost change recorded, observed on

the last day of second survey, on 27 January, was surely due to the cutting down of the second roosting tree. *Eucalyptus* are mostly used by locals to build new thatched huts known as tuguls.

The other conservative and very interesting point is the actual size of the ibis wintering home range on the Ethiopian highlands: during the survey it was 12-15 Km², similarly to what found in Nov 2006. This home range is much smaller than the area used for breeding in Syria which is about 600-800 Km². The human density is very different, as in Ethiopia is very high – a settled community in an agro-pastoral montane highlands– while in Syria it is very low – a nomadic community in an arid environment.

Ibises arrive at the wintering ground in the middle of the rainy season (August-September) and stay through the end of it and through the subsequent dry season, until early February. During the past 3 wintering seasons, they were surveyed 4 times: it was not possible to survey them during September and, partly also in October, due to the inaccessibility of the site – the earliest they were surveyed was on 2-4 October 2004 by EWNHS (Wondafrash, *pers. observ.*).

Taking into consideration the time allocated by birds for relaxation and toileting, it appears to be clear that the abundance of ibis preys is much higher when the environment is wet (September-November) than in drier conditions (November-January). This is consistent to what stated by Wondafrash and Dellelegn (2007) that in second half of October 2007 they were “spending 90% of their time in toileting and relaxation activities”. Interestingly, also on 2-4 October 2006 ibises had been found relaxing at *Hinae* pond at mid day.

The rock outcrop by *Hinae* pond systematically used by ibises as a relax perch – together with other water birds –most likely offers the advantage of allowing the birds a full control of the surrounding 3-dimensional environment, so that they are always ready to escape predation or disturbance on time by flying. This same kind of perching behavior is common among several water birds.

Two feeding habitats were recorded to be used by birds during the past wintering seasons: cut hay fields (as observed in November 2008) and pastures (as observed in November 2006, November 2008 and January 2009). During the 2 surveys undertaken in winter 2008-09 only pastures have been observed to be used. It is not clear the reason why they did not use available cut hay fields, as recorded in Nov 2006.

The Ibises' main preys at wintering grounds seem to be mainly underground larvae during wet conditions and crickets during drier periods. All range of possible macro-invertebrates and small vertebrate (like frogs hiding under stones and in the soil cracks) are most likely included in their diet. When there is food scarcity, ibises were ready to take even ants from the soil surface, like observed in Nov 2006. This estimated diet seems similar to that described at breeding grounds (Serra et al. 2008).

The environment of the IWS appeared as a very wet one when compared to other areas of the highlands, making it suitable for a combination of agriculture and livestock rearing. Mr Kubsa, the socio-economist, who has extensively surveyed the highlands in the past, agreed on the fact that IWS is characterized by an abundance of pastures *versus* cultivated fields. In the other areas of the highlands visited, pastures are a much smaller portion and peoples' livelihoods are more based on cultivation of land than on rearing livestock.

The preference of NBIs for a relatively wet environment during winter time in Ethiopia is contrasted by their use of a very arid environment for breeding in Syria (Serra et al. 2009).

No evident short-term threat was recognized during the surveyed wintering seasons: in fact, as long as no attention of local people is raised on the birds, no short-term threats to ibises is to be expected. This seemed a good indication that the strategy we have adopted and agreed so far of not advertising the

presence of these 4 rare birds among the locals seems as the best way to ensure their survival – at least until the day that funds are raised in order to protect the area officially and to be able to monitor regularly the site, to employ guards etc.

In fact, given the observed average respectful approach of local community towards local birds, surely, ninety-nine % of people would not harm the birds. The fact is that it is sufficient one kid to destroy 25% of the whole eastern ibis breeding population – by killing one bird – as well evidenced by the killing of the Long-eared Owl in front of us in January 2009. Therefore at the moment the cheaper and most effective conservation approach seems the one we have adopted so far.

On the other hand, medium and long-term threats to birds seem likely to happen. The environment used by ibises for wintering is totally converted into agriculture and pastureland with virtually no native vegetation left. Birds have adapted to use man-made habitats, especially freshly cut hay fields and pastures. Visiting other portions of the Ethiopian highlands gave a good idea of what is the real threat in the medium term: that pastures are converted into agriculture and that the use of polluting chemicals (fertilizers and pesticides) start to be used massively to counter-act the perceived decreased fertility.

