

CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA



Seventeenth Meeting of the Conference of the Parties
(Johannesburg, South Africa), 24 September to 5 October, 2016

CONSIDERATION OF PROPOSALS FOR AMENDMENTS TO APPENDICES I AND II

A. Proposal

Inclusion of the African pygmy chameleons of the genera *Rhampholeon spp.* and *Rieppeleon spp.* in Appendix II. This proposed inclusion is in accordance with Article II paragraph 2(a) of the Convention, satisfying Criterion B, Annex 2(a) of Res. Conf. 9.24 (Rev. CoP16).

A species should be included in Appendix II when, on the basis of available trade data and information on the status and trends of the wild population(s), at least one of the following criteria is met:...

B. It is known, or can be inferred or projected, that regulation of trade in the species is required to ensure that the harvest of specimens from the wild is not reducing the wild population to a level at which its survival might be threatened by continued harvesting or other influences.

<i>Rhampholeon (Rhampholeon) spectrum</i>	(Buchholz, 1874)
<i>Rhampholeon (Rhampholeon) temporalis</i>	(Matschie, 1892)
<i>Rhampholeon (Rhampholeon) viridis</i>	(Mariaux and Tilbury, 2006)
<i>Rhampholeon (Rhinodigitum) acuminatus</i>	(Mariaux and Tilbury, 2006)
<i>Rhampholeon (Rhinodigitum) uluguruensis</i>	(Tilbury and Emmrich, 1996)
<i>Rieppeleon brevicaudatus</i>	(Matschie, 1892)
<i>Rieppeleon kerstenii</i>	(Peters, 1868)

and in accordance with Article II paragraph 2(b) of the Convention, satisfying Criterion A, Annex 2 (b) of Res. Conf. 9.24 (Rev. CoP16).

Species may be included in Appendix II in accordance with Article II, paragraph 2 (b), if either one of the following criteria is met:

A. The specimens of the species in the form in which they are traded resemble specimens of a species included in Appendix II under the provisions of Article II, paragraph 2 (a), or in Appendix I, so that enforcement officers who encounter specimens of CITES-listed species are unlikely to be able to distinguish between them;...

<i>Rhampholeon (Bicuspis) gorongosae</i>	(Broadley, 1971)
<i>Rhampholeon (Bicuspis) marshalli</i>	(Boulenger, 1906)
<i>Rhampholeon (Rhinodigitum) beraduccii</i>	(Mariaux and Tilbury 2006)

<i>Rhampholeon (Rhinodigitum) boulengeri</i>	(Steindachner 1911)
<i>Rhampholeon (Rhinodigitum) chapmanorum</i>	(Tilbury 1992)
<i>Rhampholeon (Rhinodigitum) moyeri</i>	(Menegon <i>et al.</i> , 2002)
<i>Rhampholeon (Rhinodigitum) platyceps</i>	(Günther, 1892)
<i>Rhampholeon (Rhinodigitum) nchisiensis</i>	(Loveridge, 1953)
<i>Rhampholeon (Rhinodigitum) nebulauctor</i>	(Branch <i>et al.</i> , 2014)
<i>Rhampholeon (Rhinodigitum) maspictus</i>	(Branch <i>et al.</i> , 2014)
<i>Rhampholeon (Rhinodigitum) bruessoworum</i>	(Branch <i>et al.</i> , 2014)
<i>Rhampholeon (Rhinodigitum) tilburyi</i>	(Branch <i>et al.</i> , 2014)
<i>Rhampholeon hattinghi</i>	(Tilbury & Tolley, 2015)
<i>Rieppeleon brachyurus</i>	(Günther, 1892)

Rhampholeon spinosus is already listed in CITES Appendix II under its old name *Bradypodion spinosum*.

B. Proponent

Central African Republic, Chad, Gabon, Nigeria, Rwanda, and United States.

C. Supporting statement

1. Taxonomy

- 1.1 Class: Reptilia
- 1.2 Order: Squamata
- 1.3 Family: Chamaeleonidae, subfamily: Brookesiinae
- 1.4 Genus, species or subspecies affected by this Proposal:

These taxa have undergone frequent taxonomic changes and were originally all included in the genus *Rhampholeon*. Recent taxonomic revisions divide African pygmy chameleons into two genera, *Rhampholeon* and *Rieppeleon* and three sub-genera, *Bicuspis*, *Rhampholeon* and *Rhinodigitum* (Matthee *et al.*, 2004; Tilbury, 2010); the old taxonomy is still dominant in the trade market. There are currently 22 species of African pygmy chameleons (with the recent addition of *Rh. hattinghi*); this proposal seeks to include 21 species in Appendix II (Table 1).

1.7 Code Numbers: NA

2. Overview

African pygmy chameleons are the only chameleon species not yet covered by CITES; all other chameleons are listed in CITES Appendix II (except *Brookesia perarmata* listed in Appendix I). Originally classified as one genus, *Rhampholeon*, African pygmy chameleons were separated in 2004 into two genera and three species were assigned to the new genus of *Rieppeleon* (Matthee *et al.*, 2004) with the other species still included in the genus *Rhampholeon*. Four species were described as recently as 2014: *Rhampholeon (Rhinodigitum) bruessoworum*, *Rhampholeon (Rhinodigitum)*

tilburyi, *Rhampholeon (Rhinodigitum) nebulauctor* and *Rhampholeon (Rhinodigitum) maspictus* (Branch *et al.*, 2014)

International trade in *Rhampholeon* spp. and *Rieppeleon* spp. is neither monitored nor regulated. The only exception is *Rhampholeon spinosus*, which is already listed in CITES Appendix II under its former name *Bradypodion spinosum*, and is classified as Endangered in the IUCN Red List 2011 (Mariaux, 2010b). The name change to *Rhampholeon* is thought to have created the misconception that its original CITES listing was concurrently dropped (Anderson, 2011). Within the international trade community *Rhampholeon* is still offered for sale and recorded under the old taxonomy.

Compared to the large bodied and more colourful genera, African pygmy chameleons have long been spared from large scale exploitation for the international pet trade. However, possibly as a consequence of trade restrictions for other chameleon taxa, pygmy chameleons are now commonly offered in the international pet trade, most notably in Europe and the USA. The main export country is Tanzania, followed by Equatorial Guinea, Cameroon, Guinea; and the Congo has also exported small numbers of pygmy chameleons to other countries (US Fish and Wildlife Service, LEMIS Database 2015).

From 1999-2014, the USA imported 175,841 African pygmy chameleons under the taxonomy *Rhampholeon* spp. and *Rieppeleon* spp.; all the species were taken from the wild and collected for commercial trade. Of these, 7,281 known *Rhampholeon* spp. and 156,949 *Rieppeleon* spp. were imported and brought into the United States. Trade data also shows that 11,349 *Rhampholeon* chameleons, not identified to the species level, were imported from 1999-2014, and 262 unidentified *Rieppeleon* spp. were imported from 1999-2006 (US Fish and Wildlife Service, LEMIS Database 2015).

