Review

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Review

Herping the African Continent: Alien Amphibians and Reptiles in the Sub-Saharan Africa

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Simple Summary

Introductions of alien species may cause enormous ecological problems. It is, therefore, important to closely monitor their introduction and subsequent spread. The presented paper comprises an overview of alien amphibians reptiles in sub-Saharan Africa. The current status of these alien species is assessed. Their impact on the indigenous species is relatively low in the mainland, but high in the Mascarenes and other small islands surrounding Madagascar. However, recently their introduction rate have greatly accelerated everywhere mainly due to increased pet trade, so it is important to keep all records regarding their occurrence to prevent further spread.

Abstract

Introduction of species consists today one of the most important problem of nature conservation. Special attention is paid to alien vascular plants and vertebrates. In the Afrotropical Region (sub-Saharan Africa), avian and mammalian introductions have attracted the attention of many researchers and was recently reviewed, but there is a lack of such comprehensive review of alien amphibians and reptiles. The presented paper constitutes an attempt to overview the status, distribution, threats introduced herp species to sub-Saharan Africa since he second half of the 18th century. This review includes 21 amphibian (including 10 established) and 57 reptile (including 19 established) species introduced to sub-Saharan. The introduced amphibians are representatives of Urodela (n=4 spp., none established) and Anura (n=17 species, incl. 10 established). Introduced reptiles species belonged to the following orders: Testudines (n=11 species, incl. 6 established), Sauria (n=32 spp., incl. 29 established), Serpentes (n=13 spp., incl. 2 established) and Crocolylia (1 sp. not established). Most species introduced to sub-Saharan Africa which subsequently developed viable populations originated from the Afrotropical (35%), Malagasy (27%) and Oriental (27%) regions. However, the proportions of introduced species which failed to establish viable populations were quite different: Nearctics (25%), Afrotropics (22%), and Neotropics (17%); Malagasy 11%, Oriental Region only 6%. First introduction of alien herp species, i.e. *Gehyra mutilate* and *Ptachadena mascareniensis*, in Africa took place in 18th century. By the end of 19th century, four other species have been introduced and in the two last decades of that century – 5 species. Similarly, in 20th century, most introduction were made in the last two decades, when an exponential growth of introduction begun and lasts till present. This growth has been caused by an increase in international trade and herp pet industry, especially in South Africa. Stowaway and pet trade are the most common pathways of introductions. Few factors determine the successful establishment of introduced alien herp species in sub-Saharan Africa, viz.: the behavioural and morphological traits, propagula pressure, climate and habitat overlap, and presence of potentially competing species. The impact of alien herps in sub-Saharan Africa on the local biodiversity is not well-investigated. Negative effects have been, however, evidenced for species such as *Sclerophrys gutturalis, Agama agama, Hemidactylus frenatus, Trachemys scripta* (competition); *Xenopus laevis, Sclerophrys gutturalis, Rhinella marina, Lycodon aulica* (predation); *Xenopus laevis, Python sabae* (hybridization); *Xenopus laevis, Palea steindachneri* (diseases and parasites). In comparison with other continents (Europe and North America) the number of introduced and established herp species in sub-Saharan Africa is relatively low, possibly because the Afrotropical region is saturated with herps which can potentially compete and prey on the alien species, preventing their successful establishment. Madagascar, the Mascarenes and other small islands in the Malagasy Region have the highest number of introduced herp species in sub-Saharan Africa. However these numbers are still much lower than those recorded for instance in the Greater Caribbean, probably for the same reasons as in the mainland.

Keywords: nature conservation; wildlife management; invasive species; introductions; island biogeography

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1. Introduction

In recent years, one of the most important problem in nature conservation is the introduction of alien species, especially those than subsequently become invasive and expanding. Their negative impacts on local biodiversity are well documented throughout the world. These include competitive exclusion, dislocation, increased predation rate, spread of alien parasites and diseases, hybridization and others (Davis 2009). Also people health and economy can be negatively affected by invasive species (e.g. Lever 2003, Mwebaze et al. 2009, Russell et al. 2017). Preventing the introduction or invasion is the best management tool. Combating and eradicating invasive species pose often enormous difficulties to local nature conservation and government authorities. Early detection of such introduction or invasion stage remain often effective tool in the fight if the response is rapid. Species with high risk and well established, or medium risk with high potential for expansion should be a management priority to prevent further expansion into new areas within the region. However early warning and adequate management is based on the knowledge, especially that derived from regular monitoring programs (Picker & Griffith 2017).

In regard to introduced animals, vertebrates attracted the highest attention of researchers, due to their larger size, visibility and effect on local biodiversity. Therefore also the group is more intensively studied than animals. These studies are, however, not equally intense in the world. While in Europe (Kark et al. 2009), and North America (Meshake et al. 2022), the introduced vertebrates are closely monitored, in most tropical countries they often pass unnoticed. This remain true especially in regard to small species, such as frogs and lizards. In recent decades, amphibians and reptiles become popular as pets, which can easily escape from terraria into wild nature, and may subsequently survive, reproduce, develop viable population, expand, and become invasive species.

In sub-Saharan Africa, introduced birds and mammals have been subjects of recent review (Kopij 2025a, 2025b), whereas the introduction of alien amphibians and reptiles have been closely monitored only in South Africa (van Wilgen 2008, Measey et al. 2017), Madagascar, Seychelles and Mascarenes (Vinson & Vinson 1969; Owadally & Lamb 1988; Cheke & Hume 2008; Griffith et al. 2013). In most other countries, this issue remains neglected. However, the invasion of alien amphibians and reptiles has significantly accelerated in the end of 20th century (Kraus 2009; Capinha et al. 2017) and there is an urgent need to overview of the status of these animals in the whole Afrotropical Region. This is a purpose of the presented work. Specifically it 1) reports on all known cases of introduced amphibians and reptiles; 2) assesses their current invasive status; 3) evaluates their impact on the local biodiversity; and 4) outlines directions for management of the alien species in all African countries, south of Sahara.

2. Materials and Methods

All amphibian and reptile species ever introduced to Africa and its islands are objects of this review. Detailed accounts are provided for species that have developed viable populations.

The literature on amphibian and reptile introductions in Africa south of the Sahara was reviewed from 1950 to present. Islands geographically belonging to Africa were also included in this review, i.e., Cape Verde; São Tome and Principe, Bioko and Annobón of the Equatorial Guinea; Madagascar

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with small oceanic islands around, as Mascarenes (Mauritius, Reunion, Rodrigues and others), Seychelles, Comoros; Mafia, Zanzibar, Pemba off Tanzania; Socotra in the Gulf of Aden.

To search the relevant literature, the Google Scholar bibliographic database (scholar.google.com) was used. The following keywords were applied: introduced mammals (or alien amphibians/reptiles) + Africa (or particular African country or specific island). The particular amphibian/reptile species (both common and scientific names) has also been used as a keyword+ Africa (or the particular African country or specific island), e.g., Emys orbicularis + Africa, common slider + Namibia, etc. To investigate the impact of an alien amphibians and reptiles on local fauna, the following keywords have been applied: extinct (or threatened or endangered) + mammal (or bird or reptile, or amphibian, or fish) + Africa (or the particular African country or the particular African island). Special websites dealing with introduced amphibian/reptile mammal species were also consulted through direct searches on the internet.

The nomenclature and systematics of reptiles follow Mitgraard (2025), while amphibians follow ANMH (2025). The conservation status of each species has been assessed according to the IUCN Red List of Threatened Species.

Four categories/levels of the introduction are used in this work:

1. introduced, but has not developed viable population;
2. introduced and has developed viable population (usually with very restricted range);
3. introduced and developed viable population, but then after declined and finally became extinct;
4. introduced, developed viable population and is stable or expanding and may be invasive.

Main features of an invasive alien taxon are establishment of self-sustaining populations and their significant effect on native ecosystems. Species which occupy their original range are called native or indigenous. Those which were brought by human to other places are alien or introduced. Three types of introduction/invasion are distinguished according to the geographical location/distance: transoceanic, continental and local (translocation). If introduction is initiated by escape from terrarium, it is usually unintentional. In that case, the dates of release are not well-known. Introduction can be intentional and unintentional. Introduced species become invasive if it is spreading rapidly and affect negatively indigenous species. If introduced species does not spread and establish only small local population, not affecting native species, is regarded as not invasive. Established species reproduce itself and establish viable population. Depending when a species was introduced the following types of introduction can be distinguished: ancient (before 1800), historical (after 1800) and recent (last 25 years).

