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The amphibians of south-eastern Republic of Guinea
(Amphibia: Gymnophiona, Anura)

Die Amphibien Südostguineas
(Amphibia: Gymnophiona, Anura)

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KURZFASSUNG

Wir berichten über die Amphibienfauna aus sechs Wald- und Berggebieten in Südostguinea. Drei der Gebiete (Déré, Diécké, Mont Béro) wurden im Rahmen eines kürzlich von Conservation International organisierten "Rapid Assessment Program" (RAP) untersucht. Für die übrigen drei Gebiete (Nimba Berge, Ziama, Pic de Fon) werteten wir Literaturdaten aus und untersuchten Belegexemplare in der Sammlung des Museums Koenig in Bonn (ZFMK).

Insgesamt listen wir 73 für Südostguinea nachgewiesene Amphibienarten auf. Die Anzahl der pro Gebiet nachgewiesenen Arten reichte von 29 bis 58. Der Prozentsatz, der für Oberguinea endemischen Arten (insgesamt 39) pro Gebiet, schwankte von 42 bis 53 %. Einige Arten werden von uns detaillierter diskutiert. Der hohe Anteil von Störungsanzeigern (farmbush species) in allen untersuchten Gebieten ist ein untrügliches Zeichen für die bereits deutlich fortgeschrittene Walddegradation, am dramatischsten sichtbar in Déré. Wir unterstreichen die Bedeutung von Wald-Guinea als eines der artenreichsten Gebiete Afrikas und fordern nachdrücklich einen intensiveren Schutz der verbliebenen Wälder und eine gründliche Untersuchung der vielen endemischen Amphibienarten über die nahezu keine Daten verfügbar sind.

ABSTRACT

We report on the amphibians of six forest and mountain areas in south-eastern Guinea. Three forest reserves (Déré, Diécké, Mont Béro) have been recently surveyed through a Rapid Assessment Program (RAP), organized by Conservation International. For three other sites (Nimba Mountains, Ziama, Pic de Fon) we reviewed literature records and analyzed specimens from the Museum Koenig collection in Bonn (ZFMK). In total 73 amphibian species have been recorded for south-eastern Guinea. The number of recorded species per area ranged from 29-58, and the percentage of species endemic to the Upper Guinea forest zone (in total 39 species) from 42-53 %. We discuss several species in more detail. The high number of 'farmbush' species, recorded in all areas, is a clear hint of the very degraded nature of the few remaining Guinean forest areas, particularly that of Déré. We emphasize the importance of the whole area as one of Africa's hottest hotspots, strongly recommend increased forest conservation activities, and stress the particular need for more detailed field work on the endemic amphibian species.

KEY WORDS

Amphibia: Anura: Gymnophiona: *Bufo superciliaris*, *Nimbaphrynoides occidentalis*, *Ptychadena retropunctata*, *Amnirana occidentalis*, *Petropedetes natator*, *Phrynobatrachus natalensis*, forest reserves, south-east Guinea, West Africa, checklist, biodiversity, conservation, distribution, habitat selection, taxonomy

INTRODUCTION

Reasonably good amphibian inventories for West Africa are scarce (for a recent Ghanian review see RÖDEL & AGYEI 2003). Guinea has been especially neglected in this regard, and apart from the Nimba Mountains area (e.g., GUIBÉ & LAMOTTE 1958a, 1958b, 1963; LAURENT 1958; SCHIØTZ 1967), few authors have reported from the country (e.g., CHABANAUD 1919, 1920, 1921; SCHIØTZ 1968; BÖHME 1994a, 1994b; RÖDEL & BANGOURA in press). The forested south-eastern part of Guinea forms part of the Upper Guinean biodiversity hotspot (MYERS et al. 2000), but neither its fauna nor flora are well known. This area was therefore defined as a priority region for

rapid assessments during the Conservation Priority Setting workshop held in Elmina, Ghana in 1999 (BAKARR et al. 2001). In response to expert judgment, Conservation International arranged a Rapid Assessment Survey (RAP) to the forest reserves of Déré, Diécké and Mont Béro in November/December 2003, with the terrestrial mammals, bats, birds, reptiles, amphibians, insects and plants, being surveyed by a multi-disciplinary team. The amphibian data forms the basis of this paper.

As amphibian declines in other parts of the world have often involved high altitude species (e.g. LIPS et al. 2003), and as the conservation status of the live bearing toad *Nimbaphrynoides occidentalis* (ANGEL, 1943) from Monts Nimba has not been recently assessed, we took the opportunity to spend one day searching for this species. Additionally we reinvestigated a collection of amphibians from Diécké and Ziama Forest Reserves (BÖHME 1994a, 1994b) and further unpublished amphibian specimens from South-East Guinea, in the collection of the Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn (ZFMK). We present a checklist of the amphibians of south-eastern Guinea, a list of habitats investigated by us, comment on selected species, summarize habitat-specific amphibian assemblages, and discuss the amphibian diversity of south-eastern Guinea and its possible conservation threats.

MATERIALS AND METHODS

Study sites

Diécké Classified Forest (DICF) is part of the administrative regions (prefectures) of N'Zérékoré and Yomou. It is situated about 25 km south of N'Zérékoré and 10 km north of Diécké (07°22'-07°39'N, 08°47'-09°06'W); and comprises an area of 59,143 ha (PROGERFOR 1995; BÜTZLER 2000; DUFOUR 2002). Mean altitude is 400-500 m a.s.l., the highest elevation is 595 m a.s.l. The rainy season stretches from March to November, with the highest rainfall in September ($\bar{x}$ = 315 mm). Mean annual precipitation varies between 1,900-2,000 mm ($\bar{x}$ = 1,950 mm, data from 1958-1992). Mean annual temperature is 24°C (19.2-29.6°C). Humidity fluctuates between 18 % (January) and 96 % (September). DICF mostly comprises dense evergreen rainforest on brown or sandy soils above granite, quartzite, gneiss and iron-rich ground. According to satellite images only 35.7 % of the forest is primary due to selective logging (about 30 years ago) and agricultural activities. Most areas comprise secondary forest and partly abandoned plantations (banana, rice, palms, coffee and cocoa). Primary and secondary dense forest amount to about 70 % of the reserve's surface. The remaining area comprises semi-dense forest, non-forest zones and fields. The reserve is now divided into three differently managed zones: A core area of strict protection (14,762 ha); an area surrounding the protection zone where sustainable use of forest resources is permitted (19,372 ha), and a re-management zone of 25,009 ha. The latter was replanted with *Terminalia superba* and *T. ivorensis* trees, four to ten years ago (fig. 1, PROGREFOR 1995; BÜTZLER 2000; DUFOUR 2002).

Mont Béro Classified Forest (MBCF) is part of the prefectures of N'Zérékoré, Lola and Beyla. It is situated at the northern limit of the rainforest zone, 56 km north of N'Zérékoré, 52 km south of Beyla and 40 km west of Lola (08°05'-08°25'N, 08°23'-08°36'W) and has a surface of 26,850 ha. The climate in general is humid, tropical seasonal, but differs between the North and the South of the massif. The dry season lasts about five months in the North and three months in the South. Mean annual precipitation is: 1,632 mm in the North (Beyla, data from 1981-1997); 1,851 mm in the South (N'Zérékoré, data from 10 years), 2,032-2,394 mm in the West (Kognéa, data from 1997-1999) and 1,701-1,885 mm in the East (Kpinéka, data from 1997-1999). In Gouéché the mean annual precipitation dropped slightly from 1,930

to 1,820 mm from 1923-1996. Mean annual temperature is 22.1-25.0°C. The MBCF is part of the Monts Nimba Mountain Range and thus part of the Upper Guinea Highlands (stretching from western Ivory Coast into Sierra Leone). Its highest elevation is 1,210 m a.s.l. The dominant habitat types are semi-evergreen forest and savannah formations. The plateau is dominated by short grass savannah and small tress. Depressions harbour permanent watercourses, bordered by gallery forest of rainforest character. Within the reserve closed forests cover 5,013 ha, open forests 4,836 ha, abandoned fields 10,700 ha (rice, manioc, corn, peanuts, palms, sweet potato), tree savannah 4,481 ha, gallery forest 1,132 ha and rocky habitats 447 ha. About 75 % of the reserves habitats are degraded to varying extents (SCHNELL 1952; SCHMIT 1997). As with DICF, MBCF is nowadays divided in to three differently managed protection zones (PGRR 1999).

