



Catalogue of the amphibian and reptile type specimens of the Museu de História Natural da Universidade do Porto in Portugal, with some comments on problematic taxa

Luis M. P. Cerfaco^{1,2*}, David C. Blackburn³, Mariana P. Marques⁴,
Francisco M. Calado⁴

¹ Centro de Estudos de História e Filosofia da Ciência, Universidade de Évora,
Palácio do Vimioso, Largo Marquês de Marialva 8, 7000-554 Évora, Portugal

² Museu Nacional de História Natural e da Ciência, Rua da Escola Politécnica 56-58, 1250-102 Lisboa, Portugal

³ Department of Vertebrate Zoology and Anthropology, California Academy of Sciences,
55 Music Concourse Drive, San Francisco, California 94118, USA

⁴ Departamento de Biologia, Universidade de Évora, Pólo da Mitra, Apartado 94, 7002-554 Évora, Portugal

We present an annotated catalog of the type specimens of amphibians and reptiles in the collections of the Museu de História Natural da Universidade do Porto in Portugal. These specimens, all from present-day Angola, formed the basis of taxonomic descriptions by both José Júlio Bethencourt Ferreira and José Vicente Barbosa du Bocage in the latest 19th and early 20th century. We provide details for all type specimens and summarize the history and taxonomy for each species. Specimens of *Rappia bocagei* var. *maculata* and *Typhlops bocagei* could not be located during our survey, and we believe these to be lost. The collections at the University of Porto contain type specimens of one snake, *Typhlops boulengeri*, and eight frogs, *Arthroleptis carquejai*, *Hylambates bocagei* var. *leucopunctata*, *Rappia platyceps* var. *angolensis*, *Rappia bivittata*, *Rappia fasciata*, *Rappia nobrei*, *Rappia osorioi*, and *Rappia seabrai*. Of these, only two are currently recognized: *Afrivalus osorioi* and *Arthroleptis carquejai*.

INTRODUCTION

The Museu de História Natural da Universidade do Porto, Portugal, and its collections date back to the second half of the nineteenth century. These collections are one of the largest zoological collections in Portugal, probably only surpassed by the collections of the zoological section of the Museu da Ciência da Universidade de Coimbra, in Coimbra and by the collections of the Centro de Zoologia do Instituto de Investigação Científica Tropical, in Lisbon. Included in the Porto collections are type specimens of several different taxa. During recent studies of the late 19th and early 20th century collections, we identified type specimens of amphibian and reptile species described by José Júlio Bethencourt Ferreira (1866-1936) in the beginning of the twentieth century. These specimens received little attention subsequent to Ferreira's original descriptive work though they are relevant to several nomenclatural and taxonomic problems. In addition, the collection contains other specimens that appear to be syntypes or paratypes of taxa described by José Vicente Barbosa du Bocage (1823-1927) in the second half of the nineteenth century. Besides these herpetological specimens, we also located other mammalogical, ornithological, and invertebrate type specimens. Here we present the complete catalogue of the extant herpetological type specimens and contribute to clarifying several related taxonomic and nomenclatural issues. A brief note about the

history of the Museum and its collections is also presented.

The Universidade do Porto, created in 1911, is the direct heir of the defunct Academia Politécnica do Porto. Formally created in December of 1837, the Academia Politécnica replaced the former Academia Real de Marinha e Comércio. In comparison to other Portuguese scientific establishments, the history of the Academia Politécnica do Porto has been almost forgotten. Consequently, particular parts of this institution, including the zoological class and museum, are almost unknown. Since its beginning, the Academia Politécnica lectures included a class dedicated to the study of natural history that focused especially in zoology, mineralogy, geognosy, mining, and metallurgy (Basto, 1938). The “7th class”, as it was known, was divided in two years. For the zoological subjects, it was focused on the study of comparative anatomy and physiology, to the classification of animals by “natural families”, and to the description and study of economically useful species, always following Cuvier’s classification scheme (Basto, 1938).

Giving the study plan of the 7th class, collections were needed for students to observe and compare different animal groups. Unfortunately, there is little information on the collection and related facilities that were available at the time of the Academia Politécnica. In 1845, under the direction of Professor José Carneiro da Silva (1791-1853) who was in charge of the 7th chair beginning in 1840, the collections available for the class were small, with the majority being loaned to the Academia by a local patron to whose family it later returned after his death (Machado, 1937). In the following years, due to the initiative of the congressman José da Silva Passos, some funds were allocated to improve the scientific collection of the Academia Politécnica. Some of those funds were spent acquiring natural history material from Parisian dealers (Machado, 1937). However, the small teaching collection remained impoverished during the late nineteenth century until Augusto Pereira Nobre (1865-1947) arrived at the Academia Politécnica. Nobre was born in Porto and studied natural sciences at Universidade de Coimbra, but later transferred to the Academia Politécnica do Porto to finish his studies. In Porto, Nobre began private studies in malacology in the collections of the Museu Allen. His interest in maritime biology led him to transfer to Paris where he studied with Edmond Perrier in the Sorbonne University and the Muséum national d’Histoire naturelle, as well as with Armand Sabatier in the Station de Biologie Marine de Sète of Montpellier University (Almaça, 1997; Santos & Eiras, 2006). After returning to Portugal in 1891, Nobre was nominated as an assistant professor of Botany in the Academia Politécnica do Porto in 1890 and as an assistant of the Zoology chair with the charge of rearranging and cataloguing the collections (Almaça, 1997; Santos & Eiras, 2006). In the following years Nobre published catalogues of the collections of the Polytechnical Academy (Nobre, 1892, 1893a, 1893b, 1895, 1897, 1899, 1903, 1904) and dedicated himself to enriching the collections. For that, Nobre acquired collections from major European natural history dealers such as the Parisian house Deyrolle, the Hamburg house Umlauff, and the house Schlütter from Halle in Germany. He also acquired specimens from local Portuguese dealers like António F. F. Mendes, private collectors like Francisco Rodrigues Batalha or Braga Júnior (offered to the museum), and scientific institutions like the Marine Biological Association of the United Kingdom from Plymouth, from which the museum acquired a large collection of marine invertebrates in 1905. In addition, Nobre relied on contributions from private individuals and other national and international natural history institutions, such as the Museu Nacional de História Natural de Lisboa that regularly offered specimens from 1890 to the middle of the twentieth century, or in the case of Siegfried Joffe from Germany.

More importantly, the collections grew by field expeditions aimed at collecting specimens for the museum, both in Portugal and in overseas territories. These expeditions not only provided large series of collections to complete the museum and help in teaching, but also brought considerable novelties to zoological knowledge. The most significant of these expeditions was that of the Portuguese naturalist and explorer Francisco Newton (1864-1909) to Angola. Newton, a personal friend of Augusto Nobre since childhood (Nobre, 1945), had explored and collected specimens in Portuguese overseas territories, as São Tomé e Príncipe, Cape Verde, and Timor, under the orders of Barbosa du Bocage. The Angolan expedition that Newton undertook from 1903 to 1905 for the Academia Politécnica do Porto, resulted in a considerable collection of specimens from the most diverse groups: insects, crustaceans, arachnids, fishes, amphibians, reptiles, birds, and mammals. After arriving in Porto, part of this collection was sent to Lisbon in 1904, where some of it was prepared and other portions sent to be studied by specialists. That was the case of the collection of amphibians and reptiles made by Newton that was sent to José Júlio Bethencourt Ferreira. At that time, Bethencourt Ferreira was the curator of the herpetological collections in the zoological section of the Museu Nacional de História Natural de Lisboa, under the supervision of Barbosa du Bocage. Nobre charged Ferreira with the task of identifying and classifying the collections made by Francisco Newton in Angola and to return it to Porto after the work was completed (Ferreira, 1904, 1906). The first shipment sent by Nobre to Ferreira on 20th July 1904 contained the herpetological specimens collected by Newton in 1903 in the northern region of Kwanza river (Ferreira, 1904). It contained fourteen anuran taxa of which Ferreira considered two to be new (*Rappia nobrei*, *Hylambates bocagei* var. *leucopunctata*), eleven snake species of which one new taxon was described (*Typhlops bocagei*), and eight lizard species. In 1906, Ferreira described an additional

Amphibios novos ou pouco conhecidos de Angola



Arthroleptis carquejai
n. sp.



Rappia osorioi
n. sp.



Rappia bivittata
n. sp.



Arthroleptis carquejai
n. sp.



Rappia seabrai
n. sp.



R. platyceps Blgr.
var. *angolensis*
n. var.



Rappia fasciata
n. sp.