The following terms are used to determine to way of introduction of particular species to a new area/range, based on Picker & Griffith (2017).

1. not intentional (homoinscience) translocation; transportation of habitat or nursery materials, as accidentally transported contaminants of the horticultural trade, within consignments of wood, in construction materials, e.g. by stowaway, airplanes, camping vehicle (Douglas 1990);
2. intentional (homoscience) translocation; e.g. by intentional release from a terrarium (Douglas 1990);
3. relocation; done within the species range;
4. repatriation: natural return to the abandoned areas of the former occurrence;
5. reintroduction: return to the natural range with the help of human.

After careful consideration, if a species occurrence has been proofed as a result of repatriation and reintroductions, it is excluded from the presented review, as being actually not introduced or alien species.

3. The Introduced Species

3.1. Species which have Developed Viable Populations and Expanding/Invasive

3.1.1. African Clawed Frog Xenopus laevis

It is endemic to South Africa, but invasive in North America, South America, Asia and Europe (Measey et al. 2012). African clawed frogs are bred for pregnancy testing of people, as laboratory organisms, and as pets. In South Africa, it has expanded its range by occupying artificial impoundments, and as a bait used by fishermen (Measey et al. 2017). As these animals appear to be commercially available, it is likely that small numbers are moved by fishermen. Additionally, fishermen are known to seed dams with *X. laevis* in order to produce a local supply of live bait. Each of these practices is likely to propel propagules of *X. laevis* into new water bodies through jump dispersal. This is not to say that these animals cannot reach isolated water bodies through their own diffusion-based dispersal (Measey et a. 2017).

3.1.2. Guttural Toad Sclerophrys gutturalis

The only southern African invasive population of guttural toad is known from a peri-urban area in Cape Town (Constantia since 2000, and Bishopscourt since 2015). The spread of toads is thought to be mainly through leading-edge dispersal, but two confirmed instances of jump dispersal are known. A eradication scheme was passed to remove the species. From 2010 to 2015 more than 5000 post-metamorphic toads and thousands of eggs and tadpoles were removed. Despite this the species is still expanding around Cape Town. The Guttural Toad was intentionally introduced (probably from Durban area) to Mauritius and from there to Reunion in the 1920s as a biological control for mosquitoes (Telford et al. 2019).

3.1.3. Cane Toad Rhinella marina

Neotropical species. Introduced to Mauritius for pest control in 1936-1938. Introduced to many other parts in the world: to Hawaii in 1932 for pest control in sugarcane; to Queensland (Australia) in 1935 from Hawaii, to control pests in sugarcane fields; to Caribbean islands like Barbados and Martinique in early 1840s to control rats and beetles; to Jamaica in 1844 to reduce the rat population; to Puerto Rico in the early 20th century to counter beetles ravaging sugarcane plantations. Introduced populations are in Florida (USA), Papua New Guinea, the Philippines, the Ogasawara, Ishigaki Island and the Daitō Islands of Japan, Taiwan Nantou Caotun, most Caribbean islands, Fiji. It has become a pest in many host countries (especially in Australia), and poses a serious threat to native animals (Shine 2012; Shine et al. 2021).

3.1.4. Common Slider Trachemys scripta

Introduced to south Africa, Kenya and Seychelles Mauritius and Reunion. Scarce, restricted, and not expanding in Africa, including South Africa. Globally it is, however, very widespread and expanding alien species (Reshetnikov et al. 2023). Widespread and common especially in Europe and SE Asia (reported in 68 Eurasian countries). Recorded also in Australia, New Zealand, Middle East, Canaries Isl. Azores Isl., Hawaii, and several other Pacific islands (Reshetnikov et al. 2023; Ficetola et al. 2012).

3.1.5. Brahminy Blind Snake Indotyphlop braminus

The Brahminy Blind Sanke or Flowerpot Snake originates from southeast Asia, but has become invasive all over the world and is, after the Red-eared Slider, the world's most widely-distributed reptile (Kraus 2009). This was one of the first snake species recorded from South Africa (in 1838), and only recognised as an invasive in 1978. Since that time, new populations have been found at the coast in Durban (Brooke et al. 1986), and inland in the Western Cape. It is noteworthy that this species reproduces parthenogenetically, and so easily establishes new populations on introduction. The impact of these small thread snakes has not been assessed anywhere (Nussbaum1980).

3.1.6. Indian Wolf Snake Lycodon aulicus capucinus

Non-venomous snake native to SE Asia, i.e. Pakistan, India, Sri Lanka, Indochina, Malay Peninsula, Java, Philippines, Timor. One of the most common snake species in India. In Africa, it has been introduced in Mascarenes (Reunion before 1864, and Mauritius before 1888; Vogel et al. 2021) and Cape Town. Beyond Africa, it was introduced to Hong Kong and the neighbouring Guishan Island of Guangdong Province of China (Yang & Yeung 2024), Christmas Island (Indian Ocean) since 1987 (Smith 1988); probably also introduced to other islands in the ocean: Andaman, Nicobar and Maldives.

3.1.7. Common Agama Agama agama

In Africa introduced in 1998 to Comoros Isl., to Cape Verde Islands in 2006 (Vasconcelos et al. 2004) and Antananarivo (Madagascar) in 2004 (Wagner et al. 2009). Introduced also (released as a pet) to Florida (USA) in the 1970's, where it become a very common species (Enge et al. 2004); and to Malta in 1979 (Schembri & Schembri 1984).

3.1.8. Green Tree Lizard Calotes versicolor

The green tree lizard or oriental garden lizard is an Indo-Malayan species (India, Sri Lanka, Nepal, Bangladesh, Pakistan, southern China, Thailand, Malaysia and Indonesia). In Africa it has been introduced to Reunion, Rodrigues Isl., Seychelles (Matyot 2004) and recently in SW coast of Kenya. Introduced also in other parts of the world: France, Belgium, Florida (USA), NE Egypt, Oman, SW Australia, Brunei, Celebes, Singapore, and other islands in Indo-Pacific (Das et al. 2008).

3.1.9. West Madagascan Clawless Gecko Ebenavia boettgeri

It is native to Madagascar. It has been introduced to Mauritius, Comoros archipelago (including the French territory of Mayotte) and Pemba Island (Tanzania) (Vences et al. 2004).

3.1.10. Common Mourning Gecko Lepidodactylus lugubris

This species is a day gecko, which like the Tropical House Gecko is native to the north-eastern areas of South Africa but it's commensal habits have led to it invading many urban areas of the country, such that it has been described as South Africa's most successful invasive reptile. The earliest records date to around 1956 in Port Elizabeth, although other introductions may have been earlier (Rebelo et al. 2019). Expansions in peri-urban areas of Port Elizabeth and Bloemfontein have been rapid, while that in Cape Town has been comparatively slow. As no other day geckos are native to the invaded areas, there is unlikely to be any intra-guild competition. The common dwarf gecko is not known to be invasive elsewhere in the world, although it is a likely candidate, and its impact has not been assessed.

3.1.11. Moorish Wall Gecko Tarentola mauritanica

Native to Mediterranean Region. There is an isolated introduced population in southern Western Sahara and Bulgaria (Jablonski et al. 2021) and to the Levant and Port-Cros Islands (Hyères Archipelago, Var department, France (Deso et al. 2020), and Rhodes (Greece) (Stachinis et al. 2025). The adoption of this species as a pet has also led to populations becoming established in Florida (USA), Mexico and Argentina.

3.1.12. Common Four-toed Gecko Gehyra mutilata

Oriental species. In Africa, it has been introduced (released as a pet) to Mascarene Islands and Seychelles. Also introduced to Sri Lanka, Indochina, S California (USA), W Mexico, French Polynesia and probably many other Indo-Pacific small oceanic islands (including Hawaii).

3.1.13. Day Geckos Phelsuma spp.

The genus *Phelsuma* is represented by over 70 species of diurnal and arboreal geckos. Most have vibrant green, blue, red, or orange coloration attractively coloured. They are indigenous to Madagascar and other surrounding islands (Glaw & Rösler 2015). Day Geckos (and most of the other small diurnal geckos) were imported in some numbers in the 1980s and early 1990s when Madagascar allowed for the exporting large numbers of its herptile species. Luckily, there has been a dedicated group of gecko breeders who have specialized in these beautiful lizards since these early times, and captive-hatched specimens are available at larger reptile shows, pet stores, and online (Van Wilgen et al. 2008).

