# Calabar ground python *Calabaria reinhardtii*

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## Background and summary

Calabar ground pythons (*Calabaria reinhardtii*) are one of several snake species exported from West Africa for the international pet trade. Ghana and Togo, and to a lesser extent Benin, provided more than 80% of the specimens exported mainly to USA and to the EU since the 1990s, with occasional exports from countries such as Cameroon and Cote d'Ivoire. Specimens are exported under CITES "R" (ranching) and "W" (wild) source codes, but it is clear that all traded individuals are actually captured in the wild. Illegal circuits of regional trade (for instance animals imported from Nigeria to the three main exporting countries) are probably still active, but the magnitude is unknown. Preliminary data suggest that the species is generally occurring naturally at low density throughout its west African range and the number of exported animals (about 1000 per year, with no indication of an increase in recent years) suggests that the current level of trade is sustainable. Nonetheless, the species may be at risk of local extirpation because of agricultural mechanization and chemical pest controls in areas also subject to harvesting. Considering all the above-mentioned issues, some specific recommendations for future management are made.

## Species overview

### *Distribution*

The Calabar ground python (*Calabaria reinhardtii*) occurs in west and central Africa, from Liberia in the east as far as Kivu in the Democratic Republic of Congo in the west (Chippaux 2006). Throughout its range, the species is confined to the humid tropics, and especially to the humid forest ecosystems. It is native of (in alphabetical order): Benin; Cameroon; Central African Republic; Congo Brazaville; Congo Kinshasa; Côte d'Ivoire; Equatorial Guinea (including both Rio Muni and Bioko Island); Gabon; Ghana; Guinea; Liberia; Nigeria; Sierra Leone; and Togo (Fig. 1). Nonetheless, in several of these countries it occurs in only a small portion of their political territory, such as, for instance, in Togo (Segniagbeto 2009; Segniagbeto et al. 2011).

In Cote d'Ivoire it is known from a few localities, situated in the forest zone of the southern regions: Adiopodoumé, Bia, and N'Dzida (Doucet, 1963). However, it is likely to be much more widespread and perhaps locally abundant, although field studies are non-existent. In Togo, it is found only in the hilly forests at the border with Ghana, around the towns of Kpalimé and Badou (Luiselli and Segniagbeto, personal observations). In Benin, it occurs over the southern half of the country, where it is rare and occurs only at very low density (C. Toudonou, personal observation). Sites of capture in Benin include the localities of Pahou, Lama forest, Dassa-zoumè, Sèkandji (near Cotonou), Sème-Kpodji (C. Toudonou, personal observation). In Nigeria, it is confined to the forest zone in the southern portion of the country; it is widespread but generally uncommon in Bayelsa, Rivers, Akwa-Ibom, and Cross River States (Luiselli et al., personal observations). In Cameroon and in Central African countries it seems generally more abundant than in Western African countries (L. Chirio, personal communication). In Central African Republic, it is also known from a low number of localities, i.e. Belemboke, Ibengue, Mbaiki, Nola, and Pont de la Lesse (Chirio and Ineich, 2006).


**Fig. 1.** Calabar ground python (*Calabaria reinhardtii*) range countries (in orange).

***Basic biology***

This python is characterized by fossorial habits, and is confined to the humid forest region of West and Central Africa (Chippaux 2006). Generally, it can be considered a species typically found in the leaf litter of the rainforest (for instance in Cameroon), semi-deciduous forest (for instance around Kpalimé, Togo), and swamp forest (for instance around Omoku, Nigeria), but it also occurs in abandoned agricultural land and in the farm/bush mosaics.

Data from a total of 365 males and 326 females captured showed that mature forests (both swamped and dryland) were the favored habitat for both males and females, with plantations and forest-derived savannas being considerably less preferred (Figure 2).

