

Herpetological survey of the Haute Dodo and Cavally forests, western Ivory Coast, Part I: Amphibians

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Zusammenfassung

Herpetologische Untersuchungen in den Haute Dodo und Cavally Wäldern, westliche Elfenbeinküste, Teil I: Amphibien.

Wir untersuchten die Herpetofauna zweier klassifizierter Wälder der westlichen Elfenbeinküste, namentlich das Haute Dodo und Cavally Waldreservates. Insgesamt wiesen wir 42 Amphibienarten nach. Wir errechneten, dass wir damit zwischen 83-88%, der in den beiden Gebieten zu erwartenden Amphibienarten fanden. Die Mehrzahl der nachgewiesenen Arten ist entweder für Westafrika oder sogar für den oberguineischen Faunenraum endemisch. Beide Lokalitäten beherbergten einen hohen Prozentsatz der für den oberguineischen Waldblock charakteristischen Amphibienfauna.

Wir entdeckten eine hohe Anzahl seltener, schwer zu findender und wenig bekannter Amphibienarten. Dies betrifft insbesondere den vierten Nachweis von *Afraxalus vibekae*, den zweiten und dritten Nachweis einer neuen *Acanthixalus*-Art und den vierten Nachweis für *Kassina lamottei*. Wir berichten über den Erstnachweis von *Amnirana occidentalis* für die Elfenbeinküste sowie über den zweiten Nachweis von *Geotrypetes seraphini occidentalis* und den dritten Nachweis von Fröschen der Gattung *Conraua* für dieses Land.

Die hohe Amphibien-Diversität ist ein gutes Maß für das nach wie vor hohe Schutzpotential dieser Wälder. Allerdings zeigte das Vorkommen verschiedener, sich fortpflanzender Populationen invasiver Arten aus Nichtwaldgebieten (z.B. *Phrynobatrachus accraensis*, *Ptychadena bibroni*, *Hoplobatrachus occipitalis*), dass die beiden Untersuchungsgebiete bereits gestört sind.

Schlagwörter: Amphibia, Biologie, Diversität, Elfenbeinküste, Habitatwahl, Taxonomie, Regenwald, Schutz, Westafrika.

Abstract

The herpetofauna of two classified forests in western Ivory Coast, namely the Haute Dodo and Cavally forests, were investigated. In total, 42 amphibian species were recorded. It was calculated that the presence of 83-88% of the amphibian fauna in the region was confirmed. Most of the recorded species were either endemic to West Africa or even to the Upper Guinea forest bloc and both sites contained a large proportion of the characteristic amphibian fauna of the region.

A large number of rare, hard to record or little known amphibians were discovered including: the fourth known record for *Afraxalus vibekae*, the second and third records for a new *Acanthixalus* species and the fourth record for *Kassina lamottei*. For Ivory Coast the first record of *Amnirana occidentalis* was discovered as well as the second record of *Geotrypetes seraphini occidentalis* and the third record for the frog genus *Conraua*.

The high amphibian diversity documented during the survey clearly demonstrate that these areas still have a high conservation potential. However, the established presence of breeding populations of several invasive species not normally found in forested areas (e.g. *Phrynobatrachus accraensis*, *Ptychadena bibroni*, *Hoplobatrachus occipitalis*) indicated that the forests were already impacted.

Key Words: Amphibia, biology, conservation, diversity, habitat selection, Ivory Coast, rain forest, taxonomy, West Africa.

1 Introduction

West African rain forests are among the 25 most important biodiversity hotspots of the world (MYERS et al. 2000). They are highly threatened by logging, agriculture and an increasing human population (BAKARR et al. 2001). About 80% of the Upper Guinea

forests in Ivory Coast have been destroyed during the last 20 years (ROMPAY 1993, PARREN & DEGRAAF 1995, CHATELAIN et al. 1996).

There is increasing awareness that the relatively small pockets of forest habitat currently conserved in West Africa and in many other African protected areas (NEWMARK 1996) may be unable to maintain the long-term viability of the fauna and flora. Conserved areas must therefore expand in size, in the face of increasing socio-economic constraints and conflicting land use options, or become connected by viable corridors that allow the movement of species between the conserved enclaves (LAURANCE & LAURANCE 1999, GASCON et al. 1999, DELIMA & GASCON 1999). During the Conservation Priority Setting Workshop in Ghana (BAKARR et al. 2001), A. SCHIÖTZ and M.-O. RÖDEL considered the herpetologically poorly-known forests of western Ivory Coast to be areas of exceptional priority for rapid assessment. As some of these forest patches may represent suitable corridor options between Taï National Park, Ivory Coast, and adjacent forest reserves in Liberia, a detailed inventory of their remaining fauna and flora was necessary. This paper documents the results of a herpetofaunal survey of two of these sites. In the first part we deal with the amphibians, whilst the second part discusses trapping success and the reptiles (BRANCH & RÖDEL in press).

2 Methods

2.1 Study sites

During this Rapid Assessment we investigated two classified forests in western Ivory Coast. The Forêt Classée de la Haute Dodo (HD) is situated between 4°43'-5°22' N and 6°56'-7°25' W. In the North it borders Taï National Park (TNP). Its north-eastern border is made up by the Forêt Classée du Rapide Grah. In the South it is about 25 km from the Atlantic Ocean. The Liberian border in the West is about 15 km away. The largest town in the vicinity of HD is Grabo. The Forêt Classée du Cavally (CA) is situated about 15 km west of TNP and stretches roughly between 5°50'-6°11' N and 7°32'-7°51' W. Its northern border is made up by the Forêt Classée de la Goin Debé, the river Dibo forming the natural border between both reserves. The Cavally river, and therewith the Liberian border, is the western limit of CA (Fig. 1). Taï and Zagné are larger towns in the vicinity of CA. Both forest reserves lay within the zone of evergreen lowland rainforest. The HD is situated within the zone of highest floral diversity in West Africa (GUILLAUMET 1967). Both forests comprise a variety of different forest types, ranging from very humid swampy areas to comparatively dry forests on hilltops, the latter without any larger waters. In both reserves numerous, at least partly permanent, creeks exist. We found larger, stagnant ponds only in disturbed areas. Hills are numerous in both reserves, reaching heights between 260-381 m a.s.l. in CA and 220-415 m a.s.l. in HD.