Déré Classified Forest (DECF) is part of the forest region on the eastern base of Monts Nimba and directly borders Ivory Coast. It was proposed as the third protection area of the Monts Nimba Biosphere Reserve (TOURE 2002). Unfortunately this classification was delayed and a respective decree is still unsigned. DECF comprises an area of about 8,920 ha and is situated in the prefecture of Lola (07°33'-07°42'N, 08°11'-08°43'W). It is composed of low-lying floodplains, dry lowlands and hillsides culminating in the summit of Mont Tiéton (740 m a.s.l.). No further basic information about the reserve is available. Climatic conditions are probably similar to those in the foothills of neighbouring Monts Nimba (compare LAMOTTE 1998). The reserve was still completely covered with primary rainforest in the years 1990-1993 (M. A. BANGOURA, pers. obs.). An official report, printed in 2002, still claims that the surrounding human population carefully protects the reserve (TOURE 2002). However, the same report also states that non-local immigrants started to plant rice fields within the reserve, facilitated by logging tracks established between 1996-1997. During the RAP we could find no larger tracks of primary forest (fig. 2). Most areas were converted into plantations (mainly rice) or consisted of secondary forest remnants. According to local people, areas of primary forest remained towards the border with Ivory Coast. According to the same sources most parts of the reserve were illegally logged by companies from neighbouring Ivory Coast in the mid 1990s. The recent plantations seemed only 2-5 years old.

Monts Nimba (MN). The Monts Nimba Range (surface of the Nimba Massif is 12,540 ha) is situated on the borders of Guinea, Ivory Coast and Liberia (7°25'-7°45'N, 8°20'-8°35'W). The chain is orientated South-North, being approximately 40 km long and 8-12 km wide. Mean annual precipitation is 2,093 mm (data: 1994-1998, rainy season from May-October, 175 days with rain per year). Mean annual temperature on the foothills of the massif (450-550 m a.s.l.) is 25°C. On the mountain ridge (1,650-1,750 m a.s.l.) mean annual temperature is 19°C (21°C in April; 15°C in August). Despite its status as a biosphere reserve and natural world heritage site, Monts Nimba is threatened by mining plans in Guinea and Ivory Coast. Large parts of the Liberian part have been already destroyed by open cast mining activities (GATTER 1997). On 20th November we spent four hours (11 a.m. - 3 p.m.; 8 man-hours) in the area between the Cité (former research station of M. LAMOTTE and co-workers, 700 m a.s.l.) and Mont Tô (1,700 m a.s.l.), northern part of the Nimba Ridge (fig. 3). As our sole aim on MN was to confirm the presence of *Nimbaphrynoides occidentalis* (ANGEL, 1943), the amphibian data obtained on MN was excluded from the sampling efficiency analyses (see below).

Ziama Classified Forest (ZCF). The Ziama Forest Reserve has been described in detail in BÖHME (1994a, 1994b). ZCF covers a surface of approximately 130,000 ha, and ranges up to 1,400 m a.s.l. altitude. Mean annual precipitation is 2,200 mm. Mean annual temperature is 26°C. The hilly landscape, with partially steep, densely-vegetated slopes, is probably the main reason that much of the rainforest is intact (55 % of the forest are in primary state, 45 % are degraded to various extents). Above about 1,200 m a.s.l. sub-

montane floristic elements can be found. As in DICF logged areas of the reserve have been partly reforested with *Terminalia* species. Sampling was mainly done in October 1993 (W. BÖHME) with some additional specimens provided by W. BÜTZLER. As most specimens were gathered by villagers and deposited in containers with preservation liquid exact collecting details for these vouchers (location, date and habitat details) is not available. We thus exclude this material from the sampling efficiency and community analyses (see below).

RAP field data

During the RAP amphibians were mainly located opportunistically, during visual and acoustic surveys of all habitats by up to three people during day and night (RÖDEL & ERNST 2004). We also applied dip netting for tadpoles in suitable waters (see HEYER et al. 1993). We measured our sampling effort in man-hours spent searching in a certain area (table 1). We tried to spend more time in complex rather than uniform habitats to counter for differences in the ease of encountering amphibians in different habitats. We set up pitfall traps (40 m plastic fence, nine buckets) at two sites in Diécké (four days each) and at one site in Mont Béro (five days). However, trapping success was negligible and did not add any additional species to our list. Trapping results therefore are not reported herein. Table 1 gives a full list of habitats investigated, including their geographic position, date of investigation, sampling effort and short habitat characterization. Geographical positions were taken with a hand-held GPS receiver (Garmin® 12 XL).

Statistics

Because we spent only a few days at each site investigated, calculation of species richness per site is inappropriate. We assumed that sampling effort was comparable throughout time, and therefore calculated the total number of amphibian species for all three classified forests together. The Monts Nimba and Ziama records were excluded from this analysis (see above). Because we had no quantitative data available, we used the Chao2 and Jack-knife 1 estimators, based on presence/absence data for all habitats (software: EstimateS®, http://viceroy.eeb.uconn.edu/index.html). Calculation bases were the daily species lists (18 days) for 51 amphibian species (see below). To prevent order effects, all calculations have been based on 500 randomized runs. For an introduction to the methods applied see COLWELL (1994-2000) and literature cited therein.

Taxonomy and morphological data

We only comment on selected species. A full species list including all sites where a particular species was recorded in the course of the RAP is given in table 2. Nomenclature mainly follows FROST (2002); for exceptions see results and Appendix 1.

Voucher specimens were anesthetized and killed in a chlorbutanol solution and thereafter preserved in 70 % ethanol. Voucher specimens and specimens lent for comparison are deposited in the Institut Royal des Sciences naturelles de Belgique, Brussels (IRSNB, field numbers from O.S.G. PAUWELS - P), the Muséum National d'Histoire Naturelle, Paris (MNHN), the Senckenberg Museum, Frankfurt/M. (SMF), the Staatliches Museum für Naturkunde Stuttgart (SMNS), the Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn (ZFMK), the working collections of M.-O. RÖDEL (MOR) and M. A. BANGOURA (MAB, see appendix 2). M.-O. RÖDEL's specimens will be later transferred to collections of different natural history museums. M. A. BANGOURA's specimens form the basis of a Guinean reference collection, eventually to be stored at the University of Conakry. Tissue samples (toe tips) of recorded species were preserved in 95 % ethanol. These samples are stored in M.-O. RÖDEL's collection and at the Institute of Zoology at Mainz University, Germany. Measurements were taken with a dial calliper (accuracy ± 0.1 mm).

RESULTS

Selected species

Bufo superciliaris BOULENGER, 1888. We recorded this largest African toad in all forest reserves investigated. *Bufo superciliaris* is known to range from Guinea eastward to northern Democratic Republic of Congo and Gabon. From Guinea it is known from Ziama Forest (BÖHME 1994a), Monts Nimba (GUIBÉ & LAMOTTE 1958a) and the Pic de Fon Forest Reserve (RÖDEL & BANGOURA in press). *Bufo superciliaris* seems to be a very rare and/or hard to find species, e.g. GUIBÉ & LAMOTTE (1958a) collected only two specimens in primary forest (500-550 m a.s.l.) during 20 months of field work on Monts Nimba; M.-O. RÖDEL recorded only two specimens in primary rainforest of Taï National Park, Ivory Coast (> 24 months of field work, > 30,000 other amphibian specimens recorded; M.-O. RÖDEL unpubl. data). All our Guinean records were juvenile and semi-adult individuals found in primary rainforest close to large rivers. BÖHME (1994a) found juveniles towards the end of the rainy season. It thus seems that in West Africa *B. superciliaris* reproduces during the main rainy season. In Cameroon *B. superciliaris* inhabits both primary and secondary forest (AMIET 1976a; own unpublished data: IRSNB P 293: Gabon, province de l'Estuaire, Kinguélé (dam buildings): 0°27'N, 10°16'E, 80 m a.s.l., 10.VI.2001, among ferns in a clearing in secondary forest, near a river, O.S.G. PAUWELS). In Cameroon it reproduces during the dry season (AMIET 1976a). AMIET (1976a) recorded only one very faint call that he interpreted as an aggressive call. He speculated that *B. superciliaris* may have lost a proper advertisement call. However, West African specimens seem to call loudly during the breeding season (I. HERBINGER, unpubl. data from Taï National Park, Ivory Coast). One of us (W. BÖHME) found significant morphological differences between *B. superciliaris* from various African localities. AMIET & PERRET (1969) and AMIET (1976b) also noted that Central African *B. superciliaris* possess granular skin unless they exceed 40 mm SVL. The same was true for a toad from Gabon (IRSNB P 293, SVL 26.4 mm). Guinean toadlets, smaller than 40 mm, had fewer and smaller tubercles on the dorsum (SVL 15.3- 22.4 mm, n = 6). Differences in morphology, habitat choice, and acoustic communication suggest that West African populations of this forest toad may not be conspecific with *B. superciliaris* described from Gabon. An available name for West African populations would be *B. chevalieri* MOCQUARD, 1909, described from Ivory Coast, and synonymised by TANDY & KEITH (1972) without discussion. *Bufo chevalieri* was characterized by the absence of an eyelid process, a character that is clearly discernible even in juvenile Central African *B. superciliaris* (IRSNB P 293, photo in BÖHME 1994a of a specimen from Kivu province, eastern Democratic Republic of Congo), but which is always absent in juvenile as well as adult specimens from West Africa (fig. 4, RÖDEL unpublished data, compare also figures in GUIBÉ & LAMOTTE 1958a; BÖHME 1994a; LAMOTTE 1998).

