Population density estimates and threats evaluation of the highly endangered Udzungwa Forest Partridge, in the Udzungwa Mts of Tanzania

A first field census and first field assessment of the Ndundulu population.

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Executive Summary

A survey of the paratype locality had failed to locate the Udzungwa Forest-Partridge in 2002-03. However, during the present reported survey of the Ndundulu Forest, the Udzungwa Forest-Partridge was found to thrive well and the numbers recorded were higher than would have been expected from previous surveys. The altitudinal range was also found to exceed the previous known.

The fluctuation in numbers is judge to be caused by local climate, and food availability. The number of youngsters recorded among other species of birds were very pronounced.

The Udzungwa Forest-Partridge was found to occur in all suitable forest parts visited and from forest edge to forest edge. The species clearly avoids open habitats both within and outside the forest.
Therefore as the Ndundulu Forest (incl. the National Park) has a highly mosaic vegetation but also open areas and swamps the actual area of occupancy is much less than previous stated. Previous estimated number of km² occupied by the Udzungwa Forest-Partridge was made from measuring the forest covers on 1:50.000 topographic maps. These calculations are now considered inaccurate due to the findings summaries in this report.

This report therefore states:

Negative trends and findings

- Area of occupancy is less than previous thought
- The species is very shy and elusive
- It is very easy snared
- Pressure from the fast approaching new shambers (north and east of the forest) from villagers in Udekwa
- Large but abandon shambers were found within the forest
- Poachers in forest, however they seem to use the forest mainly as a road to other areas (villagers told on interviewed)
- Uncontrolled fires reported in all years surveys have taken place, and as a result relatively large areas have been burnt – both surroundings, forest edges and forest parts
- The species habitat preference seems very strict to primary uncut forest (see details above), which is under pressure

Positive trends and findings

- However, the species might occur in fair numbers, but yearly fluctuations might occur
- Larger altitudinal span
- The Udzungwa Forest-Partridge was found in good numbers
- The Udzungwa Forest-Partridge seems to thriev well

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Introduction

The discovery of the Udzungwa Forest-Partridge and relationship to other forest dwelling Phasianidae

The first encounters of the species were discovered in the late days of June 1991 when three fellow students and I undertook fieldwork and collected data for our master thesis. However, the scientific publication describing the new species was not published until 1994 (Dinesen et al. 1994) – the fieldwork laste for nine months for the two of us.

This new species caught the eyes of the world and was termed the "largest major discovery since the Peacock". The species was not only new to science but it was also endemic to a very restricted area and it compromised a new genus *Xenoperdix*. The most exciting in this discovery was the analysis (unpublished) that placed this enigmatic species near to genera found in the Indo-Himalayan area. That the species had eluded science for so many years, taking the size of the species into consideration, was a bit surprising for the world of scientist. However, the type and paratype areas were probably at that time some of the last unexplored areas of East Africa. A few of the elder "forest walkers" did however know the species.

Then in 2002 my field assistant Jacob Kiure found a feather of what was first thought to belong to this species in the Rubeho Mountains (Fjeldså & Kiure 2003). On a subsequent study to the area Kiure managed to collect specimens for scientific studies. However, in Fjeldså et al. 2005 the species was described as a very close relative to the Udzungwa Forest-Partridge but a different species (the evidence came merely from molecular work as plumages and structure does not separate these in the field). Both having affinities to genera found in the Indo-Himalayan area.

The scientific name of the Udzungwa-Forest-Partridge (UFP, here after), *Xenoperdix udzungwensis* was derived from *Xeno* (strange, new) and perdix due to the size and look-a-like structure to partridge size fowls. *Udzungwensis* was chosen as it was only believed to occur in this part. However, there are now rumours from at least three other places, but non-have at this time been verified (May 2007).

The census

The Udzungwa Forest-Partridge had recently caught some attention, as results presented (See BirdLife International's "BirdLife Species Factsheet" for the species[2]) by this author found no individuals during the three months long study on the paratype locality.

The scientific publication describing the species (Dinesen et al. 1994) summarized the little information that was available at that time on all aspects of the species. Now +15 years later a number of researchers have visited the areas of both the type (The Ndundulu forest) and the paratype (Nyumbanitu forest) but only very little information have emerged and of these only fractions in writings.

The species was thought even more rare than previous or under a sudden change[3]. There was therefore a need for a field based census (contra the desk based one made by Dinesen et al. 2001). This concurred with the grants made available by the Critical Ecosystem Partnership Fund program[4].