Figure 1. Plate with specimen photography as presented by Ferreira (1906). Reproduced from the original.

seven new anuran taxa, including five new species (*Rappia bivittata*, *Rappia osorioi*, *Rappia seabrai*, *Rappia fasciata*, and *Arthroleptis carquejai*) and two new varieties (*Rappia bocagei* var. *maculata* and *Rappia platyceps* var. *angolensis*) (Ferreira, 1906). Besides these new taxa, Ferreira (1906) provided records for species of another seventeen frogs, fourteen snakes, and seven lizards. The paper was accompanied by a plate with photographs of several of the newly described taxa (fig. 1). Part of the collection made by Newton in Angola between 1903 and 1905 was only returned to Porto in November of 1908, following offers of other herpetological specimens from the Museu Nacional de História Natural de Lisboa (also known since 1906 as Museu Bocage) to Porto, including one rare specimen of the Cape Verde giant skink, *Chioninia coctei* (AHMB Div. 519-10; Ceríaco, in press). In Lisbon, Antero de Seabra studied the collections of birds and mammals that had been sent there for preparation (Seabra, 1905a, 1905b, 1906a, 1906b, 1906c, 1906d, 1906e, 1907). In March 1921, the Museum together with the Estação de Biologia Marinha, the Laboratório de Entomologia Económica, and the general laboratory of the Universidade do Porto were incorporated under the “Instituto de Zoologia” of Universidade do Porto. Following the death of Augusto Nobre, who maintained the directorship of the Institute almost until his death, the museum largely fell into a state of disrepair. Subsequent directors did not have the same dynamic influence as Nobre, and the collections and museum stagnated with time. Today the museum is closed to the public, though there are plans for its reorganization and opening. The collections of the museum are displayed in two main rooms: the Portuguese room and the General collections rooms maintaining almost the original display of the beginning of the twentieth century (fig. 2). This situation leads to the paradoxical question of how to preserve both the collections and the museum itself. The early twentieth century display is not the best solution for preserving old and fragile specimens, because of the excess light, fragile structure of the closets, and inability to control climate and pests effectively. Yet, the display remains of historical value because it is a rare example of a natural history exhibition from the beginning of the twentieth century. This collection is thus of unique importance to those interested in biodiversity science as well as the history of science.

In general, many Portuguese collections require updated systematic organization. In addition, at least one important collection was tragically destroyed — the Bocage collections housed in Lisbon were lost in the catastrophic fire of 1978. Because of this, investigations of taxa described by Portuguese naturalists and the relevant type specimens have been difficult over the past century. One of the few such studies based on Portuguese collections is that of Perret (1976a), which was made before the catastrophic fire and based on the amphibian type specimens of Lisbon museum (Almaça & Neves, 1987). There are a variety of problems facing specimens preserved in alcohol or formaldehyde in these collections. It is frequently difficult, if not impossible, to evaluate the taxonomic status of older formalin- or alcohol-preserved specimens because they are often damaged, have been dehydrated, or have faded colouration and patterns because of extensive exposure to light. However, their study is important for addressing taxonomic, and nomenclatural queries. This is the situation with some amphibian species described by Ferreira based on the Porto collections made by Francisco Newton (Ferreira, 1904, 1906). During current investigations in the Museu de História Natural da Universidade do Porto, most of Ferreira’s anuran types were located and identified. With this annotated type catalogue, we catalog the extant herpetological type specimens present in the Porto collections, and comment on several outstanding taxonomic and nomenclatural problems.



Figure 2. Picture of the General room of the Museu de História Natural da Universidade do Porto at the beginning of the twentieth century (left) and actual picture of the same room (right). Credits: MHNFCP (left) and Luis Ceríaco (right).

MATERIALS AND METHODS

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The catalogue follows a similar structure to those published for the Institut für Systematische Zoologie of the Museum für Naturkunde der Humboldt-Universität zu Berlin (e.g., Bauer *et al.*, 2006). For each taxon, we provide the original name followed by the author, date of publication and page; the holotype or syntype catalog numbers in the Museu de História Natural da Universidade do Porto (MHNFCP), along with information derived from the jar labels, catalogue entries, and published descriptions about the collector, locality and date of collections; the current name for the species; and other general remarks. For all of the holotypes or syntypes, we present a colour photograph of the preserved specimen. In some cases, we referred to available correspondence in the Arquivo Histórico do Museu Bocage (AHMB) at the Museu Nacional de História Natural e da Ciência, Lisboa for clarifying particular details regarding specimens in the MHNFCP collections.

For the identification and clarification of problematic taxa, we conducted more detailed morphological study. For these specimens, the following measurements were taken with a digital caliper following Bossuyt & Dubois (2001): Snout-vent length (SVL), head width at the angle of jaws (HW), head length from the posterior corner of mandible to tip of snout (HL), distance from posterior corner of mandible to the nostril (MN), distance from the posterior corner of mandible to anterior corner of eye (MFE), distance from the posterior corner of mandible to posterior corner of eye (MBE), distance between the anterior corner of eyes (IFE), distance between the posterior corner of eyes (IBE), forelimb length from the elbow to base of outer palmar tubercle (FLL), hand length from base of outer palmar tubercle to tip of third finger (HAL), inner toe length (ITL), third finger length from base of first subarticular tubercle (TFL), lower leg (crus, or tibiofibula) length (TL), thigh (femur) length from vent to knee (FL), foot length from base of inner metatarsal tubercle to tip of the fourth toe (FOL), fourth toe length from base of first subarticular tubercle (FTL), internarial distance (IN), distance from the anterior corner of eye to nostril (EN), eye length (EL), distance from nostril to tip of snout (NS), maximum tympanum diameter (TYD), and the distance between the tympanum and posterior corner of eye (TYE). Some specimens are in poor condition, are still or were once preserved in formaldehyde, and/or are small and fragile, all of which inhibit DNA-based or other detailed study. We compared the type material with specimens present in the collections of the

Table 1. Localities for MHNFCP type specimens, with updated names (including province) and estimated latitude, longitude, and elevation.

Locality in publication	Corresponding taxa	Current locality name	Latitude	Longitude	Elevation (m)
N'golla Bumba	<i>Rappia bivittata</i> <i>Rappia platyceps</i> var. <i>angolensis</i>	N'Golla Bumba (Cuanza Norte Prov.)	09° 02'S	14° 36'E	750
"Quilombo" or "Quilombo, Rio Luinha"	<i>Rappia bivittata</i> <i>Rappia fasciata</i> <i>Rappia osorioi</i> <i>Rappia platyceps</i> var. <i>angolensis</i> <i>Rappia seabrai</i>	Gonguembo (Cuanza Norte Prov.)	09° 20'S	14° 54'E	750-800
Rio Luinha	<i>Rappia bivittata</i>	Rio Luinha (Cuanza Norte Prov.)	09° 16'S	14° 32'E	250
Cabiri	<i>Rappia nobrei</i>	Cabiri (Luanda Prov.)	08° 55'S	13° 40'E	60
Duque de Bragança	<i>Rappia seabrai</i>	Kalandula (Malanje Prov.)	09° 06'S	15° 57'E	1110
Gumba, Sa de Selles	<i>Hylambates bocagei</i> var. <i>leucopunctata</i>	Gumba (Cuanza Sul Prov.)	11° 27'S	14° 29'E	1100
Cambondo	<i>Arthroleptis carquejai</i>	Cambondo (Cuanza Norte Prov.)	09° 29'S	16° 38'E	1150
Quindumbo	<i>Typhlops boulengeri</i>	Quindumbo (Benguela Prov.)	12° 28'S	14° 56'E	1350-1450
Golungo Alto	<i>Rappia bocagei</i> var. <i>maculata</i>	Golungo Alto (Cuanza Norte Prov.)	09° 08'S	14° 46'E	630
Cacuaco	(see account for <i>Rappia bocagei</i> var. <i>maculata</i>)	Cacuaco (Luanda Prov.)	08° 47'S	13° 22'E	40
Cabicula, Bom Jesus	<i>Typhlops bocagei</i>	Bom Jesus (Bengo Prov.)	09° 10'S	13° 34'E	87

California Academy of Sciences (CAS; San Francisco, USA), the Muséum national d'Histoire naturelle (MNHN; Paris, France) and Zoologisches Museum für Hamburg (ZMH; Hamburg, Germany); for details on the specimens examined, see Appendix 1. The results of these comparisons are presented in the general remarks for each taxon. For identifications, we relied especially on Schiøtz (1999), Noble (1924), Frétey *et al.* (2012), and Amiet (2012). Geocoding of historical localities follows Cabral & Mesquitela (1989). Tab. 1 presents the list of type localities, current locality names, and estimated latitude, longitude, and elevation.