Nimbaphrynoides occidentalis (ANGEL, 1943) is probably one of the most well known, and certainly the most famous, West African amphibian species, its biology being the subject of numerous publications (e.g. LAMOTTE 1959). The most recent by LAMOTTE & SANCHEZ-LAMOTTE (1999) is, however, based on much older data. This small toad, males reaching 22-24 mm SVL, females 27-29 mm SVL, lives exclusively in a few km² of montane grassland on the Nimba Ridge (1.100-1.700 m a.s.l.). It hibernates from November to March in earth or rock crevices and reappears in April, mating takes place in August / September. After a gestation period of 8-9 months, during which the embryos are nourished in the uterus, the female gives birth to 1-20 fully developed juveniles (mostly 4-10, SVL 6-8 mm). Locally *N. occidentalis* may be extremely abundant, e.g. on well suited sites on Mont Tô in September up to several dozen individuals could be recorded in only 10 m² (LAMOTTE & SANCHEZ-LAMOTTE 1999; BÜTZLER in BÖHME 1994a). As amphibian species seem to be in worldwide decline, and montane species have often disappeared first (e.g., LIPS et al.

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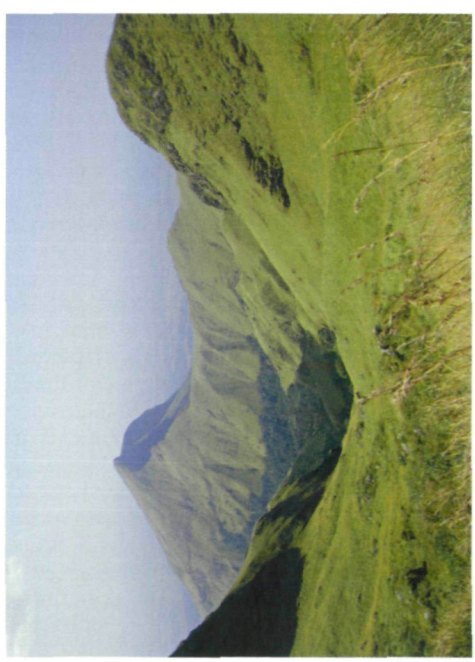

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2003), it seemed urgent to search for *N. occidentalis*. Although this species is believed to be in hibernation at the end of November (LAMOTTE & SANCHEZ-LAMOTTE 1999), we found several juvenile males on the summit of Mont Tô at about 1,700 m a.s.l. (fig. 5; SVL 14.1-14.7 mm, n = 3). They were still active on a very humid, steep, westward-orientated slope, with extremely loose earth, thus providing numerous small holes and cracks (fig. 6) into which the toads immediately tried to hide when disturbed. Other sides, known at least formerly to harbour large populations of *N. occidentalis* (BANGOURA unpubl. data), were already very dry and no toads were recorded. Our records show that the species is still present on Monts Nimba, but whether the population is in decline or stable remains unknown. As some of the most important parts of the Guinean range of *N. occidentalis* may be mined for iron ore in the future, a detailed reassessment of the current distribution and population sizes of *N. occidentalis* is urgently required. Currently, it is listed as Critically Endangered (IUCN et al. 2004).

From the Liberian part of the Nimba Ridge, a second *Nimbaphynoides* species, *N. liberiensis* (males 29 mm SVL, females 35 mm SVL), was described by XAVIER (1979). Exact data on repartition and population sizes of this species are completely lacking. As the Liberian part of MN is under heavy mining pressure (COLSTON & CURRY-LINDAHL 1986; GATTER 1997) it is also very important that this species be surveyed as well.

Ptychadena retropunctata (ANGEL, 1949). This small *Ptychadena* species (males SVL 31.5 mm, females 41 mm; GUIBÉ & LAMOTTE 1957), originally described from Monts Nimba, was only known from the vicinity of the type locality and the Loma Mountains in Sierra Leone (GUIBÉ & LAMOTTE 1957, 1958a; SCHIØTZ 1964a; LAMOTTE 1971), where it was localized on savannah habitats between 400-800 m a.s.l. and found to breed in ponds (summarized in RÖDEL 2000). It shares its habitat with well-known savannah frogs such as *Ptychadena tournieri* (GUIBÉ & LAMOTTE, 1955), *Hyperolius lamottei* LAURENT, 1958 and *Afrixalus weidholzi* (MERTENS, 1938) (LAMOTTE 1971). In MBCF we found this species to be very common in a rainforest-like, gallery forest along a broad, fast-flowing river. This habitat consisted of high, closed-canopy forest with a nearly open under storey and little stagnant water (either small puddles on the forest floor or shallow areas along smaller tributaries to the river). Our specimens ranged from 27.1-31.4 mm SVL (fig. 7). We found no adult frogs. In the adjacent savannah areas the species was absent, however, these habitats were already very dry. Our findings may suggest that *P. retropunctata* retreats into the forest during the dry season and thus requires adjacent forest and savannah habitats for survival.

LOVERIDGE (1955) synonymised *P. retropunctata* with *P. maccarthyensis* (ANDERSSON, 1937) [correct name of the latter now is *P. bibroni* (HALLOWELL, 1845) compare LAMOTTE & OHLER 1997; RÖDEL 2000]. However, *P. retropuctata* is a valid species, easily distinguished from other West African ranids by the following set of characters: comparatively small roundish body and (for a *Ptychadena*) blunt snout; numerous elongate warts instead of longitu-

Figs. 1 - 4 (opposite page) / Abb. 1 - 4 (gegenüberliegende Seite)

Fig. 1: Replanted mono-dominant *Terminalia* forest in Diécké Forest Reserve; habitat (# 5) of e.g. *Phrynobatrachus natalensis*, *Ptychadena longirostris* and *Arthroleptis* sp. 1.

Abb. 1: Aufgeforstete *Terminalia* Monokultur im Diécké Staatswald; Lebensraum (# 5) von z.B. *Phrynobatrachus natalensis*, *Ptychadena longirostris* und *Arthroleptis* sp. 1.

Fig. 2: Typical aspect of heavily degraded forest in the Déré Forest Reserve (# 1).

Abb. 2: Typische Ansicht des extrem degradierten Waldes von Déré (# 1).

Fig. 3: High altitude savannah on Monts Nimba. Photo taken on Mont Tô (1,700 m a.s.l., # 4), facing Mont Leclerc in the background.

Abb. 3: Montansavanne auf den Nimbabergen. Sicht vom Mont Tô (1,700 m ü. M., # 4) auf den Mont Leclerc.

Fig. 4: Juvenile *Bufo superciliaris* (SVL 47.2 mm) from Déré Forest Reserve (# 2).

Abb. 4: Juvenile *Bufo superciliaris* (KRL 47,2 mm) aus dem Déré Staatswald (# 2).

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dinal ridges on the back; distinctly bordered yellow spots on black background on the outer parts of thighs; and numerous additional subarticular tubercles on 2nd-5th toe.