The original description of the species mentions at least 215 adults (excluding heard birds and chicks, Dinesen et al. 1994, Table 1.) and later estimated the population not to exceed 1.000 individuals in the area surveyed (estimates made for the IUCN redlists).
The desk based population estimates Dinesen et al. 2001 however suggested a world population of 3.700 individuals. This estimate was based on the observations made during our surveys in 1991-92 and personal additional information made available by this author from additional surveys. However, their estimated was also made from conclusion about the forest cover as studying the 1:50.000 maps of the areas and a recent satellite image.
Own studies in the areas have revealed that the forest is much more heterogeneous than maps and satellite images (low resolution) reveals. Therefore there is not suitable habitat in larger parts of the Ndundulu forest to support the UFP. The present conducted fieldwork certainly supported the need for new estimates to be made from ground truthing fieldwork.

[2] http://www.birdlife.org/datazone/species
[3] There are however, now reasons to believe that the species wanders extensively (?) but only within the forest and as numbers are relatively low there may be areas and times of the year where the species seems not present.
[4] The CEPF program has been established to provide financial and technical assistance to nongovernmental organizations, community groups, and other civil society partners to help safeguard Earth's biodiversity hotspot.

Primary objective

Objectivities	**Results**
Determine the Udzungwa Forest Partridge's population size, density and abundance (in the Udzungwas)	Statistic analysis on its way

Secondary objection

Objectivities	**Results**
Determine the species food preferences	Novel data collected for the species – seeds collected and plants photos taken – to be identified by experts
Collect feathers (for DNA extraction) for further documentation of population structure and genetic variation	Feathers were found and will be stored in the tissue collection in Copenhagen and will be made available for genetic research
Nest as well as eggs and young are still not known wherefore this is also a priority	Mentioned in this report
Evaluate the need to upgrade the species conservation status on the IUCN list	Increase the species conservation status profile
Increase the local and international awareness about the Forest Partridge	Meetings held with villagers in Udekwa. The RNRO and Forestry&Beekeeping meet and discussed the rareness and unique Tanzanian avifauna

Study area

The forests on Udzungwa Mountains in south-central Tanzania compromises a number of separate forests reserves but also the well known Udzungwa National Park.
The forests are separated from each other by up to a number of kilometres and each forest is unique in its own way – either in terms of flora, fauna, primary forest status, logging status, and non of these looks a-like and have been changed over time by man, animals, climate and pure natural processes. The forests are separated from each other on an undulating hilly area with large steep escarpments and mosaic of grassland, and woodland in a fascinating way.
The study area it self is described in e.g. Dinesen et al. 2004. See also Butynski & Ehardt 2003; Jones 2006; Jones et al. 2005; Lovett & Pócs 1993.

Map of the area see Davenport et al. 2006.

The Ndundulu

The Ndundulu Forest was first described in some very broad details by Dinesen et al. 1994. However, Jones 2006 made a more detail account, see later. For forest vegetation structure see Lovett & Pócs 1993 and Butynski & Ehardt 2003.

Figure 1. Udzungwa Mts, Ndundulu Forest - looking east

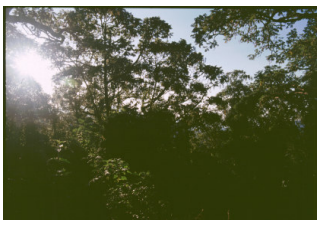

Figure 2. Udzungwa Mts, Ndundulu Forest

Figure 3. Udzungwa Mts, Ndundulu Forest - Luwala Meadow area

Methods

Field methods

From ultimo December 2006 to primo April 2007 a 100 days continues survey was carried out.

Long forest walks were conducted along natural trails and human made such. A few trails were cleared a bit in order to facilitate an easier study. Along these paths it was relatively easy to walk with a minimum of disturbances (here in the sense - noise).
The natural paths are made by buffalos and or elephants and are maintained by these – some on a regularly but season basis only and some on a non-regular basis.
It is also the preferred paths for a number of animals aside from the UFP, possible also due to the ease with which these animals can walk here: among the more spectacular were: Abbot's and Blue Duiker, Porcupine, Clawless Otter and a good number of Leopards.