Numerous dirt roads have been cut into both forests for logging purposes. Along these roads primary forest is gone. Additional to still ongoing legal logging activities, we found evidence for many other human disturbances like illegal farming and hunting. The near vicinity to oil palm plantations (HD) and rubber plantations (CA) may have further negative impact on both forests, e.g. through the use of insecticides and pesticides. We are unable to estimate the recent proportion of altered versus pristine forests in HD and CA. According to an older, official map covering the forest situation in Ivory Coast in 1994, HD comprised about 50% pristine forests (DCGT 1994). The other half consisted of a mosaic of forests and plantations. For CA nearly the whole reserve was cited as pristine on that map. However, the situation has

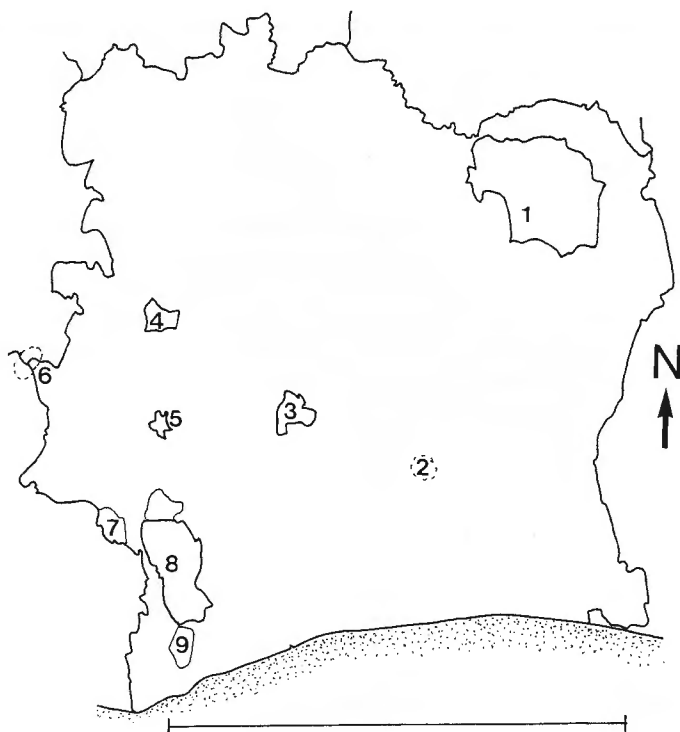


Fig. 1. Map of Ivory Coast with nine localities where relatively complete amphibian inventories have been accomplished: 1 = Comoé National Park, 2 = Lamto scientific station; 3 = Marahoué National Park, 4 = Mont Sangbé National Park, 5 = Mont Péko National Park, 6 = Mont Nimba integrated reserve, 7 = Cavally classified forest, 8 = Taï National Park, 9 = Haute Dodo classified forest. Scale bar = 500 km.

Karte der neun Regionen in der Elfenbeinküste aus denen relativ vollständige Amphibieninventare bekannt sind. Maßstich = 500 km.

dramatically worsen since then, e.g. a large portion of the north-eastern part of CA was declassified and transformed into a rubber plantation. The Mont Kopé, with 424 m a.s.l., the highest elevation in the near vicinity of HD, is deforested. The geographic position and short habitat characterization for the localities investigated are summarized in appendix 1.

Judging from published precipitation measurements in TNP, precipitation in HD may exceed 2200 mm per year, whereas precipitation in CA probably only reaches about 1800 mm per year (RIEZEBOS et al. 1994, M.-O. RÖDEL unpubl.). The rainy season stretches from March/April to October/November. September/October receive most of the rainfall. Field work was conducted in HD from March 15-22, in CA from March 23-30.

2.2 Sampling methods and sampling effort

Specimens were mainly located opportunistically, during visual surveys of all habitats by up to four people. Surveys were undertaken during the day and during the evening.

Search techniques included visual scanning of terrain and refuge examination (e.g. lifting rocks and logs, scraping through leaf litter). We also applied acoustic monitoring of all available habitat types (HEYER et al. 1993). To supplement opportunistic collecting, habitats were also sampled using arrays of funnel and pitfall traps placed along drift fences. Trap lines were set in different microhabitat types. Fuller details of trapping methods and results are discussed in the second part of this series (BRANCH & RÖDEL in press).

Some voucher specimens were collected, anesthetized and killed in a chlorbutanol solution and thereafter preserved in 70% ethanol. Vouchers were deposited in the collections of the Port Elizabeth Museum (PEM), South Africa and in the collection of the senior author (MOR). MOR's specimens will be transferred later on to collections of different natural history museums. Tissue samples (toe tips) of recorded species were preserved in 95% ethanol. These samples are stored in the Institute of Zoology at Mainz University, Germany.

3 Results and Discussion

3.1 Sampling efficiency

With our sampling design, only qualitative and semi-quantitative data can be obtained. For exact quantitative data mark-recapture experiments along standardized transects or on definite plots would have been necessary. Since this survey only allowed about one week in every of the regions studied, time was not sufficient to employ these methods. To evaluate our sampling effort, we measured the time of searching at each locality (man-hours: m-h).

During the whole survey, 42 amphibian species were recorded. Species lists, including remarks on the species distribution and habitat choice, are given below. Species accumulation curves show how many new species were added every day (Fig. 2). A continued increase of the curve's slope suggest that additional species remain to be discovered within the region.

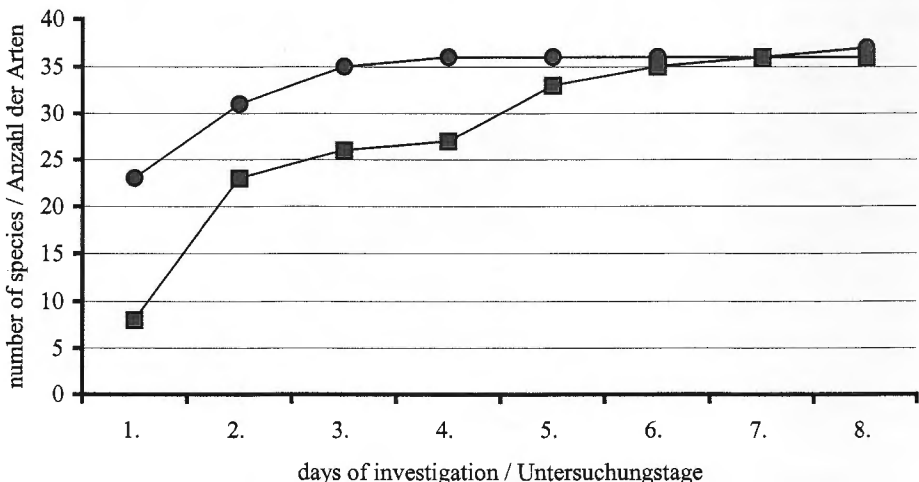


Fig. 2. Species accumulation curves for Haute Dodo (circle) and Cavally (square) classified forests. Artenakkumulationskurven der Amphibienarten im Haute Dodo (Kreise) und Cavally (Quadrate) Waldreservat.

In total, 58 m-h were spent searching in CA and 73 m-h in HD. We recorded 36 and 37 amphibian species from the areas, respectively. The HD had greater habitat diversity and the relative investigation period was about the same for different habitat types at the two sites. Assuming that sampling effort was the same for each habitat, we calculated the total number of amphibian species occurring in both forest reserves. Because we had no quantitative data available, we used the Jack-knife 1 estimator, based on presence/absence data for all habitats (software: BiodivPro from the Natural History Museum London).

This procedure estimated that about 41 amphibian species occur within HD and 43 amphibian species within CA (Fig. 3). We therefore recorded 87.8% and 83.7% of the calculated species numbers, respectively.