Amnirana occidentalis (PERRET, 1960) is known from Monts Nimba, Ziama Forest (both Guinea), Haute Dodo Forest Reserve in south-western Ivory Coast, Liberia, and from Kakum Forest in Ghana (GUIBÉ & LAMOTTE 1958a; PERRET 1983; BÖHME 1994b; RÖDEL & BRANCH 2002). Nothing has been published about the biology of the species. In contrast to a previous statement, based on a single male from Haute Dodo Forest (MOR HD7, SVL 64 mm; RÖDEL & BRANCH 2002), adult males exhibit humeral glands, however these glands are much less conspicuous than in the syntopic *A. albolabris* (HALLOWELL, 1856). Our specimens in general showed the colouration already outlined in PERRET (1983) and RÖDEL & BRANCH (2002), but we also found males with green backs. Most males and the adult females exhibited brown backs. All specimens had clearly delimitated, small, round, black spots on the back. We found breeding adults (vouchers SVL: males 54.5-66.4 mm, female 94.5 mm) in DICF along a small, slow-flowing forest creek (habitat # 9, see table 2) and one adult male within primary forest, far away from open water (# 6). At habitat # 9 adult males and females were sitting along the creek bank, either on sandy soil or in small shrubs and other plants up to 1 m height. We occasionally heard a very faint moaning call, that could neither be recorded nor assigned with certainty to this species. However, it was distinctly different from the advertisement call of syntopic *A. albolabris* (compare SCHIØTZ 1964b). Other reproducing frogs in this habitat were *Bufo togoensis* AHL, 1924, *B. maculates* HALLOWELL, 1854, *Cardioglossa leucomystax* (BOULENGER, 1903), *Conraua* cf. *alleni* (BARBOUR & LOVERIDGE, 1927), *Phrynobatrachus alleni* PARKER, 1936 and *Hyperolius chlorosteus* (E. BOULENGER, 1915), all having completely different calls to that in question. *Amnirana occidentalis* seems to be widespread in the Upper Guinean forests, but with very localized populations exclusive to primary forest. For a key to West African *Amnirana* see RÖDEL & BANGOURA (in press).

Petropedetes natator BOULENGER, 1905. We previously reported on morphological differences between specimens from Ivory Coast (Mont Sangbé National Park - MSNP, RÖDEL 2003) and the Simandou Range, Guinea (RÖDEL & BANGOURA in press). Specimens from MBCF (males SVL 42.9-47.3 mm; female SVL 46.8 mm) were identical to the Simandou Range animals, showing a dark brown back with yellow spots, and lacking pronounced elongated warts on back (fig. 8). In contrast, a specimen from ZCF (ZFMK 56290; SVL 52.5 mm) exhibited a nearly uniform black back with elongated warts on back, flanks and neck, arranged in longitudinal rows. *Petropedetes natator* from MSNP exhibited a beige colour with reddish-brown spots and elongated warts arranged in longitudinal rows. Specimens from MN show the colour of specimens from PFCF (GUIBÉ & LAMOTTE 1958a), but the skin texture of MSNP frogs. With respect to coloration and skin texture, specimens from MSNP fit

Figs. 5 - 8 (opposite page) / Abb. 5 - 8 (gegenüberliegende Seite)

Fig. 5: Subadult male *Nimbaphrynoides occidentalis* (SVL 14.7 mm) from Mont Tô, Monts Nimba (# 4).

Abb. 5: Junges *Nimbaphrynoides occidentalis* Männchen (KRL 14,7 mm) vom Mont Tô, Nimbaberge (# 4).

Fig. 6: Very humid steep slope on Mont Tô (1,700 m a.s.l. # 4) where *Nimbaphrynoides occidentalis* was found active during 20 November 2003. Compare M.A. BANGOURA for scale.

Abb. 6: Sehr feuchter Abhang am Mont Tô (1.700 m ü. M. # 4) wo wir am 20. November 2003 *Nimbaphrynoides occidentalis* gefunden haben. Man beachte M.A. BANGOURA zum Größenvergleich.

Fig. 7: *Ptychadena retropunctata* (SVL 27.8 mm) from Mont Béro Forest Reserve (# 16). Note broken dorsal ridges and yellow spots on outer part of thighs.

Abb. 7: *Ptychadena retropunctata* (KRL 27,8 mm) von Mont Béro (# 16). Man beachte die unterbrochenen Rückenleisten und die gelben Punkte auf den Oberschenkelaußenseiten.

Fig. 8: Male *Petropedetes natator* (SVL 45.8 mm) from Mont Béro Forest Reserve (# 16).

Abb. 8: *Petropedetes natator* Männchen (KRL 45,8 mm) von Mont Béro (# 16).

well the original description by BOULENGER (1905; type specimens from Sierra Leone, SVL 55 mm).

Phrynobatrachus natalensis (SMITH, 1849) was recorded in DECF, DICF and MBCF. However, the frogs occurred in a habitat (degraded forest) different to other published records (savannah, see RÖDEL 2000 for review). Our specimens measured 23.6-24.3 mm SVL. All had a uniform brown back with blackish warts; lips white-brown cross barred; belly white with few or very many black spots, fusing to two large black spots on breast; throat with black spots (in one specimen, a non-reproductive male, nearly black; no skin folds on throat); typical webbing (see RÖDEL 2000); neither toe nor finger tips enlarged. A similar frog was recently reported from a comparable habitat in Marahoué National Park in Ivory Coast as *Phrynobatrachus* sp. (MOR M 23; RÖDEL & ERNST 2003). Forest specimens seem to be smaller and show slightly differing colour patterns compared to savannah populations (RÖDEL 2000). However, specimens from northern Ghana (savannah, RÖDEL & AGYEI 2003), central Ivory Coast (savannah-forest transition zone, RÖDEL & ERNST 2003) and south-eastern Guinea (forest zone, this paper), were genetically identical (J. KOSUCH & M.-O. RÖDEL unpubl. data).

Amphibian assemblages, species richness and endemism

In total we recorded 52 amphibian species in the course of the RAP (table 2). Based on our records we calculated the species richness for the area under investigation (fig. 9; excluding the Monts Nimba data, thus 51 species, 18 days). We estimated between 60 and 64 species. In total 73 species are known to occur in the south-eastern part of Guinea (Appendix 1). During the RAP we only focused on forest habitats or habitats that had previously been forested, and probably recorded most of the amphibian species in the RAP area.

Within the three forest reserves investigated during the RAP, most species (17) were recorded in farmbush habitats exclusively, 16 species were exclusively found in forest, 13 in farmbush and forest habitats, two in farmbush and savannah, one in savannah, and only one species [*Phrynobatrachus accraensis* (AHL, 1925)] in all habitats (table 2). The only area with original savannah habitat was MBCF, where we recorded five savannah species, but possibly missed many others as savannah waters had already dried up. Almost equal numbers of species were found in farmbush and forest habitats of MBCF, 17 and 19, respectively. In DICF we found 26 species in farmbush and 23 species in real forest situations. In DECF the number of species in farmbush (21) was almost twice that in forest habitats (12).

The various degrees of habitat degradation in the forest reserves were reflected by the composition of their amphibian assemblages. For example, in the genus *Hyperolius*, savannah habitats were occupied by *H. lamottei* and *H. nitidulus* PETERS, 1875. In degraded forest areas (i.e. converted into rice plantations) these species were replaced by *H. concolor* (HALLOWELL, 1844). If more shrub-like vegetation or small forest remnants were present the latter species was joined by *H. guttulatus* GÜNTHER, 1858 (only if larger stagnant waters were present), *H. fusciventris* PETERS, 1876, and *H. picturatus* PETERS, 1875. *Hyperolius picturatus* and *H. fusciventris* also prevailed in partially open forest habitats, whereas *H. zonatus* LAURENT, 1958 and *H. chlorosteus* were only recorded when at least tracks of primary forest remained along stagnant (*H. zonatus*) or flowing (*H. chlorosteus*) waters. A similar succession could be observed in almost all species-rich genera (e.g. *Bufo*, *Ptychadena* or *Phrynobatrachus* species in table 2).

Including museum vouchers and literature records (Appendix 1) the highest species richness in south-eastern Guinea has been recorded for Monts Nimba (58-61 species), followed by Pic de Fon (57, RÖDEL & BANGOURA in press, unpubl. data), DICF (48 species), ZCF (32 species), DECF (30 species) and MBCF (29 species). In total 53 % (39 of 73) of all species known from south-eastern Guinea are endemic to the Upper Guinea forest zone. The rate of endemism varied between 42-53 % in the six Guinean forest areas (Appendix 1) investigated.