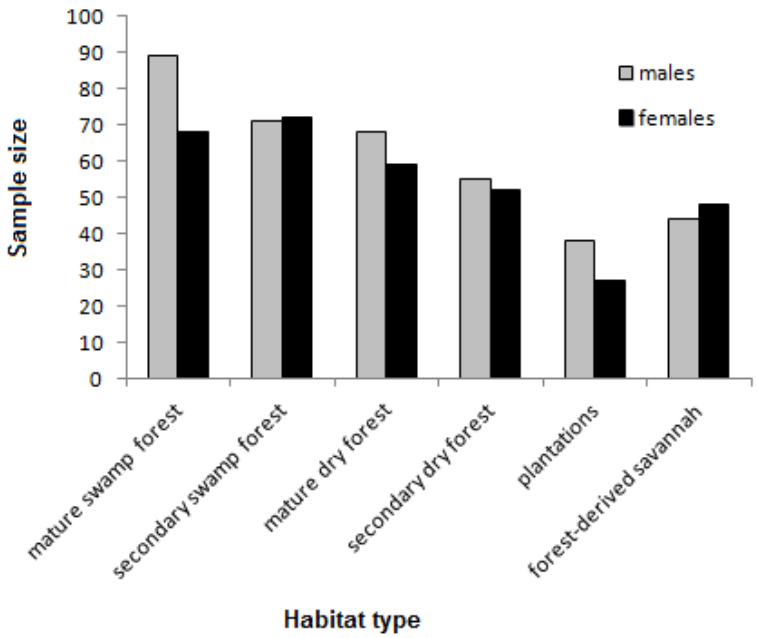


**Fig. 2**. Habitat selection by Calabar ground pythons, by sex, in the Niger Delta of southern Nigeria. Data come from L. Luiselli et al.'s unpublished researches (1994-2014).

Typically, these snakes spend most of the time inside burrows among leaves, or in the soil, but telemetric studies revealed that they can also spend considerable time inside burrows of mammals or termite mounds (Angelici et al. 2000). The species is crepuscular and nocturnal, and frequently active after rains (Chippaux 2006; Angelici et al. 2000).

**Table 1**. Variables that influence a species' resilience to use and the attributes of Calabar pythons.

| Variable | Use resilience key[1] | | Resilience of Calabar pythons |
|---|---|---|---|
| | **High** | **Low** | |
| Distribution | Broad | Narrow | Broad |
| Habitat specificity | Broad | Narrow | Broad |
| Dietary specificity | Generalist | Specialist | Generalist |
| Reproductive output | High | Low | Low |
| Growth rate | High | Low | Low |
| Reproductive rate | High | Low | Medium |
| Time until maturation | Short | Long | Unknown |
| Population size | High | Low | High |
| Population density | High | Low | Low |
| Population connectivity | High | Low | Medium |
| Dispersal ability | Good | Poor | Poor |
| Genetic variability | High | Low | Unknown |

[1]For example, if a species' reproductive output is high then it is more likely to have a high resilience to use than a species that has a low reproductive output.

Small mammals are the main prey of *C. reinhardtii* in Nigeria, where rodents accounted for over 80% of the diet (Luiselli and Akani 1999), and in Gabon (L. Chirio pers. comm. 2012). Young mice are frequently eaten (Luiselli et al. 2002), as the snake usually finds them inside their underground nests. Occasionally, it may feed also on adults and eggs of lizards of the family Scincidae (Luiselli et al. 2002).

Its breeding biology has been studied only in Nigeria, where it appears to be a biennial breeder, with oviposition occurring in the dry season. Each female produces 2-5 (maximum 9) large eggs that hatch during the wet season (Luiselli and Akani 1999, Luiselli et al. 2002).

Nothing is known on its age at maturity, or on its life expectancy.

## Status and threats

### *Status*

This species is listed on CITES Appendix II and has not been evaluated by the IUCN for the Red List of Threatened Species. None of the main exporting countries have special regulations on the species, except local rules and taboos in relation with the species' traditional worship that prevail in some localities (Gorzula et al. 1997; Eniang et al. 2006; Toudonou 2007). However, this species is listed in the Schedule I of the National Endangered Species List of the Federal Republic of Nigeria, Act 11 of 1985. Thus, in theory it is fully protected in that country.

*C. reinhardtii* has a relatively wide range, and is not confined to a single habitat (Figure 2). Thus, it is not apparently under current heavy pressure from humans, although much of the forest habitats of West Africa are severely fragmented and disappearing at a rapid rate.

