Reptiles of the Gamba Complex of Protected Areas, Southwestern Gabon

Olivier S. G. PAUWELS[1], Marius BURGER[2], William R. BRANCH[3], Elie TOBI[4], Jean-Aimé YOGA[5] and Emerie-Noël MIKOLO[6]

1 Introduction

The Gamba Complex of Protected Areas, extending from southern Ogooué-Maritime Province to northern Nyanga Province in southwestern Gabon (see map page xxxii), offers a good representation of the biotopes of Gabon. Sandy beaches, mangroves and large lagoons line the coast, and lowland to mid-altitude evergreen forests occur inland. The highest mountain peak (820 m) lies near Goumbi in the Monts Doudou region. A large patch of savanna lies in the area of Moukalaba. Detailed descriptions of the geography, climate, and vegetation are provided by Lee *et al*. (this volume). Loango National Park and the larger part of Moukalaba-Doudou National Park are situated within the Gamba Complex.

Human population density is low. Outside the parks, the main activities are fishing, hunting, cultivation and logging, but the principal income is generated by the oil extraction industry centered around Gamba and Rabi. The impact of those activities on reptile populations has never been evaluated. As part of a collaborative project between the Smithsonian Institution, the Shell Foundation and Shell Gabon, we undertook a series of herpetological surveys in various areas and biotopes within the Gamba Complex, ranging from pristine rainforests to oilfields (Branch *et al*. 2003, Pauwels *et al*. 2003, 2004a) to document the region's biodiversity and conservation threats, and thus enable a long-term management plan.

Prior to our surveys, herpetological knowledge of the Complex consisted mainly of an assessment conducted in Moukalaba-Doudou National Park (Burger *et al*. 2004), reports on sea turtle nesting and their exploitation by humans (Bellini *et al*. 2000, Fretey 2001, Fretey and Girardin 1988, Billes *et al*. this volume), and a few other scattered records (Böhme and Ziegler 1997, Boulenger 1894, 1900, 1909, Dijkstra 1993, Maran 2002, Mocquard 1902, Rasmussen 1989), among them several from the Setté Cama area. More recently, several additional records were published (Korsthorst *et al*. 2004, Maran and Pauwels, 2005, Pauwels and Bos 2004).

2 Study Sites

We investigated four sites within the Gamba Complex (Table 1), including:

- Moukalaba-Doudou National Park: a radius of 7 km from a base camp (02°35'13"S, 10°14'03"E) in the westernmost part of the park; 26-day survey; plus two days in the direct surroundings of Doussala and Moukalaba villages in the eastern part of the park.
- Gamba: Gamba city (02°44'50"S, 09°59'48"E) and its surroundings, i.e. the area bounded west by the ocean, east by Moukalaba-Doudou National Park and north by the Ngové-Ndogo Hunting Domain.
- Loango National Park: a radius of 7 km from a base camp (02°20'27"S, 09°35'33"E) in the southern part of the park; see Pauwels *et al*. (2004a), and Anonymous (2002) for the precise borders of the national parks.

[1] Monitoring and Assessment of Biodiversity Program, National Zoological Park, Smithsonian Institution, Gamba, Gabon. Mail address: Department of Recent Vertebrates, Institut Royal des Sciences Naturelles de Belgique, Rue Vautier 29, 1000 Brussels, Belgium. Email: osgpauwels@yahoo.fr

[2] University of the Western Cape, Private Bag X17, Bellville 7535, South Africa. Email: sungazer@iafrica.com

[3] Department of Herpetology, Port Elizabeth Museum, P.O. Box 13147, Humewood 6013, South Africa. Email: bitis@telkomsa.net

[4] Gabon Biodiversity Program, Smithsonian Institution, S/C Shell Gabon, BP 48, Gamba, Gabon. Email: elie_tobi@yahoo.fr

[5] Institut de Recherches Agronomiques et Forestières, Libreville, Gabon.

[6] Direction de la Faune et de la Chasse, Libreville, Gabon.

Table 1. Main biotopes investigated and sampling effort at each site. Trapping days are defined by Burger *et al.* (this volume).

Site	Main biotopes studied	Time of survey	Trapping days
Gamba	savanna / forest mosaic, urbanized area	5 weeks (Jul.-Aug. 2001, Nov. 2002)	1100 PT-days
Rabi-Toucan	lowland primary rainforest, swamps	7 weeks (Feb.-Mar. & May-July 2002)	324 FT-days + 2046 PT-days
Loango N.P.	beach, mangrove, mosaic forest / bunchgrass prairie	7 weeks (Sept.-Nov. 2002)	1108 FT-days + 1562 PT-days
Moukalaba - Doudou N.P.	lowland primary rainforest, savanna, swamps	4 weeks (Mar.-Apr. 2003)	114 FT-days + 704 PT-days

- Rabi-Toucan: total area of extraction and production sites in Rabi and Toucan oilfields managed by Shell Gabon, plus Lake Divangui (01°56'28"S, 09°59'20"E). The Rabi-Toucan extracting sites consist of about 200 wells linked by laterite roads crossing dense rainforest.

