



Assessment of herpetofauna (Amphibia, Reptilia) in the Kafa Biosphere Reserve

Tom Kirschey

1 HIGHLIGHTS

- Wetland sites especially inside or near the natural forest show the highest level of diversity, the lowest diversity is found in the Bamboo forest
- Arboreal habitats and running waters require more research
- A total of 17 amphibian species from 3 families were recorded (Annex 1)
- A total of 5 squamate reptile species (2 Sauria, 3 Serpentes) from 4 families were recorded (Annex 1)
- 1 species of Hyperoliidae (genus *Leptopelis*) is probably new to science
- 8 species of amphibians and 2 species of reptiles were recorded the first time for the Kafa Biosphere Reserve (Amphibia: *Leptopelis ragazzii*, *Leptopelis* sp., *Hyperolius kivuensis*, *Phrynobatrachus inexpectatus*, *Ptychadena schillukorum*, *P. erlangeri*, *P. mascareniensis*, *Xenopus clivii*, Reptilia: *Trachylepis wingatii*, *Megatyphlops brevis*)
- 6 (maybe 7) of the recorded amphibian species are endemic to the Ethiopian highlands (*Leptopelis ragazzii*, *L. vannutellii*, *L. spec.*, *Afrixalus clarkeorum*, *A. enseticola*, *Phrynobatrachus inexpectatus*, *Ptychadena erlangeri*)
- 1 of the recorded reptile species is endemic to the Southwestern Ethiopian highlands (*Pseudoboodon boehmei*)
- 3 species are threatened according to the updated global IUCN Red List of Threatened Species (2 vulnerable, 1 endangered), all of them endemic to Ethiopia (*Leptopelis ragazzii*, *Afrixalus clarkeorum*, *A. enseticola*), another species (*Leptopelis vannutellii*) was previously listed as vulnerable, but now is only least concern.
- Endemic species are exclusively bound to forest habitats (canopy)
- Beccari's Giant Frog (*Conraua beccarii*), Largen's Dwarf Puddle Frog (*Phrynobatrachus inexpectatus*) and Clarke's Banana Frog (*Afrixalus clarkeorum*) may be considered as flagship species for amphibians.
- This report includes a first picture of the tadpole mouthpart of the highly rheophile Beccari's giant frog (*Conraua beccarii*), which is undescribed until present

2 INTRODUCTION

According to Kingdon (1990) there are 4 major centres of endemism in Africa: the Cape flora, the moist coasts flora and fauna, the arid zone flora and fauna and the mountain flora and fauna. In Eastern Africa especially the Afromontane ecosystems show an exceptionally high degree of endemism. For example, in Ethiopia the degree of endemism of frogs is 40 %. This is largely the result of the isolation of the vast highlands by the surrounding dry lowlands. Biogeographically between the two vertebrate classes there are several different speciation centres within Ethiopia. Overall, several provinces exist within the so called Intertropical montane region¹, of which the Ethiopian highlands form the largest Afromontane area. The species that the “Ethiopian Intertropical Montane Province” shares with tropical Africa tend to be restricted to the most versatile and mobile forms. These are mainly montane species. Most of Ethiopia’s endemic species also belong to the Afrotropical Highlands biome (Kingdon 1990). The most comprehensive and up-to-date overview of the Ethiopian herpetofauna is given by Largen & Spawls (2010), while Mazuch (2013) focuses on the Eastern Ethiopian regions, where Savanna and other Afromontane dryland habitats are predominant.

More than 30 amphibian and reptile species new to science have been described from Ethiopia (and Eritrea) since 1970, indicating that the knowledge of the herpetofauna of the country has been improved substantially during the last decades, though apart from the taxonomical identification of species only very little is known about distribution, biology and ecology of a significant part of the known taxa. That is why there is still a huge potential for new distribution records and for discovery of new species.