SYSTEMATIC ACCOUNTS

Extant types

Amphibia

Hyperoliidae

Rappia bivittata Ferreira, 1906

Original name. *Rappia bivittata* Ferreira, 1906: 161.

Type specimens. The three syntypes designated by Ferreira (1906) still exist in Porto. These are represented by one specimen from “N’golla Bumba” (MHNFCP 017291, ♂, SVL 19.1 mm), one from “Quilombo” (MHNFCP 017296, Juv., SVL ≈ 14 mm), and one from “Rio Luinha” (MHNFCP 017302, ♂, SVL 19.7 mm), all of which are from the Francisco Newton expedition to Angola in 1903-1905 (fig. 3). Measurements of the type specimens are presented in tab. 2 with exception of MHNFCP 017296 which is poorly preserved and so could not be measured accurately.

Present name. *Hyperolius platyceps* (Boulenger, 1900).



Figure 3. Dorsal and ventral views of the three syntypes of *Rappia bivittata* Ferreira, 1906. Top left: MHNFCP 017302 from Rio Luinha, Angola. Top right: dorsal and ventral views of MHNFCP 017291 from N’golla Bumba, Angola. Below: Dorsal and ventral views of MHNFCP 017296, which is in poor condition because of past dehydration, from, Quilombo, Angola. Scale bar = 10 mm.

Table 2. General comparisons between *Rappia bivittata*, *Rappia fasciata*, and *Rappia platyceps* var. *angolensis* type specimens with *Hyperolius platyceps* and *Hyperolius cinnamomeoventris* specimens (see Appendix 1). When *n* specimens > 1 measurements are provided as range, followed by mean \pm standard deviation. Measurements taken in mm; ratios in %.

	<i>Rappia bivittata</i>		<i>Rappia fasciata</i>	<i>Rappia platyceps</i> var. <i>angolensis</i>	<i>Hyperolius platyceps</i>	<i>Hyperolius cinnamomeoventris</i>
	MHNFCP 017291	MHNFCP 017302	MHNFCP 017294	MHNFCP 017303	(<i>n</i> = 12)	(<i>n</i> = 14)
SVL	19.05	19.65	25.13	26.21	21.27-26.98 (23.98 \pm 1.67)	21.46-29.29 (23.87 \pm 2.18)
HW	5.59	6.38	8.46	9.69	7.66-8.98 (8.24 \pm 0.52)	6.33-8.88 (7.17 \pm 0.68)
HL	6.07	5.85	8.44	7.68	7.44-9.06 (8.15 \pm 0.57)	7.06-9.13 (7.82 \pm 0.60)
HW/HL	92	109	100	126	98-105 (101 \pm 2.14)	83-101 (92 \pm 5.60)
EN	1.55	1.43	2.60	2.37	1.48-2.53 (2.13 \pm 0.39)	1.98-3.00 (2.94 \pm 0.33)
IFE	2.63	2.71	5.06	4.85	4.05-4.98 (4.53 \pm 0.31)	3.53-5.09 (3.98 \pm 0.42)
EN/IFE	58	52	51	48	36-62 (47 \pm 7.84)	50-62 (58 \pm 4.20)
IBE	3.44	5.39	7.95	8.06	6.92-8.27 (7.54 \pm 0.43)	5.41-7.96 (6.64 \pm 0.58)
FLL	4.22	3.85	5.57	5.46	4.44-5.80 (5.25 \pm 0.49)	4.60-6.31 (5.07 \pm 0.50)
HAL	3.40	4.39	6.23	6.74	6.00-7.46 (6.76 \pm 0.51)	5.35-7.06 (6.28 \pm 0.51)
ITL	2.07	1.52	2.55	3.26	2.72-3.76 (3.29 \pm 0.30)	2.35-3.69 (2.98 \pm 0.38)
TFL	1.45	2.80	5.42	4.79	3.69-4.95 (4.14 \pm 0.39)	3.20-4.29 (3.95 \pm 0.44)
FL	8.43	7.90	11.62	12.89	10.89-13.57 (12.25 \pm 0.91)	8.75-11.66 (10.87 \pm 1.18)
FOL	7.75	7.26	10.58	10.27	8.37-11.87 (10.40 \pm 1.07)	8.26-16.73 (9.90 \pm 1.97)
FTL	4.51	5.43	6.71	8.66	6.04-8.50 (7.19 \pm 0.78)	4.74-7.20 (5.42 \pm 0.83)
IN	1.19	1.34	1.98	2.58	1.69-2.43 (2.14 \pm 0.22)	1.42-2.09 (1.77 \pm 0.20)
EL	2.53	1.99	3.02	3.94	2.89-4.03 (3.50 \pm 0.37)	2.36-3.39 (2.94 \pm 0.33)

Remarks. Ferreira's (1906:161-162) description of *Rappia bivittata* was based on three syntype specimens. Noble (1924) proposed the name *Hyperolius ferreirai* because the name *Hyperolius bivittatus* was preoccupied by *Hyperolius bivittatus* Peters, 1865; note that Noble (1924) referred to this taxon as *Rappia bivittatus* and not *bivittata*. Noble (1924) did not consult the specimens in Porto, but acknowledged that the species was only known from the type specimens. The name *Hyperolius ferreirai* has been maintained to the present. Laurent (pers. comm., in Frost, 1985) suggested that *Hyperolius ferreirai* may be a synonym of *Hyperolius platyceps* Boulenger, 1900. More recently, Frétey *et al.* (2011), following Laurent in Frost (1985) grouped *Hyperolius ferreirai* as a synonym of *Hyperolius platyceps*.

The colouration patterns of two best preserved syntypes are similar. Both present a pair of pale dorsolateral stripes extending from the anterior margin of the eye to the insertion of the leg, and some small dark spots are still visible on the dorsum especially in specimen (MHNFCP 017302). Both *H. platyceps* and *Hyperolius cinnamomeoventris* Bocage, 1866, exhibit this pattern, although *H. cinnamomeoventris* usually presents a darker band separating the dorsolateral colouration from that of the venter (Schjötz, 1999; Amiet, 2012). While this band is currently not visible in specimen MHNFCP 017291, Ferreira (1906) noted it in his description of *Rappia bivittata*.

The morphology of the head also differs between these two syntypes, with a more acuminate head (HW/HL of 92%) in MHNFCP 017291 and a broader head (HW/HL of 109%) in MHNFCP 017302. Amiet (2012) used both the wider head and shorter snout of *H. platyceps* as useful diagnostic features relative to *H. cinnamomeoventris*, and these two syntypes of *Rappia bivittata* also differ in this way (tab. 2). Another important difference noted by Amiet (2012) between these species is the presence of granulations on the palmar and plantar surfaces of *H. platyceps* and their absence in *H. cinnamomeoventris*, which again is similar to the differences between MHNFCP 017302 and 017291, respectively. Based on our comparisons and study of both the best preserved syntypes, we conclude that these represent two different species. The specimen from N'Golla Bumba (MHNFCP 017291) seems to represent *Hyperolius cinnamomeoventris* Bocage, 1866, while the specimen from Rio Luinha (MHNFCP

017302) represents *Hyperolius platyceps* Boulenger, 1900.

According to the rules of the International Code of Zoological Nomenclature (ICZN, 1999), a nomen cannot stand in two synonymies, except in the specific case in which holotypes represent hybrids. We designate specimen MHNFCP 017302 as the lectotype of *Rappia bivittata*. Thus, *Rappia bivittata* and *Hyperolius ferrerai* are unambiguously junior synonyms of *Hyperolius platyceps* Boulenger, 1900, as already suggested by Laurent (pers. comm., in Frost, 1985), Schiøtz (1999), and Frétey *et al.* (2011). The two remaining syntypes, MHNFCP 017291 and 017296, should be considered paralectotypes.

***Rappia fasciata* Ferreira, 1906**

Original name. *Rappia fasciata* Ferreira, 1906: 164.

Type specimen. A single specimen (MHNFCP 017294, ♀, SVL 25.1 mm) from “Quilombo”, captured by Francisco Newton in Angola during the 1903-1905 expedition and still present in Porto (fig. 4).

Present name. *Hyperolius platyceps* (Boulenger, 1900).

Remarks. Ferreira’s (1906:164) description of *Rappia fasciata* was based on a single specimen from Francisco Newton’s Angola collection. To date, this taxon remains known only from the type locality. Laurent (pers. comm. in Frost, 1985) suggested that *Hyperolius fasciatus* may be a synonym of *Hyperolius platyceps* Boulenger 1900, and this was followed recently by Frétey *et al.* (2011). Our comparison of the holotype with specimens of both *Hyperolius platyceps* and *H. cinnamomeoventris*, a sometimes similar species, confirms the suspicions of previous authors that this is a synonym of *H. platyceps*. These similarities are born out in measurements of relevant specimens (tab. 2).