On the medium and long term, threats are therefore probable and should be expected as the local community live under poverty conditions, as confirmed by the socio-economic survey: the key underlying threat to birds seems to be the fact that the local community live on a subsistence economy which is becoming increasingly unsustainable due to ecological degradation of the ecosystems. Among the root and underlying causes of this ecological crisis is surely the over-exploitation of the ecosystem due to the ever increasing human pressure on it.

In order to alleviate poverty, the local authorities seem to have been oriented to help the local community to “reclaim” part of the pastures for agriculture in the ibis wintering area. The other concern is about the use of fertilizers, which is currently not completely negligible, as evidenced by Mr Kubsa – even though the birds do not use agricultural fields.

As anywhere else in the region and in the world, there is no simple solution to conservation problems. The visit to a large conservation project in the southern highlands (Dodola), regarded as a pioneering one and among the most successful in the country, gave an idea of the challenges and complexities that a conservation initiative can face in the country.

Therefore, at the moment, a good short-term conservation option seems to leave the situation as it is at the IWS, so that we can focus on the most severe short-term threats for the ibis colony which are at the breeding grounds and along the migratory route. In fact, one of the four birds observed during November-January surveys, the young male Scheisch, did not reach the breeding grounds in Syria. At the same time, on the medium-term, it seems sensible to start discussing on how we could assist authorities in planning sustainable development of the local community from IWS.

The search in Djibouti was useful to identify, describe and document one of the recently discovered feeding habitat used by a young NBI during its dispersal of few years - most likely taking place all around the Red Sea Basin. Most probably the ibis immature ibises adopt an erratic and nomadic behaviour during their first 3 years, before returning to their breeding grounds in Syria.

5. Recommendations

1. Short-term: avoid advertising the presence of the birds among the locals. For this reason, it is important that the location of the IWS is not disclosed to birdwatchers and tour operators, at least as long as the colony is at the very verge of extinction.

2. Medium-term: fund raise with the aim to start discussing and planning with authorities possible measures to promote ecologically sustainable reduction of poverty in the area.

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ANNEX 1

FIGURE AND LEGENDS



Figure 1. Landscape of wintering site of NBI on Ethiopian highlands.



Figure 2. Environment of wintering site of NBI on Ethiopian highlands: mature hay fields before cutting (November 2008).



Figure 3. The four ibises resting and toileting on the rock outcrop beside the pond *Hinae*.

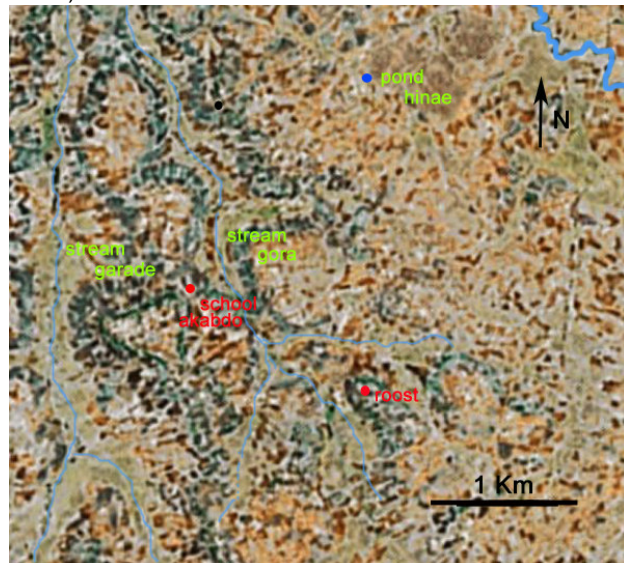


Figure 4. Study area (IWS) as shown on Google Earth, at low resolution, showing the key landmarks: the 2 streams, the school of Akabdo, the pond *Hinae* and the ibis roost.

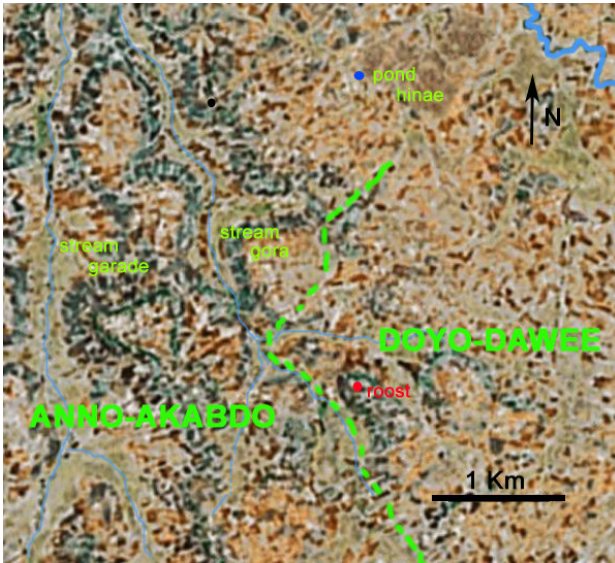


Figure 5. Study area as shown on Google Earth and its administrative demarcation of peasant associations.



