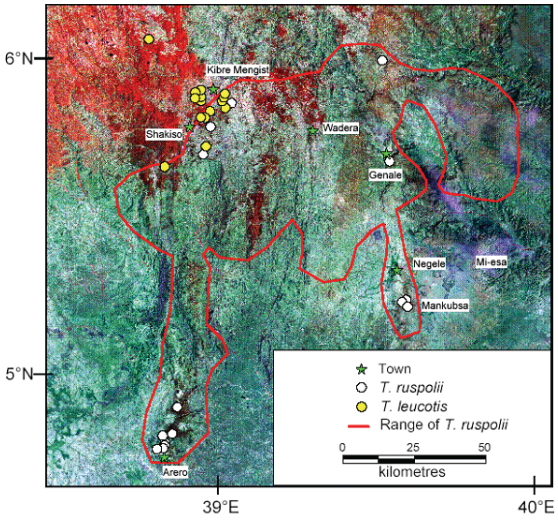

Figure 1

Figure 3

Figure 2

Figure 4

Figure 5

Captions are on page 106

A reassessment of the conservation status of Prince Ruspoli's Turaco *Tauraco ruspolii*

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Réévaluation du statut de conservation du Touraco de Ruspoli *Tauraco ruspolii*. Le Touraco de Ruspoli *Tauraco ruspolii* est endémique à l'Ethiopie du sud, où son aire de distribution ne dépasse probablement pas les 8000 km^2. Bien que l'espèce y fut encore relativement commune en 1995, des travaux sur le terrain effectués en 2001 semblent indiquer que son statut de conservation était en train de se dégrader. En février 2003 les auteurs ont prospecté quatre localités (Negele, Genale, Kibre Mengist et Arero) à l'intérieur de son aire de distribution. Bien que le Touraco de Ruspoli était toujours présent dans chacune de ces localités, une dégradation alarmante de l'habitat a eu lieu depuis 1995. Dans le nord, l'expansion de l'agriculture est le problème majeur, tandis que dans le sud, le surpâturage et les feux de brousse sont les facteurs les plus préoccupants. La coupe illégale des arbres est répandue sur toute la zone prospectée, surtout près des agglomérations les plus importantes. Le Touraco à joues blanches *T. leucotis* semblait avoir étendu son aire de distribution, empiétant sur celui du Touraco de Ruspoli, et des hybrides des deux espèces semblent répandus dans les zones marginales. Les tentatives des autorités locales pour conserver les habitats forestiers ont largement échoué à cause d'un manque chronique de ressources. La région a un besoin urgent de mesures de conservation, mais la situation socio-économique actuelle n'y est pas favorable.

Summary. Prince Ruspoli's Turaco *Tauraco ruspolii* is endemic to southern Ethiopia, where its range may be smaller than 8,000 km^2. Although the species was reported to be common in 1995, field work carried out in 2001 suggested that its conservation status might be worsening. In February 2003 we visited four localities (Negele, Genale, Kibre Mengist and Arero) within the species' range. Although Prince Ruspoli's Turaco was still present at all localities, a dramatic habitat degradation had taken place since 1995. Agricultural expansion was the main problem in the north of the area, whilst overgrazing and uncontrolled bushfires were more important in the south. Illegal felling of trees was widespread, especially near the largest human settlements. White-cheeked Turaco *T. leucotis* seemed to have expanded its range, encroaching upon that of Prince Ruspoli's Turaco, and hybrids of the two species appeared to be widespread in edge areas. Attempts by local authorities to conserve forest habitats have largely failed due to chronic lack of resources. Conservation measures are urgently needed, but the present socio-economic situation is not favourable to the implementation of such measures.