The general shape of the head and body of the holotype of *Rappia fasciata* is similar to that observed in *H. platyceps* (Amiet, 2012). Similar to *H. platyceps*, HL is approximately equal to HW, and the relative proportions of the snout (EN/IFE) are closer to the values observed in *H. platyceps* than in *H. cinnamomeoventris*.

The holotype of *Rappia fasciata* presents characters that allow it to be identified specifically as the pleurotaenia morph of *H. platyceps* (Frétey *et al.*, 2011; Amiet 2012). These characters include its stout body, large head with a rounded snout, and prominent dorsolateral stripes. Amiet (2012) used both the wider head and shorter snout of *H. platyceps* as diagnostic features relative to *H. cinnamomeoventris*, and both characteristics are present in the holotype of *Rappia fasciata*. As also indicated by Amiet (2012), the flattened granulations on the palmar and plantar surfaces also indicate that the holotype is more similar to *H. platyceps* than *H. cinnamomeoventris*.



Figure 4. Dorsal and ventral view of the holotype *Rappia fasciata* Ferreira, 1906 (MHNFCP 017294). Scale bar = 10 mm.

***Rappia nobrei* Ferreira, 1904**

Original name. *Rappia nobrei* Ferreira, 1904: 112.

Type specimens. Two syntypes (MHNFCP 017292, ♀, SVL 19.7 mm; 017298, ♀, SVL 19.5 mm) collected by Francisco Newton in Angola during the 1903-1905 expedition and still in Porto, both from “Cabiri, Angola” (fig. 5). This species is a patronym for Augusto Nobre (1865-1946), director of the Museu de História Natural of the Academia Politécnica do Porto.

Present name. *Hyperolius* cf. *adspersus* Peters, 1877.



Figure 5. Dorsal and ventral view of the two syntypes of *Rappia nobrei* Ferreira, 1904 (Top specimen: MHNFCP 017292; lower specimen: MHNFCP 017298). Scale bar = 10 mm.

Remarks. In part because of the long lack of study of these type specimens, Frost (2014) considers this taxon as incertae sedis. Our study of the syntypes confirms that this is clearly a member of the genus *Hyperolius*. Based on both geographical distribution and measurement data (tab. 3), it is plausible that this taxon is a junior synonym of *H. adspersus* Peters, 1877, which was described based on a specimen also collected near the Atlantic coast at Chinchoxo, Cabinda (Peters, 1877), approximately 455 km NW of Cabiri. *Hyperolius adspersus* is part of the taxonomically problematic *Hyperolius nasutus* group, which currently contains 16 recognized species (Channing *et al.*, 2013). Of these 16 species, only three are known to occur near the type locality of *Rappia nobrei*: *Hyperolius adspersus* Peter, 1877, *Hyperolius nasutus* Günther, 1865, and *H. benguellensis* (Bocage, 1893) (see Channing *et al.*, 2013). Both syntypes of *R. nobrei* fall within the range of SVL for *H. adspersus* (SVL 18.1-21.6 mm; Amiet, 2012) but also *H. benguellensis* (SVL 19-24 mm; Poynton & Broadley, 1987) and present a rather large and blunt head, a character shared by both species. The pedal webbing of the *R. nobrei* syntypes is also similar to both *H. adspersus* and *H. benguellensis*. While the two syntypes currently lack distinct pigmentation,

Table 3. Measures (in mm) of both syntypes of *Rappia nobrei* Ferreira, 1904.

	MHNFCP 017292	MHNFCP 017298
SVL	19.7	19.5
HW	6.46	5.91
HL	6.94	6.13
MN	5.76	5.23
MFE	4.01	3.36
MBE	2.32	1.44
IFE	3.10	2.42
IBE	4.41	4.34
FLL	3.95	4.02
HAL	4.33	4.33
TFL	2.40	2.32
TL	6.19	6.16
FOL	7.64	8.73
FTL	5.50	6.59
IN	1.79	1.84
EN	1.80	1.61
EL	2.45	1.94
ITL	2.37	2.56
FL	8.82	9.81
SL	2.23	1.94
NS	0.67	0.75

the original description by Ferreira (1904) notes the presence of dark pigmentation on the dorsum, especially on the head and middle of the dorsum, with a whitish venter. Unfortunately, the available data for *H. adspersus* and *H. benguellensis* as well as the preservation of the syntypes make it difficult to determine to which species *Rappia nobrei* should be referred.

***Rappia osorioi* Ferreira, 1906**

Original name. *Rappia osorioi* Ferreira, 1906: 162.

Type specimens. Three syntypes from “Quilombo, Angola” (MHNFCP 017307, ♂, 2 juveniles, SVL 26.3, 24.6, 17.6 mm respectively) collected by Francisco Newton in Angola during the 1903-1905 expedition (fig. 6). This species is a patronym for Baltasar Osório (1855-1926), ichthyologist, carcinologist, and director of the Zoological section of the Museu Nacional de História Natural de Lisboa (Museu Bocage).

Present name. *Afrixalus osorioi* (Ferreira, 1906).

Remarks. Ferreira’s (1906:162) description of *Rappia osorioi* was based on three specimens, one male adult and two juveniles, from “Quilombo”. The species is considered valid and is broadly distributed from northwestern Angola and across much of the Congo Basin (Schlötter, 1974; Perret, 1976b; Laurent, 1982; Channing, 2001), and perhaps even Kenya (Köhler *et al.*, 2005). Laurent (1972, 1982) discussed patterns of morphological variation in *A. osorioi* and the minor phenotypic differences from two other Congo Basin species, *A. equatorialis* and *A. leucostictus*. In his discussion of the colour pattern variation of *A. osorioi*, Laurent (1982) notes that “la phenotype représenté par l’holotype” is a somewhat rectangular elongate and somber scapular spot. However, the citation provided in this discussion (Laurent, 1941), as well as his list of specimens examined, indicates that this phenotype is that of the holotype of *Megalixalus fornasinii congicus* Laurent, 1941 and not type material of *Afrixalus osorioi*. Perret (1976b) lists three type specimens in Porto museum lacking catalog numbers (one male holotype and two paratypes, a male and a juvenile) and followed Laurent (1972) in recognizing this taxon as conspecific with *Megalixalus fornasinii congicus*.

The existence of two different jars at MHNFCP containing specimens identified as possible types of “*osorioi*” deserves further comment. One jar (MHNFCP 017307) is labeled “*Rappia osorioi* B. F. / Quilombo Newton” and contains one adult and two juveniles. In addition, the jar also contains two paper notes. The first is written in pencil (most probably by Bethencourt Ferreira) and states “*Rappia osorioi* / n. sp. B. F. / Typo ♀ ado.”, whereas the second note is written in ink with the same calligraphy but on the reverse of a label from the Lisbon museum and states “*Rappia osorioi* BF / Typo ♀ N’Golla Bumba / Angola Newton”. Last, there is a third typed note stating: “*Afrixalus osorioi osorioi* (Ferreira) / Holotype: male / Paratypes: femelle et deux jeunes”. The second jar (MHNFCP 017301) contains one adult specimen and the external label notes “*Hyperolius platyceps fasciatus* (Ferreira) / F Newton”. However, inside the jar is a typed note stating “Paratype de *Rappia osorioi* Ferreira / est en fait un *Hyperolius platyceps fasciatus* (Ferreira)”. Given that Laurent (1972) and Perret (1976b) examined specimens in both jars, it is plausible that these typed notes were written by one of these authors.

Given the poor state of preservation of MHNFCP 017301, that Ferreira (1906) noted only three specimens of *Rappia osorioi*, and that the only indication that MHNFCP 017301 is a paratype is based on a type-written note, we choose to not consider it as a type specimen. As the original description mentions specifically an adult male and two juveniles from Quilombo, this additional “adult female type” from N’Golla Bumba cannot be considered a syntype (ICZN, 1999).

***Rappia platyceps* var. *angolensis* Ferreira, 1906**

Original name. *Rappia platyceps* var. *angolensis* Ferreira, 1906: 161.