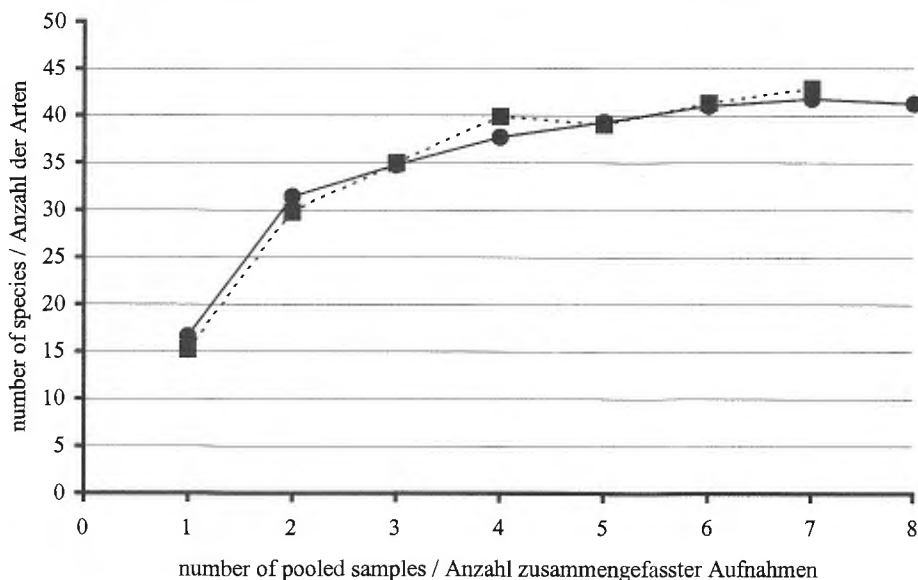


Fig. 3. Estimation of species (Jack-knife 1 estimator) number in Haute Dodo (circle) and Cavally (square) classified forests. Approximately 41 species live in Haute Dodo and 43 in Cavally.

Hochrechnung (Jack-knife 1 Schätzstatistik) der im Haute Dodo (Kreise) und Cavally (Quadrate) Waldreservat lebenden Amphibienarten. Etwa 41 Arten leben in Haute Dodo, 43 in Cavally.

3.2 Species account

Below we give a short description of size, coloration, distribution and habitat preferences for those amphibian species in which new data were gathered by us. Well known and widespread species that have been dealt with in detail in other publications (e.g. SCHIÖTZ 1967, 1999, RÖDEL 2000a), are treated in less detail. Nomenclature mainly follows SCHIÖTZ (1967), RÖDEL (2000a) and FROST (2002). Species names are followed by a list of localities from which they were recorded (see Appendix 1) and collection numbers of voucher specimens deposited in the Port Elisabeth Museum (PEM) and in the senior author's collection (MOR). When necessary, taxonomic comments are given under 'remarks'.

Code	Latitude	Longitude	Description
HD1	04°54'03"N	07°18'57"W	hollow rotting log containing pool of stagnant water on floor of primary forest
HD2	04°53'54"N	07°18'38"W	small temporary pool next to logging road with overhanging vegetation
HD3	04°53'54"N	07°18'19"W	small stream with <i>Raphia</i> palms in primary forest near camp
HD4	04°54'08"N	07°18'58"W	2 arm trap array beside small forest stream in closed canopy damp forest
HD5	04°54'10"N	07°18'58"W	3 arm trap array beside small forest stream in degraded forest with semi-open canopy
HD6	04°54'09"N	07°18'24"W	swamp with dead trees next to logging road in degraded forest
HD7	04°59'14"N	07°19'30"W	track through primary forest
HD8	04°59'14"N	07°19'39"W	river in primary forest with stony bottom and few rock bands and with water plants; recently logged
HD9	04°53'35"N	07°18'38"W	leaf litter cover in degraded forest, 1.5 km SE of camp
HD10	04°53'28"N	07°18'30"W	clearing and trail through degraded forest to cacao plantation
HD11	04°53'25"N	07°22'28"W	small forest river in degraded forest
HD12	04°53'39"N	07°20'57"W	puddles on dirt road
HD13	04°53'35"N	07°22'10"W	logging road through degraded forest
HD14	04°53'41"N	07°19'35"W	forest road, small river, logging camp with open canopy
HDCamp	04°54'01"N	07°18'57"W	main camp; large clearing on hill top
HD25	no GPS data		road through degraded forest and plantations
CACamp	06°10'26"N	07°46'16"W	logged clearing in forest
CA1	06°10'42"N	07°47'33"W	degraded forest along logging road, puddles, swampy area
CA2	06°10'19"N	07°47'26"W	tributary of river Dibo, 500 m S of Camp; running through disturbed forest
CA3	06°10'08"N	07°47'28"W	slope in forest, close to logging road, ditch in valley
CA4	06°10'02"N	07°47'18"W	clearing in heavily degraded forest
CA5	06°06'19"N	07°48'17"W	small brooks in low primary forest
CA6	06°05'53"N	07°48'17"W	slow flowing river, rocky and sandy ground, large tree hole in buttress tree
CA8	06°10'38"N	07°49'39"W	good drier forest, low canopy
CA9	06°09'11"N	07°48'36"W	heavily damaged forest, clearing due to recent logging, puddles of various sizes
CA10	06°08'57"N	07°48'46"W	dammed brook, deep without vegetation, degraded forest
CA11	06°10'58"N	07°49'40"W	river Dibo near confluence with river Cavally, running through undisturbed forest, rocky bottom
CA12	no GPS data		track through swampy primary forest
CA13	06°09'24"N	07°48'17"W	start of long trap line in dry closed canopy forest
CA14	06°09'20"N	07°48'18"W	end of long trap line in dry closed canopy forest
CA15	06°12'01"N	07°41'41"W	dam on river Dibo, at entrance to Goin Debé classified forest; lily pads and marginal vegetation
CA16	06°07'44"N	07°46'51"W	river Dibo, earth embankment beside logging road in degraded forest

Appendix 1. Locality list of habitats examined in Haute Dodo (HD) and Cavally (CA) classified forests.

Anura

Pipidae

Silurana tropicalis GRAY, 1864.

Localities: HDCamp, HDCamp-HD2, HD1, HD3, HD4, HD5, HD8, CA15. Voucher specimen: PEM A7410. A widespread West African aquatic frog that adapts well to secondary forest and is not threatened. The species was widespread throughout Haute Dodo, but absent from the Cavally forest reserve. It was found in the latter region only in a small vegetated pond on the reserve's boundary. One adult caught was exceptionally large for Ivorian specimens (SVL 48 mm, compare RÖDEL 2000a).

Bufonidae

Bufo maculatus HALLOWELL, 1885 „1854“.

Localities: HDCamp, CACamp. Voucher specimen: PEM A7933. Very common and widespread African toad that inhabits all habitat types from degraded forests to moist savannas. Only very dry savannas and primary rain forest are avoided (RÖDEL 2000a). All our records were from puddles on and around logging roads. Some males in breeding aggregation in road puddles after heavy rain were yellow (cf. Fig. 78 in RÖDEL 2000a).

Bufo togoensis AHL, 1924.

Localities: HDCamp, HD9, CA5-CA6, CA8-CA11, CA13-CA14. Voucher specimens: PEM A7903, 7919, 7920. A relatively common but localized West African forest toad (SVL: males 50-56 mm, females 75-85 mm). Most specimens either were active in leaf litter on the forest floor during the day or were captured in funnel traps.