There is much confusion about the identification of species because of their similarity. Shipments labeled "assorted pygmy chameleons" containing *Rhampholeon* spp. have included *Rh. spinosus* of varying quantities and often, specimens that have been wild caught. The "assorted pygmy chameleon" labeling impairs the ability to monitor trade of the *Rhampholeon spinosus* and is speculated to result in negative impacts to the wild population (Anderson, 2011) due to the similarity in external morphologies and the inability of exporters to distinguish between species (Mariaux and Tilbury, 2006). In the IUCN Red List (www.iucnredlist.org) it is stressed that trade management is required for *Rh. spinosus* (Mariaux, 2010b), as well as updating CITES lists and national export quotas to reflect nomenclature changes (Tolley and Menegon, 2014c).

The IUCN Red List (www.iucnredlist.org) lists four *Rhampholeon* spp. as Critically Endangered, four as Endangered, three as Vulnerable, six as Least Concern, and one as Near Threatened; the three *Rieppeleon* spp. are all listed as Least Concern. Several of the *Rhampholeon* spp. are locally restricted, including nine species that have a small distribution range and are endemic to biodiversity hotspots, such as the Eastern Ark Mountains of Tanzania and Kenya (Burgess *et al.*, 2007; Mariaux and LeBreton, 2010; Tilbury, 2010; Makda *et al.*, 2013; Branch *et al.*, 2014). This is concerning given that rare and more specialized species, such as African pygmy chameleons, tend to disappear with habitat loss and degradation (Gray, 1989; Akani *et al.*, 2001).

African pygmy chameleons are oviparous and have a low reproduction rate (Akani *et al.*, 2001; Coevoet, 2007; Hildenhagen, 2007); however, reproductive biology information is limited. Detailed studies are scarce, including data on population abundance; habitat loss and commercial trade are assumed to decimate the populations of African pygmy chameleons if conservation measures are not

implemented (Tilbury, 2010; Patrick *et al.*, 2011). Captive breeding is limited and mortality in many cases is high (Gostner, 2009).

Ongoing confusion regarding the nomenclature of species in international trade and similarity in appearance and numerous unspecified/incorrect trade records (i.e., *Rhampholeon* spp.) are strong arguments for a listing of both genera. An Appendix II listing of this family will ensure legal and sustainable international trade in African pygmy chameleons. The threats from extensive and continual habitat alteration and destruction provide additional reasons for listing African pygmy chameleons.

3. Species characteristics

3.1 Distribution

African pygmy chameleons occur only within continental African countries including Mozambique, Zimbabwe, Zambia, Tanzania, Cameroon, Equatorial Guinea, Gabon, Nigeria, Burundi, Democratic Republic of the Congo, Rwanda, Uganda, Malawi, Central African Republic, Kenya, Somalia and Ethiopia. The largest number of species is from Tanzania, where 12 pygmy chameleons are deemed native to this country. The range distributions of many *Rhampholeon* spp. are very limited due to specific habitat needs. Additional information on country range of each species is included in Appendix A.

3.2 Habitat

In general, the majority of pygmy chameleons are restricted to wet indigenous forests in central and eastern Africa and equatorial forests of the Congo River basin and West Africa. At least seven species are restricted to isolated hills and mountain massifs (Tilbury, 2010). *Rhampholeon* spp. tend to be confined to relict montane forests, while *Rieppeleon* spp. are less restricted in habitat requirements and are widely distributed in lowland forests and non-forest habitats (Anderson, 2005; Hildenhagen, 2007). Those pygmy chameleons living in montane forests generally exist in fragmented habitats and do not tolerate degraded or transformed habitats (www.iucnredlist.org; Tilbury, 2010). *Rieppeleon* spp. occur in a greater diversity of habitats including bushland and grassland, both moist and dry savannah (semi-desert), and coastal and dense woodland and thickets (Largen and Spawls, 2010). The ground cover of many of these consist of damp soils and considerable leaf litter in which eggs or juveniles can be hidden during the reproductive season (e.g., see Branch, 1988). All pygmy chameleons are diurnal and mainly terrestrial or in heights of about 0.5 meters (m). Some species, however, have been documented up to 6 m or higher off the ground. At night, pygmy chameleons climb up to a few feet off the ground into the lower undergrowth and shrubs to escape terrestrial nocturnal predators (Tilbury, 2010, Akani *et al.*, 2001). Additional information on the specific habitat of each species is in Appendix A.

3.3 Biological characteristics

Sexually mature males engage in an aggressive combat display towards rival males by assuming a species specific pattern and brighter colours. In many species an intermittent buzzing vibration has been noticed. This buzzing may be elicited from either sex when they are picked up, touched on their backs, or when males are confronting an opponent. It has been suggested that this behaviour is likely a mechanism to signal “keep away” (Tilbury, 2010).

All pygmy chameleons are oviparous and paired adults are quite commonly found in the wild. Although they have a low reproduction rate, several clutches of eggs may be laid per year in holes consisting of leaf litter and soil, often under logs and stone (Tilbury, 2010). Breeding occurs throughout the year and clutch size varies among species, ranging from 1-12 eggs (Akani *et al.*, 2001; Coevoet, 2007; Hildenhagen, 2007; Gostner, 2009; Tilbury, 2010). Hatching in the wild has been observed after 35 days for *Rh. marshalli* (Tilbury, 2010), while in captivity hatching time is prolonged between 60-113 days, depending on the species (Coevoet 2007; Gostner, 2009). It is assumed that two clutches of eggs may be laid per year (Tilbury, 2010). Sexual maturity varies among species; data suggests as early as three months and as late as 12 months (Hildenhagen, 2007; Tilbury, 2010).

3.4 Morphological characteristics

African pygmy chameleons are essentially dwarfed lizards, considered similar in appearance (Tilbury, 2010). The smallest species, *Rh. beraducci*, can reach a total length of 35-40 millimeters (mm), while the largest species, *Rh. marshalli*, can measure over 110 mm (Tilbury, 2010). Although the majority species have short, weak to non-prehensile tails, some species have relatively longer tails with significant prehensile function. Coloration consists mainly of shades of grey or brown, often resembling dead leaves; color pattern is not a consistent characteristic to distinguish the species. Some African pygmy chameleons are colorful; however, the hues and diversity of color are limited compared to that of the sub-family Chamaeleoninae. *Rhampholeon* spp. have two or three diagonal stripes along the flanks running in the anterodorsal to posteroventral direction (Mariaux and Tilbury 2006; Hildenhagen, 2007; Tilbury 2010). *Rieppeleon* spp. are typically brown, have horizontal stripes across their flanks running horizontal from the head to the tail. Coloration changes, such as becoming darker, have been observed when under stress, and they can often mimic dry leaves. Rostro-nasal processes are not present. Additional information on the morphological characteristics of each species is included in Appendix A.