Out of four *Phelsuma* species living in Seychelles, two are endemic (*P. sunbergi* and *P. astriata*) and two other are introduced (*P. laticauda* and *P. abbotti*) (Gardner 1988). Other *Phelsuma* species introduced in sub-Saharan Africa include:

- *Phelsuma borbonica agalegae* from Mauritius has been probably introduced recently to Reunion.
- *Phelsuma cepediana* from Mauritius has been probably introduced to Rodriguez.
- *Phelsuma grandis* (Madagascar giant day gecko) from N Madagascar has been introduced to Reunion and Mauritus and also to Florida and Hawaii.
- *Phelsuma dubia* from W and N Madagascar has been probably introduced in the four major Comoro islands, Zanzibar Island, Mozambique Island (Mozambique), and small coastal areas of Tanzania and Kenya.
- *Phelsuma laticauda laticauda* has been introduced or presumably introduced to the Comoro islands Mayotte and Anjouan, the southern Seychelles Islands, Farquhar, Cerf, and Providence, the Mascarene Island, Réunion and Mauritius, French Polynesia, Florida.

3.1.14. House Geckos Hemidactylus spp.

The genus *Hemidactylus* has 194 described species (Reptile Database) distributed in the tropical regions of the Old World. Five invasive *Hemidactylus* species have global distributions: *H. mabouia, H. brookii, H. frenatus, H. garnotii and H. turcicus* (Vences et al. 2004).

- *H. mabouia.* Native to Central and East Africa, extending south into the northeast of South Africa. Populations of *H. mabouia* species have invaded West Africa, Reunion and Mauritius in the mid-1990s and to Florida (USA) and Hawaii, the Caribbean, South America and Florida. Invasions have resulted in displacement of native geckos in Florida and Curaçao (Meshake et al. 2022).
- *H. frenatus.* Native to Southeast Asia, spread via ships and cargo; introduced to Hawaii, Australia, the Americas, and islands globally.
- *H. turcicus.* From the Mediterranean. Introduced to many parts of the world, with similar urban settings.
- *H. granotii*. Indo-Pacific species. Introduced to Seychelles, New Zealand, Hawaii, Fiji, the Bahamas, Costa Rica, Guatemala, Colombia, and tropical United States (Hawaii, Florida, Georgia, Texas and California).
- *H. brooki*. The geographical range of this species remains controversial and depends on the definition of. Traditionally regarded as native to sub-Saharan Africa. Introduced to small islands in the Malagasy Region.

3.2. Species which have Developed Viable Population but are not Expanding/invasive

3.2.1. Frogs

The painted reed frog *Hyperolius marmoratus* from SE Africa was introduced to Villiersdorp, Western Cape in 1997 and in Cape Town in 2004, by using a combination of human-mediated jump dispersal and artificial impoundments (Davies et al. 2013). The permanence of the dams mitigated the climatic barriers that prevented expansion of this species into drier and more unstable habitats (Davies et al. 2019). In a similar wat, the tinker reed frog *Hyperolius tuberilinguis*, also from SE Africa was introduced to Cape Town and Bloemfontein.

Only one Anuran species from the family Bufonidae, the Asian common toad *Duttaphrynus melanostictus,* has been introduced (via stowaway, with a consignment of furniture) in 2013 from the SE Asia Region to Tokai and Belville in the Western Cape, South Africa, and to Cape Twon; and in 2011 via shipping containers to Tomasina (Madagascar), where in 2014 it occupied c. 100km². The Mascarene grass frog *Ptychadena mascareniensis* has been introduced from Madagascar to Reunion as early as before 1790 and to Seychelles in the 2010's. Three other anuran species, the African red toad *Schismaderma carens,* grey foam-nest tree frog *Chiromantis xerampelina* and African bull frog *Pyxicephalus adspersus* were transported from SE Africa to various parts of Western Cape. These species have been transported via stowaway.

3.2.2. Tortoises

Four highly threatened species were introduced to Mascarenes.

Wattle-necked softshell turtle *Palea steindachneri* is critically endangered. It lives in China, Vietnam and Laos. In 1990's introduced (released in wild as a pet) to Mauritius, Reunion and Hawaii. Ephemeral release in N Germany. The radiated tortoise *Austrochelys radiata*, native to Madagascar, is critically endangered, introduced to Mauritius (Rodrigues, Round Island), and Reunion. The Northern Madagascar Spur Tortoise *Austrochelys yniphora* is the largest and rarest tortoise species in Madagascar, critically endangered (c. 450 ind.). It is endemic to dry forests in the Baly Bay area, NW Madagascar (Castellano et al. 2013). In terraria, 80 individuals are kept in Thailand and 116 individuals in China (Smith 1999, Walker 2022). The Sunda soft-shell turtle *Amyda cartilaginea* is Indo-Malayan vulnerable species. It has been introduced to Mauritius in 1980's. It was introduced also to Yunnan (China), Lesser Sunda Islands, Celebes, Moluccas, S Iraq on Persian Gulf.

3.2.3. Chameleons

There are six African chameleon species which have been translocated to other part of Africa Green Giant Chameleon *Columna parsonii* is the largest of chameleon species, kept in terraria throughout the world. The panther chameleon *Furcifer pardalis,* Cape dwarf chameleon *Bradypodion pumilum,* green giant chameleon *Calumna parsonii,* flap-necked chameleon *Chamaeleo quilensis,* dwarf chameleon *Bradypodion spp.* They are, however, not expanding (Mascarenes), or even become extinct (South Africa). From 1977 to 2001, 66 importing countries and 70 exporting countries were recorded as being involved in the chameleon trade; in Africa, mostly Madagascar, Togo, Tanzania and Kenya (Carpenter 2004).

3.2.4. Skinks

Although the family Scincidae is the most speciose reptile family, only one species, the Bouton's snake-eyed skink *Cryptoblepharus boutoni* has been introduced in sub-Saharan Africa.

3.2.5. Geckos

On the other hand, the Gekkonidae, also very speciose reptile family, are more often introduced. Three gecko species: Cape dwarf gecko *Lygodactylus capensis,* Bibron's gecko *Pachydactylus bibronii* and marbled leaf-toed gecko *Afrogecko porphyreus* were unintentionally translocated from one part of Africa to another, and the Farquhar half-toed gecko *Hemidactylus mercatorius* was introduced from Madagascar to Reunion probably through stowaway. Only one species, the Indo-Pacific slender gecko *Hemiphylodactylus typus* was introduced (through stowaway) from other region of the world (SE Asia) to islands around Madagascar

3.3. Species which Failed to Develop Viable Populations

There is a global trend for the importing and keeping of alien pets, especially reptiles, which may result is the subsequent release/escape of some of these animals into the wild (Stringham and Lockwood 2018). Many of amphibian and reptile pet species kept in Africa could have escaped or intentionally released to the wild. Since they have failed to develop viable populations, and subsequently disappeared/become extinct, they have passed unrecorded. However, there has been an exponential increase in imports from an increasing number of originating countries (van Wilgen 2008, van Wilgen et al. 2008).

In a few countries the introduction events were more closely monitored, e.g. in South Africa, a total of 275 species of alien reptiles and 14 amphibians have been reported so far. Only two snake species, the olive snake *Lamprophis inornatus* and brown house snake *Lamprophis fuliginosus* were recently introduced to Africa. It is, however, not confirmed whether they have developed viable population in the areas of introduction (South Africa). Most introduced reptiles and amphibians were recorded in four provinces KwaZulu-Natal (n=112), Western Cape (104 spp.), and Eastern Cape (65 spp.) and Gaunteng (n=?). Most popular pet species in this country are snakes (n=167 spp.) and lizards (n=77 spp.) (van Wilgen 2008).

With the advent of a greater level of awareness, we are only now discovering and noticing translocated reptiles. The proper documentation of this information is important in order to avoid not substantiated conclusions. With increase of human and trade mobility, it is becoming even more important to keep the records so that it will be known when a species has been introduced, and subsequently established and invasive.

Table 1. Family belonging of alien amphibians and reptiles recorded in sub-Saharan Africa. The percentage of the total refers to the world number of particular taxa, while the percentage of established and not established species refers to the total number of amphibians or reptiles establisher or not established in sub-Saharan Africa. %ap – percentage of the total number of all alien amphibian species, %ap – percentage of total number of all alien reptile species, %w – percentage of total number of all amphibian or reptile species in the world.