Remarks: The taxonomic status of these toads remains unresolved. Three similar species have been described from Cameroon (*Bufo camerunensis* PARKER, 1936), Togo (*Bufo togoensis* AHL, 1924) and Sierra Leone (*Bufo cristiglans* INGER & MENZIES, 1961). As our specimens resembles most those described by AHL (1924), we tentatively assign our records to that name. Further taxonomic studies on the complex are required.

Ranidae

Hoplobatrachus occipitalis (GÜNTHER, 1859).

Localities: HD11, HD12, HD13, HD25, CACamp, CA2, CACamp-CA11, CA15. Voucher specimens: PEM A7924, 7953. An extremely common, aquatic savanna species that penetrates the forest zone in disturbed areas (RÖDEL 2000a) and that is an indicator species for disturbed habitats. Not threatened in most areas, possibly threatened in some by human consumption. In the Taï region, this species is regularly eaten by villagers (M.-O. RÖDEL unpubl.). In HD this species was only recorded up to 2 km inside the forest reserve, where it lived in large puddles on the dirt road. In CA, *H. occipitalis* was recorded in puddles on logging roads in all areas of the forest investigated (up to 10 km and more from the forest border).

Amnirana albolabris (HALLOWELL, 1856).

Localities: HD1, HD2, HD4, HD5, HD6, HD7, HD8, HD11, CACamp-CA11, CA9, CA10, CA13-CA14. Voucher specimens: PEM A7959. A common West and Central African forest frog. Breeding aggregations occurred along slow flowing brooks and larger ponds.



Fig. 4. Male of *Amnirana occidentalis* from Haute Dodo forest.
Männlicher *Amnirana occidentalis* aus Haute Dodo.

Amnirana occidentalis (PERRET, 1960).

Locality: HD4. Voucher specimen: MOR HD7. Our *Amnirana* records include the first record of *A. occidentalis* from Ivory Coast. Previously, it was only known from the Mont Nimba area of Guinea and Liberia and from Ghana (Kakum Forest) (PERRET 1983, BÖHME 1994). The specimen is a male (SVL 64 mm) with dark flanks and a uniform brown back with a few clear marked black spots. The throat, chest and belly were dark with comparatively few white areas. Ventral parts of thighs and lower leg were heavily spotted black. More details of coloration are shown in Fig. 4. Our specimen showed no signs of glands on the upper arm, a character that is well developed in adult male *A. albolabris* (HALLOWELL, 1856). In addition to coloration the skin structure provides an other character to differentiate between the two species: the dorsal surface of *A. occidentalis* is nearly smooth, while that of *A. albolabris* is covered with many minute spines.

Conraua sp.

Localities: HD1, HD5, HD4, HD8, HD11. Voucher specimens: PEM A7909, 7911, 7913; MOR HD24-25, 47-55, 72. (Fig. 5). *Conraua* includes highly aquatic frogs. Our specimens were found in shallow riffles and pools in small forest streams. When disturbed, frogs shuffled underwater in sand pockets leaving only the eyes exposed, a behavior already described by KNOEPFFLER (1985) for *C. crassipes* (BUCHHOLZ & PETERS, 1875). Calling males were found in shallow water at stream edge, often beneath overhanging cover. Males called with open mouth as reported for *C. crassipes* by AMIET (1989-1990). Freshly metamorphosed juveniles had SVL 20.5-22 mm, adults had SVL 49-62 mm.



Fig. 5. *Conraua* sp. from Haute Dodo classified forest; top: male, bottom: female.

Conraua sp. aus Haute Dodo; oben: Männchen, unten: Weibchen.

Remarks: *Conraua alleni* (BARBOUR & LOVERIDGE, 1927) is endemic to the Upper Guinea rain forest and has been previously described from Ivory Coast from Bancò NP and the region between Man and Mont Nimba (LAMOTTE & PERRET 1968). Our specimens from HD differed considerably in morphology and vocalization from frogs collected in Mont Sangbé NP. Two *Conraua* taxa therefore occur in Ivory Coast and both clearly differ from *C. derooi* HULSELMANS, 1972 described from Togo, and other Central African species of the genus. The relationship of these records to *C. alleni*, and the description of a new species requires further analysis and will be dealt with in a separate publication.

Ptychadena aequiplicata (WERNER, 1898).

Localities: HD1, CA1, CA5, CA8-CA11. Voucher specimen: PEM A7948. A widespread, but not abundant, West and Central African forest species. Most records are from primary forest habitats (RÖDEL et al. 2002a). Possibly vulnerable due to habitat destruction.

Remarks: In West Africa *P. aequiplicata* may include an undescribed cryptic species (M.-O. RÖDEL, J. KOSUCH & M. VENCES unpubl.).

Ptychadena bibroni (HALLOWELL, 1845).

Localities: HDCamp, HDCamp-HD2, HD2-HD6, HD4, HD5, CA15. Voucher specimens: PEM A7406, 7902. Common in Haute Dodo, but absent in Cavally reserve, although found in a large dam on the reserve border. Very common West African inhabitant of degraded forests and moist savannas (RÖDEL 2000a). A female (56 mm SVL) was at the upper size limit of the species.

Remarks: Formerly known as *P. macCarthyensis* (ANDERSSON, 1937)(see LAMOTTE & ÖHLER 1997, RÖDEL 2000a).

Ptychadena mascareniensis (DUMÉRIEUX & BIBRON, 1841).

Locality: CACamp. Voucher specimen: PEM A7952. A large adult collected at night on forest track after heavy rain. West African populations might be restricted to larger swamps and rice fields.

Remarks: A taxonomically difficult species complex that occurs throughout Africa and Madagascar (RÖDEL 2000a), but has an overall very patchy distribution. Taxonomy is not sufficiently settled to estimate possible threats. All Ivorian specimens captured so far had a green vertebral band and a narrow yellow longitudinal line on thighs and lower leg (M.-O. RÖDEL unpubl.).

Ptychadena sp.

Localities: CACamp, CA2. Voucher specimens: MOR CA19-20. A few frogs were heard calling and observed breeding at vegetationless road puddles after heavy rain. Males (SVL: 45-53 mm) called on ground beneath vegetation up to 2 m from water. Calling activity increased from midnight to dawn. The syntopic *P. longirostris* called much earlier.

Remarks: Taxonomic determination of these frogs was not possible. They differed from *P. mascareniensis* by their much slender body shape, and an orange to beige vertebral band (Fig. 6; see above). Body shape and their reduced webbing indicate membership of the *P. stenocephala* group (PERRET 1997, LAMOTTE & ÖHLER 1997, 2000). However, they differ from frogs of this group by the absence of sacral ridges and the absence of additional subdigital tubercles. Furthermore they were larger and the webbing of the fifth toe reached the first phalanx.

Ptychadena longirostris (PETERS, 1870).

Localities: HDCamp, HDCamp-HD2, HD2-HD6, HD3, HD5, HD7, HD8, CACamp, CACamp-CA12, CACamp-CA11, CA2, CA3, CA4, CA5, CA9. Voucher specimens: PEM A7397, 7413, 7935, 7958. A common West African forest species that is however restricted to open forests, especially puddles on dirt roads (RÖDEL 2000a). The most common *Ptychadena* in both reserves, where it bred in road puddles (5-10 m²) with no vegetation in water or on bank. On March 16 we recorded more than 200 males between HD2 and HD6 (about 2 km). At some puddles more than 10 males were calling.