In spring 2015, another survey was conducted by a Russian and Kazakh team (Milto, Pestov & Terentyev 2015), in which several records have been confirmed and some species were observed, which were not detected in the biodiversity assessment. This report does not include the analysis of the whole collected material, e.g. most of the tadpoles of genus *Ptychadena* still need to be analyzed and their microhabitat data has not yet been sufficiently processed. Preserved collection material is stored partly in Ethiopian Biodiversity Institute (EBI) and partly in Zoological Research Museum Alexander Koenig (ZFMK) Bonn and could be used for further research. The author is grateful to the Ethiopian Biodiversity Institute (EBI) for research and export permits for samples, which allowed the identification of species. It is expected that the survey was only able to cover a small part of the herpetofaunal diversity (especially for the reptiles) of KBR and that within the rainy season detectability of nearly all species should increase significantly.

3 MATERIALS AND METHODS

3.1 Study area

Amphibians and reptiles were recorded at different study sites according to the project's needs: core zones, PFM sites and wetlands (tab. 1). Our “Wetland Taxagroups Team” consisted of Viola Clausnitzer, collecting dragonflies and damselflies, Thies Geertz, collecting land and freshwater mollusks, and the field assistants Tizita Tamiru, Mitiku Gebremariam and Admasu Asefa. The sample sites were usually selected according to aquatic habitats present (streams, rivers, headwaters, swamps, etc.). One species not seen personally but from a picture is included in this report.

¹ The term “intertropical” is not used in a cartographic sense, but for those mountainous areas which by climatic classification are not tropical within the Tropics (see Poynton 1999)

Table 1: Sample localities. KBR-zone: cz: core zone, bz: buffer zone, ccz: candidate core zone. The number of species recorded at each locality is given. All dates were in December 2014.

area	Site	KBR	PFM	Code	Date	Habitat	alt.	lat.	long.
Bonga	Bonga	-	-	BG1	03.12.	small stream behind guest house	1832	7,25420°N	36,25762°E
Bonga	Bonga	-	-	BG2	03.12.	hill behind KDA guest house	1980	7,25358°N	36,22633°E
Bonga	Bonga	-	-	BG3	all time	KDA guest house area	1955	7,24235°N	36,24090°E
Boka	Boka	cr	-	BK1	04.12.	stream in wetland below Boka Forest	2414	7,29467°N	36,37604°E
Boka	Boka	cr	-	BK2	04.12.	swamp along stream below Boka Forest	2414	7,29467°N	36,37604°E
Bambo	Bambo	Cr	-	BA1	04.12.	river in bambo forest	2595	7,24118°N	36,45182°E
Bambo	Bambo	Cr	-	BA2	04.12.	river in bambo forest	2650	7,24331°N	36,49564°E
Bonga	Awurada Valley	Cr	yes	AW1	05.12.	Gummi River, large river	1293	7,09281°N	36,23154°E
Bonga	Awurada Valley	Cr	yes	AW2	05.12.	floodplain (swampy forest) along Gummi River	1293	7,09281°N	36,23154°E
Bonga	Alem Gono	Bz	-	AG	06.12.	wetland, heavily grazed	1706	7,36428°N	36,22602°E
Bonga	Shoriri	Bz	yes	SHO1	06.12.	wetland, undisturbed	1626	7,35707°N	36,20437°E
Bonga	Shoriri	Bz	yes	SHO2	06.12.	stream along forest edge and Shoriri Wetland	1626	7,35707°N	36,20437°E
Komba	Komba forest	Cz	-	KO1	07.12.	clear stream in Komba Forest	1847	7,30803°N	36,12201°E
Komba	Komba forest	-	-	KO2	06.12.	forest edge	1900	7,10176°N	36,13277°E
Boginda	Gojeb wetland	ccz	-	GO-wet1	09.12.	large River			
Boginda	Gojeb wetland	ccz	-	GO-wet2	09.12.	gallery forest and wetlands along Gojeb	1530	7,55448°N	36,05687°E
Boginda	Gojeb wetland	Bz	-	GO-wet3	10.12.	swampy floodplain north of Gojeb	1516	7,55444°N	36,05209°E
Boginda	Gojeb wetland	ccz	-	GO-wet4	10.12.	stream in floodplain south of Gojeb	1518	7,55442°N	36,05213°E
Boginda	Boginda forest	Cz	-	BO	11.12.	stream with swamps in Boginda Forest, partly open (grazed glades)	2074	7,50175°N	36,09118°E