3.5 Role of species in their ecosystem

Pygmy chameleons have a role in the ecosystem, serving as both a predator and prey in the larger food web. They begin hunting early in the morning, with insect availability and consumption increasing as the sun rises until midday when prey availability lessens and thus, hunting subsides (Akani *et al.*, 2001). At dusk hunting is continued to a lesser degree as higher branches are sought for the evening. Pygmy chameleons feed mainly on insects, including beetles, juvenile cockroaches, moths, caterpillars, grasshoppers, woodlouse, spiders, termites and flies (Tilbury, 2010). Females have been found to exhibit a wider food niche than males (Akani *et al.*, 2001). Some suggest pygmy chameleons may be in competition with forest toads, *Bufo camerunensis*, which are believed to have a similar dietary spectrum (Akani *et al.*, 2001). Snakes are known predators of pygmy chameleons (Akani *et al.*, 2001), while many birds, small mammals, toads, frogs and even the larger ground living spiders are also thought to hunt these chameleons (Tilbury, 2010).

4. Status and trends

4.1 Habitat trends

Due to their specialized habitat requirements, African pygmy chameleons are considered highly vulnerable to deforestation, resulting in loss of habitat (Tilbury, 2010). Tanzania and Nigeria are among the 10 countries with the largest annual forest net loss of 1.9% and 3.67% respectively, during the last decade. In Cameroon, annual loss of forest habitat is 1.07%, in Malawi 0.99%, and Equatorial Guinea 0.71% (FAO 2010). Eroding edges of the forest in many range states have suffered extensively due to expanding cultivation, fire, timber extraction for planks and conversion to charcoal, livestock grazing, and illegal logging (Critical Ecosystem Partnership Fund, 2005; Carrere, 2010; FAO, 2010). This habitat degradation has serious impacts on *Rhampholeon* populations because they are mostly dependent upon the forest biome, do not appear to adapt to degraded forest habitats, and most of the taxa are restricted to isolated forest patches (Matthee *et al.*, 2004; Tilbury, 2010). Subsistence agriculture such as maize and yams, as well as commercial-scale products like teak, coffee (at low and mid-elevation) and tea plantations (at high elevations) have altered habitats in many regions. Several range states, including Tanzania, Cameroon, and Republic of Congo, have palm oil plantations that are quickly expanding or are currently in preparation (Carrere, 2010). Other threats include unsustainable hunting, bauxite extraction and artisanal mining (Bayliss *et al.*, 2007; Tolley, 2014). The vegetation and fauna in many areas are also threatened by subsistence farming, uncontrolled firewood collection, cutting of stream bank trees and wild fires. Exotic plants are impacting habitats such as those in Mt. Mulanje and Mt. Mchese where invasive pines, originally planted for utilization, have now become a dominant species of the plateau (Bayliss *et al.*, 2007). The ecological integrity of forests also continues to be compromised through illegal extraction of the endemic species, such as Mulanje Cedar (*Widdringtonia whytei*) in Mt. Mulanje.

Many forests are under protection resulting in a slower rate of habitat loss; however, threats are still active in these areas. For example, in many areas where the forest patch is protected the forest floor is still being utilized for the clearing of crops. This transformed environment is detrimental to pygmy chameleons that utilize the forest floor as primary habitat, impacting both the quality and quantity of available habitat. Low abundance of some chameleon species in degraded areas may also result in a locally threatened/declining status due to habitat destruction (Wild, 1994). This is likely compounded by the fact that many of the existing forests have undergone extensive shrinkage over the years. For example, the Chisangole forest has experienced a reduction from 38 square kilometres (km²) to 25 km² within the period 1974-1984 (Tilbury, 2010), while Usambara Mountains has lost over 71% of its original forest cover (Newmark, 1998). Additional information on habitat trends specific for each species is in Appendix A.

4.2 Population size

Data on population size and demography of pygmy chameleon species are scarce. Nineteen of the species within these two genera have no information regarding abundance according to IUCN (www.iucnredlist.org). Most *Rhampholeon* spp. are limited to microhabitat with fragmented populations and 13 are locally restricted, including nine endemic species. *Rh. spectrum* has been reported as common in parts of southern Nigeria and in montane areas of Cameroon; however, it is thought to be rarer in the lowlands and low abundance has been observed in degraded habitat (Akani *et al.*, 2001; Mariaux and LeBreton, 2010). Patrick *et al.* (2011) report transects on local abundance of *Rh. temporalis* in forests of the East Usambara Mountains to be 0.60/100 m, while *Ri. brevicaudatus* was found at densities of 0.026/100 m along edge habitats of the mountains. All *Rieppeleon* spp. are thought to be widespread in areas where they are known to occur

(www.iucnredlist.org). Additional information on the population size of each species is included in Appendix A.

4.3 Population structure

African pygmy chameleons live solitarily, resulting in limited information on population structure for the taxon. A survey in the Amani Nature Reserve, Tanzania, found that the number of adult specimens of *Rh. temporalis* was six-fold to that of juveniles (Patrick *et al.*, 2011). Sex ratios of males and females appear near equal, as described for *Rh. temporalis* and *Rh. spectrum* (Akani *et al.*, 2001; Patrick *et al.*, 2011). Pygmy chameleons may be found throughout the year, but in some species marked population swings have been observed, with decreases coinciding with the dry season and peaking with wet times of year. Within this seasonal fluctuation, population density may also reflect changes in predation intensity (Tilbury, 2010).

4.4 Population trends

Presently, eight pygmy chameleon species are classified in the IUCN Red List as Critically Endangered or Endangered (www.iucnredlist.org). Of these, seven species are determined to have a decreasing population trend (*Rh. spinosus*, *Rh. temporalis*, *Rh. viridis*, *Rh. chapmanorum*, *Rh. platypus*, *Rh. bruessoworum*, and *Rh. tilburyi*), while *Rh. acuminatus* has an unknown trend. *Rh. maspictus* is listed as Near Threatened; however, the population trend has been determined to be stable. Three species are classified as Vulnerable, of which *Rh. beraduccii* and *Rh. nebulauctor* have an unknown population trend and *Rh. marshalli* is decreasing. Nine pygmy chameleons are listed as species of Least Concern. *Rh. gorongosae*, *Rh. uluguruensis*, *Rh. nchisiensis* and *Rh. moyeri* have a stable trend and *Rh. boulengeri* is decreasing; *Rh. spectrum*, *Ri. brachyurus*, *Ri. kerstenii* and *Ri. brevicaudatus* have an unknown population trend.

Although few surveys on population trends exist, several publications report local disappearance (see also 4.5). According to Tilbury (2010) extinction should be considered imminent for *Rh. chapmanorum* and *Rh. platyceps* based on where they currently exist. Surveys conducted in Tanzania found *Ri. brevicaudatus* was the least counted chameleon at the Amani Nature reserve (Patrick *et al.*, 2011), while in Cameroon, *Rh. spectrum* was in lower abundance than the CITES listed *Chamaeleo montium* (Gonwouo *et al.*, 2007).

Extensive habitat alteration and degradation in many range areas have resulted in small, fragmented populations. For example, *Rh. spinosus* has a total range of 3,250 km² and only occurs in two locations with ongoing habitat loss (Mariaux, 2010b). *Rh. marshalli* also has a limited range of 7,000 km², occurring in less than 10 locations and in fragmented patches of habitat (Mariaux, 2010a). In southern Nigeria, populations of *Rh. spectrum* have dropped by 95% from habitat lost due to logging (Akani *et al.*, 2001). Ongoing, unregulated collection (except for *Rh. spinosus*) of pygmy chameleons has likely impacted these fragmented regional populations.