Petropedetidae

Phrynobatrachus accraensis AHL, 1923. Localities: HD11, CA2, CA8, CA10, CA15. Voucher specimens: PEM A7936, 7946. An extremely common and widespread West African savanna species that also inhabits degraded forest areas. While our record in HD was right outside the forest reserve, we found it not common but widespread in CA.

Remarks: DNA analyses (M.-O. RÖDEL & J. KOSUCH unpubl.) proved this species to be conspecific with frogs termed *P. latifrons* AHL, 1924 by RÖDEL (1996, 2000a).

Phrynobatrachus plicatus (GÜNTHER, 1859 „1858“).

Localities: HDCamp, HDCamp-HD2, HD1, HD2-HD6, HD4, HD5, HD7, HD9, CACamp, CACamp-CA12, CA1, CA2, CA3, CA5, CA8, CA8-CA11, CA9, CA13-CA14. Voucher specimens: PEM A7395, 7412, 7904, 7914. Widespread West African forest frog that is most abundant in open, swampy forests.

Phrynobatrachus liberiensis BARBOUR & LOVERIDGE, 1927.

Localities: HDCamp, HDCamp-HD2, HD1, HD4, HD5, HD8, HD9, HD14, CA6, CA8-CA11, CA9. Voucher specimens: PEM A7396, 7403, 7407-9, 7937, 7955. Endemic to the Upper Guinea forest bloc (GUIBÉ & LAMOTTE 1963, SCHIÖTZ 1964a, b). Common throughout both forest reserves. Usually associated with small brooks in swampy areas.

Phrynobatrachus alleni PARKER, 1936.

Localities: HDCamp, HD4, HD5, HD9, HD10, CACamp, CA1, CA2, CA4, CA5-CA6, CA8-CA11, CA11, CA13-CA14. Voucher specimens: PEM A7399, 7401, 7906, 7939. A common West African inhabitant of leaf litter in closed canopy forest.

Phrynobatrachus alticola GUIBÉ & LAMOTTE, 1961.

Localities: HDCamp, HD1, HD7, HD9, HD10, HD14, HD25, CACamp, CACamp-CA12, CA3, CA4, CA5-CA6, CA8-CA11, CA9, CA10. Voucher specimens: PEM A7928-29. A small leaf litter species restricted to the Upper Guinea forest. Due to its almost direct development able to survive in forest parts without open water (RÖDEL & ERNST 2002a). Most common in secondary growth and degraded forest.

Phrynobatrachus guineensis GUIBÉ & LAMOTTE, 1961.

Localities: HDCamp, HD1, HD9, CA3. Voucher specimen: PEM A7905. A small leaf litter frog with specialized reproductive behavior. It reproduces exclusively in small water filled cavities like tree holes, empty snail shells and fruit capsules (RÖDEL 1998b). Endemic to the Upper Guinea forests. Possibly vulnerable due to habitat destruction.

Phrynobatrachus gutturosus (CHABANAUD, 1921).

Localities: CA1, CA8-CA11, CA11. Voucher specimen: PEM A7940. A frog most typical to very swampy parts of primary and secondary forests. Reproduces in ponds. Widespread and common, even in forested habitats in the savanna zone (RÖDEL 2000a).

Phrynobatrachus phyllophilus RÖDEL & ERNST, 2002.

Localities: CA1, CA9. A recently described *Phrynobatrachus* species (RÖDEL & ERNST 2002b) reproducing in extremely small puddles. Typically living in swampy parts of primary forest. Endemic to the Upper Guinea forest. Possibly vulnerable due to habitat destruction.

Phrynobatrachus villiersi GUIBÉ, 1959.

Localities: HD4, HD5, HD9, CA8-CA11, CA13-CA14. Voucher specimens: PEM A7954, 7957. A small leaf litter species restricted to primary forests. Upper Guinea endemic (PERRET 1988). Possibly vulnerable due to habitat destruction.



Fig. 6. *Ptychadena* sp. from Cavally forest.

Ptychadena sp. aus Cavally.

Arthroleptidae

Arthroleptis sp. 1.

Localities: HDCamp, HD1, HD3, HD4, HD5, HD8, HD9, HD10, HD11, HD25, CACamp, CACamp-CA11, CA2, CA8-CA11, CA13, CA13-CA14, CA15. Voucher specimens: PEM A7400, 7405, 7907-08, 7910, 7922-23, 7927, 7938, 7951. It is common in primary and secondary forest. Males call well concealed in dense vegetation, and the advertisement call is a chirping sound.

Arthroleptis sp. 2.

Localities: HDCamp, CACamp, CA2, CA8-CA11. The taxonomic status of the genera and their species content remains uncertain (see below). Common in primary and secondary forest. Males call completely exposed from small herbs and branches. The call is a very high whistle. *Arthroleptis* sp. 2 starts calling during dusk and almost ends calling activity around 8 pm, while *A.* sp. 1 then still continues calling. Both species may also be heard during daytime after heavy rainfall.

Remarks: Squeakers are very common in forest throughout the region, but their taxonomic status remains uncertain. *Arthroleptis* sp. 1 looks similar to *A. variabilis* described from Cameroon, but is smaller in size. Investigations in Tai National Park (the same two syntopic *Arthroleptis* species as in HD and CA) showed that neither coloration, nor a variety of morphological criteria (like finger length in males) were suitable to differentiate between species (M.-O. RÖDEL & G. LEISTNER unpubl.). The only reliable characters have been advertisement call and behavior (and surely genetics)(RÖDEL & AGYEI in press). It seems likely that similar variation might exist in other



Fig. 7. *Astylosternus occidentalis* from Haute Dodo forest; top: male, bottom: female.

Astylosternus occidentalis aus Haute Dodo; oben: Männchen, unten: Weibchen.

Arthroleptis species as well. Morphometric comparison with preserved types will fail to resolve species affiliation. We therefore highly recommend our colleagues to refrain from describing more species out of this group on the basis of morphology and coloration only.

Cardioglossa leucomystax (BOULENGER, 1903).

Localities: HD1, HD4, HD8, HD11, CA2, CA8-CA11, CACamp-CA11. Voucher specimen: PEM A7398. Very common West and Central Africa forest frog. Closely associated with running water in closed canopy forest (RÖDEL et al. 2001).

Astylosternidae

Astylosternus occidentalis PARKER, 1931.

Localities: HD8, HD11. Voucher specimens: PEM A7921; MOR HD65, 73. A tadpole (MOR HD73) was collected in a very fast flowing river outside the reserve. A male (SVL 61 mm) and a female (SVL 62 mm) were caught both during night close to small rivers on comparatively open forest sites (Fig. 7).

Hyperoliidae

Acanthixalus nov. sp. Localities: HD1, CA6. Voucher specimens: PEM A7414; MOR HD67. Two adult males (SVL 34.4, 36 mm) of this new species (RÖDEL et al. in press) were collected at night on vegetation 1.2 m above ground, next to a breeding site in a hollow, fallen log. The hole in HD1 was 1.90 m long, 10–20 cm deep, and 40 cm wide. The remains of two hatched clutches and a new clutch containing seven eggs were attached to the roof of the hole. In CA6 tadpoles were discovered in a hole (25 x 15 cm, 40 cm deep, water completely filled up with leaf litter) between two roots of a large buttress tree. It is restricted to forest, primary and secondary, and possibly of conservation concern. Its breeding dependence upon hollow trees means that it is sensitive to deforestation.