Unfortunately no longitudinal, long-term demographic data are available for any wild population and information on population size is scarce. Nonetheless, several short-term population studies have been carried out in southern Nigeria (Luiselli et al. 2002). Results from these studies may be used for understanding general demographic traits of these snakes. In Eket (Akwa-Ibom State, Nigeria), Luiselli et al. (2002) studied the species in a plantation-secondary swamp-forest mosaic of 30 ha area between 1998 and 2001, for a total of 159 (non-consecutive) field days and using pitfall traps and removal of cover objects to enhance the probability of capturing these burrowing snakes. Only 16 males and 13 females were captured, with 15 individuals being recaptures. A rough calculation, without use of demographic statistics and assuming no deaths, nor emigrations or immigrations of any individuals over the study period at the study area, indicated an approximate density of 0.9 specimens per ha. Personal unpublished data from shorter-term studies by capture-mark-recapture methodology, also using pitfall traps, cover objects and relying on expert searches for snakes inside burrows at eight additional study sites in southern Nigeria, suggest that the species, although being widespread in the southernmost regions, appears to typically occur at relatively low densities (< 1 ind/ha) (Luiselli, unpublished data). In any case, these results from short-term studies are consistent with the estimates of Luiselli et al. (2002), thus suggesting that an approximate density of about 1 individual per hectare may be realistic. In the course of these studies, the average body length of the captured snakes did not vary remarkably across sites and inter-annually, thus indicating that no obvious decreasing trend in body size has been found in study areas in Nigeria

In Togo, the species is apparently rare, and occurs only in a few hilly forests situated at the border with Ghana (Segniagbeto et al., 2011). Although capture-mark-recapture studies are not available for Togolese populations, randomized surveys in appropriate areas revealed an apparently similar, or even lower, frequency of occurrence as is the case in Nigeria (Segniagbeto and Luiselli, unpublished data).

### *Threats*

In most of its range, the habitat of the Calabar ground python being lost due to agriculture and urbanization. This species, however, is tolerant of some habitat disturbance and can survive in forest-altered areas. The major threat is probably domestic harvesting and trade for the bush-meat and traditional medicine industries. It is also exploited (usually in relatively low numbers, see below) for the international pet trade in parts of its range. In Benin for example, the main threat for the species is the exploitation for pets (see Toudonou et al. 2012). In fact, although harvested in relative low numbers, the apparent low density of its populations makes the sustainability of this level of exploitation a matter of concern at the local level. Besides, the species may also be affected by climate change and more likely by loss of its habitat in favor of agriculture. Probably for this reason the species was listed as Vulnerable (VU) in Benin by Toudonou (2011) and Toudonou et al. (2012).

## Trade characteristics

### *How trade operates*

This species has been exported for the international pet trade since the early 1990s, mainly from Ghana and Togo (Fig. 3). The great majority of specimens recorded in the CITES trade database (2013) are of ‘wild’ origin.

It should be taken into account that in West Africa, the pet trade data of reptiles may be seriously biased, due to illegality. For instance, it is well known that many animals are officially exported from countries different from their country of origin. This may account for the observed differences between the number of traded specimens reported by exporters and data from importers, both in terms of total export/import figures and in sources considered individually, according to the CITES database.

In Benin, the species is exclusively harvested from the wild and specimens are exported as pets mainly to EU countries and to the USA. There is no local use of this species in this country. The trade has identical characteristics in Togo and in Ghana. During studies in Togo (2012-2014), the author surveyed facilities of several reptile dealers and never found any evidence of captive breeding for *Calabaria*. It can therefore be concluded that virtually all traded specimens are wild-caught.