3 Materials and Methods

Sampling methods used during our surveys were funnel traps (FT), pitfall traps (PT), and day and night active searches, including road cruising in Gamba and Rabi-Toucan. In the PT lines, 11 plastic buckets were positioned about eight meters from each other, giving a total line length of 80 m. FT lines generally consisted of 6 funnels, three evenly arranged on each side of the fence, and were about 15 m long. The fence consisted of black plastic sheeting 0.5 m high stapled vertically onto wooden stakes disposed along the trap line. An apron left at the base was covered with soil and leaf litter to prevent specimens passing under the fence. All sampling sites were below 300 m altitude.

Traps were checked every morning. A fully detailed description of the traps is provided in the chapter dedicated to the amphibians of the Gamba Complex (Burger *et al*. this volume, Pauwels *et al.* 2004a). Sampling details for each site are presented in Table 1. A trapping day is defined as one funnel or one bucket in use for a 24-hour period. The field team was most often composed of three persons. In addition to our observations, reliable literature data were taken into account in the species lists for each site. We preserved specimens and took photographs (see Table 2) and DNA samples for most species. Vouchers have been deposited in the following locations: the Gabon Biodiversity Program (Gamba, Gabon), the Smithsonian Institution (Washington D.C., USA), the Royal Belgian Institute for Natural Sciences (Brussels, Belgium), the Port Elizabeth Museum (Humewood, South Africa) and the South African Museum (Cape Town, South Africa).

4 Results

4.1 Species assemblages in the four investigated sites

Based on our new data and literature records, a total of 86 reptile species has been recorded from the four investigated sites. A systematic list per site is presented in Table 2.

One of the most interesting findings was the rediscovery of the tiny amphisbaenian *Cynisca bifrontalis* Boulenger 1906, that was previously known only from a single specimen (the holotype) collected at Omboué, about 90 km NW of Rabi-Toucan where we found five additional specimens. This new material, as well as our new series of the other rare amphisbaenid, *Monopeltis galeata*, was studied in detail (Branch *et al*. 2003). Our Moukalaba-Doudou National Park record of the recently described mud terrapin *Pelusios marani* Bour 2000, known only from 14 localities (Maran 2002, Maran and Pauwels 2005, Pauwels *et al.* 2002c), is the first for the species in a protected area. *Boiga* cf. *pulverulenta* and *Psammophis* cf. *phillipsii* consistently differ in some scalation or coloration characters from the definition of the species, and their taxonomic status must be evaluated; they could indeed represent new taxa. Other important findings include a number of range extensions (e.g. southwards for *Bothrophthalmus brunneus*), and many species that are poorly represented in museum collections (e.g. *Grayia caesar* and *Pseudohaje goldii*).

4.2 Total number of reptile species recorded to date from the Gamba Complex

A total of 86 reptile species is known thus far from the Gamba Complex, including: 11 chelonians (5 families), 3 crocodilians (one family), 2 amphisbaenians (one family), 22 lizards (7 families) and 48 snakes (7 families). Among lizards the best represented family is Scincidae with 9 species, and among snakes, the Colubridae with 32 species.

Ten snakes (the burrowing asps *Atractaspis boulengeri* and *A. corpulenta*, the opisthoglyphous colubrid *Thelotornis kirtlandii*, all three elapids and all four viperids) are dangerously venomous species of medical importance. Seven of these venomous species were recorded from Gamba city and its direct surroundings (see Table 2), where the forest cobra *Naja melanoleuca* is especially common, and all but the green mamba *Dendroaspis jamesoni* were encountered in Rabi and Toucan oilfields. Within the Gamba Complex, the green mamba was so far recorded only from Gamba and Moukalaba-Doudou, but it is probably well distributed, including in the four investigated sites. Because of its aggressivity, its potent venom, and the fact that it often ventures into gardens and houses, the forest cobra is the snake that could have the highest medical impact locally.

Of the 86 reptile species recorded from the Gamba Complex, all but five were encountered during the present surveys. Three of these five were found by one of us during a previous survey of Monts Doudou (Burger *et al*. 2004), and the two other records, *Eretmochelys imbricata* (*vide supra*) and *Pelusios niger* (Maran 2002), are also perfectly reliable. As an indication of the current lack of knowledge of the local herpetofauna, as many as 46 reptile species (i.e., 53 % of the 86) were newly recorded from the Gamba Complex during our surveys. The reptile diversity of the national parks of Loango (37) and Moukalaba-Doudou (42) is comparable with the list of 38 species for Lopé National Park gathered during intensive field surveys led by Blanc and Frétey (2000).