4.5 Geographic trends

All *Rhampholeon* spp. are dependent upon intact forest strata. Therefore, populations declines have been observed and are expected to continue in the future where pressure from deforestation, logging and/or agricultural use occur (Tilbury, 2010). In some regions a decline and/or disappearance in specific species has already been observed. For example, the endemic

Rh. spinosus has not been recorded in survey sites in the Amani Nature Reserve, Tanzania, where it previously occurred, possibly as a consequence of collection for the pet trade (Patrick *et al.*, 2011). In Nigeria, *Rh. spectrum* has disappeared from known study sites within mature secondary forest due to logging (Akani *et al.*, 2001). Additional information on the geographic trends for each species is included in Appendix A.

5. Threats

Research has suggested that specialized species tend to disappear with habitat loss, as compared to those deemed habitat generalists (Gray, 1989; Akani *et al.*, 2001). Because of their specialized habitat requirements, African pygmy chameleons are highly susceptible to human impacts resulting in the alteration, reduction and loss of overall habitat quality and extent (Akani *et al.*, 2001; Burgess *et al.*, 2007; Mariaux and LeBreton, 2010; Tilbury, 2010). In some regions deforestation has been so extensive that only fragments remain, that are further stressed due to surrounding transformed landscapes (www.iucnredlist.org).

While habitat destruction and degradation is the most serious risk for pygmy chameleons, collection for the international pet trade is a factor, which further complicates and impacts protection and conservation efforts of this taxon (Gonwouo *et al.*, 2007; Patrick *et al.*, 2011). USA import data (see section 6) on pygmy chameleons has shown an increase in recent years, possibly as a consequence of pet trade restrictions for other chameleons (US Fish and Wildlife Service, LEMIS Database 2015). Further, reptile keepers report that international demand for pygmy chameleons has increased since the mid-1990s (Lutzmann *et al.*, 2004; Hildenhagen 2007) and the interest continues to rise. For example, pygmy chameleon species recently discovered within the last few years (e.g. *Rh. acuminatus* and *Rh. viridis*) are now readily available for the international pet trade (Müller and Walbröl, 2008).

It is currently unknown if traditional medicinal purposes in Africa are a threat to pygmy chameleons.

6. Utilization and trade

6.1 National utilization

Chameleon species in East Africa are collected for medicinal use or “juju” practice (Akani *et al.*, 2001); however, it is unclear whether African pygmy chameleons are also used and if so, what potential impacts this may have on regional populations. From 2001 to 2011 O.S.G. Pauwels (pers. comm.) regularly surveyed markets in Libreville, Gabon, and recorded hundreds of *Chamaeleo* sold for magic practices, but not a single *Rhampholeon*. There is no additional known use for the national utilization of African pygmy chameleons within range states.

6.2 Legal trade

There is an increasing market for African pygmy chameleons in the international pet trade that is likely the result of trade restrictions of other CITES listed small chameleons (i.e. *Brookesia* spp. in 2002, *Rh. spinosus* in 2011). To date, Tanzania has been the leading exporter of African pygmy chameleons to the USA, followed by Equatorial Guinea, Cameroon, Guinea and a small number from the Congo (US Fish and Wildlife Service, LEMIS Database 2015).

The USA imported 7,281 known *Rhampholeon* spp. from 1999 through 2014 (US Fish and Wildlife Service, LEMIS Database 2015). These data contain imports of *Rh. acuminatus*, *Rh. spectrum*, *Rh. uluguruensis*, *Rh. viridis*, and the CITES Appendix II listed *Rh. spinosus* (listed under its old name *Bradypodion spinosum*). *Rh. spectrum* has had the largest number of imports into the USA, while *Rh. spinosus* has had the fewest number due to CITES trade restrictions. From 1999-2014 there were an additional 11,349 *Rhampholeon* chameleons imported into the USA that were not identified to the species level, yet reported to be caught from the wild for commercial trade (US Fish and Wildlife Service, LEMIS Database 2015). The dominant exporter for *Rhampholeon* spp. has been Tanzania, followed by Cameroon, Equatorial Guinea, the Congo and Guinea, which is not a range-state for pygmy chameleons.

Rieppeleon spp. have been exported in greater numbers than those *Rhampholeon* spp. From 1999 through 2014 the USA has imported 156,949 *Rieppeleon* spp., while an additional 337 unidentified *Rieppeleon* spp. were brought into the USA from 1999-2006 (US Fish and Wildlife Service, LEMIS Database 2015). *Ri. kerstenii* had the highest recorded amount of imports and *Ri. brachyura* had the least.

Rh. spinosus annual CITES export quotas from 1999-2011 ranged from 16-50 captive born individuals per year from Tanzania (CITES, 2015), however, from 2012-2013 no annual quotas was issued (CITES, 2015). Archived data from 1977-2011 shows 149 live individuals were exported from Tanzania for the pet trade (total of all personal and commercial exports), of which only 23 individuals were reported with source information (18 wild collected and 5 from unknown sources) (UNEP-WCMC, 2015). All exports of *Rh. spinosus* have occurred from 1993-2011, where 93% (with all but 11) of the individuals were exported between 2001 and 2011 (UNEP-WCMC, 2015). Trade data indicates 79 individuals have been imported to the USA from 2002-2011 (US Fish and Wildlife Service, LEMIS Database 2015).

Because *Rh. spinosus* is already listed in CITES Appendix II under its old name *Bradypodion spinosum*, a loop-hole for non-regulated export has been created, complicating the evaluation of its trade status (Tolley and Menegon, 2014). Only specimens incorrectly exported under the outdated name *Bradypodion spinosum* are subject to CITES regulation, suggesting illegal trade and/or harvest may be occurring at significant levels. This ambiguity has also allowed for this species to be illegally imported in multiple "assorted pygmy chameleon" shipments without CITES documents. The taxonomic confusion surrounding *Rh. spinosus*, in addition to its illegal trade, has resulted in the inability to assess the true status of the species (C. Anderson pers. obs. 2013). This species has experienced a surge in the pet trade in recent years (Anderson, 2014).

Rh. acuminatus is imported into the pet trade in limited quantities, two to three times every few years. Data show 169 individuals imported into the USA from 2010-2014, all of which were wild-caught in Tanzania (US Fish and Wildlife Service, LEMIS Database 2015). Müller and Walbröl (2008) suggest shipments to Germany may be carrying *Rh. acuminatus* as the dominant species. Because the true extent of its collection is uncertain, it is speculated that trade could be detrimental to this species because the population is likely small (Tolley *et al.*, 2014d). Internet traders offer wild-caught *Rh. acuminatus* in Germany (120 €/pair), United Kingdom and Belgium (45-90€), (www.exotic-pets.co.uk; www.dhd24.com; <http://stconnection.de>; www.reptilienserver.de; www.scales-reptiles.com), while in the USA, prices are 150-250 USD (e.g. www.generalexotics.com).