3.2 Sampling methods

VEs (Visual Encounter Surveys) are used principally to inventory taxa presence at particular sites. Visual and auditory sampling of adult and subadult/juvenile including tadpole sampling was done with bare hands, snake hooks and a sweep net at sample sites. With minor modifications methods follow up-to-date standard methods for reptiles (Mc Diarmid et al. 2012) and amphibians (Heyer et al. 1994, Olson, Leonard & Bury 1997). The time of the year (dry season) was not ideal for surveying herpetofauna. The weather, too, made the search for herpetofauna difficult (full sunshine, no rain at all). The sampling was conducted between 5 a.m. and 9 p.m. It was highly valuable that

supplementary bycatches, mostly from the “wetland taxagroups team”, especially by Viola Clausnitzer and Thies Geertz, could be used for the this assessment. The daytime survey was inappropriate but necessary because of logistic limitation (drivers who were used to working in the daytime were unable and uncomfortable with working at night). Moreover, the whole expedition group reported road kills of herpetofauna and a few samples could be collected at roads between the study sites (incidental road riding, no dedicated road riding), which proved highly valuable for the report, especially for the survey of reptiles.

In case of the collected amphibians, forensic *Batrachochytridium dendrobatidis* (Bd) samples were taken from most of the specimens. The prevalence analysis has not been completed yet. Knowledge about prevalence and impacts of Bd on species is important because of conservation implications, as the fungus has brought several amphibian taxa to extinction worldwide and was classified as one of the major threats for amphibian populations across the globe.

3.3 Nomenclature and data analysis

With exception of the scincid genus name *Trachylepis* (instead of *Mabuya*) for both *maculilabris* and *wingatii*, the nomenclature follows Largen & Spawls (2010), but uncertainties of the taxonomic status of several taxa remain and are further described below. Data on presence/absence of species were insufficient for a more detailed analysis of the sample sites, but by clustering them a gradient of forest cover and site occupancy of some wetland complexes could be demonstrated.

4 RESULTS AND DISCUSSION

A total of 22 species (17 amphibians, 5 reptiles) was recorded. Eight species of amphibians and two species of reptiles were recorded the first time for the Kafa Biosphere Reserve (Amphibia: *Leptopelis ragazzii*, *Leptopelis* sp., *Hyperolius kivuensis*, *Phrynobatrachus inexpectatus*, *Ptychadena schillukorum*, *P. erlangeri*, *P. mascareniensis*, *Xenopus clivii*, Reptilia: *Trachylepis wingatii*, *Megatyphlops brevis*).

4.1 Amphibia

From the 65 Amphibia species known for Ethiopia, these records only represent 26,2 %. By excluding species with strong geographic restrictions in other parts of Ethiopia and considering methodological problems like weather and season this is a remarkably good result, but it also shows a number of gaps, e.g. not a single Bufonid could be recorded. There have been observations by local villagers and guides, that the Ethiopian Gymnophiona (*Sylvacaecilia grandisonae*) occurs in the area and is found frequently in gardens and in agriculturally used land, but the species was not found during our assessment. Neither was with Shovel-nosed Frogs of the genus *Hemisus* or the foam-nest building Keller’s Frog (*Chiromantis kelleri*), both of which are said to occur in the area. In Bonga City, local traders offer frogs for food consumption, but the author was not able to detect them. Table 2 shows all recorded amphibian species. Those species, which are endemics, represent new records to the KBR and threatened species according to IUCN red list are described further below.

Table 2: Recorded amphibian species

No.	Species	Family	Status
01	<i>Leptopelis ragazzii</i> Boulenger, 1896	Arthroleptidae	IUCN VU, endemic, new record to KBR
02	<i>Leptopelis vannutellii</i> Boulenger, 1898	Arthroleptidae	“downgraded” from VU to LC,