Eighty-six reptile species is by far the longest list ever gathered for any geographic area of comparable size in Gabon. For comparison, 61 were recorded by Knoepffler (1966, 1974) for Ogooué-Ivindo and Woleu-Ntem provinces, 50 by Pauwels *et al*. (2002a) for the Massif du Chaillu, and 48 by Pauwels *et al*. (2002b) for the Monts de Cristal. The number of species recorded to date from the Gamba Complex represents more than half (54 %) of the 160 reptile species listed for Gabon by Frétey and Blanc (no date), although another figure of 95 species for Gabon was given by Lötters *et al*. (2000). The number of reptile species inhabiting the country remains largely unknown (Pauwels 2004a-b), hence the crucial importance of intensive, documented surveys like those we did in the Gamba Complex.

5 Discussion

5.1 Respective success of sampling methods

Four of the 81 taxa we encountered in the Complex (5%) were found only by trapping, not by active searching. These taxa are the skinks *Feylinia currori* (pitfall) and *Lygosoma fernandii* (funnel and pitfall), and the snakes *Polemon notatus* and *Typhlops congestus* (pitfall), i.e., mainly ground-living or fossorial species. These four species had, however, been found previously by active search in Gabon, including two by one of us (Pauwels *et al.* 2002a-b).

The efficiency of the traps in terms of increasing the species list was limited as far as reptiles are concerned. However pitfall traps allowed us to collect a larger series of fossorial taxa than was generally possible with active searching (for instance four specimens of *Polemon notatus*). Also, our pitfall traps proved to be particularly effective for rarely encountered animal groups: among amphibians (Burger *et al*., this volume), small mammals (O'Brien *et al*., this volume), spiders (R. Jocqué and J.-F. Van der Donckt, pers. comm.) and scorpions (our pitfalls in Loango National Park captured the rare scorpion *Babycurus melanicus*; see Prendini 2004: 259). Pitfall traps should always be used in such multi-taxa surveys. No unique species were found in funnel traps. The most productive method for finding snakes during our surveys proved to be nighttime road cruising. For instance, in Rabi-Toucan, road cruising allowed us to find 56 % of the total number of reptile species, 18 % of which were found only through that method. Five glue traps were put on five large live trees near a stream during three weeks in July 2002 in the rainforest at Toucan, but they did not catch a single reptile nor amphibian.

Species accumulation curves for each site (active searching and traps combined) approached a plateau after at least a month of survey (see Figure 1 for

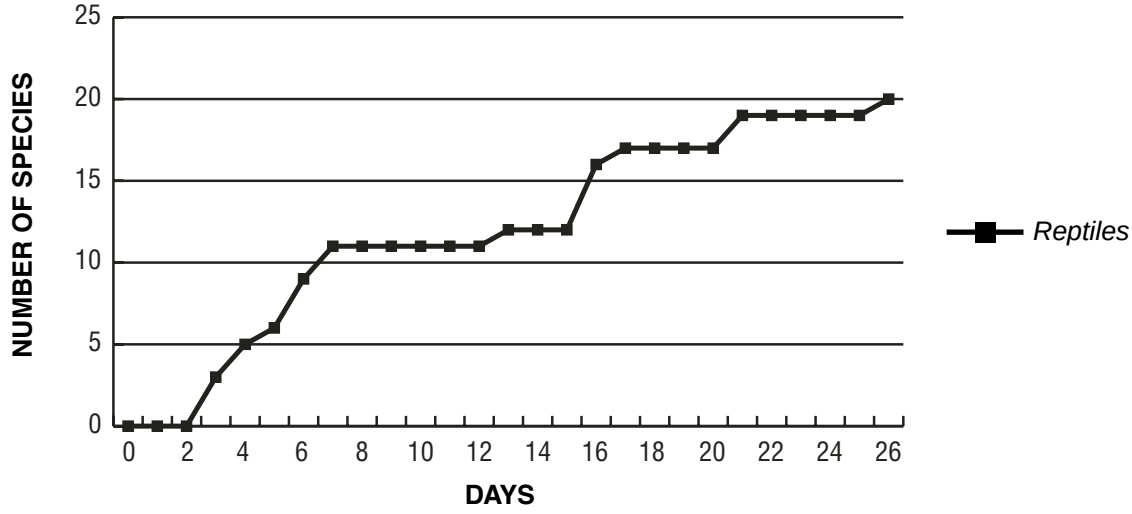

Figure 1. Accumulation curve (species numbers/days) for reptiles during the Moukalaba-Doudou survey (Mar.-Apr. 2003).