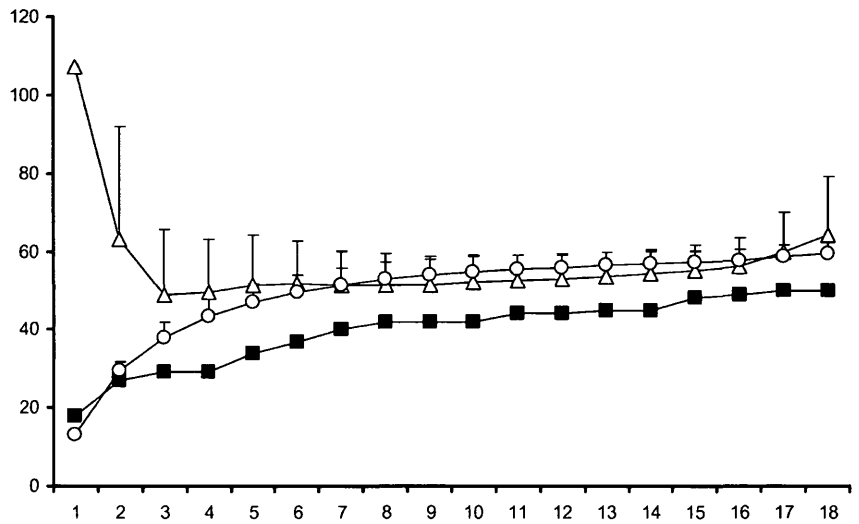

Fig. 9: Calculated species richness and species accumulation curve (black squares) of the amphibian records in Déré, Diécké and Mont Béro Classified Forests, Guinea. Calculations are presented in mean values with standard deviation (only positive SD indicated) of 500 random runs of the daily species lists. White triangles: Chao2 estimator (64.3 ± 14.8 species); white circles: Jack-knife 1 estimator (59.5 ± 2.9 species).

Abb. 9: Geschätzter Artenreichtum und Artenakkumulationskurve (schwarze Quadrate) der Amphibiennachweise aus den Déré, Diécké und Mont Béro Staatswäldern, Guinea. Wir zeigen die berechneten Mittelwerte mit Standartabweichung (nur positive Abweichung dargestellt) für 500 randomisierte Berechnungen auf der Basis der täglichen Artenlisten. Weiße Dreiecke: Chao2 Schätzstatistik (64,3 ± 14,8 Arten); weiße Kreise: Jack-knife 1 Schätzstatistik (59,5 ± 2,9 Arten).

DISCUSSION

Our findings strongly support the categorisation of the south-eastern Guinean forests as one of the 'hottest' hotspots in Africa (BAKARR et al. 2001), and clearly underline the necessity of increased conservation efforts in this region. Compared to other West African areas with known amphibian faunas (reviewed in RÖDEL & AGYEI 2003), the reserves here reviewed rank among the areas of highest recorded amphibian species richness. Monts Nimba has the highest number of amphibian species recorded for any site in West Africa (defined as stretching from Senegal to eastern Nigeria). Pic de Fon ranks in position two (RÖDEL & BANGOURA in press and unpubl. data), Diécké in position four, behind Taï National Park (RÖDEL & ERNST 2004).

The high number of species on Monts Nimba and Pic de Fon is due to the large variety of habitats (savannah to rainforest) that cover, as far as West Africa is concerned, an exceptional range of altitudes. Given the variety of potential habitats and altitudinal range of the Ziama forest, its amphibian fauna is probably undersampled and will likely harbour an amphibian diversity equal to, or even higher, than Diécké, as many common and widespread leaf litter frogs are still unrecorded from Ziama.

The comparatively lower number of species in Déré and Monts Béro, and the high percentage of farmbush species in all three forest reserves investigated throughout the RAP, reflects the degree of degradation these forests have already suffered, particularly Déré. However, even in the latter seven species were recorded that are restricted to primary or at least late secondary forest, and 50 % of the Déré species were Upper Guinea endemics. Despite its badly degraded habitats, an amazingly high percentage of forest species still survived in

Monts Béro. This is probably because these species are almost exclusively specialised in fast flowing waters and adjacent habitats, and the rivers in Monts Béro remained bordered by sound gallery forests that seem sufficient for these species to survive, at least at the present stage.

All areas investigated had a very high number of species endemic to the Upper Guinean forest zone. The lower percentage of endemic species on Monts Nimba, Diéké and Ziama forest areas is due to their natural habitat mosaic which includes lowland savannah biota and, hence, species that are generally widespread in Africa. Efforts aiming towards the conservation of species which occupy very small ranges are of particular priority. Many montane and submontane species observed in the areas studied represent local endemics and, thus, belong into the above category (e.g., *Nimbaphrynoides occidentalis*). Most of these species have never been investigated thoroughly, and no data on their distribution, habitat requirements, or population sizes is available [e.g., *Nimbaphrynoides liberiensis* (XAVIER, 1979), *Schoutedenella crusculum* (ANGEL, 1950), *Ptychadena submascareniensis* (GUIBÉ & LAMOTTE, 1953)]. Unfortunately it is just these highest elevation areas of Monts Nimba and Pic de Fon forest reserve, and their exceptional habitat of montane grassland, which are in the focus of open-cast mining plans.

Endemic amphibian species of very localized distribution are not restricted to montane forms. Most Upper Guinea endemics are, in fact, forest species, e.g., *Amnirana occidentalis*. As *Bufo superciliaris* illustrates, forest species currently believed to occur in West and Central Africa, may comprise several cryptic species. We have genetic evidence that this is true for a wide range of African frog species from quite different families (M.-O. RÖDEL, M. BURGER & J. KOSUCH unpubl. data). Hence, the current percentages of Upper Guinea endemics are very conservative estimates. These forest dwelling species are no less threatened than montane ones. In Guinea, only 7,655 km² (4.1 %) of originally 185,800 km² of closed tropical moist forest, had survived until 1992 (NAUGHTON-TREVES & WEBER 2001). The forests dealt with in this paper in fact represent the last real forest areas in the Guinean forest zone! Déré forest is a frightening example of how fast these remaining forest patches may vanish when not carefully monitored, even though theoretically protected by law and planned to receive higher protection status. Only ten years ago Déré was untouched primary lowland forest, and yet nowadays nearly all of its forest has been converted into rice fields. As *Ptychadena retropunctata* may show, it is not only necessary to protect specific habitat types, but also habitat mosaics that may be essential for sustainable living of certain species. Consequently, protection of the remaining forest and mountain areas of Guinea is thus indispensable to conserve the exceptional diversity of one of Africa's most threatened faunas.

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Table 1: Sites investigated for amphibians in three forest reserves and the Monts Nimba biosphere reserve, south-eastern Guinea. Given are reserve's name, period of sampling, number of days with rain, sampling effort (measured in man-hours), site number, geographic position and short habitat description. For species recorded per site see table. 2.

Tab. 1: Amphibienfundorte in den drei untersuchten Staatswäldern und dem Mont Nimba Biosphärenreservat in Südostguinea. Aufgelistet sind die Gebiete, Sammeldatum, Anzahl der Regentage, Sammelaufwand (in Personenstunden), Fundortnummer, geographische Position und eine kurze Lebensraumbeschreibung. Zu den jeweils nachgewiesenen Amphibienarten siehe Tab. 2.