Prince Ruspoli's Turaco *Tauraco ruspolii* is endemic to a restricted area of southern Ethiopia (Borghesio & Massa 2000), where its total range is perhaps less than 8,000 km^2. Its very small range, the difficulties of accessing this remote area, the scarcity of information on its biology, and the history of its discovery, during an adventurous and ill-fated expedition in the late-19th century, all contribute to its charisma. Its discovery (Salvadori 1913) was not followed up until the 1940s, when Benson (1942) traced it again, to Arero Forest, near the border between Kenya and Ethiopia. Thereafter, for several decades, almost no further information was collected, although the species was considered close to the brink of extinction, because of its small population, ongoing habitat degradation and possible competition with White-cheeked Turaco *Tauraco leucotis* (Collar & Stuart 1985). More detailed surveys, in 1995 (Borghesio 1997a,b, Borghesio & Massa 2000), found that Prince Ruspoli's Turaco was still relatively common within its small range and that its preferred habitats were forest edge and relatively open *Acacia* woodland. Moreover, White-cheeked

Turaco mainly occurred in dense forest habitats, thus reducing competition between the two. Thus, Prince Ruspoli's Turaco was reclassified in a lower threat category (Vulnerable rather than Endangered) under IUCN criteria (BirdLife International 2000).

Field work in 2001 (Lernould & Seitre 2002) provided fresh information on the species' conservation status, suggesting that unexpected factors could threaten the bird and required evaluation. Photographic evidence from Kibre Mengist, at the western edge of the species' range, revealed that a significant proportion, if not the majority, of turacos in this area were hybrids between *T. ruspolii* and *T. leucotis*. Lernould & Seitre (2002) further suggested that habitat degradation in this area was responsible for reducing the barriers between the two species, thus permitting inter-breeding. Their observations appear to be the first report of natural hybrids between two species of turaco, and are of great concern, as they suggest that the genetic integrity of Prince Ruspoli's Turaco could be threatened by the introgression of genes of another species.

In February 2003 we visited the range of Prince Ruspoli's Turaco in order to reassess its conservation status.

Study area and methods

Our survey lasted from 12 to 23 February 2003, and covered various localities within the range of Prince Ruspoli's Turaco (Fig. 1). During the survey, conditions were mainly dry, and many of the trees leafless and without fruit.

On 12–13 February we visited Negele Borana, in the south-east of the species' range. The area is dominated by open grassland and sparse woodland, unsuitable for *ruspolii*. However, Prince Ruspoli's Turaco is known to occur in Mankubsa, a small forest formerly dominated by *Juniperus procera* and *Olea africana*. These tree species have now largely been removed by man, and small trees such as *Pistacia aethiopica* and *Euclea schimperi* are now much commoner (Borghesio 1997b, Borghesio & Massa 2000). We also visited Mi-esa, another locality *c*.30 km west of Negele, where other patches of *Juniperus* forest occur.

We next proceeded to Genale (13–15 March), another well-known locality for *ruspolii* (Borghesio 1997b, Borghesio & Massa 2000). Here, habitat is mainly riverine woodland (with *Ficus* spp.) and wide expanses of drier *Acacia–Combretum–Terminalia* woodland.

Between 15 and 18 February we surveyed the area around Kibre Mengist. Here, the wetter climate supports forest where species such as *Podocarpus gracilior*¸ *Olea capensis* and *Aningeria adolfi-friedericii* are common. The forest gradually grades into *Acacia–Combretum–Terminalia* woodland. Cultivation is also widespread, as the wetter climate favours agriculture. Both Prince Ruspoli's and White-cheeked Turaco occur here (the former mainly in the woodland, the latter usually in the forest: Borghesio 1997b). This area is where hybrid turacos were originally observed, *c*.25 km

Captions to figures on page 104

Figure 1. Satellite view (LANDSAT image of 01/2002) of the survey area and the estimated range of *T. ruspolii*, showing the localities mentioned in the text, and the observations of *T. ruspolii* and *T. leucotis* during the survey. Colours in the satellite image correspond to habitat types: red = wet forest (*Podocarpus–Aningeria*); black = *Juniperus* dry forest (mainly at Arero); blue-green = *Acacia–Combretum–Terminalia* woodland.

Image de satellite LANDSAT (janvier 2002) de la zone prospectée et de l'aire de distribution estimée de *T. ruspolii*. Les localités mentionnées dans l'article et les observations de *T. ruspolii* et *T. leucotis* faites pendant la prospection sont indiquées. Les couleurs de l'image correspondent à des types d'habitats: rouge = forêt humide (*Podocarpus–Aningeria*); noir = forêt sèche de *Juniperus* (principalement à Arero); bleu-vert = zone de *Acacia–Combretum–Terminalia*.