Figure 6. Satellite image from Google Earth with high resolution, showing a portion of landscape few tens of Km north of the study area: clusters of tached huts (tuguls) are recognizable, together with isolated metal buildings (schools) and cultivated fields (green) and ploughed fields (dark brown).



Figure 7. Survey team and local administration staff in winter 2008-09.



Figure 8. Environment of wintering site of NBI on Ethiopian highlands: mature hay fields before cutting (November 2008).



Figure 9. Environment of wintering site of NBI on Ethiopian highlands: there are several streams.



Figure 10. The four ibises while feeding on a dry pasture some 80 m away from tuguls and some hundreds m away from *Hinae* pond.



Figure 9. Two NIBIs feeding together with 1 Wattlebird on a cut hay field in November 2006.



Figure 10. Wattlebird and Sacred Ibises and Cattle Egrets feed on uncut hay fields, differently from NIBIs.



Figure 11. Moth caterpillar occurring in the underground: the most preyed animal by NIBIs in November 2008.



Figure 12. Cricket occurring in the underground: the most preyed animal by NIBIs in January 2009.



Figure 13. Roost used by NIBs in November 2006, October 2007 and November 2008.



Figure 14. Roost used by NIBs in January 2009.



Figure 15. NIB roost cut down in January 2009.



Figure 16. First-year NIB juvenile photographed on Djibouti coast in January 2008 (photo H. Lind).



Figure 17. Reaching the study area posed some difficulties in November 2008, as the soil was very wet: some hundred meters away from the planned site for camping the vehicle got stuck badly and it took a whole day of efforts and the manpower of several villagers to set it unstuck.



Figure 18. Beetle caterpillars found underground on an NBI feeding site in January 2009.



Figure 19. Local teen and women shepherding their livestock and cutting the hay in November 2008. They became very familiar with us and took a big interest in the survey.



Figure 20. Long-eared Owl severely injured by a kid in January 2009: it died few days later.



Figure 21. Escarpment of Ethiopia highland, not far from the NBI wintering site.



Figure 22. Ibises taking off from one of the feeding site (one of the fourth was not captured by the photography), with the



Figure 23. Part of the survey team, resting in Mendida village (from left): Mengistu Wondafrash, Gianluca Serra, Getiye Girma and Solomon Fayisaa.