Reserve, Site #; Latitude; Longitude / Schutzgebiet, Fundortnummer; Breite; Länge	Habitat description / Lebensraumbeschreibung
Déré	17.XI.-19.XI.2003; 3 days with rain (3 Regentage); 39.0 m-h
1; 7°36'13.2"N; 8°12'42.3"W	small remnants of primary and secondary rainforest, rice fields, degraded forest, swampy areas and creeks of various sizes, 444 m a.s.l. / kleine Reste primären und sekundären Waldes, Reisfelder, degradierter Wald, Sumpfgebiete und Bäche unterschiedlicher Größe, 444 m ü. M.
2; 7°35'49.7"N; 8°12'02.9"W	degraded forest, rice fields, primary forest / degradierter und primärer Wald, Reisfelder
Nimba	20.XI.2003; no rain (kein Regen); 8 m-h
3; 7°40'35.8"N; 8°22'35.4"W	high altitude savannah, gallery forest at water source, 1,200 m a.s.l. / Montansavanne, Galeriewald an Quelle, 1.200 m ü. M.
4; 7°39'43.7"N; 8°22'40.2"W	Mont Tô, high altitude savannah, very moist slope with loose stones, facing West, many deep cracks in stones, 1,700 m a.s.l. / Mont Tô, Montansavanne, sehr feuchter, nach Westen orientierter Hang mit tiefen Spalten im losen Gestein, 1.700 m ü. M.
Diécké	21.XI.-29.XI.2003; 4 days with rain (4 Regentage); 119 m-h
5; 7°35'46.9"N; 8°52'18.8"W	area in-between replanted (mono-dominated by *Terminalia* spp.) and partly exploited forest, river with gallery forest, palm swamps, ponds, banana plantations, 454 m a.s.l. / Gebiet zwischen neu aufgeforsteten (*Terminalia* Monokulturen) und teilweise genutzten Wald, Fluß mit Galeriewald, Palmensümpfe, Tümpel, Bananenplantagen, 454 m ü. M.
6; 7°35'49.7"N; 8°12'02.9"W	protected core area, primary rain forest with deep valleys with small creeks and swampy areas / geschützte Kernzone, primärer Regenwald mit tiefen Tälern, kleinen Bächen und Sumpfgebieten
7; 7°37'57.1"N; 8°51'09.1"W	village outside the reserve, rice fields, small extremely polluted river with gallery forest remnants, vegetationless puddles on dirt road, degraded forest / Dorf außerhalb des Staatswaldes, Reisfelder, extrem verschmutzter Fluß mit Galeriewaldresten, vegetationslose Pfützen auf Piste, degradierter Wald
8; 7°35'43.6"N; 8°51'52.3"W	fast flowing river with rapids, bare rock, good gallery forest, vast swampy area along small, shallow creek on muddy soil / schnellfließender Fluß mit Stromschnellen und gut ausgebildetem Galeriewald, ausgedehntes Sumpfgebiet entlang eines flachen, schlammigen Baches
9; 7°29'45.7"N; 8°49'59.4"W	small river on sandy ground in forest, old secondary forest, hills with high forest, very humid valleys with small creeks, selectively logged about 30 years ago / kleiner Waldbach mit sandigem Grund, alter Sekundärwald (vor 30 Jahren selektiv geschlagen), Hügel mit geschlossenem Primärwald, sehr feuchte Täler mit kleinen Bächen
10; 7°31'05.2"N; 8°50'08.9"W	large pond (50 x 20 m) at border of degraded forest, very densely vegetated edges with shrubs, only few trees, only a few shallow parts of border with shadow, shallow puddles on forest road / großer Tümpel (50 x 50 m) am Rande degradierten Waldes, stark bewachsenes Ufer (Büsche, wenige Bäume), nur wenige Flachwasserzonen beschattet, flache Pfützen auf Piste
11; 7°31'10.6"N; 8°50'20.1"W	small rocky river at edge of degraded forest / kleiner Felsbach am Rande von degradiertem Wald
12; 7°35'40.7"N; 8°13'15.4"W	remnants of primary forest, hilly landscape / hügeliges Gebiet mit Primärwaldresten
Béro	30.XI.-5.XII.2003; 1 day with rain (1 Regentag); 89.5 m-h
13; 8°08'20.7"N; 8°34'23.7"W	large fast flowing river on rocky ground with many rapids and small waterfalls, slow flowing parts with sandy soil, small creeks and swampy areas in good gallery forest that is connected to the remaining pieces of rain forest, 633 m a.s.l. / großer, schnellfließender Felsbach mit Stromschnellen und kleinen Wasserfällen, weniger stark durchströmte Stellen mit sandigem

Table 1 (continued) / Tab. 1 (Fortsetzung)

Reserve, Site #; Latitude; Longitude / Schutzgebiet, Fundortnummer; Breite; Länge	Habitat description / Lebensraumbeschreibung
	Grund, kleine Bäche und Sumpfgebiete in gutem Galeriewald, der mit verbliebenen Primärwaldresten in Verbindung steht, 633 m ü. M.
14; 8°08'41.0"N; 8°33'11.1"W	floated short grass savannah on base of the east flank of a small mountain, patches of higher grass, most parts of rocky bottom covered with 2-4 cm water, many algae in water, puddles on foot path, 540 m a.s.l. / geflutete Kurzgrassavanne am Fuß der Ostflanke eines kleinen Berges, wenige Stellen mit höherem Gras, die meisten Stellen des felsigen Untergrunds mit einer 2-4 cm hohen, stark veralgten Wasserschicht bedeckt, Pfützen auf Fußweg, 540 m ü. M.
15; 8°08'37.0"N; 8°33'17.7"W	small gallery forest along a creek with dense swampy vegetation, near plantations and forest remnant / kleiner Galeriewald entlang eines Baches mit dichter Sumpfvegetation, nahe Plantagen und Waldresten
16; 8°09'07.0"N; 8°34'49.5"W	very rocky part of river with waterfalls, steep valley with good forest on West flank, East flank completely degraded / sehr felsiger Bereich des Flusses mit Wasserfällen, steiles Tal mit primärem Wald auf der Westflanke, Wald auf Ostflanke stark degradiert
17; 8°08'30.9"N; 8°34'09.6"W	slow flowing permanent creek with dense swampy vegetation on bank in highly degraded forest remnant, surrounded by savannah / langsam fließender, permanenter Bach mit dichter Sumpfvegetation am Ufer, stark degradierter Waldrest von Savanne umgeben
18; 8°10'43.6"N; 8°37'46.3"W	core area of reserve with remnants of primary forest / Kernzone des Staatswaldes mit Resten primären Waldes

Table 2: Habitat selection of amphibian species recorded in Monts Nimba (N), Déré (D), Diécké (I), and Mont Béro (B) classified forests in south-eastern Guinea and sites where a particular species was recorded (compare text, table 1 and Appendix 1).

Tab. 2: Lebensraumwahl von in den Waldgebieten Monts Nimba (N), Déré (D), Diécké (I) und Mont Béro (B) in Südostguinea nachgewiesenen Amphibienarten. Aufgeführt sind außerdem alle Fundorte, an denen eine bestimmte Art gefunden wurde (vergleiche Text, Tab. 1 und Anhang 1).

Species / Art	Savannah / Savanne	Farmbush / Farmbusch	Forest / Wald	Site # / Fundortnummer
Silurana tropicalis		I	I	5, 11
Bufo maculatus		D, I	I, B	1, 7, 9, 13
B. regularis		D, I		1, 2, 7, 10
B. togoensis			I, B	6, 9, 13, 15, 17
B. superciliaris			D, I, B	2, 5, 13
Nimbaphrynoides occidentalis	N			4
Amnirana albolabris			D, I, B	1, 9, 11, 13, 15, 17
A. occidentalis			I	6, 9
Hoplobatrachus occipitalis		I		11
Conraua cf. *alleni*		B	I, B	8, 9, 12, 13, 17
Ptychadena aequiplicata			D, I	2, 9
P. aff. *aequiplicata*		D		1
P. bibroni		I		7, 10, 12
P. longirostris		I		7, 10
P. mascareniensis		D, I, B		1, 7, 15, 17
P. aff. *mascareniensis*		D		1
P. pumilio	B	D, I, B		1, 7, 14, 17
P. retropunctata			B	13, 16, 17
P. submascareniensis	B			14
P. superciliaris		D, I		1, 7
Petropedetes natator			B	13, 16
Phrynobatrachus accraensis	B	D, I, B	B	1, 2, 7, 13, 14, 17
P. alleni			D, I, B	1, 2, 5, 9, 13
P. fraterculus		D, I		2, 5, 8, 10

Table 2 (continued) / Tab. 2 (Fortsetzung)

Species / Art	Savannah / Savanne	Farmbush / Farmbusch	Forest / Wald	Site # / Fundortnummer
P. guineensis			I	6
P. gutturosus		I		5, 10
P. liberiensis		D, B	D, I, B	2, 6, 8, 9, 10, 11, 12, 15, 16
P. natalensis		D, I, B		1, 7, 17
P. phyllophilus			D, I	2, 5, 9
P. plicatus			I, B	5, 6, 8, 12, 16
P. tokba		N, I, B	I, B	3, 5, 6, 8, 10, 13, 15, 16, 17
Cardioglossa leucomystax			I, B	5, 8, 9, 11, 13
Arthroleptis sp. 1		D, I, B	D, I, B	1, 5, 6, 7, 8, 10, 11, 12, 13, 17
A. sp. 2			D	2
A. sp. 3 "warty"			D	2
A. sp. 4			I	12
A. cf. *poecilonotus*		B	B	13, 16
Leptopelis hyloides		D, I, B	D, I, B	1, 2, 5, 9, 11, 13, 16, 17
L. macrotis			I	5
Kassina cochranae		D		1
Phlyctimantis boulengeri		I		10
Afrixalus dorsalis		D, I, B		1, 2, 10, 15
A. fulvovittatus		D, I, B		1, 2, 7, 15
Hyperolius chlorosteus		I, B	D, I, B	1, 5, 8, 9, 10, 11, 13, 16, 17
H. concolor		D, I, B		1, 2, 7, 10, 15, 17
H. fusciventris		D, I, B	I	1, 2, 5, 10, 17
H. guttulatus		D, I		1, 10
H. lamottei	B			14
H. nitidulus	B	B		17
H. picturatus		D, I, B	B	1, 7, 13, 15, 16, 17
H. zonatus		D, I	I, B	1, 5, 8, 10, 16
Chiromantis rufescens		I	D, I	1, 5, 10