Type specimens. One syntype from “Quilombo” (MHNFCP 017303, ♀, SVL 26.2 mm), collected by

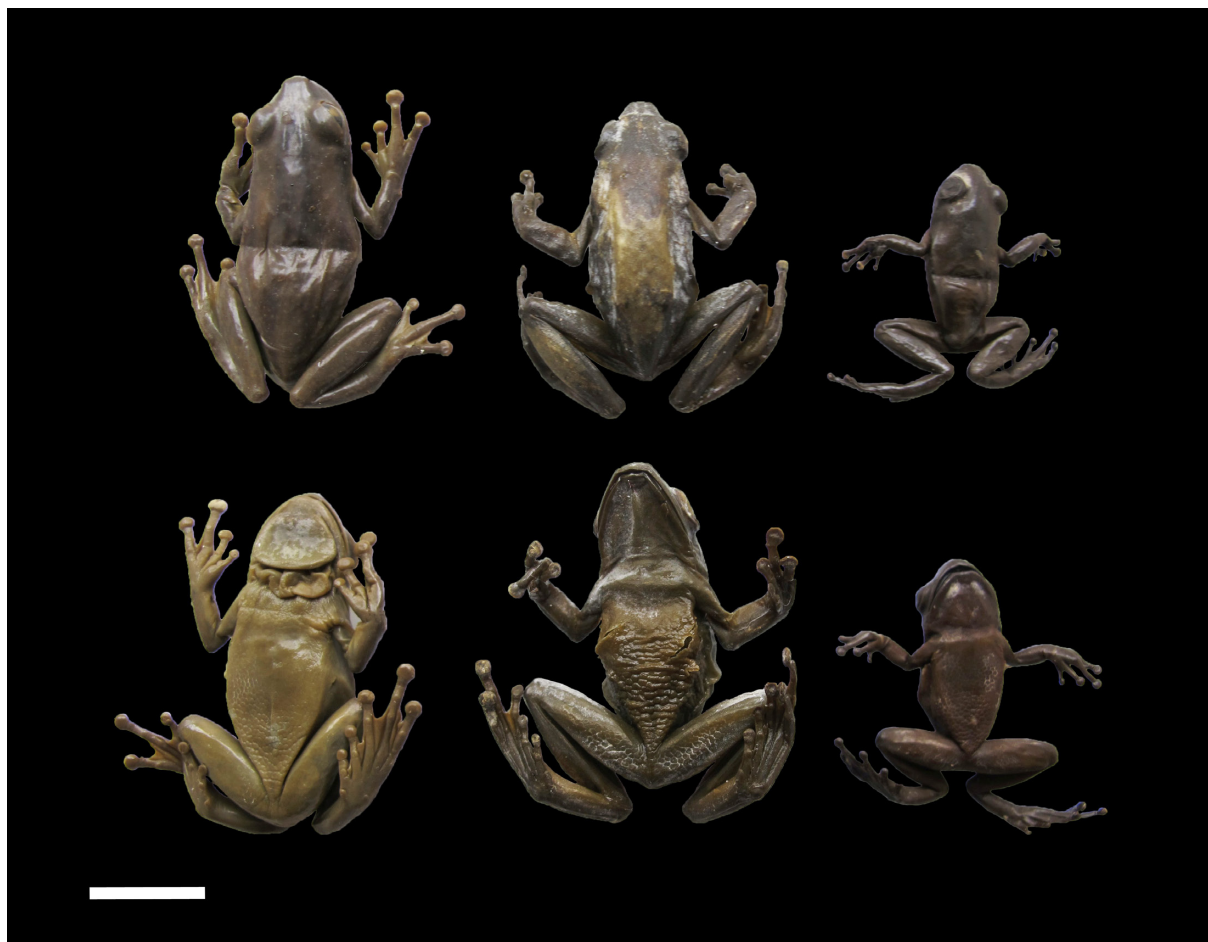


Figure 6. Dorsal and ventral views of the syntypes of *Rappia osorioi* Ferreira, 1906 (catalogued as a lot, MHNFCP 017307). Scale bar = 10 mm.



Figure 7. Dorsal and ventral views of the syntype of *Rappia platyceps* var. *angolensis* Ferreira, 1906 (MHNFCP 017303). Scale bar = 10 mm.

Francisco Newton in Angola during the 1903-1905 expedition and still present in Porto (fig. 7). The other syntype from “N’golla Bumba” was not located.

Present name. *Hyperolius platyceps* (Boulenger, 1900).

Remarks. The genus *Hyperolius* Rapp, 1842 contains more than 140 recognised species (Frost, 2014) that display a wide breadth of phenotypic variation both within and between species that often complicates species identification and delimitation (Frétey *et al.*, 2011). Some hyperoliid species are characterized by remarkable polymorphism (Hoffman & Blouin, 2000) that is in some cases reflected by the number of nominal subspecies (Wieczorek *et al.*, 1998, 2000, 2001) and many junior synonyms. Many of the subspecies (and species) may in fact represent colour variants of a single taxon (Köhler *et al.*, 2005). However, in addition, genetic analyses have revealed that many nominal taxa comprise two or more cryptic species (Rödel *et al.*, 2002).

Ferreira’s (1906:161) description of *Rappia* (now *Hyperolius*) *platyceps* var. *angolensis* was based on two specimens and Ferreira considered it rare. Ahl (1931) recognized this taxon as a species and also proposed the replacement name *Hyperolius angolanus* because of the previously described *Hyperolius marmoratus* var. *angolensis* Steindachner, 1862. More recently, Frétey *et al.* (2011), following Laurent (pers. comm., in Frost, 1985), recognized *Hyperolius platyceps angolensis* as a synonym of *Hyperolius platyceps*, although they made no reference to examinations of the type specimens of *H. platyceps angolensis*. Our comparisons with other specimens of *H. platyceps* confirm that the specimen is indeed a member of this species. More specifically, it resembles the “platyceps” morph because of the “hour-glass” pattern present on the dorsum.

***Rappia seabrai* Ferreira, 1906**

Original name. *Rappia seabrai* Ferreira, 1906: 163.

Type specimens. One paratype from “Duque de Bragança” collected by “capitão Bayão” (Captain Francisco António Pinheiro Bayão) in 1865 and still present in Porto (MHNFCP 018587, ♂, SVL 25.0 mm; fig. 8). Ferreira (1906: 163) noted this additional specimen located in the Lisbon collections in his description and thus we consider it a paratype. The Bayão collections, mostly from Duque de Bragança, were among the first and most important of Angolan herpetological collections as they served as the basis for taxonomic description of a number of taxa by Bocage, Steindachner, and Günther. Ferreira apparently sent this specimen to the Porto museum following his sending of the holotype. Unfortunately, the holotype from “Quilombo, Rio Luinha”, which was collected by Francisco Newton in Angola during the 1903-1905 expedition, was not found during our survey and we believe that it may be lost. The species is a patronym for Antero de Seabra (1883-1938), a mammalogist and entomologist, and curator of the Zoological section of the Museu Nacional de História Natural de Lisboa (Museu Bocage).

Present name. *Hyperolius bocagei* (Steindachner, 1867).



Figure 8. Dorsal and ventral views of the syntype of *Rappia seabrai* Ferreira, 1906 (MHNFCP 018587). Scale bar = 10 mm.

Remarks. The species is currently recognized as valid (Frost, 2014), though no further data or records of the species have been presented subsequent to its description. This species might be a synonym of *Hyperolius bocagei* Steindachner, 1867 (Laurent pers. comm. in Frost, 1985; Frétey *et al.*, 2011). The general morphological characters noted by Ferreira (1906) agree with the original description of *H. bocagei* (Steindachner, 1867) and subsequent descriptions (Bocage, 1895; Schiøtz, 1999), including granulations on the head, a truncated snout, the presence of small terminal discs on the fingers, and a nearly complete pedal webbing. The SVL of the species, 21 mm in the holotype according to the original description, 25 mm in the the paratype, falls within the range of the SVL *H. bocagei* (Schiøtz, 1999). Because of the poor condition of the available specimen, it is not possible to discern its colouration and patterns. Based on the original description, *Rappia seabrai* presents a greyish colouration on the back, with small dark spots dispersed dorsolaterally and on the limbs (especially the crus), a yellowish venter, and a dark line beginning at the nostrils and extending to the insertion of the upper arm (Ferreira, 1906). This description generally agrees with the colouration of *H. bocagei* (Steindachner, 1867; Bocage, 1895; Schiøtz, 1999). The type locality of Quilombo, currently Gonguambo, Cuanza Norte province, is approximately 140 km west of Kalandula falls at Malanje (formerly Duque de Brangança), which is both the type locality of *H. bocagei* and the locality from which the paratype of *R. seabrai* was collected. Based on available evidence we follow Frétey *et al.* (2011) by suggesting that *R. seabrai* is as a junior synonym of *H. bocagei*. However, as indicated by Schiøtz & Von Daele's (2003) suggestion that *H. bocagei* may be a junior synonym of the *Hyperolius viridiflavus* complex, there clearly is need for further study to resolve the systematics of these taxa.

Arthroleptidae

Hylambates bocagei var. *leucopunctata* Ferreira, 1904

Original name. *Hylambates bocagei* var. *leucopunctata* Ferreira, 1904: 113.