ANNEX 2

BIRD CHECKLIST OF NORTHERN BALD IBIS WINTERING SITE

ORDER/FAMILY	#	SCIENTIFIC NAME	COMMON NAME	REMARKS
Podicipedidae - Grebs	1	<i>Podiceps ruficollis: P. r. capensis</i>	Little Grebe	R
Phalacrocoracidae - Cormorants	2	Phalacrocorax africanus: P. a. africanus	Long-tailed Cormorant	R
Ardeidae - Herons, Egrets & Bitterns	3	<i>Ardeola ibis (Sy. Bubulcus ibis)</i>	Cattle Egret	M
	4	<i>Egretta garzetta</i>	Little Egret	R
	5	<i>Egretta intermedia</i>	Yellow-Billed Egret	R
	6	<i>Ardea cinerea</i>	Grey Heron	PM/R
	7	<i>Ardea melanocephala</i>	Black-headed Heron	M
Scopidae - Hamerkop	8	<i>Scopus umbretta</i>	Hamerkop	R
Threskiornithidae - Ibises & Spoonbills	9	<i>Plegadis falcinellus</i>	Glossy Ibis	R
	10	<i>Bostrychia carunculata</i>	Wattled Ibis	E*, R
	11	<i>Threskiornis aethiopicus</i>	Sacred Ibis	M
	12	<i>Geronticus eremita</i>	Northern Baled Ibis	M
	13	<i>Platalea alba</i>	African Spoonbill	R
Anatidae - Ducks & Geese	14	<i>Cyanochen cyanoptera</i>	Blue-winged Goose	E*, R
	15	<i>Alopochen aegyptiacus</i>	Egyptian Goose	R
	16	<i>Anas sparsa</i>	African Black Duck	R
	17	<i>Anas undulata</i>	Yellow-billed Duck	R
	18	<i>Anas clypeata</i>	Northern Shovler	PM
Accipitridae - Hawks, Eagles & Vultures	19	<i>Elanus caeruleus</i>	Black-shouldered Kite	R
	20	<i>Milvus migrans</i>	Yellow-billed Kite	M
	21	<i>Neophron percnopterus</i>	Egyptian Vulture	R
	22	<i>Necrosyrtes monachus</i>	Hooded Vulture	R
	23	<i>Gyps africanus</i>	White-backed Vulture	R
	24	<i>Gyps ruppellii</i>	Ruppell's Vulture	R
	25	<i>Torgos/Aegyptius? tracheliotus</i>	Lappet-faced Vulture	R
	26	<i>Trionoceph /Aegyptius? occipitalis</i>	White-headed Vulture	R
	27	<i>Circus macrourus</i>	Pallid Harrier	PM
	28	<i>Circus pygargus</i>	Montagu's Harrier	PM
	29	<i>Buteo oreophilus</i>	Mountain Buzzard	R
	30	<i>Buteo rufofuscus</i>	Augur Buzzard	R
	31	<i>Aquila clanga</i>	Greater Spotted Eagle	PM
	32	<i>Aquila rapax</i>	Tawny Eagle	PM/R
	33	<i>Aquila nipalensis</i>	Steppe Eagle	PM
Falconidae - Falcons	34	<i>Falco tinnunculus</i>	Common Kestrel	PM/R
	35	<i>Falco biarmicus</i>	Lanner Falcon	R
	36	<i>Falco peregrinus</i>	Peregrine Falcon	PM/R
Phasianidae - Francolins, Quails	37	<i>Francolinus sephaena</i>	Crested Francolin	R
	38	<i>Francolinus psilolaemus</i>	Moorland Francolin	R
	39	<i>Coturnix coturnix</i>	Common Quail	PM/R
	40	<i>Rallus/Ruogetius rougetii??</i>	Rouget's Rail	E, R
Gruidae - Cranes	41	<i>Grus grus</i>	Common Crane	PM
Recurvirostridae - Avocet, Stilt	42	<i>Himantopus himantopus</i>	Black-winged Stilt	PM /R
	43	<i>Glareola pratincola</i>	Red-winged Patincole	R/ PM?