Moukalaba-Doudou), showing the importance of investing much time in reptile inventories; amphibian species approached a plateau after much shorter periods (see Burger *et al*., this volume, for the Rabi-Toucan curves). Surveys should also take place during the rainy season, when most reptiles are more active.

5.2 Conservation issues

Fifty-six (65 %) of the 86 species known to occur in the Gamba Complex have been recorded in Loango and Moukalaba-Doudou national parks. Among the 30 remaining species, all but *Eretmochelys imbricata*, *Feylinia currori* and *Philothamnus dorsalis* were recorded from Rabi-Toucan (where 77 % of the species known from the Gamba Complex occur), and nine (including *F. currori*) were found in protected areas elsewhere in Gabon (Blanc and Frétey 2000, Pauwels *et al*. 2002b, 2005). Efforts should be made to make sure that all vulnerable species, particularly those restricted to undisturbed forest or peculiar biotopes, are represented by viable populations in protected areas.

Seven of the species are included on the IUCN Red List of Threatened Species (Anonymous 2003) all sea turtles: *Chelonia mydas*, *Eretmochelys imbricata*, *Lepidochelys olivacea* and *Dermochelys coriacea* (indicated as endangered or critically endangered), *Kinixys erosa* and *Crocodylus cataphractus* (data deficient) and *Osteolaemus tetraspis* (vulnerable). Within the Gamba Complex, the reptile species suffering the highest human predation pressures are all sea turtles (see Fretey 2001, Billes *et al*. this volume), freshwater and soft-shelled terrapins, *Kinixys erosa* (pers. obs.) and all three crocodiles (see Pauwels *et al*. 2003 for *C. cataphractus*). The soft-shell turtle *Trionyx triunguis* is regularly sold as food in Gamba. That large species is overhunted everywhere in Gabon, and, according to fishermen, becoming rare in many places (Maran and Pauwels 2005). Fortunately, it was recorded from both Loango and Moukalaba-Doudou national parks (Pauwels *et al*. 2005). Four sea turtle species are definitely known to nest on the beaches of the Gamba Complex (Fretey 2001, Billes *et al*. this volume), including at least three in Loango National Park (Pauwels *et al*. 2004a). The possible impact of oil activities in the Gamba Complex on the sea turtles has not yet been evaluated (Billes *et al*., this volume). The Complex harbors important populations of the three African crocodile species, notably of *Crocodylus cataphractus* at Lake Divangui at the Rabi-Toucan site (Pauwels *et al*. 2003). This lake, situated at an altitude of about 20 m, is 80 m deep, and has a very peculiar geological history. We strongly encourage its thorough study (the possibility of fish and invertebrate endemicity seems high) and its protection as an exceptional sanctuary for *Crocodylus cataphractus*.

Beyond hunting, the main threat to the herpetofauna in the Gamba Complex is habitat loss through logging and deforestation, which particularly affects sylvicolous species (e.g. *Panaspis reichenowii*, *Grayia caesar*). Conversely, anthropophilic species (e.g. *Agama agama*, *Hemidactylus mabouia*) have largely widened their former distributions.

Rabi-Toucan had by far the richest reptile diversity, despite the intensive oil production activity in the region. Its species diversity is clearly comparable with that of other rainforest sites in Gabon. Industrial activities have in fact positively affected a few species inhabiting open areas (e.g. *Agama agama*, *Hemidactylus mabouia*, *Gerrhosaurus nigrolineatus*, and *Mabuya affinis*) by artificially increasing the amount of open habitat available. The assemblage of primary forest species in Rabi-Toucan seems intact, but a study on the effects of forest fragmentation by roads should be undertaken. Roads should be as narrow as possible and bordered by trees, in order to avoid too much exposure to sun and to predators for the reptiles crossing the roads. The strictly-applied driving rules of Shell Gabon in Rabi-Toucan (40km per hour speed limit, no night driving) help decrease the number of road fatalities among reptiles, many of which are nocturnal.

Knowing the ecological requirements of each species is very important for their conservation. The data gathered during our survey shed much light on the biotope preferences and diet of a number of species (see Branch *et al*. 2003, Pauwels *et al*. 2003, 2004a). Future study of the preserved specimens will bring much additional information on their biology: reproductive status, parasites, etc. Yet, the natural history of most of the recorded species is indeed very poorly known. For example, for some (e.g. *Grayia caesar*), diet is totally unknown.