			endemic
03	<i>Leptopelis</i> sp.	Arthroleptidae	?, new record to KBR
04	<i>Hyperolius viridiflavus</i> Duméril & Bibron, 1841	Hyperoliidae	LC
05	<i>Hyperolius kivuensis</i> Ahl, 1931	Hyperoliidae	LC, new record to KBR
06	<i>Hyperolius nasutus</i> Günther, 1864	Hyperoliidae	LC
07	<i>Afrixalus clarkeorum</i> Largen, 1974	Hyperoliidae	“upgraded” from VU to EN, endemic
08	<i>Afrixalus enseticola</i> Largen, 1974	Hyperoliidae	VU, endemic
09	<i>Conraua beccarii</i> Boulenger, 1911	Ranidae	LC
10	<i>Phrynobatrachus minutus</i> Boulenger, 1895	Ranidae	LC
11	<i>Phrynobatrachus inexpectatus</i> Largen 2001	Ranidae	LC, endemic, new record to KBR
12	<i>Phrynobatrachus natalensis</i> Smith, 1849	Ranidae	LC
13	<i>Ptychadena erlangeri</i> Ahl, 1924	Ranidae	LC, endemic, new record to KBR
14	<i>Ptychadena schillukorum</i> Werner, 1907	Ranidae	LC, new record to KBR
15	<i>Ptychadena mascareniensis</i> Duméril & Bibron, 1841	Ranidae	LC, new record to KBR
16	<i>Ptychadena neumanni</i> Ahl, 1924	Ranidae	LC
17	<i>Xenopus clivii</i> Peracca, 1898	Pipidae	LC, new record to KBR

4.1.1 Arthroleptidae

Ragazzi’s Treefrog or Shoa Forest Treefrog (*Leptopelis ragazzii*) was not seen as an adult during the survey, but could be identified in the form of tadpoles. This should be mentioned to underline the value of combined methods (search for terrestrial stages + search for larval aquatic stages). It is an Ethiopian mountain endemic and strictly bound to forests at elevations of about 1.900-3.100 m asl. Because of massive deforestation in Ethiopia suitable habitats have been destroyed and some of the previously known populations are declining or have been already become extinct. That’s why it was listed as “vulnerable” (IUCN SSC 2013) in IUCN Red list. Moreover, it is one of the species which was recently detected as a host of the Chytrid fungus *Batrachochytridium dendrobatidis* (Gower et al. 2012), but its impact is still unknown. Taxonomic status of this species is a matter of discussion. Recent molecular data suggest that *L. ragazzii* comprises two or more distinct taxa. Remarkably this is the first record of this species south of Gojeb river and west of Omo river. This species was also confirmed by Milto et al. (2015) to occur at Barta waterfall, Barta river and in Mankira Forest.

The Dime Forest or Vannutelli’s Treefrog (*Leptopelis vannutellii*) was found with a single female specimen, which was discovered on a leaf in the garden of KDA guesthouse. *L. vannutellii* is also a prevalent species for Bd (see Gower et al. 2012). Its occurrence was previously confirmed in the Kafa BR (pers. comm. S. Loader 2012, cited in IUCN SSC 2013) and also found afterwards by Milto et al. (2015) in Alem Gono Wetland. Additionally, a photograph by Bianca Schlegel from Alem Gono Wetland confirms the presence of the species there. Unfortunately, the specimen collected during expedition escaped after being photographed and could not be recaptured. *L. ragazzii* it is an

Ethiopian highland forest endemic, which was previously classified as “vulnerable” because of its limited known range and its vulnerability to deforestation as a major threat. Nowadays it is classified as “least concern” by the IUCN Red List (IUCN SSC 2013), to which the author disagrees. No considerable new data on distribution and status of the so far recorded subpopulations was assessed and it is proven to be a strictly forest-bound species. Habitat loss due to forest clearance, human settlement, and both small- and large-scale agricultural encroachment puts a heavy and continued pressure on known populations.

The most exciting finding was a single specimen of treefrog, of which by size and appearance it was distinguished as an Arthroleptidae. It belongs most probably to the genus *Leptopelis*, but some characteristics (especially the very special dorsal ornamental skin sculpturation and color patterns) do not fit to one of the previous mentioned species, neither to *L. bocagii*, *L. gramineus* nor *L. susanae*. It was found in the Boka Forest Wetland on the very last day of the survey. In email correspondence with several colleagues (e.g. Stephen Spawls) the author learnt that this type of treefrog had not been seen before and most probably represents an undescribed taxon. It is likely that this taxon is also an endemic, because most of the people contacted for identification from the picture are experienced at least with Eastern Africa and especially with Afromontane amphibians. Unfortunately, just as the *L. vannutellii* specimen, it escaped after the picture was taken. Therefore the author expresses his large interest in continuing the search for this frog. Within the tadpole samples from Boka Forest wetland there is also one species which could not be identified, but samples were taken and stored in ZFMK. So there is hope that at least the tadpole of this species was found and it might be possible to characterize it not only morphologically but also by molecular methods.