Type specimen. Syntype (MHNFCP 017324, ♂?, SVL 25.1 mm), from “Gumba, Sa [Serra] de Selles = Angola” collected by Francisco Newton during the 1903-1905 expedition in Angola (fig. 9). Ferreira (1904) notes two syntypes, one adult and one juvenile from the same locality, collected by Francisco Newton in his expedition to Angola. The second syntype may be lost (but see below).

Present name. *Leptopelis bocagii* (Günther, 1865).

Remarks. *Leptopelis bocagii* is a widespread species in southern and central Africa (Channing, 2001), though whether all populations currently referred to this species are truly conspecific remains unclear (i.e., Amiet, 2012). In a review of the amphibians of the Zambezi region, Poynton & Broadley (1987) described a similar species, *Leptopelis parbocagii* Poynton & Broadley, 1987 based on five specimens collected at Mabwe on the eastern shore of Lake Upemba, Zaire (currently the Democratic Republic of Congo; DRC). The distribution of *Leptopelis parbocagii* overlaps that of *L. bocagii* which extends east from Angola and DRC to Malawi, Zambia, and Mozambique, though doubts remain about the identification of these species (Schiøtz, 1999; Schiøtz & Von Daele, 2003). Poynton & Broadley (1987) used the ratio of the interorbital distance to the nostril-tympanum distance as a diagnosis for these two species: in *L. bocagii* this ratio is less than 36%, whereas in *L. parbocagii* it is 36% or more. Because this ratio in MHNFCP 017324 is 33%, we refer it to *L. bocagii* rather than *L. parbocagii*. Subsequent to the description of *Hylambates bocagei* var. *leucopunctata*, Ferreira (1906) referred to three specimens of “*Hylambates bocagei*” from Rio Luinha, Quilombo (currently Gonguambo), and N’golla Bumba. Note that Ferreira (1904, 1906) misspelled the epithet *bocagii*, writing it always as *bocagei*; thus in citing Ferreira (1904, 1906) directly we use his spelling of “*bocagei*”. In addition to the syntype located during this survey, we found three additional specimens, one adult from “N’Golla Bumba” (MHNFCP 017323) and another adult (MHNFCP 017325) for which the locality data is uncertain because of a damaged label. Ferreira (1906) notes two adult specimens of *Hylambates bocagei*, one from “Rio Luinha, Quilombo” and the other from “N’Golla Bumba”, which likely correspond to these two additional specimens. Among other specimens at MHNFCP identified as *Hylambates bocagei*, there is a jar containing a juvenile specimen (MHNFCP 017326) bearing an original label stating “*Hylambates bocagei* [torn area] ... erreira.” It is possible that the missing portion would have stated “var. *leucopunctata* Ferreira” and thus this might represent the missing juvenile syntype.

There are several of other records of *Leptopelis bocagii* from Angola. Laurent (1953) cited ten specimens from Muita, Luembe and as well as later citing two others from Dundo (Laurent, 1954). Because *Hylambates angolensis*, which was described by Bocage (1893) from a type series collected by José de Anchieta (1832-1897) from the district of Benguela, is considered a synonym of *L. bocagii* (Frétey *et al.*, 2011; Amiet, 2012), the known distribution of *L. bocagii* is extensive. Ferreira (1904) considers his “var. *leucopunctata*” as “a transition between *H. viridis* and *H. bocagei*” and distinguished this new taxon by the presence of a “very extensive and protruding dorsal lateral fold” and by “the stronger development of the terminal disks of the fingers” (our translation). Based



Figure 9. Dorsal and ventral views of the holotype of *Hylambates bocagei* var. *leucopunctata* Ferreira, 1906 (MHNFCP 017324). Scale bar = 10 mm.

on our examination, the principal morphological feature suggesting that “var. *leucopunctata*” is distinctive is the expansion of the terminal disks of the fingers, as noted by Ferreira (1904). While suggestive given the typically non-expanded digits of *Leptopelis bocagii*, the absence of interdigital webbing clearly places the remaining syntype with this species. In addition, the geographic distribution of Ferreira’s taxon occurs on the northwestern margin of the wide geographic range of *L. bocagii*. Based on available evidence, we follow Amiet (2012) and Frétey *et al.* (2011) by suggesting that *Hylambates bocagei* var. *leucopunctata* should remain a synonym of *L. bocagii*.

Doubts exist regarding the history of the type specimens of *Leptopelis bocagii* (Amiet, 2012) which was described based on specimens from “Duque de Bragança” (now Malanje) in Angola. This uncertainty arises because of apparent contradictions between the accounts of Günther (1864) and Bocage (1895), and demands attention here. During the course of our work, we examined the correspondence between Günther and Bocage in an attempt to reconstruct the history of the type specimen. Albert Günther (1864) described “*Cystignathus bocagii*” based on a single specimen from “Duque de Bragança (Angola)” loaned by Barbosa du Bocage (1923-1907), director of the zoological section of the Museu Nacional de História Natural de Lisboa (Gray, 1864). In 1864, Bocage loaned this specimen, surely collected by Francisco Pinheiro Bayão, who sent several collections from the Duque de Bragança region to Bocage in 1863 (AHMB CN B19; AHMB CN B20; AHMB CN B21a; AHMB CN B21b), to Günther to assist with its identification (AHMB CE G75, see Appendix 2). After his examination of the material and published description of the species, based on a single specimen (AHMB CN B32), Günther returned the specimen to Bocage in July 1865 (AHMB CE G76, See Appendix 2). Subsequent to the publication of the species description, Bocage wrote a letter of thanks to Günther for naming the species after him (20 June 1865; AHMB CN B32).

On 25 May 1866, Bocage wrote again to Günther noting that he had a specimen of *Leptopelis natalensis* that he thought could be “*C. [Cystignathus] bocagii*”, from another (unknown) location (AHMB CN B32). In the same month Bocage sent a loan of the type and a second specimen of the species to Günther (AHMB CE G78, see Appendix 2). After receiving the specimens, Günther wrote asking Bocage if he could retain the second specimen in his collection (AHMB CE G79, see Appendix 2). Bocage apparently agreed to this since he later (Bocage, 1866) noted that the Zoological Section of the Museu Nacional de História Natural de Lisboa had two specimens of “*Cystignatus Bocagii*” from the Duque de Bragança, both collected by Bayão. Bocage also indicated that one of these was the type specimen, while the other was given to the British Museum. In 1895, Bocage again referred to this species noting that the only known specimens of the species were “two types” in the British Museum and that there were two other juvenile specimens in the Angolan collections of the Museu Nacional de História Natural de Lisboa. The statement made by Bocage (1895) is problematic because it is unclear whether either of the two specimens that Bocage sent to Günther in 1866, one of which was certainly the holotype, later returned to Lisbon

or if one or both instead remained in London. The timeframe of both collection and loan of the two other juveniles mentioned by Bocage (1895) also remains unclear. The last African type catalog published by Bocage in 1897 stated only that a type of “*Hylambates Bocagii*” was in the Lisbon collections and noted the locality as “Angola: Duque de Bragança, Bayão” (Bocage, 1897). Perret (1976a) claimed to have found the “cotype” of *Hylambates bocagii* from “Duque de Bragança, Angola” (No. T. 15-232), a juvenile specimen. This specimen, lost in the fire that destroyed the museum in 1978, was surely one of the two juvenile specimens cited by Bocage (1895), but it seems unlikely that this specimen was the holotype given the earlier the correspondence between Günther and Bocage. Further investigations in the archives and collections of the Natural History Museum of London are needed to address this problem.

***Arthroleptis carquejai* Ferreira, 1906**

Original name. *Arthroleptis carquejai* Ferreira, 1906: 165.

Type specimen. Holotype (MHNFCP 018586, ♀, SVL 27.8 mm) from “Cambondo, Angola” collected by Francisco Newton during the 1903-1905 expedition in Angola (fig. 10). The species is a patronym for Bento Carqueja (1860-1935), professor and naturalist in the Academia Politécnica do Porto.

Table 4. Measures (in mm) of the holotype of *Arthroleptis carquejai* Ferreira, 1904 (MHNFCP 018586) and the specimens of *A. carquejai* from Zoologisches Museum Hamburg.