Figure 2. A former tract of *Juniperus–Olea* forest at Mankubsa, south of Negele. The trees have been totally removed (compare with Fig. 5).

Ancienne forêt de *Juniperus–Olea* à Mankubsa, au sud de Negele. Les arbres ont tous été coupés.

Figure 3. Genale, February 2003. Although agricultural intensification occurred between 1995 and 2003, Prince Ruspoli's Turaco is still present in the area.

Genale, février 2003. Malgré l'intensification de l'agriculture qui a eu lieu entre 1995 et 2003, le Touraco de Ruspoli est toujours présent dans la zone.

Figure 4. *Acacia–Combretum–Terminalia* woodland south of Kibre Mengist; a mixed group of five *T. ruspolii* and *T. leucotis* was observed here on 17 February 2003.

Zone de *Acacia–Combretum–Terminalia* au sud de Kibre Mengist; un groupe mixte de cinq *T. ruspolii* et *T. leucotis* a été observé ici le 17 février 2003.

Figure 5. *Juniperus–Olea* forest at Arero.

Forêt de *Juniperus–Olea* à Arero.

west of Kibre Mengist (Lernould & Seitre 2002).

On 19–23 February we visited Arero Forest, where the principal habitat is *Juniperus procera–Olea europaea* forest (similar to that at Mankubsa), fringed by *Acacia–Combretum–Terminalia* woodland. Only *ruspolii* is known to occur, often at high densities (Borghesio 1997b, Dellelegn 1991).

In each of these areas we searched for turacos using unlimited-distance point counts lasting 15 minutes. Points were located at 250 m distance from each other along approximately straight lines. The starting point and the direction of each line were located randomly within suitable habitats (i.e. grassland and dry *Acacia–Commiphora* woodland were avoided, as they are known to be unsuitable: Borghesio 1997b, Borghesio & Massa 2000). At each point we played recordings (supplied by the National Sound Archive of the British Library) of the song and calls of both *T. ruspolii* and *T. leucotis* in an attempt to elicit a response. The location of each point, as well as the distances between points, was recorded using a GPS.

In each area, we also interviewed local people and officers of the Rural Land Administration Department, in order to acquire information concerning perceived ecological problems and possible solutions. Throughout, the results of our 2003 survey are compared with those of previous (1995) work in the same localities (Borghesio 1997a,b, Borghesio & Massa 2000).

Results

Negele. We performed 35 point counts in this area, and found Prince Ruspoli's Turaco in three. All points where the species was observed were in the same area, a small valley with extremely degraded remnant *Juniperus* forest intermixed with *Acacia–Combretum–Terminalia* woodland. At Mi-esa, we searched for turacos on one morning, but were unable to find any. However, the habitat appeared suitable for the species, and local people suggested its presence, at least seasonally. We recorded severe habitat degradation in the Negele area, especially in Mankubsa Forest (Fig. 2). Here, comparison of satellite imagery from 1986 and 2002 revealed a reduction of 39% in the forested area, from 12.5 to 7.6 km^2, and the remaining habitat was degraded to such an extent that it was difficult to define the area as forest, but rather dense brush with scattered trees (Borghesio *et al.* in press). Increased demand for wood in the large town of Negele is probably the main cause of this destruction. High grazing pressure of domestic animals (cows and goats) is also significant, and the effects of overgrazing are widespread, both in the forest and in the surrounding *Acacia* woodland, as testified by the much higher abundance of low thorny bushes (*A. drepanolobium*) in 2003 compared with 1995. *A. drepanolobium* is avoided by domestic herbivores and its increase is a well-known sign of excessive grazing pressure (Pratt & Gwynne 1977). Forest fires are also a conservation problem, and the most recent burn (in 2001) destroyed a large tract of forest (perhaps 2 km≈), *c.*8 km south of the town. According to local people, fires are usually started by pastoralists, in an attempt to create more grazing land and control the abundance of ticks. Agricultural areas have also increased, but only around Negele, as most other areas appear too dry to sustain cultivation.