5.3 Other species of probable occurrence in the Gamba Complex

Additional species having been found in Gabon in habitats that are represented in the Gamba Complex include: *Pelusios chapini* (Pelomedusidae), *Cynisca haughi* (Amphisbaenidae), *Agama* cf. *paragama* (Agamidae), *Chamaeleo chapini*, *C. cristatus* (Chamaeleonidae), *Hemidactylus kamdemtohami* (Gekkonidae), *Panaspis rohdei* (Scincidae), *Polemon bocourti* (Atractaspididae), *Bothrolycus ater*, *Buhoma depressiceps*, *Dasypeltis fasciata* and *D. scabra*, *Hydraethiops laevis*, *Lamprophis virgatus*, *Philothamnus heterodermus* (Colubridae), *Boulengerina annulata annulata*, *Paranaja multifasciata* (Elapidae), *Letheobia pauwelsi*, *Ramphotyphlops braminus* (Typhlopidae) and *Causus maculatus* (Viperidae) (Bauer and Pauwels 2002, Blanc and Frétey 2000, Branch *et al*. 2003, Knoepffler 1974, Maran 2002, Pauwels and Lavoué 2004, Pauwels *et al*. 2002a-b, 2004b, Wallach 2005). Some of them are still known only from mountainous, forested areas (e.g. the recently described *Hemidactylus kamdemtohami* and the rare aquatic snake *Hydraethiops laevis*), while most others were recorded from a wide range of altitudes. Thus the best way to verify the presence of most of these still-unrecorded species is to conduct thorough surveys in the highest zones of the Gamba Complex, i.e., in the northern part of the Monts Doudou. A total number of 100 reptile species in the Gamba Complex seems to be a reasonable expectation.

6 Conclusion

Because of our surveys, the Gamba Complex, with 86 recorded reptile species, is herpetologically the best known area of Gabon. Loango and Moukalaba-Doudou national parks have proved to be herpetologically as rich as, or even richer than, Lopé National Park, the only other Gabonese park for which a preliminary species list is currently available. The Rabi-Toucan area has the greatest diversity (66 species) and, together with Lake Divangui, represents an exceptional site that could harbor, after the oil extraction activities finish, an ideal biological and/or ecotouristic station. To preserve the remarkable herpetological richness of the Gamba Complex, intensive and urgent conservation actions should be encouraged, including the implementation of species protection laws, better control of logging and deforestation, study of road effects and exotic species invasions in forested areas, awareness building, and further studies on the biology and ecological requirements of the species. Although the forest herpetofauna of Gabon is very rich, it is also one of the least known and potentially one of the most endangered in the long term.

Table 2. Reptiles of the Gamba Complex: combined checklist for reptile species recorded during the Gamba, Rabi-Toucan, Loango and Moukalaba-Doudou surveys and from the literature. L = literature record (see References); P = photographic record; S = sight record; V = voucher specimen. For Gamba and Rabi-Toucan, literature records were included if they occurred within the area we investigated (*vide supra*); for Loango and Moukalaba-Doudou if they occurred within the national parks of Loango or Moukalaba-Doudou (except the part situated out of the Complex). Within families, taxa are arranged in alphabetical order.

Taxa	Gamba	Rabi-Toucan	Loango N.P.	Moukalaba-Doudou N.P.
CHELONII (11 spp.)				
Cheloniidae (3 spp.)				
Chelonia mydas	L		V	
Eretmochelys imbricata	L			
Lepidochelys olivacea	L		P	
Dermochelyidae (1 sp.)				
Dermochelys coriacea	L		LP	
Pelomedusidae (4 spp.)				
Pelusios castaneus	LPV		PV	L
Pelusios gabonensis		PV		
Pelusios marani				PV
Pelusios niger	L		L	
Testudinidae (1 sp.)				
Kinixys erosa	LV	PV	S	LV
Trionychidae (2 spp.)				
Cycloderma aubryi	L		P	
Trionyx triunguis	S		P	P
CROCODILIA (3 spp.)				
Crocodylidae (3 spp.)				
Crocodylus cataphractus	P	P	L	L
Crocodylus niloticus			PV	
Osteolaemus tetraspis	PV	P	P	P
SQUAMATA (72 spp.)				
Agamidae (1 sp.)				
Agama agama	LPV	V	PV	S
Amphisbaenidae (2 spp.)				
Cynisca bifrontalis		PV		
Monopeltis galeata		PV		
Chamaeleonidae (3 spp.)				
Chamaeleo dilepis	PV	LPV	V	
Chamaeleo owenii		PV		
Rhampholeon spectrum		PV		LV
Gekkonidae (5 spp.)				
Hemidactylus fasciatus	V	PV	PV	LV
Hemidactylus mabouia	PV	PV	V	LV
Hemidactylus muriceus	PV	PV	PV	LV
Hemidactylus richardsoni		PV		
Lygodactylus fischeri		PV		
Gerrhosauridae (1 sp.)				
Gerrhosaurus nigrolineatus	PV	V	PV	LS
Lacertidae (2 spp.)				
Holaspis guentheri		PV		
Poromera fordii		PV		
Scincidae (9 spp.)				
Feylinia currori	V			
Feylinia grandisquamis	V	PV	V	L
Lygosoma fernandii	PV	PV	V	