A typical day survey was begun with doing camp studies and tape records for primarily forest birds. Then at 800 hours a walk a long a trial walk would begin and continue for a number of hours and kilometres. In most cases I used to backtrack the same trail in order to check the path more thoroughly and often this would reveal a few missed tracks and signs.
Before we reached back to camp we always (heavy rain might have hindered this a few times) discussed the day and made a summary of the day's total findings (some times we had to estimated the number of animals due to many irregular and confusing tracks from e.g. Bush Pigs, and Buffalos). At the end of the day path length was calculated, and drawn on maps (1:50.000).
Along the trail it was typical only possible to see positive sign of the UFP up to *circa* 10 meters from the trail. Therefore we zigzag our ways along a trail, by doing so we covered roughly 25 meters to either side of the trail.

Figure 4. Udzungwa Mts, Ndundulu F., Luwala area – Trail walking with Janus, Tanapa camp

Such trails were used as baselines and were walked as many days per altitudinal span as possible. Individuals, sound, tracks and signs was counted, species was sexed and aged when possible.

Other areas like surroundings around the various camps (incl. fly-camps) were survey by random walks through dense vegetation to calculate the number of UFP – this technique was adapted whenever there were no trials to follow. Dust bathing places were specially sought after.

Knowledge

Previous surveys in the Udzungwas Mountains have bequeathed me with some experience on survey studies in the forests. Therefore I could initiate the studies as soon as I came to the forest and use data from the first day without first going through a training phase.

Timing

From previous visit to the area I had knowledge of where the UFP would occur and where I could expect it to occur in high densities. This knowledge obtained from previous surveys made me decide where the first camp should be set and which season fieldwork should be undertaken in.

The rainy season was chosen as this also concurs with the breeding season of the majority of avifauna inside the forest.
In the rain season it is likely to expect higher precipitation, which seems to trigger insects to breed or emerge and in the late rainy season some trees and bushes carries enormous amount of fruits. Previous studies told me that the diet of the UFP is rather varied and eats both invertebrates and plants seeds (Dinesen et al. 1994). Therefore; the rainy season was carefully picked as possible the best time to study the UFP.
However, dry season is a better season for some species as many trees, bushes and herbs flower then which will favour the sunbirds and e.g. hornbills.

This year the climate in the Udzungwas was a bit out of the usual as southern Africa was hit by an El Nino, though not big, but it caused (possible this reason) the rainy season to commence almost two months earlier than usual.
This sudden unset of early heavy precipitation was welcomed by the local villagers in Udekwa started the shamber preparation in September and could plant their crop's seeds in medio-late September. I the forest this seems also to have had a positive effect as many species had produced many youngsters. Whatever this influenced the UFP as well is still to early to say.

Sub-localities in the Ndundulu

I have chosen to follow the names used on the very fin sketched sub-localities map in Jones's 2006 (Fig. 4), and will refer to these with the names as used in the Jones (*op.cit*).

Due to a number of reasons we had chosen to first survey areas outside the Udzungwa National Park and concentrate on not previous survey areas within this area[5]. This had a two-folded purpose. First as we assumed the UFP would be present inside the Udzungwa National Park as the whole area is one continuous block of forest and therefore, on paper at least, the species would likely be better protected than individuals occurring outside the National Park. The second purpose was that we wanted to study areas, which were known to be "virgin" – not visited before –, at least not with a scientific purpose.

The first area to be survey was the sub-locality named Vikongwa (see Jones 2006). I knew a perfect spot to camp from previous surveys and therefore we camped there. From here, where a main camp was established for more than one month, long walks were conducted in the surroundings. The camp also made it possible to survey the sub-locality Bundi (again see Jones 2006). This Bundi area was also a familiar area to me, where we previous had encountered the UFP.

The second area was the sub-locality named Luwala (see Jones 2006). Here our second large main camp was established.
This was also a very familiar area for me as I had spent time there before (however, with another purpose than surveying the UFP). From here walks were also conducted into the sub-locality Pimbi (but still outside the National Park). This sub-locality Luwala was very "productive" in species.
From Luwala we made two additional fly-camps in to remote places on Mount Chervemba. I refer to these fly-camps under one "label" Chervemba in Table 1 below.

The third sub-locality main camp area became Mount Chervemba area. Here we established two fly-camps and spent just over one month here – the team was split into the first two fly-camps here and later one part of the team in fly-camp.

For the larger part of the four months the survey lasted we had more than one camp running and surveys made more or less simulations from these.