Remarks: This new taxon was first discovered in Taï National Park (RÖDEL et al. in press). It is the second species in the genus and the first for the Upper Guinea forests. It is currently endemic to south-western Ivory Coast, and the survey records constitute the second and third known localities.

Leptopelis "hyloides" (BOULENGER, 1906).

Localities: HDCamp, HDCamp-HD2, HD1, HD2-HD6, HD4, HD5, HD7, HD8, HD11, CACamp, CA2, CACamp-CA11, CA8-CA11, CA15. Voucher specimen: PEM A7917. A pair in amplexus was caught in a funnel trap on the ground in closed canopy forest next to a stream after a night of heavy rain at Haute Dodo (HD5). It is a widespread West African forest species, that inhabits primary and degraded forests.

Remarks: SCHIÖTZ (1999) discusses the availability of this name for frogs from the Upper Guinea forests.

Leptopelis macrotis SCHIÖTZ, 1967.

Localities: HD4, HD8, HD11, CA2, CA8-CA11. Voucher specimen: MOR HD16. Forest species endemic to the Upper Guinea forests (SCHIÖTZ 1967, 1999). Inhabits primary forests along rivers. A large adult female (SVL 78 mm) was collected 3 m high in vegetation in a *Raphia* palm swamp along a small forest stream. Possibly vulnerable due to habitat destruction.

Leptopelis occidentalis SCHIÖTZ, 1967.

Localities: HDCamp-HD2, HD1, HD2-HD6, HD4, HD11, CACamp, CA2, CACamp-CA11, CA8-CA11. Voucher specimens: PEM A7918, 7934, 7950. West African forest endemic that is known only from a few localities in Ivory Coast and Ghana (SCHIÖTZ 1967, 1999). Inhabits primary and rarely degraded forests. Adults collected in vegetation adjacent to forest puddles. Possibly vulnerable due to habitat destruction.

Hyperolius cf. *picturatus* PETERS, 1875.

Localities: HD1, HD2, HD3, HD4, HD5, HD11, HD25, CA2, CA8-CA11. Voucher specimens: PEM A7415; MOR HD18, 69. Lives at forest edges or along heavily vegetated borders of smaller rivers. We caught a male (SVL 31 mm) at 2 m height in a shrub close to a shallow river. Its back was beige with a few yellow spots, the belly white yellow, the gular flap yellow. Females (SVL 33.5–34.5 mm) had dark canthal stripes, a chocolate brown dark speckled back with an indistinct hour glass pattern, a yellow venter, red webs and toe tips, orange finger tips, the ventral parts of arms and

hands were yellow orange. One of them deposited 98 eggs with black and white poles. The embryo measured 2-2.5 mm. With the transparent jelly the eggs measured 4-6 mm.

Remarks: A frog endemic to the Upper Guinea forest zone (SCHIØTZ 1967, 1999). Possibly known populations comprise two species (SCHIØTZ 1967, 1999).

Hyperolius concolor (HALLOWELL, 1844).

Localities: HD1, HD2, HD3, HD4, HD5, HD11, HD25, CA2, CA8-CA11. Voucher specimen: PEM A7415. Widespread and common West and Central African farmbrush frog that inhabits degraded forests in the forest zone and gallery forests in the savanna zone (SCHIØTZ 1967, 1999, RÖDEL 2000a). One female laid 223 yellow eggs embedded in milky jelly.

Hyperolius fusciventris complex.

Localities: HD3, HD6, HD8, HD11, CA15. Voucher specimens: PEM A7417, 7925-26, 7945; MOR HD15, 17, 63-64, CA9-10. Calls were recorded at all localities. Males (SVL 23-24.5 mm) were collected at the edge of a log-jammed large pond (HD6) bordered by degraded forest calling from very dense low vegetation. They had a brown back, clear dorsal stripes, clear dorsolateral bands with dark row of spots in each stripe. Females (28 mm) had clear green backs, red thighs, a dark venter and therefore fitted best the description of *H. fusciventris fusciventris* PETERS, 1876. One deposited 195 eggs with clear blue and black poles, embedded in transparent jelly.

Outside the reserve (HD11) we caught males (SVL 21-22 mm) with green or olive green backs, yellow dorsolateral stripes, a dark canthal stripe, and red eyes. They best fitted males of *H. fusciventris lamtoensis* SCHIØTZ, 1967 that is also common around Taï National Park (M.-O. RÖDEL & R. ERNST unpubl.). They called from very dense shrubs close to a fast flowing river. In CA15 we recorded males (SVL 23-25 mm) in small trees and herbs close to a very large dammed lake. They had green backs, greenish yellow lateral stripes, a dark vertebral stripe, green or red toe tips, green or yellow throat, greenish gray eyes.

Remarks: In West Africa the complex comprises three described subspecies of *H. fusciventris* and two additional very similar species, restricted to Taï National Park and the Mont Nimba region, respectively (RÖDEL 1998c). During this survey we recorded two *fusciventris* „subspecies“ in sympatry, indicating specific status for the taxa. The taxonomic situation of the *H. fusciventris* group will form the topic of a separate publication.

Hyperolius chlorosteus (BOULENGER, 1915).

Localities: HD4, HD5, HD8, HD11, HD13, CACamp-CA11, CA2, CA8-CA11. Voucher specimens: PEM A7912, 7956. A large *Hyperolius* endemic to the western part of the Upper Guinea forests and closely associated with running water in forested habitats (SCHIØTZ 1967, 1999). Males (SVL 37-40 mm) were larger than reported by (SCHIØTZ 1967, 1999). Males with identical advertisement calls from one site may have the coloration figured in SCHIØTZ (1967, 1999) or the pattern that is given in the respective publications for *H. laurenti* SCHIØTZ, 1967. Possibly vulnerable due to habitat destruction.

Hyperolius guttulatus GÜNTHER, 1858.

Localities: HD3, HD6, HD25, CA15. Voucher specimen: PEM A7418. A typical West and Central African farmbrush *Hyperolius* that lives at forest edges and needs very large stagnant waters for reproduction (SCHIØTZ 1967, 1999, RÖDEL 2000a).

Hyperolius sylvaticus SCHIÖTZ 1967.

Localities: HD4, HD8. Voucher specimen: MOR HD19. Widespread West and Central African forest reed-frog (SCHIÖTZ 1967, 1999). Confined to closed canopy forests. Breeds in stagnant waters.

Afrixalus dorsalis (PETERS, 1875).

Localities: HDCamp, HDCamp-HD2, HD2, HD2-HD6, HD3, HD13, HD25, CACamp, CACamp-CA11, CA15. Voucher specimen: PEM A7944. Widespread and common West and Central African forest frog that inhabits degraded forests in the forest zone and gallery forests in the savanna zone (SCHIÖTZ 1967, 1999, RÖDEL 2000a).

Afrixalus nigeriensis SCHIÖTZ, 1963.

Localities: HD7, CACamp, CA2. Voucher specimens: PEM A7915-16, 7931. A West African forest species that exclusively inhabits primary forest (SCHIÖTZ 1967, 1999). The species reaches its western limit at Mont Nimba, and the survey records confirm the species in the western forests of Ivory Coast. Possibly vulnerable due to habitat destruction.