Taxa	In the world	Established		Not establ.		Total	
	n	n	%ar	n	%ar	**n**	%w
AMPHIBIA	**8973**	**10**	**26.32**	**11**	**57.89**	**21**	**0.23**
Caudata	836	0	0.00	4	21.05	4	0.48
Salamandridae	147	0	0.00	3	15.79	3	2.04
Ambystomatidae	32	0	0.00	1	5.26	1	3.13
Anura	7 917	10	26.32	7	36.84	17	0.14
Pipidae	41	1	2.63	0	0.00	1	0.01
Bufonidae	666	4	10.53	0	0.00	4	0.03
Rhacophoridae	462	1	2.63	0	0.00	1	0.01
Hyperoliidae	236	2	5.26	0	0.00	2	0.02
Ptychadenidae	63	1	2.63	0	0.00	1	0.01
Pyxicephalidae	91	1	2.63	0	0.00	1	0.01
Ceratophryidae	12	0	0.00	1	5.26	1	0.01
Microhylidae	764	0	0.00	1	5.26	1	0.01
Hylidae	762	0	0.00	2	10.53	2	0.02
Dendrobatidae	213	0	0.00	3	15.79	3	0.02
REPTILIA	**12502**	**38**	**100.00**	**19**	**100.00**	**57**	**0.46**
Testudines	366	6	14.63	5	13.89	11	0.09
Emyidae	58	0	0.00	1	2.78	1	0.01
Testudinidae	47	3	7.32	2	5.56	5	0.04
Chelydridae	5	0	0.00	1	2.78	1	0.01
Trionychidae	36	3	7.32	0	0.00	3	0.02
Pelomedusidae	27	0	0.00	1	2.78	1	0.01
Sauria	7905	29	70.73	3	8.33	32	0.26

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Agamidae	604	1	2.44	1	2.78	1	0.01
Chamaeleonidae	234	6	14.63	0	0.00	6	0.05
Iguanidae	45	0	0.00	1	2.78	1	0.01
Gekkonidae	1713	22	53.66	0	0.00	22	0.18
Scincidae	1793	0	0.00	1	2.78	1	0.01
Serpentes	4203	2	4.88	11	30.56	13	0.10
Pythonidae	40	0	0.00	1	2.78	1	0.01
Colubridae	2167	1	2.44	7	19.44	7	0.06
Lamprophiidae	93	0	0.00	2	5.56	2	0.02
Viperidae	406	0	0.00	1	2.78	1	0.01
Typhlopidae	425	1	2.44	0	0.00	1	0.01
Crocodylia	27	0	0.00	1	2.78	1	0.01
Crocodylidae	17	0	0.00	1	2.78	1	0.01
Total	**21475**	**41**	**100.00**	**36**	**100.00**	**77**	**0.62**

The number of amphibian species in the world are according to 'AmphibiaWeb' (Uetz & Hellermann 2025). https://amphibiaweb.org. Accessed 15 December 2025.

The number of reptile species in the world are according to 'The Reptile database'. 2025. https://reptile-database.reptarium.cz/ contactus. Accessed 15 December 2025.

4. Places of Introductions

Most alien amphibian and reptile species were introduced to South Africa (n=57), mostly to Cape Town, Durban and Witwatersrand areas; and small islands around Madagascar (Malagasy Region), such as Reunion (n=19), Mauritius (n=17), Rodriguez (n=8) and Comoros (n=5). Five alien species were recorded so far in Kenya and 4 species in Tanzania. In other countries only 1-2 species were recorded to date. It is important to point out that this distribution of introduced species reflect both the importance of these areas for the introduction of alien species, as well as the level of reporting alien species. Certainly in many African countries, especially those having large seas ports, most introductions/releases pass unrecorded/unrecorded. This may, however, not apply to established alien species. It can be, therefore concluded that most established alien species occur in the small islands in the Malagasy Region, especially in Reunion and Mauritius. This remains true also in regard to alien bird (Kopij 2025a) and mammals (Kopij 2025b).

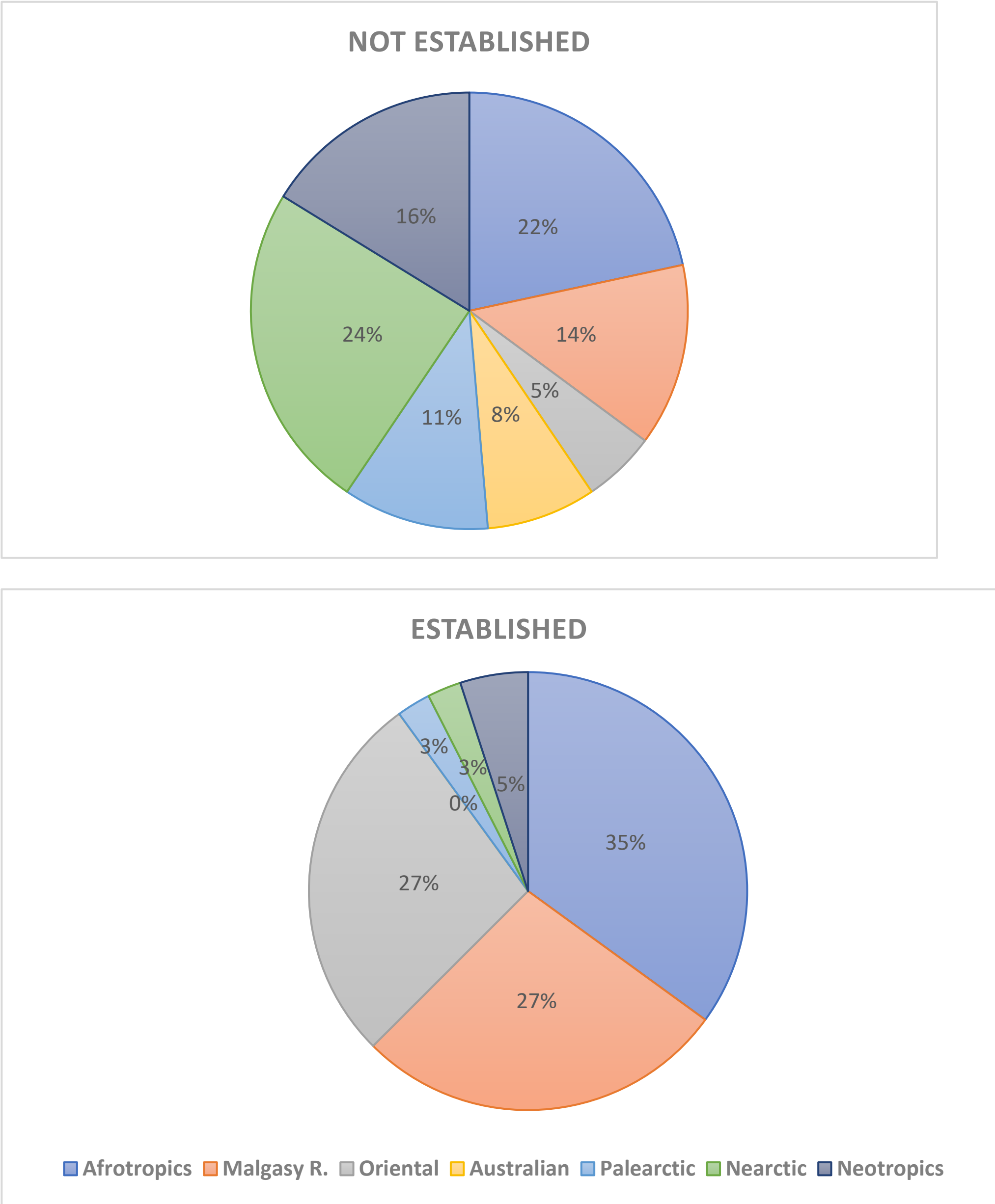

Figure 1. Original zoogeographical regions of amphibian and reptile species introduced to sub-Saharan.

5. Timing of Introduction

Most introductions of small reptile and amphibian species are in Africa non-intentional, except for species used as pets (e.g., *Phelsuma grandis*). Consequently, alien reptiles are often detected several years after their introduction (Cheke 1987; Deso et al. 2020) and their exact origins remain uncertain (Vogel et al. 2021).

First introduction of alien herp species, i.e. the common four-clawed gecko *Gehyra mutilate* and Mascarene green frog *Ptachadena mascareniensis*, in Africa took place in 18th century. Like with birds and mammals (Kopij 2025a, 2025b), these were introduced from SE Asia (Indo-Malayan Region) to the Mascarenes. To the end of 19th century, four other species have been introduced and in the two last decades of that century – 5 species (this sudden increase was probably caused by a scheme of intentional introduction carried out by colonial authorities). Similarly, in 20th century, most introduction were made in the last two decades, when an exponential growth of introduction begun and last till present. This growth has been caused by an increase in international trade and herp pet industry, especially in south Africa.