[5] A meeting was held with Trevor Jones in Dar es Salaam prior to our unset of the survey. Here we received valuable and precise information on where suveys have been conducted by him and his teams.

Results

Table 1. Short summary of major areas survey and effort

Name of area	Altitudinal range (Surveyed)	Lat and long (Roughly estimates[2])	Survey effort [Days]	Area surveyed [Km²]
Vikongwa	1450-1650		2	2
Chervemba[1]	1900-2463		21	15
Pimbi	1880-1650		2	2
Luwala	1800-1950		30	15
Bundi	1330-1550		2	2
Totals			57[3]	31[3]

Keys: 1) this area was not named in the Jones 2006 report. It would be natural to name it Chervemba due to the highest peak in the Ndundulu Forest outside the National Park. Further studies might want to make a sub division to this area due to its size. 2) No GPS was available for this survey wherefore map coordinates are used. 3) Survey effort and Area surveyed is less than number of days stayed in the forest and the total area outside the National Park, due to weather and as trails were walked more than one time.

Distribution

Findings from the *Xenoperdix* expedition of 1991-92 (Dinesen et al. 1994) found the UFP to be distributed in the Bundi, Vikongwa, Luwala and marginally in the lower Chervemba sub-locations within in the Ndundulu Forest. However, findings by Jones 2006 found it more widespread within these areas. In additional Butynski & Ehardt 2003, and Jones 2006 also found it in the National Park areas surveyed. These were the first findings from a scientific expedition within the National Park.

There are very good reasons to believed that the species occurs throughout suitable habitatthe Ndundulu Forest including the National Park. However, the area of true occupancy is much smaller as the species clearly avoids open habitats within the forest and is not found outside the primary forest. Open habitats also includes; rock faces, swamps, rivers and larger flodded areas. In addition no encounters were made on forest edges or outside true primary forest (see also Executive Summary – this report).

Density and abundance estimates

There are relative big differences in density and abundance from season to season (Dinesen et al. 1994), and year to year (unpublished and this report), but also between areas which appears comparable.
On one trail from the Luwala main camp to the highest forest borders on Chervemba only *circa* 10 individuals were recorded covering around nine kilometres of forest trail. However, on another trail covering *circa* five kilometres at least 69 individuals were encountered. The number of microhabitat and the structure of these trails did however differ.

The number of youngsters recorded among other species of birds were very pronounced. The survey also encountered a total of at least six immature birds.

Other sources on population and density

A few interviews were made with local villagers from Udekwa. These provided an even wider insight to the possible peak-breeding season of the UFP. Also some valuable information on its occurrence, habitat choice and food. These interviews also enlighten that several people have been out looking for the UFP over the years. Clearly the local community benefits from this as it has increased the livelihood for many families in the village and their social status have increased.

Population and threat status of the Partridge in the Ndundulu Forest

In order to "measure" and evaluate the threat to a species we must know of all possible threats and risks. This information is of cause not always possible to get. In many cases this is because we do not know the right question to ask or the right places to look for these questions.
Interviews with villagers can often reveal some insight that a census survey does not give. However, one should be very careful when asking questions on e.g. hunting, as the villagers know it is forbidden to hunt in particular areas. But listening to stories around the fire in the evenings sometimes tells different stories as does evidence of snares found in the forest.

I came to the forest for the first time more than 15 years ago as one of the very few people from outside. Today I can see than the forest has changed in many ways.
The causes to these are changes are two-folded:

- Man's directly inflicted and man's indirectly inflicted changes. The later due to climate which man is said to have caused to changed too.
- Man have directly inflicted the forest in several ways:
    - Cultivated the forest (inside and on borders)
    - Setting fire to grassland and woodland (only to clear herbs they say, and to get the land open so they can see the wild animals, however there are a few people the villagers say, whom deliberately sets fire on the mountain slope to clear land for farming).
    - Hunting (materials, fire making during these trips)
    - Cutting tools for home and shambers
    - Forest opening up due to more people in the forest (scientist and their helpers)
    - Tourism – Tanapa have cut long and wide trail through the forest. This open up the forest and makes it more dry (poachers and other people travel along these trails)

I found old shambers in the forest one of considerable size. However, they were all abandoned and seem to be 4-7 years old. Such findings are previous unreported of (however, they are known by the local authorities) from this area in scientific papers.