Rh. nchisiensis is considered a fairly new species in the pet trade industry, yet it is readily available and sold in limited quantities. It sells in several European countries for approximately 60 € and in the USA for 20 USD (www.exotic-pets.co.uk). *Rh. moyeri* is imported into the pet trade in limited quantities every few years in Europe (e.g. Short's Tropical Connection 2012). In Tanzania, traders report that *Rh. moyeri* are wild-caught (Busch and Graeber, 2005). Although both *Rh. nchisiensis* and *Rh. moyeri* do not have large markets in the pet trade, the true extent of their collection is unknown (Tolley and Menegon, 2014b,e).

No data currently exists for *Rh. gorongosa*, *Rh. marshalli*, *Rh. beraduccii*, *Rh. boulengeri*; *Rh. chapmanorum*, *Rh. playyceps*, *Rh. bruessoworum*; *Rh. nebulauctor*. *Rh. maspictus* and *Rh. tilburyi*; however, these species are not known to be present in captive markets (Tolley, 2014c,d; Tolley, *et al.*, 2014b,c,e; Tolley and Plumtre, 2014; Tolley and Bayliss, 2014a,b,c,d).

Rh. temporalis, *Rh. viridis*, *Rh. nchisiensis*, and *Rh. uluguruensis* are regularly traded within the pet market. European traders have been documented selling these species from Belgium, the Czech Republic, Germany, Slovakia, and United Kingdom (Auliya, 2003; UNEP-WCMC, 2009; offers at www.terrarium.com; www.exotic-pets.co.uk; www.the-livingrainforest.co.uk; www.reptilienserver.de; www.scales-reptiles.com; www.animal-paradies.de; www.animalfarm.cz; www.terrariumladen.de; www.dhd24.com). *Rh. temporalis* is often misidentified for sales as either *Ri. brevicaudatus* or *Ri. kerstenii*, however trade data on this species is limited (Tolley and Menegon, 2014d). The cost for *Rh. temporalis* range from 30-45 €. *Rh. viridis* is imported into the pet trade in limited quantities, one to two times every few years (Tolley *et al.*, 2014a). Because it is not subject to trade regulations, the degree of harvest is unknown. The USA has imported 2,441 *Rh. viridis* individuals from 2013-2014 (US Fish and Wildlife Service, LEMIS Database 2015).

Rh. uluguruensis are imported for the pet trade in limited quantities every few years, however, the true extent of collection is uncertain. It is not known whether the source populations for many exports are in fact *Rh. uluguruensis* or *Rh. moyeri* or one of the still-undescribed species within this complex (Tolley and Menegon, 2014f). This chameleon is available in European markets for approximately 45 € and in the USA for \$249 for a pair (<http://www.chameleonforums.com/uluguru-dwarf-chameleons-pygmy-leafs-veileds-stock-96354/>). The USA has imported 398 individuals from 2012-2014 (US Fish and Wildlife Service, LEMIS Database 2015).

Rh. spectrum is a species that has been targeted for the international pet trade (Mariaux and LeBreton, 2010). In the Mt. Cameroon region it is the most frequently collected chameleon species after *Ch. montium*; approximately 20 individuals are caught on average per collector, per month for the pet trade industry (Gonwouo, 2002). The USA imported 6,393 individuals from 1999-2014. All animals were wild-caught for commercial trade, with more than half coming from Equatorial Guinea, followed by Cameroon, Guinea and Tanzania (US Fish and Wildlife Service, LEMIS Database 2015). *Rh. spectrum* is sold widely throughout Europe (Mariaux and LeBreton, 2010). In Germany, the Czech Republic and the United Kingdom, several traders offer wild-caught specimens at reptile fairs and in the internet; prices vary from 30-85 € (UNEP-WCMC, 2009; on sale at www.terrarium.com; www.animalfarm.cz; www.animal-paradies.de; www.terrariumladen.de; www.tarantulaspiders.com; www.cardiffreptilecentre.co.uk and many more).

Ri. brachyurus has on occasion been known to be traded in the captive market in very limited numbers (Tolley, 2014a). Although it can sometimes be found on sale on the internet

(www.terrarium.com), it is believed to not be threatened by the captive pet trade at any significant extent. The USA has imported 393 *Ri. brachyurus* individuals from 2013-2014 (US FWS LEMIS Database 2015).

Ri. kerstenii is the most frequently imported African pygmy chameleon into the USA with approximately 98,941 wild-caught specimens being recorded from 1999-2014 (US FWS LEMIS Database 2015). All imports were recorded as being originated in Tanzania. Specimens are offered by traders from Austria, Czech Republic, United Kingdom and Germany, often under the old name *Rh. kerstenii* (Auliya, 2003; UNEP-WCMC, 2009; www.exotic-pets.co.uk; www.zooaustria.com; www.faunaimportuk.com; www.terrarium.com; www.zoofachgeschaef.at; www.cardiffreptilecentre.co.uk; www.reptilica.de). Prices vary from 29-60 € within Europe and 25 USD (<http://www.faunaclassifieds.com/forums/showthread.php?p=1816158>). While shipments of pygmy chameleons labeled as *R. kerstenii* are frequent, these shipments typically contain *R. brevicaudatus* and *Rh. temporalis*, not *Ri. kerstenii*. Due to this species' wide range, it is not subject to major threats of overexploitation (Spawls *et al.*, 2002; Tilbury, 2010).

Ri. brevicaudatus has been popular in the pet trade industry since the 1990's, sold commonly throughout Europe and the USA. It is considered the second-most common pygmy chameleon coming into USA with approximately 57,615 individuals being imported from 1999-2014; trade numbers for this species have been on the rise over the last decade (US Fish and Wildlife Service, LEMIS Database 2015). The majority of *Ri. brevicaudatus* are exported from Tanzania, with small numbers also coming from Cameroon, although it is not a range state for this species. In Europe, traders from Belgium, Czech Republic, Germany, and United Kingdom are regularly offering this species where it is often sold as *Rh. brevicaudata* or under the old name of *Rh. brevicaudatus* (e.g. www.exotic-pets.co.uk; www.animalfarm.cz; www.terrarium.com; www.reptilica.de; www.scales-reptiles.com; www.chameleons-vl.be). It is also frequently imported via the label *Ri. kerstenii* (Tolley and Menegon, 2014a). Animals cost 25-69 € within Europe (UNEP-WCMC, 2009) and 35 USD in the USA (<http://www.backwaterreptiles.com/chameleons/pygmy-chameleon-for-sale.html>).

6.3 Parts and derivatives in trade

Only live animals are known to be in trade.

6.4 Illegal trade

In Cameroon, collection of reptiles is only permitted by license, but this rule is often ignored by local people (Gonwouo, 2002). Confusion regarding the name of *Rh. spinosus* has allowed for this species to be illegally imported in multiple "assorted pygmy chameleon" shipments without CITES documents enabling illegal trade of the species (C. Anderson pers. obs. 2013). In March of 2015, border officials in the United Kingdom seized 136 *Ri. brevicaudatus* in the London Heathrow Airport (TRAFFIC, 2015). To the best of our knowledge additional illegal trade of African pygmy chameleons is not occurring.