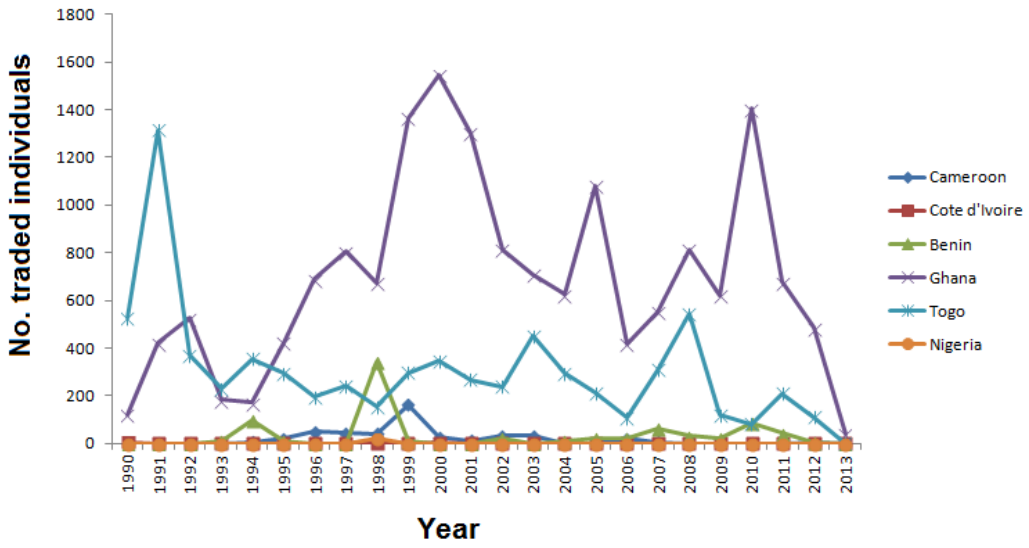


**Fig. 3**. Variation in the yearly number of Calabar ground pythons exported by country, between 1990 and 2013 (Source: CITES Trade Database).

The dynamics of the trade, from the site of capture to exportation, and including also the main characteristics of the pet industries in Togo, Ghana, and Benin, were examined by Ineich (2006). Toudonou (2014 – report on *Python regius*) correctly summarized the whole trade as a succession of actions carried out by eight categories of actors: field collectors, intermediaries, exporters, bushmeat vendors, national regulation authorities (exporting countries), pet breeders, pet shop holders, pet users (in the importing countries), and CITES authorities. For a description of the roles of the various actors, see Toudonou (2014).

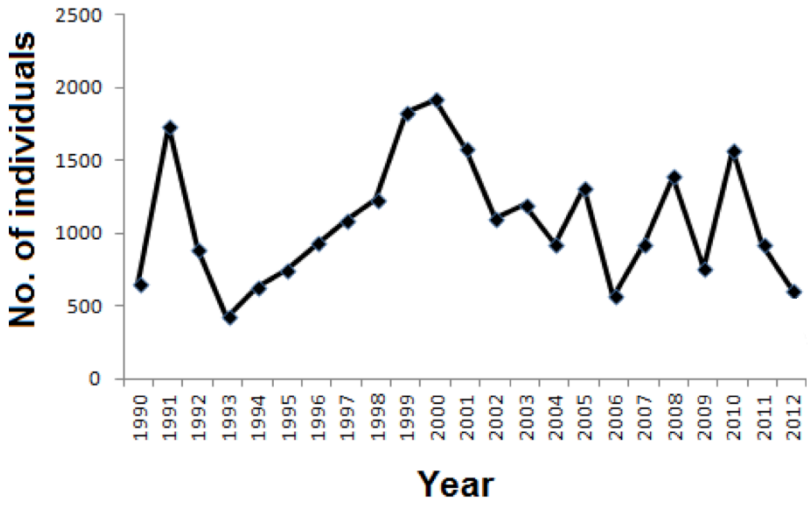


**Fig. 4.** Cumulative number of Calabar ground pythons exported on a yearly basis from Africa.

The CITES trade database reveals that the mean number of exported specimens is fairly low (around 1,040 individuals per year on average in the period 1990-2013, with a maximum

number of about 2,000 specimens and a minimum of less than 50; Fig. 4). In addition, if the export trends of the two most relevant exporting countries (i.e. Ghana and Togo) are specifically analyzed, the following is observed: there was no correlation between year and number of exported individuals in Ghana, whereas the trend over time appears to be declining in Togo (Fig. 5). Overall, the data demonstrate that the trade is not increasing. However, it is not clear whether the apparent declines in Togo exports are the result of a lower demand from the international pet market, or because the wild populations are declining. Furthermore, data from 2013 should be considered preliminary as most CITES parties did not report exports-imports immediately.