Table 2. *Continued.*

Taxa	Gamba	Rabi-Toucan	Loango N.P.	Moukalaba-Doudou N.P.
Mabuya affinis	V	PV	PV	L
Mabuya albilabris	PV	PV	PV	L
Mabuya maculilabris				PV
Mabuya polytropis	V	PV	PV	LV
Panaspis breviceps	PV	PV	PV	LV
Panaspis reichenowii		PV	V	V
Varanidae (1 sp.)				
Varanus ornatus	LPV	PV	PV	S
Typhlopidae (2 spp.)				
Typhlops angolensis	V	PV	S	
Typhlops congestus		PV		
Boidae (1 sp.)				
Calabaria reinhardtii	SV	PV		LV
Pythonidae (1 sp.)				
Python sebae	LV	PV	V	
Atractaspididae (5 spp.)				
Aparallactus modestus		PV		
Atractaspis boulengeri		PV		
Atractaspis corpulenta	V	PV		L
Polemon collaris	V	PV		
Polemon notatus	V	PV		
Colubridae (32 spp.)				
Boiga blandingii	PV	PV	P	
Boiga cf. *pulverulenta*		PV		L
Bothrophthalmus brunneus		PV		L
Chamaelycus fasciatus		V		
Crotaphopeltis hotamboeia				LV
Dipsadoboa duchesnii	LPV	PV	V	L
Dipsadoboa underwoodi		PV		V
Dipsadoboa viridis		PV		V
Dipsadoboa weileri				L
Gonionotophis brussauxi		PV		V
Grayia caesar		PV		
Grayia ornata	LV	PV		L
Hapsidophrys lineatus		P		
Hapsidophrys smaragdinus	PV	PV	S	L
Hormonotus modestus	V	PV		
Hydraethiops melanogaster		PV		
Lamprophis olivaceus		PV		
Lycophidion laterale	PV	PV		
Mehelya capensis		V		
Mehelya guirali				L
Mehelya poensis		PV		
Mehelya savorgnani				L
Mehelya stenophthalmus		PV	V	
Natriciteres fuliginoides		PV	PV	LV
Philothamnus carinatus		PV	PV	L
Philothamnus dorsalis	PV			
Philothamnus nitidus	V	PV		
Psammophis cf. *phillipsii*	V		PV	
Rhamnophis aethiopissa	V	PV	V	L
Rhamnophis batesii		PV		

Table 2. *Continued.*

Taxa	Gamba	Rabi-Toucan	Loango N.P.	Moukalaba-Doudou N.P.
Thelotornis kirtlandii	V	PV		
Thrasops flavigularis			PV	
Elapidae (3 spp.)				
Dendroaspis jamesoni	V			L
Naja melanoleuca	V	PV		L
Pseudohaje goldii	V	PV		
Viperidae (4 spp.)				
Atheris squamigera		PV		LV
Bitis gabonica	V	P	P	L
Bitis nasicornis	PV	PV		
Causus lichtensteini		PV		L
TOTAL: 86	47	66	37	42

References

Anonymous. No date [2002]. *Les Parcs Nationaux du Gabon. Stratégie pour le troisième millénaire*. Republic of Gabon, National Geographic Society and Wildlife Conservation Society, Libreville, Gabon, 96 p.

Anonymous. 2003. *2003 IUCN Red List of Threatened Species*. www.redlist.org.

Bauer, A.M. and O.S.G. Pauwels. 2002. A new forest-dwelling *Hemidactylus* (Squamata: Gekkonidae) from Gabon, West Africa. *African Journal of Herpetology* 51: 1-8.

Bellini, C., T.M. Sanches and A. Formia. 2000. Hawksbill turtle tagged in Brazil captured in Gabon, Africa. *Marine Turtle Newsletter* 87: 11-12.

Billes, A., B. Huijbregts, J. Marmet, A. Mounguengui, J.C. Mamfoumbi and C. Odzeano. 2006. Nesting of sea turtles in the Gamba Complex of Protected Areas: first monitoring of a nesting beach. *In*: Alonso, A., M.E. Lee, P. Campbell, O.S.G. Pauwels and F. Dallmeier, eds., *Gamba, Gabon: Biodiversity of an Equatorial African Rainforest*. Bulletin of the Biological Society of Washington, Washington, D.C.