6.5 Actual or potential trade impacts

Contrary to other chameleons which have an arboreal lifestyle, *Rhampholeon* and *Rieppeleon* spp. are generally terrestrial (Akani *et al.*, 2001), a characteristic that often facilitates collection. While habitat destruction and degradation are the major threats for African pygmy chameleons, trade is an additional and increasing threat. According to US import data from 2000-2001, a total of 12,049 *Rhampholeon* spp. were imported, however, trade sharply increased to 22,527 by 2007 (US FWS LEMIS Database 2015) after other pygmy chameleons (*Bradypodion* spp.) were listed in CITES App. II in 2002. Reptile magazines confirm an increased interest in trading both *Rhampholeon* and *Rieppeleon* spp. (Anon, 2005; Coevoet, 2007). Species such as *Rh. acuminatus* and *Rh. viridis* were only described a few years ago, have a very restricted range, and are listed as critically endangered and classified as endangered under IUCN Red List (Tolley *et al.*, 2014a,d). Unfortunately, both species are now offered in international pet trade in considerable numbers (Müller and Walbröl, 2008). To ensure that levels of trade are monitored, conservation recommendations for *Rh. viridis* and *Rh. acuminatus* suggest listing under CITES as soon as possible. Tracking impacts from trade on *Rh. viridis* is critical considering it is already vulnerable due to severe fragmentation of the population and multiple tangible threats that have degraded existing habitat (Tolley *et al.*, 2014a). Regarding *Rh. acuminatus*, non-detriment findings need to be determined since it is believed that the pet trade is one factor threatening its survival (Tolley *et al.*, 2014d).

Scientists warn that African pygmy chameleons, especially those in diminished forest patches, are prone to over-collection and may possibly become extinct. For example villagers in the Usambaras have identified chameleons as the most collected vertebrates (Patrick *et al.*, 2011), which is likely impacting species such as *Rh. temporalis* and *Rh. viridis*. Akani *et al.* (2001) attributed one of the reasons for the rarity of chameleons in the forest zone of southern Nigeria is because of illegal trade resulting from the great demand for chameleons following increased market values. In Southwest Cameroon, villagers are intensely collecting *Rh. spectrum* to satisfy the demand of international reptile traders (Gonwouo, 2002). The unregulated trade in *Rhampholeon* and *Rieppeleon* spp. further compromises wild populations of *Rh. spinosus*, which are increasingly found in shipments of wild caught “assorted pygmy chameleons” (Anderson, 2011) and are very difficult to distinguish from other pygmy chameleons.

7. Legal instruments

7.1 National

In August 2011 the country of Tanzania established a temporary export ban on all wildlife shipments (Liganga, 2011), which resulted in an interim pause of exports. To the best of our knowledge no other legal instruments have been established at this time.

7.2 International

None, with the exception of *Rh. spinosus*, which is listed in CITES Appendix II under its former name *Bradypodion spinosum*.

8. Species management

8.1 Management measures

For *Rh. spinosus* (listed as *Bradypodion spinosum* in CITES Appendix II) Tanzania has had varying quotas of 16-50 individuals over the last decade. The following are the set export quotas from 1999-2011: 16 (1999), 16 (200), 8 (2001), 39 (2002), 50 (2003), 38 (2004), 28 (2005), 19 (2006), 26 (2007), 24 (2008), and 18 (2009-2011). These quotas are for F1-specimens (CITES national export quotas for Tanzania 2001-2011). Export quotas for this species were not issued for 2012, 2013 or 2014.

8.2 Population monitoring

To the best of our knowledge there is no specific population monitoring currently underway for African pygmy chameleons. Assessments have been completed on several regional populations; however, long-term population monitoring is not being implemented.

8.3 Control measures

8.3.1 International:

None known, except for CITES which controls trade for *Rh. spinosus*.

8.3.2 Domestic:

Some species are protected at the range State and provincial level (see Section 7.1 Legal Instruments, National). However, domestic protection appears to be inadequate to control the harvest pressure caused by international trade. Additional regional information for each species, as applicable, is in Appendix A.

8.4 Captive breeding and artificial propagation

Hobbyists occasionally report captive breeding of different *Rhampholeon* and *Rieppeleon* spp. (e.g., Lutzmann *et al.*, 2004; Anon, 2007; Coevoet, 2007; Gostner, 2009); however, it appears mortality is high as a result from being egg-bound, inappropriate temperatures and/or humidity (Busch and Graeber, 2005; Deckers, 2006; Stemper, 2006; Gostner, 2009). Because pygmy chameleons are easily misidentified by traders and buyers, survival is often reduced in captive environments due to improper care/habitat requirements necessary for individual species (Hildenhagen, 2007). Captive breeding of African pygmy chameleons on a commercial scale remains economically unprofitable and hence the vast majority are still collected in the wild (Auliya 2003, see also US Fish and Wildlife Service, LEMIS Database 2015).

8.5 Habitat conservation

Rh. marshalli is only protected in the Chimanimani and Nyanga National Parks and the Bunga Forest Botanical Reserve in the Vumba Mountains. Currently most of the remaining habitat of *Rh. temporalis* is protected within the East Usambara Forest Conservation Project (Amani Forest Reserve) and related forest conservancies in the East Usambara. At present *Rh. moyeri* is protected within the Udzungwa National Park, the first and only area in the “Eastern Arc” to be protected for its biodiversity and given realistic long-term conservation. Only the Malawian Nyika Plateau is protected as a National Park where *Rh. nchisiensis* is known to inhabit. Additional populations of African pygmy chameleons occur in unprotected areas or in nature reserves,

however, in practice, protection is not afforded for species living in these locations (Pauwels *et al.*, 2008; Mariaux, 2010a,b; Mariaux and LeBreton, 2010; Tilbury, 2010).

9. Information on Similar Species-

Brookesia are also dwarf chameleons like *Rhampholeon* and *Rieppeleon* spp. Endemic to Madagascar, they range from 25-105 mm in total length. Although considered smaller than most African pygmy chameleons, *Brookesia* can often be very similar in size (e.g., *Rh. beraduccii* has a maximum length of 36 mm) and coloration. Generally, African pygmy chameleons are referred to as the “ground chameleons”, while *Brookesia* are referred to as the “leaf chameleons” (Glaw *et al.*, 2012). *Rhampholeon* and *Rieppeleon* spp. superficially resemble *Brookesia*; however, they can be differentiated by hemipenis characters. The hemipenis apex has crests in *Brookesia* and horns in *Rhampholeon* (Raxworthy and Nussbaum, 1995). All *Brookesia* are listed under Appendix II for CITES, with the only exception being *B. perarmata* under Appendix I. Trade is regulated for all *Brookesia*, except *B. perarmata*, which is not permitted, yet has been recorded to be illegally traded (Jenkins, *et al.*, 2011).

10. Consultations

Consultation letters have been sent to all 16 range countries with the following responses regarding *Rhampholeon* and *Rieppeleon* spp (with respect to species found in that country):

Gabon: Gabon, home to one of the species discussed herein (*Rh. spectrum*), tentatively supports the inclusion of the African pygmy chameleons of the genera *Rhampholeon* spp. and *Rieppeleon* spp. in Appendix II.