Clearly these shambers will have a negative effect on the species. First of all because the species will be scared away, but also lose habitat. Secondly there are risk that these people making these shambers uses the forest on a regular basis and they will often and most likely utilise whatever available food the forest may provide.
Gunshots in the forest were heard on a few occasions in 2002-03 in the Ukami forest. This year we only heard one (or two – later not sure as it seems to come from very fare away and could have been something else). It is however, not likely that guns are used to kill UFP, but almost any disturbances will scare the UFP and also other animal species away (at least for some time).
An African Goshawk (*Accipiter tachiro*) and a forest dwelling Genetta sp. were seen to predate on the UFP, but it is not likely that the African Goshawk is a threat to the UFP as these two species have co-existed for many years. Only if the UFP is threatened by other factors the predation by the African Goshawk might have a negative effect – but the Goshawk eats a large variety of animals (this study and Brown et al. 1982).
The gennetta sp. however, might posses a threat if it shows to be a nonforesrt species that have penetrated the forest due to opening up of the forest. The UFP is then not accustomed to this type threat. The genetta sp is not identified at this time of writing the report (May 2007).

Discussion

A previous survey in the paratype locality had failed to locate the species. However, during this survey in the Ndundulu Forest, the Udzungwa Forest-Partridge was found to thrive well and the numbers recorded were higher than would have been expected from previous surveys.

A fluctuation in numbers is judge to be caused by local climate, and food availability. During late 2006 and into (at least) April 2007 the southern parts of Africa were hit by a small El Nino, whatever this could have caused some positive and optimal situation is too early to judge, but other species of birds seems also to have had a very good breeding season.
As this survey reports of findings of the partridge in new areas but also findings in areas where previous studies have failed to find it, it shows that there are either year-to-year or seasonal fluctuations that. Wherefore areas might hold good numbers of the UFP in certain years but not in other years.

The Udzungwa Forest-Partridge was found to occur in all suitable forest parts visited and from forest edge to forest edge – seems to be more common in vegetation types with *Podocarpus* sp., *Ficus* sp. and *Cyperus* s.. However, the species clearly avoids open habitats both within and outside the forest. Open habitats also includes: rock faces, swamps, rivers and larger flooded areas. No encounters were made on forest edges or outside true primary forest.
Also certain natural ocurring forest types such as: monocultures of bamboo (*Sinarundinaria alpina*) was found to be avoided by the partridge, as well as; bracken, bracken-herb, and dense herbs vegetation. Monocultures of mimosacea are present here-and-there within the Ndundulu Forest, but neither were any UFP.

Therefore as the Ndundulu Forest (incl. the National Park) is a composite of a high number of mosaic vegetation types of which many are avoided by the UFP and as there area open areas and swamps the actual area of occupancy is less than previous stated. Previous estimated number of km² occupied by the Udzungwa Forest-Partridge was made from measuring the forest covers on 1:50.000 topographic maps. These calculations are now considered inaccurate due to the findings summaries in this report.

Results from this survey alone and the report by Jones 2006 and the publication by Butynski & Ehardt 2003 do not give reason to down or up grade the species on the IUCN threat scale.

Recommendations - Udzungwas

The remainder of the Ndundulu Forest that lies within the Udzungwa National Park should also be survey. In addition, a complete survey of the Nyumbanitu Forest. The later as a survey in 2002-03 did not find any UFP despite my knowledge of the species.

These surveys are to be conducted first of all to evaluate the species distribution in these parts but also in order estimate the population size there.
Thorough surveys of remaining little surveys forest within the Udzungwa Mts. The rumours of sighting and calls of the UFP should be taken serious and followed up.

The partridge individuals found in the Rubeho was first thought to belong to the same species as in the Udzungwas (Fjeldså & Kiure 2003). However, molecular work suggested these to belong to a close but separate species (Fjeldså & Bowie 2005).
The larger parts of the Rubehos is still unsurveyed and ornithological the area is still very poorly known despite recent surveys (e.g. Fjeldså et al. 1997).

Recommendations - Rubeho Mountains

No long thorough ornithological survey of the Rubeho Mountains has yet been undertaken. Such surveys are needed for a justified statement about the the population.

Summary of recommendations

- Survey of the Udzungwa National Park and the Nyumbanitu Forest
- More intensive studies in other primary forest parts of the Udzungwas should be conducted
- The Rubeho population and species should be evaluated
- Rumours reporting possible sightings/calls of partridges should be given more attentions and followed up

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