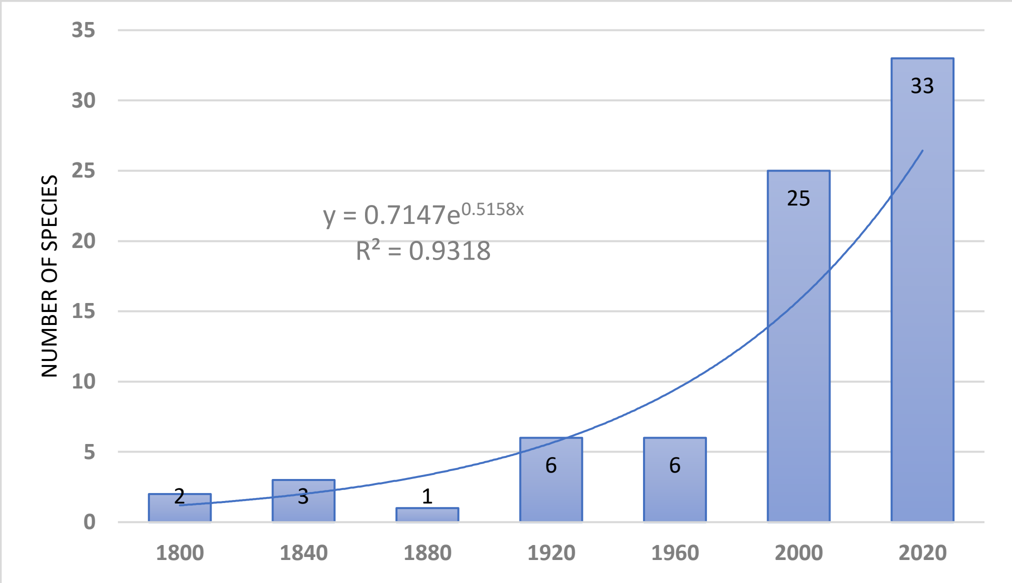

Figure 2. Known years of introductions of amphibians and reptiles to sub-Saharan Africa.

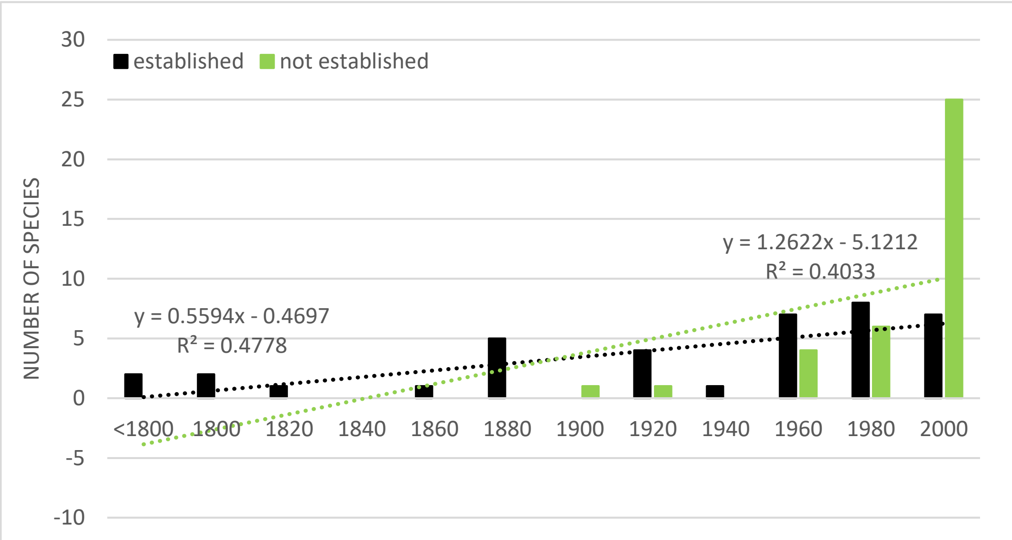

Figure 3. Known years of successful (n = 38) and unsuccessful introductions (n = 37) of amphibians and reptiles to sub-Saharan Africa.

6. Pathways of Introduction

6.1. Stowaways

It is clear that most reptile and amphibian individuals were introduced unintentionally. Geckos, tree frogs and reed frogs have a particular properties for being translocated. They are capable of moving large distances on vehicles unintentionally. Historical records suggest that this has very often been the case in southern Africa as there is an anecdotal record of introductions occurring, albeit at a low frequency, over a long period. However, most of these accidental introductions involves single individuals (no propagule pressure), so that invasion never occurred.

Examples of some southern African frogs that have been moved out of their range include (a) the foam-nest tree frog which was associated with bananas and other fruits; (b) the red toad which was regularly transported in luggage. The foam-nest tree frog is capable of surviving long trips, but would not be likely to start invasive populations unless propagule pressure to a suitable breeding site was increased. Introductions of these, and other species of tree frogs and reed frogs, will likely increase as trade increases. Adults of the red toad are common in peri-urban areas and have a propensity to climb inside shoes and suitcases and are subsequently carried to new areas. Toads (and presumably other anurans tolerant of desiccation or high salinity) are capable of surviving ocean crossings inside containers. The Asian common toad *Duttaphrynus melanostictus* arrived to South Africa in this way, as it arrived to other countries (Kolby et al. 2014a; Mecke 2014).

The introduction of *Lygodactylus capensis* to Cape Town is thought to have originated with the establishment of a population in a nursery. Hitch-hiking and stowaways as adults and eggs are likely to be the pathway of these invasions (Rebelo et al. 2019).

6.2. Pet Trade

The capture of reptile and amphibian species for the pet trade is regarded as the second largest threat to these species (Böhm et al. 2013). Mainland Africa supports more than 571 snake species (Uetz 2016). Between 2013 and 2017, a total of 2.269 wild snakes represented by 42 species from 15 African countries have been advertised in internet for sale. Three main hubs for the trade are located in Tanzania, Togo, Egypt and Madagascar (Jansen et al. 2018; Andreone et al. 2021).

Today it is illegal to import alien reptile and amphibians to South Africa, but since the 1980s, shipments of amphibians have been sent there for the pet trade. Over 300 reptile and amphibian specie have been imported to South Africa as pets (van Wilgen et al. 2008). These animals were quickly disseminated throughout the country, in both the pet and scientific trade, resulting in occasional introductions into the wild. Fortunately, almost all these released animals did not established viable populations. Although it is illegal to import alien reptiles and amphibians, it does not necessary mean that the pet trade no longer takes place in the country.

6.3. Leading-edge (jump) Dispersal

Some species of African amphibians are prone to being moved large distances, e.g. the guttural toad and painted reed frog. In south Africa, invasive amphibians the use artificial water bodies, such as impoundments or garden ponds, as a resource that facilitates reproduction and dispersal through steppingstone movement.

In the case of the painted reed frog both human-mediated jump dispersal and diffusion-based leading-edge dispersal play a role in the range expansion. This species jump dispersal into new localities is mainly due to accidental translocation in nursery plants and aquatic plants. It is, however, also able to travel long distances over land and this may contribute to the leading-edge dispersal between water bodies.

The African clawed frog has expanded its natural distribution in southern Africa through colonization of farm dams, irrigation channels and other artificial water bodies also through a leading-edge dispersal (e.g. Measey 2016).

6.4. Cultivation Dispersal

The axolotl was bred successfully in some laboratories and then traded throughout the world as a pet since about 1864 (Reiß 2015). It can be called as cultivation dispersal, as almost all traded animals originate from six animals imported to Paris in 1864 (Reiß et al. 2015).

Table 2. Pathways of introduction of alien amphibians and reptiles in sub-Saharan Africa. Explanations: est. – established, not est. – not established.

Way of introduction	Amphibians		Reptiles		Total	
	est.	not est.	est.	not est.	est.	not est.
Pet released	0	12	5	18	5	30
Unintentional translocation	1	2	3	6	4	8
Intentional translocation	0	0	1	1	1	1
Stowaway	0	3	18	3	18	6
Biological control	2	0	0	0	2	0
Unknown	0	0	2	0	2	0

Total	3	17	29	28	32	45

7. Factors Determining Introduction Success

7.1. Behavioural and Morphological traits

Species that are easy to breed and handle or are large, colourful or patterned are preferred as pets. The most common alien snake in South Africa is therefore the corn snake. It is probably because it has conspicuous colouration, which attract attention of pet breeders. Similarly conspicuous coloration of geckos from the genus *Phelsuma* attract attention of herp breeders. In consequence, there is a higher likelihood of unintentional or intentional release of these animals in the wild

7.2. Propagule Pressure

Propagule pressure (the number of introduced individuals) is an important factor determining an establishment of alien reptile and amphibian species. It can be the main reason why most escapee from terraria cannot develop viable populations (van Wilgen 2008). For instatnce, up to 2011, only one alien reptile species recorded in South Africa: Brahminy blind snake has established viable population (Picker & Griffiths 2017).