Afrixalus vibekae SCHIÖTZ, 1967.

Locality: HD7. Voucher specimen: PEM A7402. The female, collected on a leaf (1.5 m height) at the border of a forest road at night after heavy rain, is much larger (SVL 29 mm) than those cited by SCHIÖTZ (1967, 1999: SVL 23-25 mm).

Remarks: The survey record is the fourth record of this forest hyperoliid (SCHIÖTZ 1967, 1999, RÖDEL 2000b). Its known records from western Ivory Coast and central Ghana implies a relatively wide distribution. However, it seems to be extremely patchy distributed and dependant on very high amount of rainfall (M.-O. RÖDEL & R. ERNST unpubl.).

Kassina lamottei SCHIÖTZ 1967.

Localities: CA8-CA11. A leaf litter frog, endemic to primary Upper Guinea forests from Mont Nimba to Taï National Park (RÖDEL & ERNST 2001b). The distinctive call was recorded at two localities. The survey records are the fourth known locality of the species. Possibly vulnerable due to habitat destruction.

Phlyctimantis boulengeri PERRET, 1986.

Localities: HDCamp, HDCamp-HD2, HD2, HD2-HD6, HD3, HD13, CACamp, CA15. Voucher specimen: PEM A7411. Patchy distributed but locally very common frog of open and/or disturbed forests.

Remarks: Recorded from West and Central Africa (PERRET 1986, SCHIÖTZ 1999, RÖDEL & ERNST 2001a). Upper Guinea populations might represent an undescribed species.

Rhacophoridae

Chiromantis rufescens (GÜNTHER, 1868).

Localities: HDCamp, HD3, HD7, HD25, CACamp, CACamp-CA11, CA2, CA5, CA8-CA11. Voucher specimens: PEM A7900, 7901, 7932. Widespread and common West and Central African forest frog that lives in primary and secondary forests (SCHIÖTZ 1967, 1999). Reproduces in smallest puddles up to large ponds (RÖDEL et al. 2002b). With up to SVL 52 mm, males exceeded known maximum size (SCHIÖTZ 1999).

locality / Gebiet	habitats / Lebensräume	#	sources / Quellen
Mt. Nimba	mountain, forest	57	GUIBÉ & LAMOTTE 1958, 1963; SCHIØTZ 1967
Taï	forest	56	RÖDEL 2000b + unpubl. data
Haute Dodo	degraded forest	37	this paper
Cavally	degraded forest	36	this paper
Mt. Péko	forest, mountain, farmbush	33	M.-O. RÖDEL & R. ERNST unpubl. data
Mt. Sangbé	forest, mountain, savanna	45	RÖDEL in press
Lamto	forest savanna	39	LAMOTTE 1967
Marahoué	forest, savanna	33	M.-O. RÖDEL & R. ERNST unpubl. data
Comoé	savanna	34	RÖDEL 1998a, 2000a, RÖDEL & SPIELER 2000

Tab. 1. Amphibian species number and habitats of nine Ivorian localities (compare Fig. 1). The Nimba records include the Liberian and Guinea part of the mountain. # = number of species.

Anzahl der Amphibienarten und Lebensräume in neun ivoirischen Gebieten (vgl. Abb. 1). Die Nachweise von Mount Nimba beinhalten auch die liberianischen und guineischen Anteile des Berges. # = Anzahl der Arten.

Sørensen	Marahoué NP	Lamto	Taï NP	Mt. Péko NP	Mt. Nimba RI	Mt. Sangbé NP	Haute Dodo CF	Cavally CF
Comoé NP	0.76	0.70	0.26	0.38	0.37	0.68	0.23	0.25
Marahoué NP		0.83	0.39	0.58	0.48	0.79	0.42	0.45
Lamto			0.51	0.58	0.56	0.74	0.51	0.53
Taï NP				0.60	0.73	0.51	0.76	0.78
Mt. Péko NP					0.57	0.63	0.66	0.71
Mt. Nimba RI						0.59	0.65	0.60
Mt. Sangbé NP							0.51	0.54
Haute Dodo CF								0.86

Tab. 2. Similarity in amphibian species composition between nine Ivorian localities (compare Tab. 1); Sørensen indices (%) calculated with presence/absence data; CF = classified forest, NP = national park, RI = integrated reserve. Mont Nimba: GUIBÉ & LAMOTTE 1958, 1963; SCHIØTZ 1967; Lamto: LAMOTTE 1967.

Ähnlichkeit der Zusammensetzung von Amphibiengemeinschaften zwischen neun Regionen der Elfenbeinküste (vgl. Tab. 1); Sørensen Indizes (%) errechnet auf der Basis des Vorhandenseins oder Fehlens von Arten; CF = Waldreservat, NP = Nationalpark, RI = integriertes Reservat.

species	Haute Dodo	Cavally restricted	habitat					
			OWA	WAUG	F	S	FB	
Amphibia - Anura								
Arthroleptidae								
Arthroleptis sp. 1	14*	14*	0	0	1	1	0	1
Arthroleptis sp. 2	1	3	0	0	1	1	0	1
Cardioglossa leucomystax	5	5	1	0	0	1	0	0
Astylosternidae								
Astylosternus occidentalis	2	0	0	0	1	1	0	0
Bufonidae								
Bufo maculatus	11	8	1	0	0	0	1	1
Bufo togoensis	2	6	0	1	0	1	0	0
Hyperoliidae								
Acanthixalus nov. sp.	1	1	0	0	1	1	0	0
Afrixalus dorsalis	11	3	1	0	0	0	0	1
Afrixalus nigeriensis	1	2	0	1	0	1	0	0
Afrixalus vibekae	1	0	0	0	1	1	0	0
Hyperolius chlorosteus	7	7	0	0	1	1	0	0
Hyperolius concolor	4	2	1	0	0	0	1	1
Hyperolius fusciventris sensu lato	4	1	0	1	0	1	0	1
Hyperolius guttulatus	3	1	1	0	0	0	0	1
Hyperolius picturatus	8	4	0	0	1	0	0	1
Hyperolius sylvaticus	3	0	1	0	0	1	0	0
Kassina lamottei	0	1	0	0	1	1	0	0
Leptopelis hyloides	16	7	0	1	0	1	0	1
Leptopelis macrotis	3	4	0	0	1	1	0	0
Leptopelis occidentalis	7	8	0	0	1	1	0	0
Phlyctimantis boulengeri	13	2	1	0	0	1	0	1
Pipidae								
Silurana tropicalis	11	1	0	1	0	1	0	1
Ranidae								
Amnirana albolabris	10	4	1	0	0	1	0	1
Amnirana occidentalis	1	0	0	0	1	1	0	0
Conraua sp.	8	0	0	0	1	1	0	0
Hoplobatrachus occipitalis	4	7	1	0	0	0	1	1
Petroedetidae								
Phrynobatrachus accraensis	1	4	0	1	0	0	1	1
Phrynobatrachus alleni	6	11	0	1	0	1	0	0
Phrynobatrachus alticola	11	11	0	0	1	1	0	1
Phrynobatrachus guineensis	5	1	0	0	1	1	0	0
Phrynobatrachus gutturosus	0	3	0	1	0	1	0	1
Phrynobatrachus liberiensis	15	3	0	0	1	1	0	1
Phrynobatrachus phyllophilus	0	2	0	0	1	1	0	0
Phrynobatrachus plicatus	12	14	0	1	0	1	0	1
Phrynobatrachus villiersi	3	2	0	0	1	1	0	0
Ptychadena aequiplicata	1	3	1	0	0	1	0	0
Ptychadena bibroni	7	1	1	0	0	0	1	1
Ptychadena longirostris	19	13	0	1	0	1	0	1