The local Rural Land Department has endeavoured to tackle the shortage of wood in Negele by creating plantations of exotic species (especially *Leucaena leucocephala* and *Grevillea robusta*). However, these plantations have met with little success with local people, who prefer to cut native trees. Moreover, local authorities complain of a severe shortage of funds to manage the plantations effectively, e.g. by watering or pruning. As a result, seedlings have a low establishment rate, and trees are stunted and of low quality. It appears that pressure on natural habitats is steadily increasing. At both Mankubsa and Mi-esa the forests are criss-crossed by many tracks, permitting vehicle access to transport felled trees away from the sites. Moreover, large numbers of people travel on foot each day from the town to extract firewood. In sum, attempts to stem the destruction of natural forest have been largely unsuccessful at Negele. Although forests are protected, local authorities lack the funds and manpower to enforce existing legislation. Moreover, given that timber products are essential to local people, it is obvious that a ban on tree felling will prove impossible to implement, as it would have unbearable consequences on the local human population. As the supply of wood in Mankubsa is now almost exhausted, woodcutters are working more remote areas, such as Mi-esa, which are likely to be completely destroyed within a short period.

Genale. Twenty-five point counts were performed in this area, and Prince Ruspoli's Turaco was observed in only one (four individuals in a group). Additionally, another individual was recorded in a second area, 31 km north of Genale River. Both records were in *Acacia–Combretum–Terminalia* woodland. Our data must be considered incomplete, as on the second day we were denied permission to continue our survey, because local authorities were suspicious that we were attempting to illegally capture turacos. These suspicions arose largely because, shortly before our visit, another party of 'white men' had endeavoured to capture turacos in the area. We were unable to verify if they had been successful. The situation was tense, and on the same day of our arrival, a party of tourists was denied permission to camp in the area.

Our general impression at Genale was that, compared with 1995, cultivation had increased somewhat, especially along the Genale River, but further away from there habitat appeared little changed. It seems likely that large areas of suitable habitat for the species are still present in the region (Fig. 3).

Kibre Mengist. Sixty-two point counts were made in this area, and *ruspolii* was found in three (one individual in cultivated landscape with remnants of *Podocarpus* forest, one at the edge of a *Podocarpus* forest and a mixed group of five (three *T. ruspolii* and two *T. leucotis*) in *Acacia–Combretum–Terminalia* woodland (Fig. 4). One apparently hybrid *T. ruspolii* x *T. leucotis* was also observed in *Acacia–Combretum–Terminalia* woodland on 16 February, *c.*10 km south of Kibre Mengist. At the latter, White-cheeked Turaco was apparently much commoner than Prince Ruspoli's Turaco, being abundant in plantations of exotic trees (*Eucalyptus* spp. and *Cupressus lusitanica*), where it was recorded on six point counts of a total of nine, as well as in *Podocarpus* forest (eight points of 45). White-cheeked Turaco also occurred in open, cultivated landscapes (one point of six). Compared with 1995, White-cheeked Turaco seemed to have expanded its range, especially into tree plantations, but also towards cultivated areas and *Acacia–Combretum–Terminalia* woodland, where it was apparently absent at the time of the 1995 survey.

Human activity increased significantly in the Kibre Mengist area between 1995 and 2003. There was a general increase in the size of villages and towns, especially around Shakiso (*c.*15 km south of Kibre Mengist), where a mine has attracted large numbers of settlers in recent years. Cultivated areas and plantations of exotic trees had also expanded greatly, at the expense of both *Podocarpus* forest and *Acacia–Combretum–Terminalia* woodland. Plantations probably already existed in 1995, as most trees were apparently 10–20 years old, but in 1995 they were much smaller and did not offer suitable habitat for turacos. However, in 2003 White-cheeked Turaco had invaded most such areas. Exotic trees were stunted and of low quality, as at Negele. The local Natural Resource Administration Department complained that no, or very few, resources were available for thinning, pruning and watering plantations. Apparently, local people showed very little interest in exploiting the timber products provided by plantations, and preferred to use native trees, despite felling being forbidden. Pit-sawing was common in wooded areas, and according to local authorities had greatly increased since the closure of government-owned sawmills.