7.3. Climate and Habitat Overlap

If climate (rainfall and temperature averages, minima and maxima) and habitat are unsuitable, a species will not establish viable population, regardless of propagule pressure. The climate in western and central Africa is suitable for establishment of the green iguana, but the climate in southern Africa is not suitable for establishment of this species (van Wilgen 2008). The painted reed frog exhibits a high desiccation resistance and plasticity of thermal tolerance, which may enable to establish viable population in drier and thermally less stable habitats, such as these in the Western Cape in South Africa (Davies et al. 2015).

7.4. Presence of Potentially Competing Species

On islands, invasions take place 110 times more frequently and with a higher probability of viable populations establishment than in the mainland (Kraus 2003). According to Case & Bolger (1991a, 1991b) on islands, reptile communities with a high number of species are more resistant to invasion by exotic reptile species than communities with fewer reptile species; predation and competition probably set there barriers on the distribution, colonization and abundance. For example, the Cape Verde Islands are relatively poor in reptile species diversity (Carranza et al. 2001; Jesus et al. 2002), so the introduction of two house gecko species (*Hemidactylus angulatus* and *H. mabouia*; Jesus et al. 2001) caused a decline of the indigenous Cape Verde Leaf-toed Gecko *Hemidactylus bouvieri* (Vasconcelos et al. 2009; Pinho et al. 2023). On the other hand in the mainland South Africa, out of 571 alien animal species recorded, only one herp species, the Brahminy blind snake, has been regarded as established by 2015 (Picker & Griffiths 2017).

8. Impacts of Introduced Amphibians and Reptiles on Local Fauna

Introduced amphibians and reptiles may cause ecological damage to native biodiversity through competition, predation, hybridization and transmission of parasites and diseases. However, the impacts are usually not appropriately evaluated, because these evaluations are not based on abundance, distribution, and population trends studies.

8.1. Competition

There are several evidenced cases of competition between alien and indigenous herp species. In Western Cape, South Africa, the introduced guttural toad compete for habitat and food resources with the endangered indigenous western leopard toad (*Sclerophrys pantherina*). In South Africa and Reunion, the red-eared slider may compete with native turtles for food and basking sites, while the common house gecko is known to displace other smaller gecko species (Sanches Probst 2014). In Mauritius, the Indian wolf snake competes with the indigenous snakes. The Indian agama is known to compete with indigenous gecko species. The cane toad competes for food with native anuran species.

The conservation status of the endangered Cape platanna, *Xenopus gilli* rests, in part, on the threats produced by sympatric populations of *X. laevis* which competes with *X. gilli* (De Villiers et al. 2016). 1989). The common agama on Comoros Islands (introduced there in 1990) affects indigenous and endemic geckos (*Phelsuma* spp.), Comoro Island skink (*Trachylepsis comorensis*) and Cuvier's Madagascar swift (*Oplurus cuvieri comorensis*). Although the species was introduced on the Township of Moroni only, at present it occurs in different parts of the island reducing the population size and home range of the above-mentioned reptile species. They can cause cascading effects in native ecosystems by disrupting trophic interactions and sharing ecological resources with native species.

In Mauritius and Reunion introduced day geckos encroach on the habitats of the blue-tailed day gecko *Phelsuma cepediana*, lowland forest day gecko *Phelsuma guimbeaui*, ornate day gecko *Phelsuma ornata*, and upland forest day gecko *Phelsuma rosagularis* (Buckland et al. 2014). The Arabian leaf-toed gecko *Hemidactylus homoeolepis* introduced to Socotra, competes with indigenous *Hemidactylus spp.*, while the Madagascar giant day gecko release from nursery in Reunion in 1994, and Mauritius in the 1990's. Both are possible threat to indigenous lizards.

8.2. Predation

Predation od alien species on threatened indigenous species is suspected in some alien herp species, although there are only few recorded cases of such predation. The guttural toad introduced to Mauritius and Reunion preys on some threatened native invertebrates. In Mauritius, the Indian wolf snake preys on native reptiles. The cane toad preys upon some endangered species. *Xenopus laevis* preys on the indigenous *X. gilli* in the Western Cape (De Villiers et al. 2016).

8.3. Hybridization

Released alien pythons may hybridize with the indigenous rock python *Python sebae. Xenopus laevis* hybridize with the indigenous *X. gilli* in the Western Cape. This genetic pollution is quite common and may threaten *X. gilli* (Picker 1985). No other cases of hybridization have been recorded so far, but this phenomenon may pass undetected.

8.4. Transmission of New Diseases and Parasites

Alien species may transmit new diseases and new parasites against which indigenous animals are not immune. However, only few cases have been hitherto recorded. The common platanna may transmit to the indigenous *Xenopus gillii*, a particularly vicious chytridiomycosis caused by the *Batrachochytrium fungus* (Chytridiomycetes). Alien turtles, especially the red-eared slider and the soft-shelled Chinese terrapin, increase the risk of trematode and protozoan (e.g. transmission *Haemogregarina stepanova*) to native species (Hidalgo-Vila et al. 2009, 2020).

9. Comparison with Other Regions

Globally, a total of 78 amphibian and 198 reptile species have become established outside their native ranges, i.e. c. 1% of amphibian and 1.9% of reptile species. Countries most affected by alien amphibians are UK, France, Hawaii (7-8 established species); whereas those most affected by reptiles (>10 species): Japan, Florida, California, Balearic Islands, Hawaii, Bahamas; 9-10 spp.: Spain, Mautitius, Reunion; 7-8 species: Madagascar, Texas. The most widespread introductions include the following amphibian species: *Rhinella marina, Eleutherodactylus johnstonei, Xenopus laevis, Eleutherodactylus planirostris, Osteopilus septentrionalis; whereas Ramphotyphlops braminus, Trachemys scripta, Hemidactylus frenatus, Hemidactylus mabouia, Hemidactylus turcicus, Anolis sagrei, Podarcis siculus, Tarentola mauritanica, Gehyra mutilate, Hemidactylus garnotii* are among the most widely introduced reptile species (Capihha et al. 2017).

In Europe, in total 29 amphibian and 48 reptiles species were introduced and become established. The country with the highest number is UK (20 amphibian and 88 reptiles species introduced, with 14 and 23 established; the London Area (c. 6400 km^2) is the centre of these introductions, Langton et al. 2011) and Spain (26 amphibians and 49 reptiles, including 17 and 20 established species) (Kark et al. 2008; Fliz et al. 2017). In Central Europe, 16 alien reptiles species were recorded (Fliz et al. 2017), with *Anolis carolinensis, Lampropeltis getula, Pantherophis guttatus, Telescopus fallax* and *Vipera ammodytes* posing the highest establishment risk.

For North America Meshake et al. (2022): 100 introduced and subsequently established species were listed, including 2 salamander, 18 Anura, 12 turtle, 60 lizard, 7 snake and one crocodilian. Florida is a state with the highest number of alien species. A total of 180 alien herp species were recorded there, including 4 Urodela, 13 Anura, 27 turtle, 4 crocodylian, 92 lizard and 40 snake species (Kryśko et al. 2011, 2015).

For the comparison, the total of 57 reptile and 21 amphibian species were recorded in sub-Saharan Africa, although only 19 and 10 species respectively become established. These numbers are comparable with Spain and are much lower than in Florida, and still much lower than in Europe and North America. It is possibly because the Afrotropical Region is saturated with herps which can potentially compete and prey on the alien species, preventing their successful establishment.

Madagascar, the Mascarenes and other small islands in the Malagasy Region have the highest number of introduced herp species in sub-Saharan Africa. However these numbers are still much lower than those recorded for instance in the Greater Caribbean. These include 130 species, i. e. 25 amphibians and 105 reptiles (Powell et al. 2011), including five amphibian and 21 reptile species in the largest island, Cuba (Borrto-Paez et al. 2015).

10. Management Implications

Intentional introductions should not be prohibited by law before a risk assessment has been carried out at a species-by species basis. In South Africa, it is now illegal to import alien amphibians. A risk assessment protocol should be implemented for categorizing species as permissible or prohibited for import and trade in each country. For highly dangerous species, ban on import, trade and possession should be considered.