<i>Ptychadena mascareniensis</i>	0	1	1	0	0	0	1	1
<i>Ptychadena</i> sp.	0	3	0	0	1	1	0	0
Rhacophoridae								
<i>Chiromantis rufescens</i>	6	5	1	0	0	1	0	1
Amphibia - Gymnophiona								
Caecilidae								
<i>Geotrypetes seraphini occidentalis</i>	1	0	0	0	1	1	0	0
total number of species	37	36	13	9	19	33	6	22

Appendix 2. Presence (number of records per species per region), distribution, and habitat association of the amphibians of the Haute Dodo and Cavally regions. Species can be cited for more than one main habitat. OWA= outside West Africa; WA= West Africa; UG= Upper Guinea; F= forest; S= savanna; FB= farmbrush; *= number of sites per classified forest.

Gymnophiona

Caecilidae

Geotrypetes seraphini occidentalis PARKER, 1936.

Localities: HD5 (north). Voucher specimen: PEM A7930. We caught an adult male in a pitfall trap in closed canopy forest after heavy overnight rain. Rarely found because of subterranean life, but probably common throughout the West African forest belt.

Remarks: This is the second record of the species for Ivory Coast (RÖDEL 2000b).

3.3 Comparison of the amphibian fauna from Haute Dodo and Cavally classified forests with other sites in Ivory Coast

Although herpetological investigations in West Africa started in the 19th century, very few areas are well known. Only in the 1960's were nearly complete amphibian inventories presented for a number of West African localities, e.g. Mt. Nimba (GUIBÉ & LAMOTTE 1958, 1963), Lamto (LAMOTTE 1967) and Mts. Loma (LAMOTTE 1971). SCHIÖTZ (1963, 1964a, b, 1967) also surveyed several other West African localities, although with an emphasis on tree frogs. In the 1990's one of us (MOR) started to investigate most national parks of Ivory Coast. All together (including the present study) the amphibian faunas of no more than nine areas in Ivory Coast can be regarded as more or less well known (Tab. 1). Figure 1 gives an overview of the geographic position of Ivorian localities with reasonably well known amphibian inventories. Generally, areas that naturally comprise diverse habitat types (e.g. mountain savannas, different forest types, different savanna types) showed highest species richness (Tab. 1). This is also obvious for relatively dry areas, e.g. Comoé National Park, where different vegetation zones meet (Guinea and Sudan savanna, as well as gallery and island forests). However, diversity is normally higher in the more humid forest zone than in the savanna area.

The western part of the Upper Guinea forest block harbors more species (Tab. 1 plus 38 species on Mts. Loma, Sierra Leone; LAMOTTE 1971) than the eastern part (< 30 species per locality investigated: SCHIÖTZ 1967, RAXWORTHY & ATTUQUAYEFIO 2000, RÖDEL & AGYEI in press). This is also shown by comparing species numbers of Ivory Coast (> 100 species; M.-O. RÖDEL unpubl.) and Ghana (70 species, including several that have not yet been recorded but are believed to exist in the country; HUGHES 1988).

Anuran faunas in savanna areas of the Ivory Coast had between 68-83% of the species in common. Forest communities resembled each other by 65-86% in species identity. The HD and CA showed closest similarity between each other. Otherwise both areas were most closely related to the neighboring Taï National Park (Tab. 2).

3.4 Status of the amphibian faunas of Haute Dodo and Cavally classified forests

In HD and CA we recorded 37 and 36 amphibian species, respectively (Appendix 2). With 41 and 43 estimated species (Fig. 3), the classified forests do not reach the species richness of Taï National Park that both border. However, they are well within the most diverse West African regions so far investigated (see above). The species composition of HD and CA are very similar, and both areas share about 86% of their species. In both areas most species were Upper Guinea rain forest endemics (HD: 43.2%; CA: 38.9%) or at least restricted to West Africa (defined as the region from Senegal to eastern Nigeria; HD: 24.3%, CA: 27.8%). Only 12 species in HD (32.4%) and in CA (33.3%), are also distributed outside West Africa (Appendix 2).

In both areas several remarkable species were recorded. In HD we found the fourth known locality for *Afrixalus vibekae*, the third locality for members of the genus *Conraua* in Ivory Coast, and the second known locality in Ivory Coast for *Geotrypetes seraphini occidentalis*. In CA we found the fourth known locality for *Kassina lamottei*. A new *Phrynobatrachus* species (RÖDEL & ERNST 2002b) was also recorded in CA, whilst a new *Acanthixalus* species (RÖDEL et al. in press) was recorded in both HD and CA (the second and third known records for the species).

Despite the dominance of forest specialists, a number of typical farmbrush species (e.g. *Afrixalus dorsalis*, *Hyperolius concolor*) or even savanna species (e.g. *Hoplobatrachus occipitalis*, *Phrynobatrachus accraensis*, *Ptychadena bibroni*) were recorded in both areas (Appendix 2). This indicates that both forest reserves have already been invaded by species that are not normally present. CA seems to be more affected by the invasion of non-native species than HD. This is shown not only by species numbers but also, e.g. by the almost omnipresent *Hoplobatrachus occipitalis* and *Phrynobatrachus accraensis* in CA. In HD these two species were only recorded towards the forest edge and outside the reserve.

No amphibian species recorded from either Haute Dodo or Cavally are currently considered threatened or included in the Red List 2001 (HILTON-TAYLOR 2001). Neither is their international trade monitored or regulated by inclusion in CITES appendices.

4 Conclusions and Conservation implications

Both diversity and species composition in Haute Dodo and Cavally classified forests indicate that these forests still have a very high potential in preserving amphibian species typical for the Upper Guinea forest region. In contrast the presence of typical farmbrush and even savanna species is a clear hint that the respective habitats are already seriously damaged. This reflects the obviously unsustainable forestry management. Numerous dirt roads occur giving access to almost all parts of the forest. Careless handling of logged trees also has resulted in a huge number of open areas with altered microclimate (Fig. 8). The past and current logging activities in both HD and CA have caused erosion and silting of natural water courses, which in the hilly terrain of CA could have significant impacts on aquatic systems. Numerous open water bodies and marshy areas have been created and these artificial habitats offer non-native species

the opportunity to enter formerly closed forest habitats. Our observations clearly prove that some of these invasive species are already well settled within the classified forests. It is not unlikely that they will compete and eventually displace true forest species.



Fig. 8. Logging road in Cavally forest, showing the unsustainable way this road was cut into the forest.

Holzfällerpiste im Cavally Wald. Deutlich zu erkennen ist die nicht nachhaltige Weise wie die Piste in den Wald geschlagen wurde.

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