Nigeria: Though the population size of African Pygmy Chameleon is not documented for now and the conservation trend is unknown, it is pertinent to start regulating trade on it before it is too late.

After consultation with Scientific Authority, (National Park Service) Nigeria concluded and supports the suggestion to list all species of the African Pygmy Chameleon in Appendix II of CITES.

In addition to the letters, a CITES CoP 17 Coordination Workshop between West and Central African countries was held in Senegal March 15-17, 2016. Two range states, Gabon and DRC, spoke in support of the proposal. All countries present at the workshop (Burkina Faso, Côte d’Ivoire, Ghana, Guinee-Bissau, Mali, Niger, Nigeria, Senegal, Togo, Liberia, Tchad, Central African Republic, Congo, Sierra Leone, Mauritania, and Gabon) agreed by consensus to support the proposal at CoP17

11. Additional remarks

12. References

Akani, G., O. K. Ogbalu and L. Luiselli. 2001: Life–history and ecological distribution of chameleons (Reptilia, Chamaeleonidae) from the rain forests of Nigeria: conservation implications. *Animal Biodiversity and Conservation*, 24(2): 1–15.

- Anderson, C.V.. 2005. Summary of the latest taxonomic revisions to the genus *Rhampholeon* GÜNTHER, 1874. Chameleons! Online E-Zine, June 2005.
(<http://www.chameleonnews.com/05JunAndersonRhampholeon.html>)
- Anderson, C. 2011. An interview with the Chameleon forum, available at www.chameleonforums.com/interview-chris-anderson-66414/.
- Anderson, C.V.. 2014. Words from the Editor. Chameleons! Online E-Zine, June 2014.
(<http://www.chameleonnews.com/14JunAndersonWFTE.html>)
- Anon. 2005. Editorial. *Chamaeleo* 30(1): 3.
- Anon. 2007. Breeding statistics of the working group chameleons. *Chamaeleo* 33(2): 46.
- Auliya, M. 2003. Hot Trade in Cool Creatures – A review of the live reptile trade in the European Union in the 1990s with a focus on Germany. TRAFFIC Europe, Brussels, Belgium, 112 pp.
www.traffic.org/species-reports/traffic_species_reptiles2.pdf.
- Bayliss, J., S. Makungwa, J. Hecht, D. Nangoma and C. Bruessow. 2007. Saving the Island in the Sky: the plight of the Mount Mulanje cedar *Widdringtonia whytei* in Malawi. *Oryx* 41(1): 64-69.
- Burgess, N., N.D. Burgess, T.M. Butynskid, N.J. Cordeiro, N.H. Doggart, J. Fjeldsa, K.M. Howelli, F.B. Kilahama, S.P. Loaderk, J.C. Lovetl, B. Mbilinyi, M. Menegon, D.C. Moyer, E. Nashanda, A. Perkin, F. Rovero, W.T. Stanley, S.N. Stuart. 2007. The biological importance of the Eastern Arc Mountains of Tanzania and Kenya. *Biological Conservation* 134: 209-231.
- Busch, A. and D. Graeber. 2005. Zur Haltung und Zucht von *Rhampholeon moyeri*. *Chamaeleo* 30(1): 28-30.
- Branch, W.R. 1988. Field guide to snakes and other reptiles of South Africa. Ralph Curtis Books.
- Branch, W.R., J. Bayliss and K.A. Tolley. 2014. Pygmy chameleons of the *Rhampholeon platyceps* complex (Squamata: Chamaeleonidae): Description of four new species from isolated 'sky islands' of northern Mozambique. *Zootaxa* 3817(1): 1-36.
- Carrere, R. 2010. Oil palm in Africa – past, present and future scenarios. World Rainforest Movement series on tree plantations No.15.
- Coevoet, M. 2007. Eigene Erfahrungen mit der Haltung und Nachzucht von *Rhampholeon nchisiensis*. *Chamaeleo* 34(1): 22-26.
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). 2015. CITES Export Quotas. Available at: <http://www.cites.org/eng/resources/quotas/index.php>. (Accessed: 1 May).
- Critical Ecosystem Partnership Fund (CEPF). 2005. Eastern Arc Mountains and Coastal Forests of Kenya and Tanzania: Ecosystem Profile. Conservation International / International Centre of Insect Physiology and Ecology.

- Deckers, S. 2006. Eine interessante Beobachtung an Stummelschwanzchamäleons. *Chamaeleo* 33(2): 11-12.
- FAO. 2010. Global Forest Resources Assessment 2010. FAO Forestry Paper 163, Rome.
- Glaw F., Köhler J., Townsend T.M., Vences M. 2012. "Rivaling the World's Smallest Reptiles: Discovery of Miniaturized and Microendemic New Species of Leaf Chameleons (*Brookesia*) from Northern Madagascar". *PLoS ONE* 7 (2): e31314. doi:10.1371/journal.pone.0031314
- Gonwouo, L. 2002. Reptiles of Mount Cameroon with specific reference to species in intercontinental trade. Dissertation Dept. Animal Biology and Physiology, University of Yaounde.
- Gonwouo, N. L., M. LeBreton, L. Chirio, I. Ineich, M. N. Tchamba, P. Ngassam, Dzikouk G. & J.L. Dikko 2007: Biodiversity and conservation of the Reptiles of Mount Cameroon Area African Journal of Herpetology 56 (2).
- Gostner, A. 2009. Zur Haltung und Nachzucht von *Rhampholeon (Rhampholeon) viridis*. *Chamaeleo* 38 (1): 37-46.
- Gray, J. S. 1989. Effects of environmental stress on species rich assemblages. *Biol. J. Linn. Soc.*, 37: 19–32.
- Hildenhagen, T. 2007. East African stump-tailed chameleons. Chameleons! Online E-Zine (<http://www.chameleonnews.com/07FebHildenhagen.html>).
- Jenkins, R.K.B., Andreone, F., Andriamazava, A., Anjeriniaina, M., Glaw, F., Rabibisoa, N., Rakotomalala, D., Randrianantoandro, J.C., Randrianiriana, J., Randrianizahana, H., Ratsavina, F. & Robsomanitrondrasana, E. 2011. *Brookesia perarmata*. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>. Downloaded on 05 May 2015.
- Largen, M. J., and S. Spawls. 2010. *The Amphibians and Reptiles of Ethiopia and Eritrea. Frankfurt Contributions to Natural History. Volume 38*. Frankfurt am Main: Edition Chimaira.
- Liganga, L. 2011. Tanzania: Govt Bans Animal Export, Suspends Director of Wildlife. The Citizen, Dar es Salaam, of 18 August.
- Lutzmann, N., S. Esser, A. Flamme, and H. Schneider. 2004. Care and breeding of the stump-tailed chameleon *Rhampholeon brevicaudatus*. *Reptilia (GB)* 35: 22-27.
- Makda, F., A. Fisseha, J. Mariaux and M. Menegon. 2013. The “*Rhampholeon uluguruensis* complex” (Squamata: Chamaeleonidae) and the taxonomic status of the pygmy chameleons in Tanzania. *Zootaxa* 3746 (3): 439–453.
- Mariaux, J. 2010a. *Rhampholeon marshalli*. In: IUCN 2011. IUCN Red List of Threatened Species. Version 2011.2. <www.iucnredlist.org>.
- Mariaux, J. 2010b. *Rhampholeon spinosus*. In: IUCN 2011. IUCN Red List of Threatened Species. Version 2011.2. <www.iucnredlist.org>.