4.1.2 Hyperoliidae

Clarke’s Banana Frog (*Afrixalus clarkeorum*) is an endemic only known from moist tropical forest in Southwestern Ethiopia (Largen 1974). According to Largen & Spawls (2010) the preferred terrestrial microhabitat of the species are leaf axilles of *Ensete ventricosum* plants found in forest clearings and tall grasses and reeds in recently-flooded hollows at the edge of the forest. As an arboreal species it is bound to forest. Because the emendation by Largen (2001) is not accepted or described to be “unjustified” by some databases, it is named *Afixalus clarkei* e.g. in the IUCN Red list, where it is listed as “endangered”. This species was found in or near to BK2 and SHO1, but only in higher vegetation (bushes and shrubs). Deforestation and overgrazing by cattle seem to have a strong impact on this species, as it was not found in the intensively used Alem Gono and Gojeb Wetlands. In addition to the records of this assessment, Milto et al. (2015) did manage to find this species also in Gojeb Wetland, but maybe in the gallery riparian forest remnants near one of the small rivers there. It was recently detected as a host of the Chytrid fungus *Batrachochytridium dendrobatidis* (Gower et al. 2012), but its impact on this species is still unknown.

The Ethiopian Banana Frog (*Afrixalus enseticola*) is another endemic of the Ethiopian highland forests, but it also occurs in and around the Bale Mountains National Park on the other side of the Rift Valley. It was also described by Malcom Largen in 1974. The species is characterized to be essentially sylvicolous and all known breeding sites are in or close to forest glades. Its microhabitat is more or less similar as the one of the previous species. Both species do not only occur sympatric by site but also syntopic. This supports that they are distinct taxa and further research is necessary to define each species’ ecological niche. One of the species was recently detected as a host of the Chytrid fungus *Batrachochytridium dendrobatidis* (Gower et al. 2012), but its impact is still unknown. Because of its larger known distribution it is listed as “vulnerable” by IUCN Red List. *A. enseticola* was found in Boka Forest Wetland, Alem Gono and Shoriri Wetland as well as in Gojeb Wetland. In Gojeb Wetland, it was found during daytime in higher shrub and tree vegetation of the riparian galleries, but in the night, numerous specimens were observed sitting on highly overgrazed wet meadows in small

(300 mm height) shrubs. It was confirmed by Milto et al. (2015) to occur in Alemgono Wetland and was also found near Barta Waterfall.

Records of the Lake Kivu Reed frog (*Hyperolius kivuensis*) were not expected in the Kafa BR, as this not only represents the third record for this species for the country but also is approximately 100 km away from the known localities in the very Southwestern edge of the country. Our occurrence data represent a huge extension of the most Northeastern part of its distribution range. It was only found in Gojeb Wetland and was confirmed by Milto et al. (2015) for the same locality. Abundant Hyperoliid species in nearly all sample sites are the long-snouted reed frog (*Hyperolius nasutus* s.l.) and the variable reed frog (*Hyperolius viridiflavus* s.l.).

4.1.3 Ranidae

Beccari's Giant Frog (*Conraua beccarii*) was another species, which was not observed as subadult or adult, but only recorded as a tadpole, which again shows the importance of tadpole search to complete the site inventory. This was challenging, as there is no description of larval characters in literature to date (see Channing et al. 2012), even though this species has a very recognisable tadpole. The author was grateful to Mark-Oliver Rödel from Natural History Museum Berlin, who helped with the determination of the tadpole. Because of its highly rheophilous larval preference and also because it is reported to be consumed by local people for food purposes (which could lead to overexploitation of its natural population) it is proposed as a good indicator species for both water quality, deforestation (which leads to unsuitable temperatures of running waters) and the sustainable use of natural resources. Tadpoles of Beccari's giant frog were found in Komba Forest Stream and Bamboo Forest Stream. It has to be mentioned that this species should be distributed much more widely in the area, as Milto et al. (2015) reported it for several localities including river near KDA guesthouse Bonga, Barta waterfall, God's Bridge and river in Mankira Forest.