Appendix 1

Checklist of amphibian species of south-eastern Guinea

73 species are known to occur in this area, 39 (40 if *Bufo chevalieri* is valid) of them are endemic to the Upper Guinean forest zone (√). Literature records are adopted to recent taxonomic changes. cf, aff., ? = taxonomic status not clear; X = records of the recent RAP; B = BÖHME (1994a, 1994b); C = CHABANAUD (1920, 1921; excluding several species listed by this author that cannot be assigned unambiguously to valid names); GL = GUIBÉ & LAMOTTE (1958a, 1963); L = LAURENT (1958); LO = LAMOTTE & OHLER (1997, 2000); P = PARKER (1936); RB = RÖDEL & BANGOURA (in press and unpubl. data); R1 = RÖDEL (1998); R2 = RÖDEL (unpubl. data, M. LAMOTTE's MNHN collection without #); S1 = SCHIØTZ (1967); S2 = SCHIØTZ (1968, records from N'Zérékoré included in the Diécké list); T = TAYLOR (1968, from Beyla near Pic de Fon); UG = species endemic to Upper Guinean rainforest hotspot; [1] only Guinean records included; [2] see RÖDEL & BANGOURA (in press); [3] vouchers of GL and C not seen, another possibility is *H. guineensis*; [4] compare RÖDEL & BRANCH (2002), RÖDEL (2003), RÖDEL & BANGOURA (in press); [5] compare VENCES et al. (2004); [6] *P. alticola* is a junior synonym of *P. tokba* (compare RÖDEL & ERNST 2002a, 2002b; RÖDEL 2003; RÖDEL & BANGOURA in press; RÖDEL et al. in press); [7] not distinguished between *Arthroleptis* and *Schoutedenella*; for definition of *Arthroleptis* sp. 1 and 2 see RÖDEL & BRANCH (2002); for *Arthroleptis* sp. 3 "warty" and general remarks on West African *Arthroleptis* / *Schoutedenella* species see RÖDEL & BANGOURA (in press) and RÖDEL & AGYEI (2003); it is likely that *Arthroletptis* sp. 1, *A.* sp. 2 and *A. poecilonotus* occur on Monts Nimba, however respective records have not been published; *Arthrolpetis* sp. 4 differs from all other species listed herein by its much more slender body, black back and two light dorsolateral lines, however it may be only a colour variety of one of the other species; our genetic data indicate the presence of at least five distinct *Arthroleptis* / *Schoutedenella* species in south-eastern Guinea (KOSUCH & RÖDEL unpubl. data); [8] the type of *L. hyloides* seems to be conspecific with *L. viridis*; in the most recent list of FROST (2002) this name therefore is not longer listed; however, as there is a common West African forest *Leptopelis*, distinct from *L. viridis*, and to

avoid confusion we continue using the name *L. hyloides* herein as defined in SCHIØTZ (1967) and recent publications of the senior author; [9] West African populations probably are specifically distinct from *P. boulengeri* (type locality Cameroon, S. LÖTTERS & J. KÖHLER pers. comm.); [10] in Guinea occurs the westernmost subspecies, *H. f. fusciventris*; probably all *H. fusciventris* subspecies deserve species rank (compare e.g. RÖDEL & BRANCH 2002); [11] synonymised by CHANNING et al. (2002) but compare RÖDEL & ERNST (2003); the two distinct species occur in sympatry on Pic de Fon; [12] *H. wermuthi* LAURENT, 1961 is a junior synonym of *H. soror* CHABANAUD, 1921 (compare SCHIØTZ 1999 and FROST 2002); [13] see RÖDEL (1998). [14] likewise recorded from Monts Nimba are *Afrixalus vibekae* SCHIØTZ, 1967 (Ivorian flank) and *Nimbaphrynoides liberiensis* (Liberian part).

Family, Species / Familie, Art	UG	Déré	Monts Nimba[1]	Diécké	Ziama	Mont Béro	Pic de Fon
Caeciliidae							
Geotrypetes pseudoangeli	√						T
G. seraphini			GL		B		T, P, RB
Pipidae							
Silurana tropicalis			GL	X, C	B		RB
Bufonidae							
Bufo maculatus		X	GL	X, B	B	X	RB
B. regularis		X	GL	X, B, C	B		RB
B. superciliaris	(√)	X	GL	X	B	X	RB
B. togoensis	√		GL	X		X	RB
Bufo (?) sp.[2]	√						RB
Nimbaphrynoides occidentalis	√		X, GL				
Hemisotidae							
Hemisus cf. *marmoratus* [3]			GL	C			RB
Ranidae							
Aubria subsigillata				C			
Amnirana albolabris		X	GL	X, S2	B	X	RB
A. occidentalis	√		GL	X	B		RB
Amnirana nov. sp.[2]	√						RB
Hoplobatrachus occipitalis			GL	X, C	B, C		RB
Conraua cf. *alleni* [4]	√		GL	X		X	RB
Ptychadena aequiplicata		X	GL	X	B		RB
P. aff. *aequiplicata* [5]	√	X					RB
P. bibroni			GL, B	X	B		RB
P. longirostris			GL, B, R2	X, C, S2	C, B		RB
P. mascareniensis		X	GL	X, C, S2	C, B	X	C, RB
P. aff. *mascareniensis* [5]	√	X					C, RB
P. oxyrhynchus			GL	S2			C, RB
P. pumilio		X	B	X		X	RB
P. pujoli	√		LO				
P. retropunctata	√		GL			X	RB
P. submascareniensis	√		GL			X	RB
P. superciliaris	√	X	GL, B	X	B		RB
P. tournieri	√		GL, B, LO				RB
Petropedetidae							
Petropedetes natator	√		GL		B	X	RB
Phrynobatrachus accraensis		X	GL, R2	X, C, S2	C, B	X	RB
P. alleni		X	GL, R2	X, S2	B	X	RB
P. annulatus	√		GL, R2				RB
P. calcaratus			GL				
P. fraterculus	√	X	GL, R2	X			RB
P. guineensis	√		GL, R2	X, B			RB
P. gutturosus			GL, R2	X			RB
P. liberiensis	√	X	GL, R2	X, B		X	RB
P. natalensis		X	GL	X, B, C		X	RB
P. phyllophilus	√	X	R2	X			RB
P. plicatus			GL, R2	X		X	RB
P. sp. Pic de Fon [2]	√						RB
P. tokba [6]	√		X, GL, R2	X, C	C [2]	X	RB
Arthroleptidae							
Cardioglossa leucomystax			GL	X		X	RB
Arthroleptis sp. 1 [7]	√	X	[7]	X, C?, S2?	B	X	RB
A. sp. 2 [7]	√	X	[7]		B		

Checklist (continued) / Checklist (Fortsetzung)

Family, Species / Familie, Art	UG	Déré	Monts Nimba[1]	Diécké	Ziama	Mont Béro	Pic de Fon
A. sp. 3 "warty" [7]	√	X					RB
A. sp. 4 [7]	√			X			
A. cf. *poecilonotus* [7]			[7]			X	
A. crusculum [7]	√		GL				
Astylosternidae							
Astylosternus occidentalis	√		GL	S2	B		RB
Hyperoliidae							
Leptopelis hyloides [8]		X	GL	X, B		X	C, RB
L. macrotis	√		GL	X			RB
L. viridis			GL	S2	B		RB
Kassina cochranae	√	X	GL		C		C, RB
Phlyctimantis boulengeri [9]			GL	X			
Afrixalus dorsalis		X	GL	X, C, S2	B	X	RB
A. fulvovittatus	√	X	GL	X, S2	B	X	RB
A. vittiger							RB
A. weidholzi			GL	C	C		
Hyperolius chlorosteus	√	X	S1, L	X		X	RB
H. concolor		X	S1, L	X, C, S2	C, B	X	RB
H. fusciventris [10]	√	X	L	X, S2	B	X	RB
H. guttulatus		X	S1, L	X, C			
H. lamottei [11]	√		S1, L	S2		X	RB
H. nasutus [11]							RB
H. nimbae	√		L				
H. nitidulus			S1		B	X	RB
H. picturatus	√	X	S1, L	X, C, S2	B	X	RB
H. soror [12]	√		S1	C	cf. B		
H. zonatus	√	X	S1, L	X	B	X	
H. "Ziama" [13]	√				B, R1		
Rhacophoridae							
Chiromantis rufescens		X	GL	X			
Total Species #	39 (40)	30	58 (61 [7]) [14]	48	32	29	57
% of UG Endemics		50	48 (49)	42	44	48	53

Appendix 2

List of voucher specimens from South-East Guinea; given are area (Déré Forest Reserve = DECF; Diécké Forest Reserve = DICF; Mont Béro Forest Reserve = MBCF; Monts Nimba Biosphere Reserve = MN; Ziama Forest Reserve = ZCF); ZFMK, MOR and MAB numbers; for taxonomic remarks see text and Appendix 1.