	Holotype	specimens from ZMH	
	MHNFCP 018586	ZMH A 09493	ZMH A 09492
SVL	27.77	29.70	20.00
HW	9.68	10.66	6.76
HL	9.45	9.95	7.31
MN	8.26	6.79	6.70
MFE	6.72	6.49	5.44
MBE	3.25	3.19	2.50
IFE	3.88	4.31	3.61
IBE	6.36	8.95	5.50
FLL	5.85	7.79	5.10
HAL	8.64	9.39	5.98
TFL	6.99	5.74	3.61
FOL	14.20	15.68	10.10
FTL	9.81	7.48	6.30
IN	2.09	2.99	1.91
EN	2.26	2.09	1.42
EL	3.38	3.59	3.19
ITL	3.87	4.55	2.69
FL	13.22	15.42	10.06
NS	1.37	1.82	1.03
EE	2.78	3.00	2.33
TYE	0.99	1.14	0.64
TYD	1.29	1.49	0.84

Present name. *Arthroleptis carquejai* Ferreira, 1906.

Remarks. Since its initial description, this species has remained known only from the holotype and no subsequent authors have investigated its validity. Our investigation suggests that *Arthroleptis carquejai* is indeed a valid species and is likely part of the group of species that includes *Arthroleptis variabilis* Matschie, 1893, *Arthroleptis perreti* Blackburn, Gonwouo, Ernst, Rödel, 2009, and *Arthroleptis palava* Blackburn, Gvoždik, Leaché, 2010, from Cameroon and other Central African countries. While the pigmentation of the specimen has faded, Ferreira’s (1906) original plate (fig. 1) indicates that the gular and anterior venter were darkly pigmented with pale spots. Because the gular region has pale spots but lacks a pale mid-line stripe, the holotype of *A. carquejai* differs from *A. variabilis*, in which there is a prominent and well-defined mid-line gular stripe in females and juveniles, and pale markings are generally lacking on the more uniformly pigmented gular region of males (Blackburn *et al.*, 2009). Darkly pigmented gular and ventral surfaces are generally uncommon in *Arthroleptis* but are characteristic of *A. variabilis* and related species (Blackburn *et al.*, 2009, 2010). During this work, we examined specimens from Zoologisches Museum Hamburg (ZMH) collected during the Hellmich expedition to Angola (Hellmich, 1957), including several that are similar in external morphology, size, and proportions to the holotype of *Arthroleptis carquejai* (tab. 4). Both specimens (ZMH A09492-93) were collected from “Roca Novo” (Roça Novo Mundo) not far from the type locality (approx. 135 km north) of *A. carquejai*. These specimens exhibit the similar dark ventral pigmentation and traces of a pale mid-line stripe (similar to *A. palava*; Blackburn *et al.*, 2010) but it is not well-defined as it is in *A. variabilis*. In addition, these ZMH collections demonstrate that *A. carquejai* is sympatric with *Arthroleptis poecilnotus* Peters, 1863, a wide-ranging species complex in western and central Africa, which was also collected at “Roca Novo” (ZMH A09491, A09494-95).



Figure 10. Dorsal and ventral views of the holotype of *Arthroleptis carquejai* Ferreira, 1906 (MHNFCP 018586). Scale bar = 10 mm.

Reptilia

Typhlopidae

Typhlops boulengeri Bocage, 1893

Original name. *Typhlops boulengeri* Bocage, 1893: 117.

Type specimen. A syntype (MHNFCP 017434) from Angola (fig. 11) was donated to the Porto museum from Lisbon. This is supported by the original label on the jar (“*Typhlops boulengeri* Boc. / Angola off. Mus. Boc.”) and the fact that the catalog notes that the specimen MHNFCP 017434 was offered by Museu Bocage (L. Sousa, pers. comm.). In his description of this species, Bocage (1893) noted that he received several specimens of this species from Quindumbo, “dans l’intérieur de Benguella” that were collected by the explorer José de Anchieta.



Figure 11. Dorsal and ventral views of the paratype of *Typhlops boulengeri* Bocage, 1893 (MHNFCP 017434). Scale bar = 10 mm.

Present name. *Afrotyphlops lineolatus* (Jan, 1864).

Remarks. Though Laurent (1964) considered *T. boulengeri* to be a valid species, we follow the opinion of Broadley & Wallach (2009) in referring *Typhlops boulengeri* to the synonymy of *Afrotyphlops lineolatus*. In addition, *Typhlops bocagei* Ferreira, 1906, based on one specimen collected by Francisco Newton in Angola during his 1903-1905 expedition, is also a synonym of this same species (see below).

Missing types

Amphibia

Hyperoliidae

***Rappia bocagei* var. *maculata* Ferreira, 1906**

Original name. *Rappia bocagei* var. *maculata* Ferreira, 1906: 160.

Present name. *Hyperolius bocagei* Steindachner, 1867.

Remarks. Ferreira described this new variety based on one specimen collected in “Golungo Alto” by Francisco Newton during the 1903-1905 expedition to Angola. The description of this taxon by Ferreira (1906) was based largely on the colour pattern of this single specimen. Despite thorough searches of the amphibian and reptile collections in the Museu de História Natural da Universidade do Porto, we could not locate this specimen. There are, however, three specimens noted as “*Rappia bocagei*” corresponding to a female and a male from “Cucuaco” (MHNFCP 052189 – ♀ and MHNFCP 017306 – ♂) that might represent those from “Cacuaco” mentioned earlier by Ferreira (1904: 112), and a third specimen noted only as deriving from “Angola” (MHNFCP 017308). In these two works, Ferreira noted only three specimens of “*Rappia bocagei*”, the two from “Cacuaco” (Ferreira, 1904) and the “*maculata*” from “Golungo Alto” (Ferreira, 1906). Because it is unlikely that other specimens of this species were catalogued in the Porto collections, it is conceivable that MHNFCP 017308 represents the holotype of *Rappia bocagei* var. *maculata*. The loss of the original label may have resulted in the loss of the only information relating this specimen to Ferreira’s work. However, despite the loss of the original label, the catalog notes that MHNFCP 017308 was offered by Museu Bocage (L. Sousa, pers. comm.), which thus excludes the possibility of this specimen being the holotype.

Reptilia

Typhlopidae

***Typhlops bocagei* Ferreira, 1904**

Original name. *Typhlops bocagei* Ferreira, 1904: 114.

Present name. *Afrotyphlops lineolatus* (Jan, 1864).

Remarks. Ferreira (1904) described *Typhlops bocagei* based on two specimens from “Cabicula, Bom Jesus (margens do Quanza)”, but we were unable to locate any specimens that plausibly represent these type specimens. The systematics of the African Typhlopidae has received considerable attention (Laurent, 1964; Roux-Estève, 1970, 1974; Broadley & Wallach, 2009; Segniagbeto *et al.*, 2011; Hedges *et al.*, 2014) and *Typhlops bocagei* remains currently considered a synonym of *A. lineolatus*. Note that *Typhlops boulengeri* Bocage, 1893 is also considered a synonym of *A. lineolatus* (see above). Some doubts remain regarding the taxonomy of *Typhlops bocagei* (Broadley & Wallach, 2009) but without either the type specimens or new investigations in the region, little more can be said on its status.

DISCUSSION

Of the 18 type specimens expected from Ferreira’s papers on Newton collections we located a total of 12. The two syntypes of *Typhlops bocagei* Ferreira, 1904 and the holotype of *Rappia bocagei* var. *maculata* Ferreira, 1906 could not be located and are probably lost. One syntype of *Rappia platyceps* var. *angolensis*, one syntype of *Hylambates bocagei* var. *leucopunctata*, and the holotype of *Rappia seabrai* were also not found. However, two other type specimens were found during this survey: a paratype of *Rappia seabrai* Ferreira, 1906 from the Bayão collection of the Lisbon museum (and supposedly lost in the 1978 fire), and a paratype of *Typhlops boulengeri* Bocage, 1893, given by the Lisbon museum. In addition to the type specimens, our survey revealed

approximately 90 to 110 reptile specimens and 60 to 80 amphibians from the Newton Angolan collection; some of these specimens are still in the original collecting jars and remain to be inventoried and catalogued. Most of the non-type specimens cited by Ferreira (1904, 1906) are still present in the collections and in generally good condition, though some are in need of immediate conservation measures. It is possible that some of the type specimens thought to be missing are still present in the collection but difficult to identify because of the lack of labels or other identifying information.

Of the taxa described by Ferreira, we confirm that two of these should be recognized today (*Rappia osorioi*, now *Afrivalus osorioi*, and *Arthroleptis carquejai*). We argue above that *Rappia nobrei* should be considered a junior synonym of *Hyperolius adspersus*. The problematic *Rappia bivittata*, *Rappia fasciata*, *Rappia platyceps* var. *angolensis* should all be considered junior synonyms of *Hyperolius platyceps*. Pending further investigations, we recommend that *Hylambates bocagei* var. *leucopunctata* be considered a synonym of *Leptopelis bocagii*. These taxonomic clarifications contribute to our understanding of anuran diversity in southwestern Africa and are a modest first step towards refining our knowledge of the species richness of Angola amphibians.