Preventing introductions is a key issue of nature conservation. Prevention is widely considered to be the most cost-effective way to combat invasions and needs to be promptly organised at the national, continental and international scales. Prevention requires, however, a certain level of knowledge about frequency and ways of species trade, and the identification of taxa in which invasion risks and potential impacts on native ecosystems are highest.

Invasive alien species impacts on small islands are especially acute and are exacerbated through agricultural intensification, urban development, over-exploitation, and climate change. Eradication of is an effective way to combat the invasion alien species on islands, but only at early stages of invasion (Rocamora & Henriette 2015; Russell et al. 2017).

On small islands (archipelagos), such as Mascarenes, Comoros, and Seychelles, stronger collaborations is advocated among island countries and territories with similar socio-ecological environments, facing with the same invasion alien species.

11. Conclusions

Although in a few recent decades, introduction of alien reptiles and amphibians accelerated on a global scale, the mainland Africa is fortunate to have escaped their invasions. Such conditions exist despite the fact that most African countries do not use any national legislation or programs to control invasions. Even in South Africa, where many introductions took place, there are only single established alien species. It probably because of high diversity of indigenous herp species in the mainland, which outcompete the introduced species and also high predation rate by native mammals, birds and reptiles. Contrary to that, the small islands around sub-Saharan Africa, especially those around Madagascar have been invaded by many species which become subsequently well-

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established and some of them even invasive. Most of these invasive species are representative of Gekkonidae family. There is an urgent need to closely monitor and control the invasions of reptiles and amphibians, especially on the islands, as the process of their invasion is on increase.

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Conflicts of Interest: The author declares no conflicts of interest.

Appendix A

Table A1. Amphibian and reptile species introduced to sub-Saharan Africa.

Inv. = Invasiveness: 1) Yellow – established, developed viable population; 2) blue – not established although developed small isolated viable population; 3) green – released, but still has not developed viable population; 4) grey – released to the wild, it could even established/developed viable population, but now extinct.

Scientific name	Common name	Family	Natural range	Inas.	Place and date of introduction	Source
AMPHIBIANS						
Cynops pyrrhogaster	Japanese fire-bellied newt	Salamandri-dae	Japan	3	South Africa: KwaZulu-Natal, Cape Town, 2016	Measey et al. 2017
Triturus cristatus	crested newt	Salamandri-dae	Europe	3	South Africa, 2010's	Measey et al. 2017
Notophthalmus viridescens	eastern newt	Salamandri-dae	E North America	3	South Africa: W. Cape, 2010's; a pet	Measey et al. 2017
Ambystoma mexicanum	axolotl	Ambystomatidae	Mexico	4	South Africa: Bloemfontein, 1980's, now extinct	Van Rensburg et al. 2011
Xenopus laevis	African clawed frog	Pipidae	Africa	1	South Africa (W Cape), 1908's	De Moor & Bruton 1988
Sclerophrys gutturalis	African common toad	Bufonidae	Southern Africa	1	Reunion (1927), Mauritius (1922); South Africa: Cape Town (2000); Kenya: Nairobi (2025)	Starmühlner 1979 De Villiers 2006 Telford et al. 2019
Rhinella marina	cane toad	Bufonidae	Neotropics	1	Mauritius; two cases of introduction, 1936-1938	Lever 2003
Schismaderma carens	African red toad	Bufonidae	S and E Africa	2	SA: Cape Town' stowaway, 2013; regularly transported in luggage, although records are scarce	Measey et al. 2017
Duttaphrynus melanostictus	Asian common toad	Bufonidae	SE Asia	2	South Africa: W. Cape: Tokai, Bellville, 2012; Tomasina (Madagascar), 2015	Measey et al. 2017 Moore et a. 2015

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Chiromantis xerampelina	grey foam-nest tree frog	Rhacophoridae	S and E Africa	2	South Africa: Stellenbosch, Porterville, Victoria West, 2012	Measey et al. 2017
Hyperolius marmoratus	painted reed frog	Hyperliidae	Mozambique, Malawi, SA	2	South Africa: W. Cape: Villiersdorp (1997) and Cape Town (2004)	Davis et al. 2013
Hyperolius tuberilinguis	tinker reed frog	Hyperolidae	S and E Africa	2	South Africa: Cape Town, Bloemfontein, 2009; jump dispersal	Measey et al. 2017
Ptychadena mascareniensis	Mascarene grass frog	Ptychadeni-dae	Mascarenes	2	Reunion (before 1790) Seychelles, 2010's; Madagascar?	Betting de Lancastel 1827, Labisko et al., 2015; Williams et al. 2020
Pyxicephalus adspersus	African bull frog	Pyxicephalidae	S Africa	2	South Africa: Cape Peninsula: Muizenberg Mountains, 1980's	de Moor and Bruton 1988
Ceratophrys ornata	Argentine horned frog	Ceratophryidae	Argentina	3	South Africa, c. 2008/2009	Measey et al. 2017
Dyscophus antongilii	Madagascar tomato frog	Microhylidae	Madagascar	3	South Africa: Transvaal Snake Park, 1990's	Measey et al. 2017
Dendrobates leucomelas	yellow-banded poison dart frog	Dendrobati-dae	N South America	3	South Africa: Johannesburg: Montecasino Bird Gardens; 2010's	Measey et al. 2017
Dendrobates auratus	green-and-black poison dart frog	Dendrobati-dae	Central America	3	South Africa: Johannesburg: Montecasino Bird Gardens; uShaka; Two Oceans, 2010's	Measey et al. 2017
Dendrobates tinctorius	dyeing poison dart frog	Dendrobati-dae	N South America	3	South Africa: Johannesburg: Montecasino Bird Gardens, 2010's	Measey et al. 2017
Litoria albolabris	Wandolleck's white-lipped tree frog	Hylidae	New Guinea	3	South Africa, 2010's	Measey et al. 2017
Litoria caerulea	Australian green tree frog	Hylidae	Australia	3	South Africa, 2010's	Measey et al. 2017
REPRILES						
Crocodylus niloticus	Nile crocodile	Crocodylidae	Africa	3	South Africa, 1960's	Douglas 1996
Macrochyles temmincki	alligator snapper turtle	Chelydridae	USA	4	South Africa: George, 2000's, now extinct	Van Wilgen 2008
Palea steindachneri	wattle-necked softshell turtle	Trionychidae	China, Laos Vietnam	2	Mautitius, c. 1990 Reunion, SA	Iverson 1992 King & Burke 1989

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Amyda cartilaginea	Sunda softshell turtle	Trionychidae	Oceania	2	Mauritius, 1980's	Owadally & Lambert 1988
Trachemys scripta	common slider	Trionychidae	E USA	1	South Africa: Pretoria/Johannesburg and Durban areas; Reunion, Seychelles, 1990's; Kenya: Nairobi	Douglas 1997 Rhodin et al. 2011
Pelusios subniger	East African black mud turtle	Pelomedusidae	E Africa	4	Mauritius; Seychelles; 1970's; now extinct	Wermuth & Mertens 1977
Emys orbicularis	European pond turtle	Emyidae	Europe	3	South Africa (E Cape), 1990's?	Douglas 1996
Geochelone platynota	Burmese star tortoise	Testudinidae	SE Asia	4	Kenya, failed to establish viable population, now extinct	Douglas 1996
Astrochelys radiata	radiated tortoise	Testudinidae	S Madagascar	2	Mauritius (Rodrigues, Round Island), Reunion; 1980's; Rodrigues, 2006	Owadally & Lambert 1988; Griffiths et al. 2013
Astrochelys yniphora	Madagascar spur tortoise	Testudinidae	NW Madagascar	2	Mauritius, 2010's?	Rhodin et al. 2017
Geochelone pardalis	leopard tortoise	Testudinidae	Africa	2	South Africa, 1960's?	Douglas 1996
Aldabrachelys gigantea	Aldabra giant tortoise	Testidinidae	Seychelles		Rodrigues, 2006	Griffiths et al. 2013
Indotyphlops braminus	Brahminy blind snake	Typhlopidae	SE Asia	1	Tanzania; Durban, SA: Cape Town, 1920's; Reunion, beg. 19th cen.?; Mauritius; Seychelles; Annobon, 2003	Douglas 1996, Maillard 1862, Guibe 1958; Williams et al. 2020 Jesus et al. 2003
Python molurus bivittatus	Burmese python	Pythonidae	SE Asia	4	Cape Town, 2000's; escapee, now extinct	Van Wilgen 2008
Boa constrictor	Boa constrictors	Boidae	South America	4	South Africa, now extinct, 2000's	Booth et al. 2012, 2016
Lycodon aulicus	Indian wolf snake	Colubridae	India	1	Reunion, beg. 19th cen.?; Mauritius (1879)	Duméril et al. 1854 Daruty de Grandpré 1883
Lampropeltis californiae	Californian king snake	Colubridae	North America	4	South Africa, escapee, now extinct, 2000's	Booth et al. 2012, 2016
Lampropeltis triangullum	Sinaloan king snake	Colubridae	North America	4	South Africa, escapee, now extinct, 2000's	Booth et al. 2012, 2016