Geotrypetes seraphini: ZCF: ZFMK 56279; *Silurana tropicalis*: DICF: MOR Gu 135; ZCF: ZFMK 54895, 57227-229, 58158-159, 60560, 62169; *Bufo maculatus*: DECF: MOR Gu 12; ZCF: ZFMK 56288, 56378-382, 62171; *B. regularis*: DECF: MOR Gu 5, 11; MAB Gu 13; ZCF ZFMK 56287; *B. togoensis*: DICF: MOR Gu 146, 151, 184, 185; MAB 152-154; MBCF: MOR Gu 191, 192, 202; *B. superciliaris*: ZCF: ZFMK 56292, 60724, 66282; MBCF: MAB Gu 128; *Nimbaphrynoides occidentalis*: MN: MAB without #; *Amnirana albolabris*: DECF: MOR Gu 7-9; MAB Gu 10; DICF: MOR Gu 139, 147, 148; ZCF: ZFMK 56302; MBCF: MOR Gu 188, 193-196; MAB 197-199; *A. occidentalis*: DICF: MOR Gu 115, 138, 149, 150; MAB Gu 178, 181; ZCF: ZFMK 56303, 64147; *Hoplobatrachus occipitalis*: ZCF: ZFMK 54892, 56280-286, 58653-660, 73900, 72298; *Conraua* cf. *alleni*: DICF: MOR Gu 137, 140, 141, 187; MAB Gu 143, 181; MBCF: MOR Gu 247, 248, 256; *Ptychadena aequiplicata*: ZCF: ZFMK 56336-343; *P.* aff. *aequiplicata*: DECF: MOR Gu 24; *P. bibroni*: MN: ZFMK 72297, 73899; DICF: MOR Gu 70, 96, 97, 132; MAB Gu 142; ZCF: ZFMK 58619; *P. longirostris*: MN: ZFMK 72294; DICF: MOR Gu 62, 64-68, 98; MAB Gu 61, 63; ZFMK 62170; *P. mascareniensis*: DECF: MOR Gu 1; MN: ZFMK 72281, 72283-292, 73895-896; ZCF: ZFMK 54893, 56353-356, 58613-614, 58618, 60561; MBCF: MOR Gu 225; MAB Gu 226; *P.* aff. *mascareniensis*: DECF: MOR Gu 2, 3; *P. pumilio*: MN: ZFMK 72293; DICF: MOR Gu 69; MBCF: MOR Gu 212-215, 217, 219, 249; MAB Gu 216, 218, 233; *P. retropunctata*: MBCF: ZFMK Gu 237, MOR Gu 222, 236, 237, 252; MAB 253; *P. superciliaris*: DECF: MAB Gu 6; MN: ZFMK 72282, 72299-302, 73897-898; DICF: MOR Gu 131, 136; MAB Gu 116; ZCF: ZFMK 54894, 56344-352; *P. tournieri*: MN: ZFMK 72295-

296; *Petropedetes natator*: ZCF: ZFMK 56290-91 (tadpole); MBCF: MOR Gu 257-260; MAB 261-262; *Phrynobatrachus accraensis*: DECF: MOR Gu 18, 20; MAB Gu 19; DICF: MAB Gu 120; ZCF: ZFMK 56323-327, 58652, 62577; MBCF: MOR Gu 209, 242; *P. alleni*: DECF: MAB Gu 54; DICF: MOR Gu 122, MAB Gu 180; ZCF: ZFMK 56328-334, 58661, 64146; MBCF: MOR Gu 273; *P. fraterculus*: DICF: MOR Gu 59, 133; *P. guineensis*: DICF: MOR Gu 107; ZCF: ZFMK 56335; *P. liberiensis*: DECF: MOR Gu 21, 22, 33; DICF: MOR Gu 71, 73, 102, 103; MAB Gu 72, 104, 105; ZFMK 56377; MBCF: MOR Gu 267; *P. natalensis*: DICF: ZFMK 56372-376, MOR Gu 110, 111, 113, 114; MAB Gu 112; MBCF: MOR Gu 239; *P. phyllophilus*: DECF: MOR Gu 55; DICF: MOR Gu 106, 121; MAB Gu 130; *P. plicatus*: DICF: MOR Gu 117, 118; MAB Gu 79, 123; MBCF: MOR Gu 231; *P. tokba*: MN: MOR Gu 91, 93, 94; MAB 90, 92; DICF: MOR Gu 74, 75, 82; MAB Gu 80, 81; MBCF: MOR Gu 210, 211, 240, 241; MAB 232; *Cardioglossa leucomystax*: MBCF: MOR Gu 264, 274; MAB 263; *Arthroleptis* sp. 1: DECF: MOR Gu 23; DICF: MOR Gu 77, 84, 86, 108, 144, 145; MAB Gu 76, 85, 109, 119, 157; ZCF: ZFMK 56357-361; MBCF: MOR Gu 203, 223; *A.* sp. 2: DECF: MOR Gu 35; *A.* sp. 3 "warty": DECF: MOR Gu 34; *A.* sp. 4: DICF: MOR Gu 183; *A.* cf. *poecilonotus*: MBCF: MOR Gu 189, 251; *Astylosternus occidentalis*: ZCF: ZFMK 56289, 58651; *Leptopelis hyloides*: DECF: MOR Gu 25-27; MAB Gu 28, 29; DICF: MOR Gu 88; ZFMK 56371; MBCF: MOR Gu 245; *L.* sp. (tadpoles): ZCF: ZFMK 56362-367; *L. viridis*: ZCF: ZFMK 56370, 58650; *Kassina cochranae*: DECF: MOR Gu 60; MAB Gu 99; *Phlyctimantis boulengeri*: DICF: MOR Gu 155, 156, 168, 169; MAB Gu 170, 171; *Afrixalus dorsalis*: DECF: MOR Gu 36; MAB Gu 40; ZCF: ZFMK 56294-296, 58628-631; MBCF: MOR Gu 270, MAB Gu 204; *A. fulvovittatus*: DECF: MOR Gu 42-44; MAB Gu 41, 45; DICF: MOR Gu 125; MAB Gu 126; ZCF: 56304-322, 58632-645, 62576; MBCF: MOR Gu 265, 266; *Hyperolius chlorosteus*: MBCF: MOR Gu 200, 229, 230; MAB Gu 201; *H. concolor*: DECF: MOR Gu 46, 47; MAB Gu 48, 49; DICF: MOR Gu 124, 162-164; MAB Gu 161; ZCF: ZFMK 56297-299, 60562; MBCF: MOR Gu 207, 250; *H. fusciventris*: DECF: MAB Gu 56; DICF: MOR Gu 95, 166, 167; ZCF: ZFMK 56293, 62575; MBCF: MOR Gu 235, 243; MAB Gu 244; *H. guttulatus*: MOR Gu 30, 31; DICF: MAB Gu 160; *H. lamottei*: MBCF: MOR Gu 190; *H. nitidulus*: ZCF: ZFMK 56369; MBCF: MOR Gu 205; MAB Gu 206; *H. picturatus*: DECF: MOR Gu 37; MAB Gu 38, 39; ZCF: ZFMK 58646-649; MBCF: MOR Gu 208, 234, 235, 268, 269; *H.* cf. *soror*: ZCF: ZFMK 56301; *H.* sp. "Ziama": ZCF: ZFMK 62574; *H. zonatus*: DECF: MOR Gu 50, 52; MAB Gu 51, 53; DICF: MOR Gu 165; ZCF: ZFMK 56300; MBCF: MOR Gu 254, 255; *Chiromantis rufescens*: DICF: MOR Gu 87, 159; MAB Gu 158.

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