Largen's Dwarf Puddle Frog (*Phrynobatrachus inexpectatus*) was described by Malcom Largen in 2001. It is an Ethiopian mountain endemic, which was so far only known from the terra typical near Bore at 2.650 m altitude and a second population near Dorse in margins of pools surrounded by *Schefflera-Hagenia* forest. It was found sympatrically with *P. minutus* in Boka Forest Wetland and in Shorori Wetland. These records are remarkable because they are the first from West of Rift Valley and approximately 100 km northwest of the known distribution records near Arba Minch. Both of the other two *Phrynobatrachus* species – *natalensis* and *minutus* were also recorded in the Kafa BR. Interestingly, *P. inexpectatus* was found in high abundance in a very special microhabitat, the headwaters mire formed by Marchantiophyta in Boka Forest Wetland at a site no larger than 1 hectare. In this particular microhabitat only very few Ethiopian Dwarf Puddle Frogs (*Phrynobatrachus minutus*) have been recorded, which seemed to be more abundant in reeds or near the small waterbodies, including the shores of the river itself. *P. minutus* was the predominant puddle frog in all the other Wetlands and at Forest sites except for Gojeb Wetland, where *P. natalensis* was predominant.

4.1.4 Pipidae

We recorded Peracca's Clawed Frog (*Xenopus clivii*) for the first time in Kafa BR, though this cannot really be seen as a range extension due to the lack of previous distribution data.

4.2 Reptilia

Of the 214 reptile species known to occur in Ethiopia only four were observed during the survey, plus one other that could be determined from a photograph taken by a participant of the expedition, so the 5 species represent only 2,34 % of the Ethiopian reptile fauna and 5,49 % of the expected reptile diversity of the KBR. This was mainly because of the season and the limited timeframe, but also due

to the fact that the study did not include savanna and dryland habitats at all and several species seem to have an aestivation period during the dry season.

Table 3: Recorded reptilian species.

No.	Species	Family	Status
01	<i>Trachylepis maculilabris</i> Gray, 1845	Scincidae	LC
02	<i>Trachylepis wingatii</i> Werner, 1907	Scincidae	LC, first record for KBR
03	<i>Pseudoboodon boehmei</i> Rasmussen & Largen, 1992	Colubridae	Endemic
04	<i>Megatyphlops brevis</i> Scortecci, 1929	Typhlopidae	LC, first record for KBR
05	<i>Naja melanoleuca</i> Hallowell, 1857	Elapidae	LC

The Speckle-lipped Skink (*Trachylepis maculilabris*) reaches its northwestern range border in Ethiopia. It inhabits a great variety of habitats, from urban areas to pristine natural habitats. It was found in relatively high abundances e.g. in the area of KDA guesthouse at rocks and walls, near bushes and shrubs and also on the roofs of houses. We also found several specimens in Boginda Forest, Awurada Valley and on riparian palm trees in Gojeb Wetland. Only a single specimen of the Wingate's Skink (*Trachylepis wingatii*) was recorded in Boka Forest Wetland, in relatively dry grassland at the edge of the forest. However, this does not seem to reflect a habitat preference, as it is known from a broad variety of habitats from forest clearings to moist savanna (Largen & Spawls 2010). Böhme's Ethiopian Snake (*Pseudoboodon boehmei*) was found as a single specimen roadkill by the mammal team on the road north to the bamboo forest east of Bonga. The habitat this road crosses is characterized by intact forest with dense canopy. The Somali Giant Blind Snake (*Megatyphlops brevis*) was found as a roadkill on the road crossing the Gojeb Wetland. This species was reported the first time from the Kafa BR.

The forest cobra (*Naja melanoleuca*) is the only species mentioned as a proper record in this report though it was not seen by the author. It could be determined with full certainty from a mobile phone picture taken by a participant of the expedition. It was crossing a small river to the Gojeb Wetland, while the ichthyology team was capturing fish. According to Largen & Spawls it should be common in southwestern Ethiopia.

5 CONCLUSIONS AND RECOMMENDATIONS FOR CONSERVATION AND MONITORING

Deforestation and environmental degradation due to human disturbance as well as a drastic increase in water pollution due to growing economies even in remote areas pose a major threat to Ethiopia's environmental wealth: With few exceptions the natural landscape has been turned into agricultural land. Already 95 % of Ethiopia's original forest has been lost to agriculture and human settlement.