Angola is among the largest countries in Africa at 1246700 km² and perhaps the only biodiverse country in Africa that remains seriously lacking in surveys of vertebrate diversity. Angola presents a great variety of biomes and habitats and represents an important puzzle piece for understanding biogeographic patterns across sub-Saharan Africa. Unfortunately, there has been little study of Angolan amphibians and reptiles since the mid-1960s. Recent studies have been prohibited by the civil war and resulting social instability that engulfed the country for nearly three decades (1975-2002; or four decades of war, if considering the beginning of the independence war in 1962). A few recent field studies will hopefully spark a new era for the Angolan biodiversity studies (Conradie *et al.*, 2012, 2013; Ernst *et al.*, 2014). New field studies will surely deepen the knowledge of the Angolan herpetofauna, and help to address many long-standing taxonomic problems for Angolan and, more generally, southern African species. Museum studies, however, remain crucial for addressing taxonomic and nomenclatural issues, especially given that many species reported by Ferreira (1904, 1906) and others have not been reported since their initial description.

NOTE

After the acceptance and final revision of this manuscript (July 2014), we located two specimens that may represent one of the syntypes of *Typhlops bocagei* Ferreira, 1904 and the holotype of *Rappia bocagei* var. *maculata* Ferreira, 1906. Further details on these specimens will be presented separately in a future study.

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APPENDIX 1

Specimens used in comparisons

Hyperolius platyceps: California Academy of Sciences: CAS 199349-51, 199354, 201956, 201958, 201963, 201966, 208544-46. Muséum national d’Histoire naturelle: MNHN 1968-160, 1968-160A, 1968-161, 1968-161A, 1969-142.

Hyperolius cinnamomeoventris: California Academy of Sciences: CAS 98164, 144780, 154511, 154519, 154746, 180133-35, 180141, 199355, 202322, 202508, 204508, 204512. Muséum national d’Histoire naturelle: MNHN 01-584, 01-578, 01-579, 06-209, 21-17A, 21-17B, 21-134A, 21-164B, 21-164C, 21-164D, 46-149, 84-17, 96-571, 96-572.

Arthroleptis carquejai: Zoologisches Museum für Hamburg: ZMH A09492-93.

Arthroleptis poecilonotus: Zoologisches Museum für Hamburg: ZMH A09491, A09494-95.

APPENDIX 2

Letters between Albert Günther and Barbosa du Bocage concerning the type specimens of “*Cystignathus bocagii*”

All the letters are deposited in the Historical Archive of Museum Bocage (AHMB) in the Museu Nacional de História Natural e da Ciência, Lisbon, Portugal.

Letter from Albert Günther to José Vicente Barbosa du Bocage: 19 September 1864

AHMB CE G. 75

“British museum

19. Sept. 64

My dear sir

I have just returned from a journey which I undertook during my holidays, & hasten to thank you for your kindness in sending me the reptiles from the province of the Duke de Braganca, & some very fine portuguese fish: all of which arrived in perfect safety. I have not had time yet to examine the reptiles, but one of the snakes is unknown to me, & several of the frogs appear to be new. I shall return all the specimens which you desire to keep, hoping that if you should receive duplicates at some future time, you will kindly communicate to us what you can spare. If you receive any other examples from the west coast of africa, which are doubtful to you, I should consider it as a great kindness if you would allow me to examine them. Mr. Monteiro has delivered the reptiles, & the Trustees of our museum will send you their acknowledgment. I am glad to hear from you that the specimens sent by me to your museum, were of some use; I hope to be able to add others when I shall return your specimens.

Yours most Truly

A. Günther”

Letter from Albert Günther to José Vicente Barbosa du Bocage: 24 July 1865

AHMB CE G. 76

“British museum

24. 7. 65.

My dear Sir,

Excuse me for having kept the specimens kindly lent to me, for so long a time. I send them off to your address today, & hope that they will in safety reach you. I add the names:

- kindly presented to B. M.
1. *Limnophis bicolour*, g. & sp. n.
 2. *Causus rhombeatus*
 3. *Lycophidium horstockii*
 4. & 5 I shall send the name at the later period end of this letter
 6. has not arrived
 7. *Hyperolius marmoratus*
 8. cannot be determined without other specimens
 9. *Hyperolius fulvovittatus*, Cope
 10. - *nasutus*, sp. n.
 11. *Cystignathus bocagii*, sp. n.

12. *Leptopelis natalensis*
13. *Hyperolius* sp?
14. *Hyperolius modestus*
15. *Hyperolius nasutus* - type
16. *Hyperolius* sp? an *nasutus*, young.
17. *Hyperolius* sp?
18. *Hyperolius modestus*
19. *Bufo panterinus*
nos. 11-19 are returned in today's parcel
20. *Grayia triangularis*
21. *Ahaestulla irregularis*
22. *Boodon lineatus*
nos. 20 - 22 have been returned through mr. Monteiro several months ago; I hope you have safely received them.
23. *Prosymna meleagris*. - very rare, is returned today with the frogs.

I add in a second bottle some specimens as a present from me for your museum:

Xenopeltis unicolour, Siam / large brown snake /

Typhlops braminus, Siam

Vermicella occipitalis, Moreton Bay, (black & white snake)

Lialis punctulata, Sasan River

(Ophidioid Saurian).

Further I add some paper of mine. Many thanks for the loan of your valuable specimens!

The address of the manufacturers of bottles employed by the British museum, is

Messus Powel & Son

Glass works

Whitefriars

London F. C.

The name of the frogs are

4. *Rana oxyrhyncha*

5. - *mascareniensis*

I am very sorry not to have a single specimen of *Rana delalandii* which is not entered into the register and catalogue of the collection, & which, therefore, cannot be given away. This species is not rare, & I have no doubt that I can soon send you an example.

Thanking you again for your kindness

I remain

Yours most truly

A. Günther"

Letter from Albert Günther to José Vicente Barbosa du Bocage: 6 May 1866

AHMB CE G78

"British museum

6. 5. 66

My dear sir

I do not consider the disks of *Cystign. bocagii* to be well enough developed to deserve the name of disks. It is quite true the extremities of its fingers hands, but such dilatations you find also in several *Rana* & other so called oxydactyle frogs. *Cystign. bocagii* has no webb between the fingers & toes, & therefore it cannot be associated with *Leptolepis*. I do not recollect the specimen of *Leptolepis* which I returned with *C. bocagii*, & cannot speak with confidence about its determination; but I should regard it as a great favour, if you would give me another opportunity of examining these two specimens, so as to explain the question to your & to my own satisfaction. I would return the specimens without detaining them for more than a week. I have the manuscript of the second volume of the record in the printer's hands, but have not been able to obtain your paper on *arvicola*. I shall retain the proof-sheet for three other weeks, hoping to be able to insert it. I should be much obliged to you for a separate copy of the paper, or for a short abstract of it. Have you now received the Zool. Soc. publications? The clerk told me they had been sent to you some time back. The third part of the proceedings for 1865 will be out in the course of next week, the print part of 1866 is published, but not without illustrations. I am afraid, Peter's Fishes of Mozambique will be indefinitely delayed; as the [?] Prussian government wants too much money for [?], to spare [?] a little for science.

Yours ever truly.

A Günther.”

Letter from Albert Günther to José Vicente Barbosa du Bocage: 29 June 1866

AHMB CE G79

“British museum

29 June 1866

My dear Sir

I have to thank you much for your kindness in sending me your memory on *arvicola*, & the reptiles which I received from Mr. Joanson. You are right that the two frogs are of the same species, *vig. = Cystignath bocagii*, they differ widely from ~~*Hylambates*~~ *Leptopelis* which has broad disks [small drawing of a finger disk]. As you possess two specimens of *Cystign. boc.*, would you give us one of them for our collection? I should return the specimens (with other things) [?] but I think it better to wait for your answer as regards this specimen of *Cystign.* The snake is the young of some species of *Psammophis*; the [?] poster tooth is distinct on one side. But I would not determine of what species it is the young, it may be new, but it is not advisable to describe a new species from such a young specimen, from which no certain characters may can be taken.

Lizards:

1. *Stellio angolensis* = *Agama atricollis*, A. Smith, Ill. Slep. Cpp p. 14. I have compared your specimen with the type.
2. is very closely allied to *Agama occipitalis*, but has somewhat smaller scales.
3. *Ichnotropis bivittatus* = *Algiru (Tropidosaura) dumerilii*, Smith, App. p. 7 I have compared your specimen with the type.
4. *Chamaeleo gracilis* is certainly not a distinct species; see Gray's paper in Proc. Zool. Soc. 1864
5. & 6. are well determined.

I remain yours very truly

A. Günther”