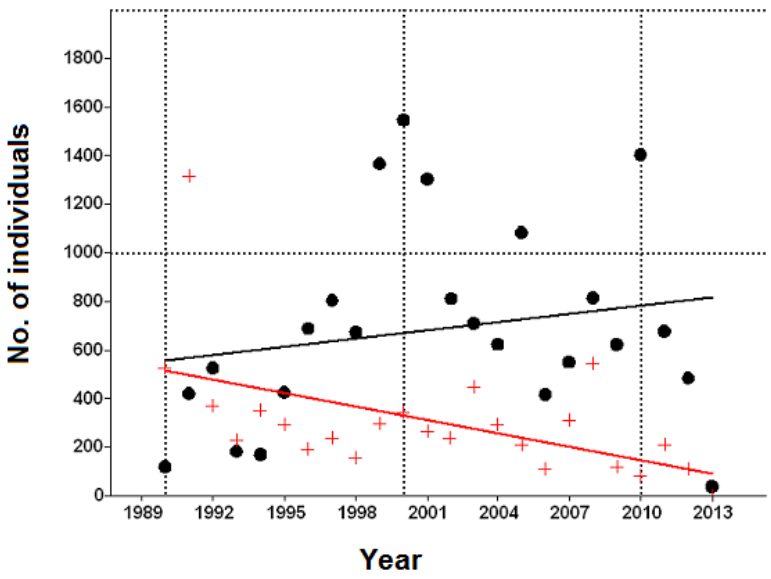


**Fig. 5.** Trend lines for the annual number of exported pythons from Ghana (black dots) and Togo (red crosses).

***Sustainability of the trade***

The list of variables that influence this species' resilience to use and the attributes of Calabar ground pythons are given in Table 1. The country-by-country extent of occurrence (EOO) is presented in Table 2.

**Table 2**. Country-by-country EOO of *Calabaria reinhardtii*, based on Luiselli et al. (2006) estimates of West African countries.

| Country | Estimated range ($km^2$) |
|---|---|
| **Liberia** | 111,369 |
| **Cote d'Ivoire** | 37,123 |
| **Ghana** | 109,000 |
| **Togo** | 5,600 |
| **Benin** | 2,600 |
| **Nigeria** | 184,700 |
| **Cameroon** | 160,000 |
| **Equatorial Guinea** | 28,051 |
| **TOTAL** | **638,443 $km^2$** |

Assuming that about 1 individual per hectare may occur in the majority of habitat types (estimates generated from data reported above for Nigeria), and assuming conservatively that just 20% of the whole territory is the Area of Occupancy (AOO), suitable for these pythons, it

can be concluded that the minimum total population size of this species should be over 12,000,000 individuals. Thus, it is clear that the current annual trade rate (about 1,000 individuals per year) is absolutely negligible compared to the potential overall population size.

## Conclusions

*C. reinhardtii* is mainly a forest-dweller, usually occurring at relatively low density in most of its range. There are (1) no apparent declines reported for any locality throughout the range; (2) there is no evidence of any decreasing trend in average body size of these animals in Nigeria?; (3) the number of traded specimens is relatively low; (4) there is no evidence of any increase in the annual harvest rate for the pet trade; and (5) the true abundance and population densities of these animals can be heavily underestimated because of the subterranean habits of the Calabar ground python. Indeed, it has already been very well established that the apparent abundance of burrowing snakes can be heavily underestimated in forested regions of tropical Africa (e.g., see Akani et al., 2007). Therefore, it may be concluded that the current trade of *C. reinhardtii* is sustainable in the mid and long term, under the present quotas and regulations, with the possible exception of Benin.

## Recommendations

1) To extend breeding of this species to major exporting countries in order to reduce the impact on the wild stocks. In this regard, these snakes require small cages and are easily kept in captivity, so breeding programs should not be very expensive or logistically difficult.

2) To date, nothing is known about the impacts of trade/harvest on wild populations of the species. Thus, it would be desirable to devise sound demographic studies in the sites that are regularly used by hunters for catching these snakes for the pet trade. For instance, the localities of Kpalimé and Badou (south-western Togo) are potentially very useful for such an assessment, as these sites are regularly surveyed for snake harvesting. The results of these assessments would form the basis for non-detriment findings for these species.

3) To promote python ecotourism with the assistance of hunters, collectors and breeders, as well as with worshiper communities.

4) To improve the monitoring system carried out by national regulatory authorities.

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