Most of Ethiopian forest highland endemics are extremely sensitive to habitat transformation. The endemic species, which require forested and clear rocky streams or rivers, like Ragazzi's Treefrog, Clarke's Banana Frog, Ethiopian Banana Frog, Ethiopian Dwarf Puddle Frog and Largen's Dwarf Puddle Frog are of conservation concern and can act as monitoring species for the core zones of the Biosphere Reserve. Unfortunately, some of the expected charismatic species like the Ethiopian Mountain Adder (*Bitis parviocula*) could not be found in the survey and therefore cannot be proposed as flagship species. Because they are easy to recognize and endemic to the montane habitats, only some

of the tree frogs like *Leptopelis ragazzii*, *Leptopelis vannutellii* or the two banana Frog species of the genus *Afrivalus* could act as flagship species for the Kafa BR. The more abundant and wider distributed species often are relatively tolerant to habitat disturbance. But even species quite adaptable to altered landscapes, like the Baccari's giant frog or the Natal Puddle Frog, will disappear with the ongoing loss of their habitats due to water pollution, water extraction and large scale reforestation with eucalyptus and pine trees.

Table 4: Species suggested as monitoring and flagship species.

Species	Endemic	Red List	Monitoring species	Flagship species
<i>Leptopelis ragazzii</i>	yes	VU	yes	yes
<i>Leptopelis vannutellii</i>	yes		yes	yes
<i>Leptopelis sp.</i>	?	-	?	?
<i>Afrivalus clarkeorum</i>	yes	EN	yes	yes
<i>Afrivalus enseticola</i>	yes	VU	yes	yes
<i>Conraua beccarii</i>	no		yes	no
<i>Phrynobatrachus minutus</i>	yes		yes	no
<i>Phrynobatrachus inexpectatus</i>	yes		yes	no
<i>Ptychadena erlangeri</i>	yes		no	no
<i>Pseudoboodon boehmei</i>	yes		no	no

The wetlands have so far been neglected in the KBR zonation. A protected zone should be established covering the huge wetlands of the Gojeb river as well as the wetlands in the afroalpine zone, e.g. beyond Boka Forest.

5.1 Conserving, restoring and monitoring wetlands: the global task of this century

Globally, freshwater habitats are being disturbed, polluted and even destroyed at an alarming rate. Access to clean water is essential to human health, with the United Nations declaring it as a fundamental human right in 2010. Fresh waters represent one of the most threatened ecosystems globally, containing 10% of all known species in an area of only 1% of the Earth's surface. In general, the protection of terrestrial ecosystems is much better than that of wetlands, owing to the fact that conservation efforts have been largely focused on large terrestrial mammals. Wetlands, associated with their watershed, provide valuable ecosystem services like water catchment, retention and purification. They provide habitats for a large range of specialized flora and fauna and they serve as important longitudinal and transversal corridors for the dispersal of biota. Overall, freshwater ecosystems and freshwater biodiversity are under great peril and urgent protection measures are needed. Especially in countries like Ethiopia, where water sanitation hardly exists, while the economy grows and hence the pollution and destruction of wetlands and their ecosystem services rises tremendously, wetlands need to be protected and their status monitored. Amphibians and reptiles are among the most threatened taxa groups worldwide. Because of their both aquatic and terrestrial

ecology, amphibians in general are good indicators for freshwater and terrestrial habitats. The Kafa BR represents one of the last remnants of afro-montane forest in Ethiopia and only stronger conservation efforts for the cluster of wetlands and forests can secure favourable conservation status of endemic and typical herpetofauna assemblages.