- Mariaux, J. and M. LeBreton. 2010. *Rhampholeon spectrum*. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>. Downloaded on 08 April 2015.
- Mariaux, J. and C. Tilbury. 2006. The Pygmy Chameleons of the Eastern Arc Range (Tanzania): Evolutionary relationship and the description of three new species of *Rhampholeon* (Sauria: Chamaeleonidae). *Herpetological Journal* 16(3): 315-331.
- Matthee, C., C.R. Tilbury and T. Townsend. 2004. A phylogenetic review of the African leaf chameleons: genus *Rhampholeon* (Chamaeleonidae): the role of vicariance and climate change in speciation. *Proc. R. Soc. Lond. B* . 271: 1967–1975.
- Menegon, M., S. Salvidio, C. Tilbury. 2002. A new dwarf chameleon from the Udzungwa Mountains of Tanzania (Squamata: *Rhampholeon* Günther, 1874). *Journal of Herpetology* 36, 51–57.
- Müller, R. and U. Walbröl. 2008. Vorstellung von *Rhampholeon (Rhinodigitum) acuminatus*, Mariaux & Tilbury 2006. *Chamaeleo* 37(2): 30-33.
- Newmark, W.D. 1998. Forest Area, Fragmentation, and Loss in the Eastern Arc Mountains: Implications for the Conservation of Biological Diversity. *Journal of East African Natural History* 87: 1-8.
- Patrick, D., P. Shirk, J. R. Vonesh, E. B. Harper and K.M. Howell. 2011. Abundance and Roosting Ecology of Chameleons in the East Usambara Mountains of Tanzania and the Potential Effects of Harvesting. *Herp. Cons. Biol.* 6(3): 422-431.
- Pauwels, O. S. G., W. Böhme and J.-J. Tanga. 2008. Das Westliche Erdchamäleon *Rhampholeon spectrum* Buchholz, 1874 in Gabun. *Elaphe* 16: 59-61.
- Raxworthy CJ, Nussbaum RA. 1995. Systematics, speciation and biogeography of the dwarf chameleons (*Brookesia*, Reptilia, Squamata, Chamaeleontidae) of northern Madagascar. *J Zool.* 235: 525–558.
- Spawls, S., Howell, K.M., Drewes, R.C. and Ashe, J. 2002. *A Field Guide to the Reptiles of East Africa*. Academic Press, Elsevier Science.
- Stemper, A. 2006. Beobachtungen zur Haltung und Vermehrung von *Rhampholeon spectrum*. *Chamaeleo* 33(2): 17-22.
- Tilbury, C. 2010. Chameleons of Africa – An Atlas including the chameleons of Europe, the Middle East and Asia. Edition Chimaira, Frankfurt.
- Tilbury, C.R. & K.A. Tolley. 2015. Contributions to the herpetofauna of the Albertine Rift: Two new species of chameleon (Sauria: Chamaeleonidae) from an isolated montane forest, south eastern Democratic Republic of Congo. *Zootaxa* 3905(3): 345–364.
- Tolley, K. 2014a. *Rieppeleon brachyurus*. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>. Downloaded on 09 April 2015.

- Tolley, K. 2014b. *Rieppeleon kerstenii*. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>. Downloaded on 09 April 2015.
- Tolley, K. 2014c. *Rhampholeon marshalli*. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>. Downloaded on 08 April 2015.
- Tolley, K. 2014d. *Rhampholeon platyceps*. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>. Downloaded on 17 April 2015.
- Tolley, K. and J. Bayliss. 2014a. *Rhampholeon bruessoworum*. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>. Downloaded on 10 April 2015.
- Tolley, K. and J. Bayliss. 2014b. *Rhampholeon maspictus*. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>. Downloaded on 10 April 2015.
- Tolley, K. and J. Bayliss. 2014c. *Rhampholeon nebulauctor*. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>. Downloaded on 10 April 2015.
- Tolley, K. and J. Bayliss. 2014d. *Rhampholeon tilburyi*. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>. Downloaded on 10 April 2015.
- Tolley, K. and M. Menegon. 2014a. *Rieppeleon brevicaudatus*. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>. Downloaded on 09 April 2015.
- Tolley, K. and M. Menegon. 2014b. *Rhampholeon nchisiensis*. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>. Downloaded on 09 April 2015.
- Tolley, K. and M. Menegon. 2014c. *Rhampholeon spinosus*. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>. Downloaded on 08 April 2015.
- Tolley, K. and M. Menegon. 2014d. *Rhampholeon temporalis*. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>. Downloaded on 09 April 2015.
- Tolley, K. and M. Menegon. 2014e. *Rhampholeon moyeri*. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>. Downloaded on 09 April 2015.
- Tolley, K. and M. Menegon. 2014f. *Rhampholeon uluguruensis*. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>. Downloaded on 09 April 2015.
- Tolley, K., M. Menegon and A. Plumtre. 2014a. *Rhampholeon viridis*. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>. Downloaded on 09 April 2015.
- Tolley, K., M. Menegon and A. Plumtre. 2014b. *Rhampholeon beraduccii*. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>. Downloaded on 09 April 2015.

- Tolley, K., M. Menegon and A. Plumptre. 2014c. *Rhampholeon chapmanorum*. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>. Downloaded on 09 April 2015.
- Tolley, K., M. Menegon and A. Plumptre. 2014d. *Rhampholeon acuminatus*. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>. Downloaded on 09 April 2015.
- Tolley, K., M. Menegon and A. Plumptre. 2014e. *Rhampholeon gorongosae*. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>. Downloaded on 08 April 2015.
- Tolley, K. and A. Plumptre. 2014. *Rhampholeon boulengeri*. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>. Downloaded on 09 April 2015.
- TRAFFIC. 2015 TRAFFIC *Bulletin* Volume 27 No. 1.
- UNEP-WCMC. 2009. Review of non-CITES reptiles that are known or likely to be in international trade. A Report to the European Commission. Available at: http://ec.europa.eu/environment/cites/pdf/reports/non_cites_reptiles.pdf.
- UNEP-WCMC. 2015. CITES Trade Database. Available at: http://www.unep-wcmc-apps.org/citestrade/expert_accord.cfm?CFID=50172297&CFTOKEN=72268891. (Accessed: 1 May).
- US Fish and Wildlife Service, LEMIS Trade Database. 2015. US import data for *Rhampholeon* and *Rieppeleon* species.
- Wild, C. 1994. Ecology of the Western Pygmy Chameleon *Rhampholeon spectrum* Buchholz 1874 (Sauria: Chamaeleonidae). *British Herpetological Society Bulletin* 49: 29-35.