Lampropeltis alterna	gray-banded kingsnake	Colubridae	Mexico	4	South Africa: Strand, 2000's, now extinct	Van Wilgen 2008
Pantherophis guttatus	red corn snakes	Colubridae	SE USA	4	South Africa: Durban, Johannesburg, Cape Town, 2000's, now extinct	Van Wilgen 2008
Elaphe obsoleta spiloides	grey rat snake	Colubridae	E and C USA	4	South Africa: Durban, 2000's, now extinct	Van Wilgen 2008
Elaphe obsoleta quadrivittata	yellow rat snake	Colubridae	USA	4	South Africa: Cape Town, 2000's, now extinct	Van Wilgen 2008
Pituophis m. melanoleucus	northern pine snake	Colubridae	SE USA	4	South Africa: Durban, 2000's; now extinct	Van Wilgen 2008
Lamprophis inornatus	olive snake	Lamprophi-idae	Africa	3	South Africa, 2000's	Van Wilgen 2008
Lamprophis fuliginosus	brown house snake	Lamprophi-idae	Africa	3	South Africa, 2000's	Van Wilgen 2008
Crotalus atrox	western diamond-backed rattlesnake	Viperidae	SW USA, N Mexico	4	South Africa: Gauteng, 2000's, now extinct	Van Wilgen 2008
Furcifer pardalis	panther chameleon	Chamaeleonidae	Madagascar	2	Reunion (before 1830)	Mertes 1966, Cuvier 1829
Bradypodion pumilum	Cape dwarf chameleon	Chamaeleonidae	Africa	3	Namibia, 1990's: Swakopmund and Walvis Bay; also Luderitz, Windhoek, now extinct	Irish 2025
Calumna parsonii	green giant chameleon	Chemeleontidae	E Madagascar	3	Mauritius, 1960's	Mertes 1966
Chamaeleo quilensis	Flap-necked chameleon	Chemeleontidae	South Africa: KZN	3	South Africa: Free State (before 1978)	Douglas 1997; Kopij & Bates 1997
Bradypodion spp.	dwarf chameleon	Chemeleontidae	South Africa: KZN	3	South Africa: Free State (1939)	Douglas 19960, 1997; Kopij & Bates 1997
Cryptoblepharus boutoni	Bouton's snake-eyed skink	Scincidae	Easter coast of Africa	3	South Africa: KZN (natural translocation); 1990's	Douglas 1996
Iguana iguana	green iguana	Iguanidae	Neotropics	4	South Africa: Gauteng, 2000's, now extinct	Van Wilgen 2008
Agama agama	common agama	Agamidae	E Africa	1	Reunion (before 1995) Comoro Isl. (1997) Madagascar (2004)	Guillermet et al. 1998,

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						Meirte 2004 Wagner et al. 2009
Pogona vitticeps	Bearded dragons	Agamidae	Australia	4	South Africa, 2000's, now extinct	Booth et al. 2012, -16
Calotes versicolor	green tree lizard	Agamidae	Indonesia	1	Reunion 1865; Rodrigues, Mauritius Seychelles Keyna, end of 20th cen., Nairobi (1920)	Vinson 1870 Matyot 2004 iNaturalist
Gehyra mutilata	common four-clawed gecko	Gekkonidae	SE Asia	1	Reunion, 18th cen.?; seaway; Mauritius, Rodrigues, Seychelles	Bory de St. Vincent 1804; Vinson & Vinson 1969
Phelsuma laticauda	flat-tailed day gecko	Gekkonidae	N Madagascar	1	Reunion, 1975; TRL; Mauritius, Mayotte, Comoros, Seychelles	Glaw & Rösler 2015 Moutou 1995
Phelsuma astriata	Seychelles day gecko	Gekkonidae	Seychelles	1	Reunion, before 2003; unknown	Mozzi et al. 2005; Gardner 1988
Phelsuma grandis	Madagascar giant day gecko	Gekkonidae	N Madagascar	1	Reunion 1994, Mauritius, 1990's	Glaw & Rösler 2015; Probst 1997; Sanchez & Probst 2014
Phelsuma lineata	lined day gecko	Gekkonidae	Madagascar	1	Reunion, 1940; TRL	Cheke (1975)
Phelsuma mad-agascariensis	Madagascan day gecko	Gekkonidae	Madagascar	1	Reunion, mid.1990's; Mauritius; translocation?	Buckland et al. 2014
Tarentola mauritanica	Moorish wall gecko	Gekkonidae	Mediterranean Region	1	S Western Shara; 1970's,	Salvador & Peris 1975
Lepidodactylus lugubris	common mourning gecko	Gekkonidae	Indo-Pacific	1	Seychelles, Rodrigues; 1960's, Mauritius	Vinson & Vinson 1969
Lygodactylus capensis	Cape dwarf gecko	Gekkonidae	S, E Africa	2	Central Africa, 1956; Tanzania: Pemba; Free State (before 1978)	Measey et al. 2017 Kopij & Bates 1997
Pachydactylus bibronii	Bibron's gecko	Gekkonidae	South Africa: KZN	2	Free State (before 1978)	Douglas 1997; Kopij & Bates 1997

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Ebenavia boettgeri	west Madagascan clawless gecko	Gekkonidae	E Madagascar	1	Mauritius; 1960's	Vinson & Vinson 1969
Hemidactylus mercatorius	Farquhar half-toed gecko	Gekkonidae	Madagascar Mozambique, Seychelles	1	Cape Verde (Santo Antao, Sao Vincente), Comoro Islands, Europa Is., Reunion, Mauritius, Rodrigues, Mayotte; 1960?	Vinson & Vinson 1969
Hemidactylus mabouia	tropical house gecko	Gekkonidae	W and C Africa	1	Principe, Sao Tome, 1884; Bazaruto Arch. (Down 1999, J. Biog.); Free State (before 1978);Simon's Town, 1962; Gordon's Bay, 1976 East London and Port Elizabeth,	Greeff 1884 Weterings & Vetter 2018; Douglas 1992; Brooke et al. 1986; Rebelo et al. 2019
Hemidactylus longicephalus	long-head half-toed gecko	Gekkonidae	C, W Africa	1	Principe, Sao Tome, 1892	Bedriaga 1892
Hemidactylus flaviviridis	northern house gecko	Gekkonidae	SE Asia	1	Socotra, end of 19th cen.?; only known from Hadiboh town and outskirts	Blanford 1881a
Hemidactylus robustus	Heyden's gecko	Gekkonidae	SW Asia, Horn of Africa	1	Socotra, end of 19th cen.	Boulenger 1903
Hemidactylus homoeolepis	Arabian leaf-toed gecko	Gekkonidae	S Arabian Peninsula	1	Socotra, 1990's	Joger 2000
Hemidactylus frenatus	common house gecko	Gekkonidae	India, Sri Lanka	1	Reunion (19th cen.), Mauritius, Rodriguez, Seychelles, Comoros, Madagascar, SA, Somalia	Vinson & Vinson 1969, Maillard 1862
Hemidactylus mercatorius	Farquhar half-toed gecko	Gekkonidae	Madagascar	2	Reunion, 2000?; seaway?	Sanchez et al. 2012
Hemidactylus parvimaculatus	small spotted house gecko	Gekkonidae	S India, Sri Lanka	2	Mauritius, Reunion, Rodrigues, Comoro; end of 19th century; Seychelles	Bauer et al. 2010, Vinson & Vinson 1969
Hemiphylodacty-lus typus	Indo-Pacific slender gecko	Gekkonidae	SE Asia	2	Reunion, 1960's?; Mauritius, Rodrigues, Comoro Isl. (Moheli)	Vinson & Vinson 1969
Afrogecko porphyreus	marbled leaf-toed gecko	Gekkonidae	South Africa	2	South Africa: Cape Town, Port Elizabeth, 2010's	Rebelo et al. 2019

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