Arero. Seventy point counts were made in this area, with *ruspolii* being recorded in ten, either as singles or in groups of up to nine. Only Prince Ruspoli's Turaco was observed, usually in narrow valleys at the edge of *Juniperus* forest, apparently in places with nearby water.

Compared to Mankubsa, forest loss at Arero was relatively less (Fig. 5). Comparison of satellite imagery (Borghesio *et al.* in press) from 1986 and 2002 showed a reduction in forest area of 8.7%, from 85 to 78 km^2. However, grazing pressure in 2002 was much higher than in 1995, which poses the question of how it will be possible to preserve the forest as it gradually ages. Large-scale commercial tree exploitation was absent, undoubtedly because of difficult road access, and trees were apparently only felled to satisfy the relatively low demands of local, nomadic tribes. Agricultural areas had expanded, but affected only a small area of the land, as traditional, nomadic cattle- and goat-herding remain the principal land-uses. The local Rural Land Department has created a small number of plantations, but again with little success due to lack of resources. There were traces of fires in many places, but at least up to now these seem to have affected only a minor area of forest.

Discussion

Our survey was short in duration, and we had no opportunity to visit core areas of *ruspolii*'s range, where presumably the species' strongholds occur. However, we were able to collect important new data, which suggest that the conservation status of the species might demand reassessment. In sum, the following issues appear relevant.

Range. Positively, we found no evidence that the range of Prince Ruspoli's Turaco contracted between 1995 and 2002. The species was still present in all localities searched. However, the extent of habitat degradation at Negele was such that the species is unlikely to persist there for long. Further research might locate new subpopulations of *ruspolii* in areas where lack of road access has thus far precluded exploration, especially at Mi-Esa, where some relatively intact *Juniperus* forest appears extant, and local people suggested that the species was present (although we failed to observe it).

Population trend. During our survey, contact rates with the species during point counts was very low, such that we were unable to derive population estimates from our data. The small number of observations might, in part, reflect the dry conditions during our survey, rather than a population decline. Prince Ruspoli's Turaco is known to make short-range seasonal movements (Borghesio 1997a), expanding into more peripheral areas in the wet season and retreating to its core range during dry periods. This, in turn, may result in a lower detection rate, as in the dry season the birds are more localised. However, we believe that seasonal shifts can only partially explain low detection rates, and that significant population decline might have occurred through habitat degradation. More field work is required and we suggest that counts should preferably be made during the wet season (April–May), when the species is more evenly distributed across its range.

Habitat changes. Compared with 1995, we found that human pressure had increased substantially. This had triggered high rates of habitat destruction. We found a noticeable difference in the quality and intensity of human activities between northern (Kibre Mengist) and southern parts of the study area. In the northern, more humid region, agriculture has probably driven most land-use change, as we found that many areas formerly occupied by natural habitats had been replaced by cultivated fields. In the drier southern part, the most noticeable changes were due to excessive grazing pressure, and perhaps to fires, which are mainly set by pastoralists. Also important is that all major urban areas had expanded across the study area, generating increased demand for firewood, construction poles, etc., which are mostly extracted, unsustainably, from natural woodland and forest. Finally, throughout the study area, but more noticeably in the north, we found that many plantations of exotic trees have been created recently. Unfortunately, they seem to have largely failed as a renewable source of timber products, mainly due to a scarcity of funds for their management. As a result, local people prefer felling trees in natural habitats, rather than using low-quality wood from plantations.

In sum, it appears that all types of forest (both *Juniperus*, in the south, and *Podocarpus*, in the north) are currently highly threatened and have shrunk rapidly in recent years. *Acacia–Combretum–Terminalia* woodland, which is the most widespread habitat in the study area (Fig. 1), seems to have suffered least, and it is probable that reasonable expanses are still present, especially where road access is poor.