Blanc, C.P. and T. Frétey. 2000. Les reptiles de la Réserve de Faune de la Lopé et de la Forêt des Abeilles (Gabon). *Bulletin de la Société zoologique de France* 125(4): 281-292.

Böhme, W. and T. Ziegler. 1997. A taxonomic review of the *Varanus* (*Polydaedalus*) *niloticus* (Linnaeus, 1766) species complex. *Herpetological Journal* 7(4): 155-162.

Boulenger, G.A. 1894. *Catalogue of the snakes in the British Museum (Natural History). Vol. 2. Conclusion of the Colubridae aglyphae*. Trustees of the British Museum (Natural History), London: i-xi + 1-382 + pl. I-XX.

Boulenger, G.A. 1900. A List of the Batrachians and Reptiles of the Gaboon (French Congo), with Descriptions of new Genera and Species. *Proc. Zool. Soc. London*: 433-456.

Boulenger, G.A. 1909. On the Ophidian Genus *Grayia*. *Proc. Zool. Soc. London*: 944-952.

Branch, W.R., O.S.G. Pauwels and M. Burger. 2003. Rediscovery of *Cynisca bifrontalis* in Gabon, with additional notes on *Monopeltis galeata* (Reptilia: Amphisbaenia). *African Journal of Herpetology* 52: 93-100.

Burger, M., W.R. Branch and A. Channing. 2004. Amphibians and reptiles of Monts Doudou, Gabon: species turnover along an elevational gradient. Pp. 145-186 *in*: Fischer, B.L., ed., *A Floral and Faunal Inventory of Monts Doudou, Gabon, with Reference to Elevational Variation*. Memoirs of the California Academy of Sciences, Number 28, San Francisco, CA.

Burger, M., O.S.G. Pauwels, W.R. Branch, E. Tobi, J.A. Yoga and E.N. Mikolo. 2006. An assessment of the Amphibian fauna of the Gamba Complex of Protected Areas. *In*: Alonso, A., M.E. Lee, P. Campbell, O.S.G. Pauwels and F. Dallmeier, eds., *Gamba, Gabon: Biodiversity of an Equatorial African Rainforest*. Bulletin of the Biological Society of Washington, No. 12.

Dijkstra, A.J. 1993. Amphibians and reptiles. Pp. 254-9 *in*: Schepers, F.J. and E.C.L. Marteijn, eds., *Coastal waterbirds in Gabon*. Foundation Working Group International Wader and Waterfowl Research, Report 41, Zeist.

Fretey, J. 2001. *Biogeography and Conservation of Marine Turtles of the Atlantic Coast of Africa / Biogéographie et conservation des tortues marines de la côte atlantique de l'Afrique*. CMS Technical Series Publ. No. 6, UNEP/CMS Secretariat, Bonn, Germany, 429 p.

Fretey, J. and N. Girardin. 1988. La nidification de la tortue luth, *Dermochelys coriacea* (Vandelli, 1761) (Chelonii, Dermochelyidae) sur les côtes du Gabon. *Journal of African Zoology* 102(2): 125-132.

Frétey, T. and C.P. Blanc. No date [2004]. *Liste des reptiles d'Afrique Centrale*. Les dossiers de l'ADIE. Serie Biodiversité N°2 [sic]. ADIE, Libreville, Gabon, 73 p.

Knoepffler, L.P. 1966. Faune du Gabon (Amphibiens et Reptiles). I. Ophidiens de l'Ogooué-Ivindo et du Woleu N'tem. *Biologia Gabonica* 2(1): 3-23.

Knoepffler, L.P. 1974. Faune du Gabon (Amphibiens et Reptiles). II. - Crocodiles, Chéloniens et Sauriens de l'Ogooué-Ivindo et du Woleu N'tem. *Vie Milieu* 24(1), sér. C: 111-128.

Korthorst, M., A. Diyombi, A. Nzigou, J.C. Manzanza and A. Diramba. 2004. WWF Turtle Update 2004. *Le Perroquet* [Monthly Magazine for the communities of Shell Gabon] 167: 27-28.

Lee, M.E., A. Alonso, P. Campbell, F. Dallmeier and O.S.G. Pauwels. 2006. The Gamba Complex of Protected Areas: an illustration of Gabon's biodiversity. *In*: Alonso, A., M.E. Lee, P. Campbell, O.S.G. Pauwels and F. Dallmeier, eds., *Gamba, Gabon: Biodiversity of an Equatorial African Rainforest*. Bulletin of the Biological Society of Washington, No. 12.