Glareolidae –Coursers, Pratincoles	44	<i>Charadrius tricollaris</i>	Three-banded Plover	R
	45	<i>Vanellus melanopterus</i>	Black-winged Plover	R
	46	<i>Vanellus melanocephalus</i>	Spot-breasted Plover	E, R
Scolopacidae - Sandpipers	47	<i>Gallinago nigripennis</i>	Ethiopian/African Snipe	R
	48	<i>Limosa limosa</i>	Black-tailed Godwit	PM
	49	<i>Tringa stagnatilis</i>	Marsh Sandpiper	PM
	50	<i>Tringa nebularia</i>	Greenshank	PM
	51	<i>Tringa ochropus</i>	Green Sandpiper	PM
	52	<i>Tringa glareola</i>	Wood Sandpiper	PM
	53	<i>Tringa hypolucos</i>	Common Sandpiper	PM
	54	<i>Calidris minuta</i>	Little Stint	PM
	55	<i>Philomachus pugnax</i>	Ruff	PM
Columbidae – Pigeons, Doves	56	<i>Columba guinea</i>	Speckled Pigeon	R
	57	<i>Columba albitorques</i>	White-collard Pigeon	E*, R
	58	<i>Streptopelia lugens</i>	Pink-breasted Turtle Dove	R
	59	<i>Streptopelia semitorquata</i>	Red-eyed Dove	R
Strigidae - Owls	60	<i>Asio otus</i>	Long-eared Owl	R
Meropidae - Bee-eaters	61	<i>Merops variegatus</i>	Blue-breasted Bee-eater	R
	62	<i>Merops apaister</i>	European Bee-eater	PM
Upupidae - Hoopoes	63	<i>Upupa epops</i>	Hoopoe	PM/R
Alaudidae - Larks	64	<i>Calandrella erlangeri</i>	Erlanger's lark	R
	65	<i>Galerida theklae</i>	Theckla Lark	R
Hirundinidae - Swallows, Martins	66	<i>Riparia riparia</i>	Common Sand Martin	PM
	67	<i>Riparia paludicola</i>	Brown-throated Martin	R
	68	<i>Delichon urbicum</i>	House Martin	PM
	69	<i>Hirundo rustica</i>	Barn Swallow	PM
Motacillidae -Wagtails, Pipits and Longclaws	70	<i>Motacilla alba</i>	White Wagtail	PM
	71	<i>Motacilla flava</i>	Yellow Wagtail	PM
	72	<i>Anthus cinnamomeus</i>	African Grassland Pipit	R
	73	<i>Anthus campestris</i>	Tawny Pipit	PM
	74	<i>Anthus similis</i>	Long-billed Pipit	R
	75	<i>Anthus trivialis</i>	Tree Pipit	PM
	76	<i>Anthus cervinus</i>	Red-throated Pipit	PM
	77	<i>Macronyx flavicollis</i>	Abyssinian Longclaw	E, R
Subfamily Turdinae – Thrushes, Chats, Robins	78	<i>Turdus abyssinicus</i>	Mountain Thrush	R
	79	<i>Psophocichla litsipsirupa</i>	Ground-scraper Thrush	R
	80	<i>Saxicola torquata</i>	Stonechat	PM/R
	81	<i>Oenanthe oenanthe</i>	Northern Wheatear	PM
	82	<i>Oenanthe pleschanka</i>	Pied Wheatear	PM
	83	<i>Oenanthe lugubris</i>	Abyssinian Black Wheatear	R
	84	<i>Oenanthe bottae</i>	Botha Wheatear	R
	85	<i>Oenanthe isabellina</i>	Isabelline Wheatear	PM
	86	<i>Cercomela sordida</i>	Hill Chat	R
Sylviidae - warblers	87	<i>Bradipterus cinnamomeus</i>	Cinnamon-bracken Warbler	R
	88	<i>Hippolais languida</i>	Upcher's Warbler	PM
	89	<i>Phylloscopus trochilux/trochilus</i>	Willow Warbler	PM
	90	<i>Sylvia atricapilla</i>	Blackcap	PM
	91	<i>Sylvia lugens</i>	Brown Parisoma	R
	92	<i>Cisticola brunnescens</i>	Pectoral-patch Cisticola	R
	93	<i>Cisticola lugubris</i>	Ethiopian Cisticola	R
	94	<i>Cisticola juncidis</i>	Zitting Cisticola	R
	95	<i>Prinia subflava</i>	Tawny-flanked Prinia	R
Paridae - Tits	96	<i>Cameroptera brachyura</i>	Grey-backed Cameroptera	R
	97	<i>Parus leuconotus</i>	White-backed Black Tit	R, E*

Nectariniidae - Sunbirds	98	<i>Nectarinia tacazze</i>	Tacazze Sunbird	R
Laniidae - Shrikes	99	<i>Lanius collaris</i>	Fiscal Shrike	R
Corvidae - Crows & Ravens	100	<i>Corvus albus</i>	Pied Crow	R
	101	<i>Corvus capensis</i>	Black Crow	R
Sturnidae - Starlings	102	<i>Lamprotornis chaylbaeus</i>	Greater Blue-eared Starling	R
	103	<i>Buphagus erythrohynchus</i>	Red-billed Oxpecker	R
Passeridae	104	<i>Passer griseus</i>	Swaision's Sparrow	R
Ploceidae - Weavers, Sparrows	105	<i>Ploceus baglafecht</i>	Baglafecht Weaver	R
	106	<i>Euplectes macrourus</i>	Yellow-mantled Widowbird	R
Estrildidae - Waxbills and Finches	107	<i>Lagonosticta senegala</i>	Red-billed Firefinch	R
	108	<i>Ortygospiza atricollis</i>	Quail Finch	R
Viduidae - Indigobirds & Widows	109	<i>Vidua chalybeata:</i> <i>V. c. ultramarina</i>	Village Indigobird	R
	110	<i>Vidua macroura</i>	Pintailed Widow	R
	111	<i>Serinus nigriceps</i>	Black-headed Siskin	E, R
	112	<i>Serinus citrinelloides:</i> <i>S. c. citrinelloides</i>	African Citril	R
	113	<i>Serinus tristriatus</i>	Brown-rumped Seed-eater	R
	114	<i>Serinus striolatus: S. s. striolatus</i>	Streaky Seed-eater	R
Emberizidae - Buntings	115	<i>Emberiza hortulana</i>	Ortolan Bunting	PM

NOTE: E = Endemic Species; E* = Endemic Species shared with Eritrea; R = Resident; PM = Palearctic migrant; A = Intra-African migrant; PM/R = Palearctic migrants with resident subspecies in Ethiopia;

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