The effects of such changes on *ruspolii* are probably largely negative. In the south, the almost complete destruction of Mankubsa Forest has probably caused the species' local extirpation. At Arero, the situation is undoubtedly better, but the very low regeneration rate of forest trees (due to the destruction of saplings by grazing animals) obviously poses a future threat. In the north, steady reduction of *Podocarpus* forests probably poses only a minor threat to the species, as *ruspolii* is only rarely found in such habitat (Borghesio 1997b). Agricultural intensification is, however, also eroding *Acacia–Combretum–Terminalia* woodland, on which the species is dependent. Moreover, our data suggest that exotic tree plantations in the north have provided White-cheeked Turaco with a stepping stone to encroach the rarer species' habitat, thus increasing the risk of hybridisation and competition between the two.

Hybridisation with White-cheeked Turaco. During our survey we observed one hybrid *T. ruspolii* x *T. leucotis* in the Kibre Mengist area. It was

seen *c.*30 km west of the hybrid bird observed by Lernould & Seitre (2002). Although our data do not permit an estimation of the proportion of hybrids within the total population, they confirm that the occurrence of hybrids is widespread and that they can be expected to occur over most of the contact zone (i.e., a line running from Shakiso, in the north-west, to Wadera in the north-east). That no hybrids were observed during the 1995 survey does not prove that none existed then, as we unable to exclude the possibility of having missed such individuals. However, a new insight from the 2003 survey was that White-cheeked Turaco had apparently expanded into the range of *ruspolii*, occupying some cultivated areas and exotic tree plantations in the Kibre Mengist area, where we also observed a mixed flock of the two species. Such flocks were not recorded in 1995, despite the relatively long period of time spent in the area, supporting the hypothesis of Lernould & Seitre (2002) that habitat changes have lowered ecological barriers between these turacos, thereby increasing the chances of hybridisation and competition.

Illegal smuggling. During our survey we collected evidence of attempts to illegally capture Prince Ruspoli's Turacos, suggesting that this might be an increasing threat to the species. Access to the area is still difficult, but has improved in recent years and, although this could result in increased possibilities for ecotourism, it will also provide additional opportunities for illegal trade in adults and eggs. It is impossible to evaluate the magnitude of this threat, but the issue should be taken into account during future surveys.

Possible conservation measures. Given the present rapidly deteriorating situation, urgent measures appear to be required to improve the conservation status of *ruspolii* and that of the entire South Ethiopian highlands Endemic Bird Area, where four other threatened endemic bird species occur (Stattersfield *et al.* 1998). We believe that the different socio-economic conditions in the southern and the northern parts of the study area demand separate approaches be taken. In the south, where the main economic activity is nomadic pastoralism, more emphasis should be placed on lowering grazing pressure, especially within *Juniperus* forests. In the north, attempts would better focus on reducing agricultural encroachment on natural habitats.

Given increasing demand for timber products in the area, establishing new tree plantations also seems to be a high priority, but more resources need to be allocated to post-planting management (pruning, watering, thinning etc), and, rather than exotic species, more emphasis should be attached to reforestation using indigenous trees. These measures are necessary if tree plantations are to be accepted by local people as a timber source. However, more research is needed to better understand how tree plantations favour the expansion of White-cheeked Turaco into *ruspolii*'s range. Firewood use is certainly a main cause of habitat destruction throughout the survey area. It has been demonstrated (Habermehl 1999) that high-efficiency stoves, which are cheap and easy to construct, can substantially lower amounts of firewood used, and the introduction of such devices would seem to be another important priority. However, these stoves could only interest people living in larger towns, because they are the only ones who need to buy firewood (and possess sufficient money to pay for it). It is likely that such people would quickly realise the savings inherent in using high-efficiency stoves. On the other hand, for a large part of the human population, firewood is free of cost, as they simply need to collect it from the nearest forest. At present, it is unlikely that high-efficiency stoves could spread to poorer people, who live far from towns and have no economic benefit to gain, as they simply do not possess the economic resources required.

We believe that the implementation of conservation strategies in southern Ethiopia will be challenging, because present levels of poverty in the area mean that any attempt to conserve the environment by applying existing legislation will fail. Moreover, as exploitation of natural resources is presently the only source of income for many people, it is unclear how plausible (or moral) it would be to prevent local people from continuing to use natural habitats, even unsustainably.

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