Lötters, S., V. Gossmann and F. Obame. 2000. Erfassung der Diversität der Amphibien und Reptilien Gabuns. *Elaphe* 8(3): 63-66.

Maran, J. 2002. Les tortues continentales du Gabon. *La Tortue* 58-59: 46-67.

Maran, J. and O.S.G. Pauwels. 2005. Etat des connaissances sur les tortues continentales du Gabon: distribution, écologie et conservation. *Bulletin de l'Institut Royal des Sciences naturelles de Belgique*, *Biologie* (in press).

Mocquard, F. 1902. Sur des Reptiles et Batraciens de l'Afrique orientale anglaise, du Gabon et de la Guinée française (région de Kouroussa). *Bull. Mus. Nat. Hist. nat. Paris* 8: 404-417.

O'Brien, C.J., W.J. McShea, S. Guimondou, P. Barrière and M.D. Carleton. 2006. Terrestrial small mammals (Soricidae and Muridae) from the Gamba Complex in Gabon: species composition and comparison of sampling techniques. *In*: Alonso, A., M.E. Lee, P. Campbell, O.S.G. Pauwels and F. Dallmeier, eds., *Gamba, Gabon: Biodiversity of an Equatorial African Rainforest*. Bulletin of the Biological Society of Washington, No. 12.

Pauwels, O.S.G. 2004a. Reptiles, amphibiens et parcs nationaux au Gabon. *Canopée* 26: 3-7.

Pauwels, O.S.G. 2004b. Book review. Liste des reptiles d'Afrique Centrale by Thierry Frétey and Charles P. Blanc. *Hamadryad* 29: 142-143.

Pauwels, O.S.G. and G. Bos. 2004. The shy scaly monsters of Lake Yenzi. *Le Perroquet* [Monthly Magazine for the communities of Shell Gabon] 167: 19-20.

Pauwels, O.S.G., W.R. Branch and M. Burger. 2004a. Reptiles of Loango National Park, Ogooué-Maritime Province, southwestern Gabon. *Hamadryad* 29(1): 115-127.

Pauwels, O.S.G., P. Christy and A. Honorez. 2005. Reptiles and national parks in Gabon, western central Africa. *Hamadryad* 30(1) (in press).

Pauwels, O.S.G., A. Kamdem Toham and C. Chimsunchart. 2002a. Recherches sur l'herpétofaune du Massif du Chaillu, Gabon. *Bulletin de l'Institut Royal des Sciences naturelles de Belgique*, *Biologie* 72: 47-57.

Pauwels, O.S.G., A. Kamdem Toham and C. Chimsunchart. 2002b. Recherches sur l'herpétofaune des Monts de Cristal, Gabon. *Bulletin de l'Institut Royal des Sciences naturelles de Belgique*, *Biologie* 72: 59-66.

Pauwels, O.S.G., A. Kamdem Toham, J. Mayombo and R. Mikala-Mussavu. 2002c. Geographical Distribution. *Pelusios marani* Bour, 2000. Maran's mud turtle. *African Herpetological News* 35: 20-21.

Pauwels, O.S.G. and S. Lavoué. 2004. Geographic distribution. *Boulengerina annulata annulata* (Banded water cobra). *Herpetological Review* 35: 290.

Pauwels, O.S.G., V. Mamonekene, P. Dumont, W.R. Branch, M. Burger and S. Lavoué. 2003. Diet records for *Crocodylus cataphractus* (Reptilia: Crocodylidae) at Lake Divangui, Ogooué-Maritime Province, southwestern Gabon. *Hamadryad* 27: 200-204.

Pauwels, O.S.G., V. Wallach, J.P. Biteau, C. Chimsunchart, J.A. Yoga and B.C. O'Heix. 2004b. First record of *Ramphotyphlops braminus* (Serpentes: Typhlopidae) from Gabon, western central Africa. *Hamadryad* 29: 138-139.

Prendini, L. 2004. On the scorpions of Gabon and neighboring countries, with a reassessment of the synonyms attributed to *Babycurus buettneri* Karsch and a redescription of *Babycurus melanicus* Kovařik. Pp. 235-67 *in*: Fisher, B.L., ed., *Monts Doudou. A floral and faunal inventory with reference to elevational variation*. Memoirs of the California Academy of Sciences, Number 28, San Francisco, CA.

Rasmussen, J.B. 1989. A taxonomic review of the *Dipsadoboa duchesnei* complex. *Bonn. zool. Beitr*. 40: 249-264.

Wallach, V. 2005. *Letheobia pauwelsi*, a new species of blindsnake from Gabon (Serpentes: Typhlopidae). *African Journal of Herpetology* 54(1): 85-91.