6 REFERENCES

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7 APPENDIX



Leptopelis ragazzii tadpole mouthpart, 1st anterior labial tooth row not visible,
locality: Komba Forest



Leptopelis vannutellii, locality: KDA guesthouse Bonga



Leptopelis spec., locality Boka Forest Wetland



Leptopelis spec., locality Boka Forest Wetland



Hyperolius kivuensis, locality Gojeb Wetland



Hyperolius viridiflavus, locality: Gojeb Wetland



Hyperolius nasutus, locality: Alem Gono Wetland



Afrivalus clarkeorum, locality Boka Forest Wetland



Afrivalus enseticola in untypical microhabitat, locality Gojeb Wetland



Tadpole mouthpart of *Conraua beccarii*, locality Komba Forest Stream



Tadpole of Conraua beccarii, locality Komba Forest Stream



Foot of Phrynobatrachus minutus (female), locality: Shoriri Wetland



Phrynobatrachus minutus ventral color patterns, locality: Boka Forest Wetland



Phrynobatrachus inexpectatus, locality: Boka Forest Wetland



Phrynobatrachus natalensis, locality: Alem Gono Wetland



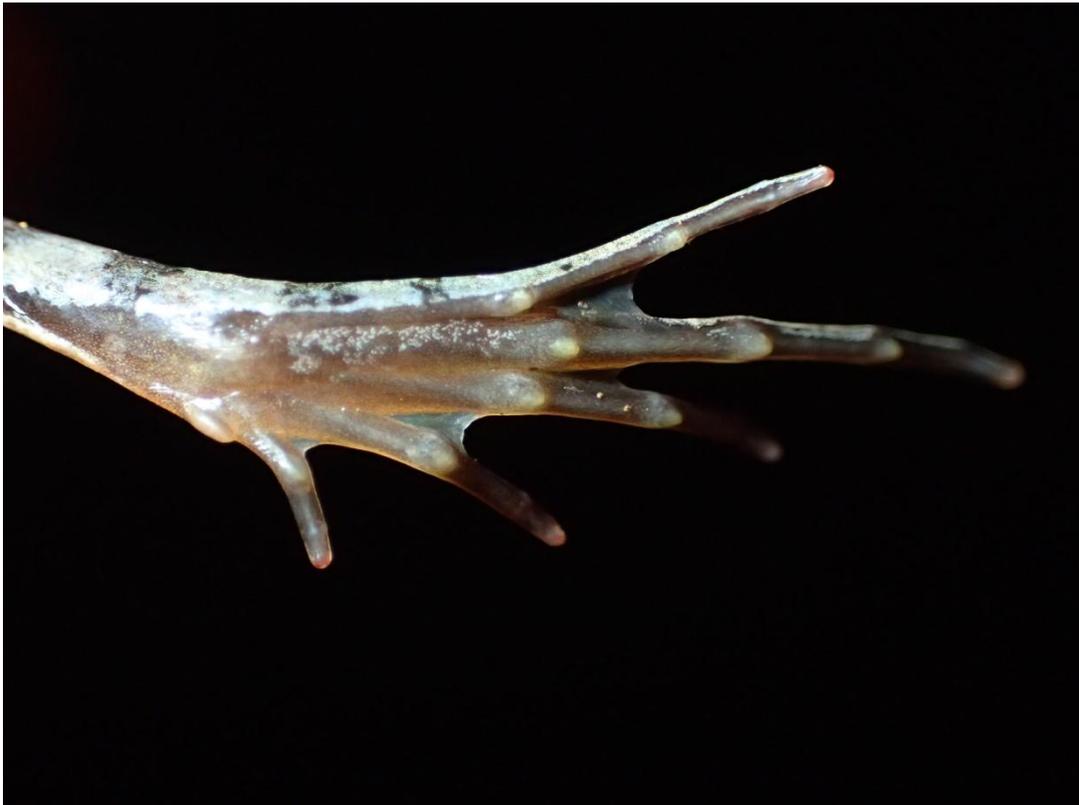
Ptychadena cf. neumanni, locality Gojeb Wetland



Ptychadena cf. schillukorum, locality: Boka Forest Wetland



Ptychadena erlangeri, locality Gojeb Wetland



Foot of Ptychadena erlangeri, Gojeb Wetland



Foot of Ptychadena mascareniensis, locality: Alem Gono Wetland



Ptychadena mascareniensis, locality: Shoriri Wetland



Xenopus clivii, locality: Shoriri Wetland



Trachylepis maculilabris, locality: KDA Guest House Bonga



Trachylepis (Mabuya) wingatii, locality: Boka Forest Wetland



Megatyphlops brevis, roadkill, locality: road between Gojeb Wetland and Boginda Forest



Pseudobodon boehmei, roadkill, locality: road north of Bamboo Forest