

# Boa latotecta Hermann, 1804, a junior subjective synonym of Bungarus caeruleus (Schneider, 1801) (Serpentes, Elapidae), with comments on the types of the latter taxon

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1	<i>Boa latotecta</i> Hermann, 1804, a junior subjective synonym of <i>Bungarus</i>
2	caeruleus (Schneider, 1801) (Serpentes: Elapidae), with comments on the
3	types of the latter
4	
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6	(Schneider, 1801) (Serpentes: Elapidae) incluant des commentaires sur les types
7	de ce dernier
8	
9	Running title: Boa latotecta holotype
10	
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### 2 ABSTRACT

3 The Musée zoologique of the city of Strasbourg (MZS) holds the late 18th century 4 collection of Jean Hermann. Among the herpetological collection we discovered a 5 specimen that Hermann had described as *Boa latotecta* in a posthumous 6 publication edited by his son-in-law Frédéric-Louis Hammer. Morphometric 7 measurements and the examination of pholidosis facilitated comparisons with its 8 original description and with relevant species included in the genus *Bungarus*. We 9 conclude that the specimen MZS Oph0612 unambiguously constitutes the holotype 10 by monotypy of *Boa latotecta* Hermann, 1804 and that the binomen is a junior 11 synonym of *Bungarus caeruleus* (Schneider, 1801). We also add some clarifications 12 about the composition of the type series of the latter.

13

## 14 **RÉSUMÉ**

15 Le Musée zoologique de la ville de Strasbourg (MZS) conserve la collection 16 historique de Jean Hermann datant de la fin du XVIIIè siècle. Nous y avons localisé 17 un spécimen qu'il avait décrit comme Boa latotecta dans une publication posthume 18 mise en forme par son gendre Frédéric-Louis Hammer. Les données 19 morphométriques et l'écaillure de ce spécimen ont permis de le comparer à sa 20 description originale et avec les autres espèces du genre Bungarus auquel il doit 21 être rattaché. Nous concluons que ce specimen MZS Oph0612 constitue de façon 22 non équivoque l'holotype par monotypie de *Boa latotecta* Hermann, 1804 et que ce 23 binôme est un synonyme junior de *Bungarus caeruleus* (Schneider, 1801). Nous 24 précisons également le contenu de la série-type de ce dernier.

25

- 1
- 2 **KEY WORDS**: *Bungarus caeruleus*, nomenclature, synonymy, holotype
- 3

4 **MOTS CLÉS**: *Bungarus caeruleus*, nomenclature, synonymie, holotype

5

#### 6 INTRODUCTION

7 The *Bungarus caeruleus* group of south Asian elapid snakes currently comprises four species, namely Bungarus caeruleus (Schneider, 1801), B. sindanus Boulenger, 8 9 1897, B. walli Wall, 1907 and B. ceylonensis Günther, 1864. A recent phylogenetic 10 analysis by Sunagar et al. (2021) yielded four subclades within the *caeruleus* group 11 based on two mitochondrial markers (ND4 and cyt b). Although they only included 12 one specimen each from Pakistan and India assigned to the *B. sindanus* complex it 13 turned out that their genetic divergence was very low. The Indian specimen was 14 from Maharashtra and according to currently accepted taxonomy represents *B*. 15 walli. Based on their results Sunagar et al. (2021) regard the latter as a subspecies 16 and concluded that the full species status of *B. walli* may not be supported and 17 needs to be re-evaluated.

18 More importantly Sunagar et al. (2021) recovered one clade, sister to *Bungarus* 19 *caeruleus* sensu stricto, that showed a considerable genetic distance to the 20 remaining members of the group and was identified as a hitherto undescribed 21 species. They named the species "Bungarus romulusi" in honour of Romulus 22 Whitaker, an American-Indian conservationist and herpetologist (Z. Whitaker 23 1989). Shortly afterwards Dubois et al. (2021) discussed the Sunagar et al. (2021) 24 publication in view of nomenclatural availability of the new taxon and concluded that the name "Bungarus romulusi" is unavailable under the rules of the 25

1 International Code of Zoological Nomenclature (ICZN 1999, the Code). More 2 recently Wüster & Kaiser (2023) pointed out that Sunagar et al. (2021) also failed 3 to take relevant historical material into account that potentially constitute senior 4 synonyms of their "Bungarus romulusi". One of the species Wüster & Kaiser (2023) 5 listed was "Boa latotecta Hermann in Boie, 1827". In order to shed further light on 6 this issue we searched the MZS collection and rediscovered the specimen of Boa 7 *latotecta*, discuss its original description and provide taxonomically relevant data 8 for its holotype.

9

#### 10 MATERIAL AND METHODS

Meristic and morphometric data were recorded from the type specimen MZS
Oph0612. Measurements were taken using a ruler with a precision to the nearest
millimetre. Scale counts were performed by placing a fine needle at every tenth
scale. Abbreviations used in the text are: SVL, snout-vent length; TL, tail length;
MBS, midbody scale rows; V, ventral scales counted from the first enlarged
subgular (preventral) scale to the cloacal plate excluded from count; SC, subcaudal
scales excluding cloacal plate.

18 Measurements provided by Hermann (1804) were in agreement with the

19 prevailing French standard system before 1795 -the time of introduction of the

20 metric system in France- and are adjusted accordingly: 1 pied/foot (Latin pes) =

21 324.8 mm; 1 pouce/inch (Latin *pollex*) = 27.07 mm.

22 Throughout his publication we will place the taxon name "Bungarus romulusi"

and manuscript names between inverted commas to clarify that these respective

24 names are nomenclaturally not available and not made available in this

25 publication. Additionally these names are not italicized.

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T	Specimen	erammeu.
	1	

2 MZS Oph0612, holotype of *Boa latotecta* Hermann, 1804

3 Collection abbreviations:

- 4 MNHN, Muséum national d'Histoire naturelle, Paris, France
- 5 MZS, Musée zoologique de la ville de Strasbourg, France
- 6 NHMUK, Natural History Museum, London, United Kingdom
- 7 ZMB, Zoologisches Museum Berlin, now Museum für Naturkunde, Leibniz-Institut
- 8 für Evolutions- und Biodiversitätsforschung, Berlin, Germany
- 9

#### 10 **RESULTS**

The current herpetological literature (e. g. Wallach et al. 2014, Wüster & Kaiser
2023) treats Hermann in Boie (1827) as the authority for the original description

13 of *Boa latotecta*. However, F.[riedrich] Boie (1827: 552) only listed *Boa latotecta* as

14 a synonym of *Bungarus caeruleus* (Schneider, 1801) without any further

15 description. The original text reads as: "*Boa latotecta* Herm. ist zu Folge des

16 Straßburger Exemplars diese Species [*Boa latotecta* is according to the Strasbourg

17 specimen this species]". F. Boie's brother (Heinrich Boie) visited the Strasbourg

18 museum and examined the herpetological collection. Based on his experience with

19 snakes from the Asian realm he concluded that *Boa latotecta* was conspecific and

20 consequently synonymous with *Bungarus caeruleus*. Without further information

21 provided in F. Boie's (1827) publication "Boa latotecta Hermann in F. Boie, 1827"

22 was only published as a junior subjective synonym of *Bungarus caeruleus* and

- would constitute a *nomen nudum* in the sense Art. 12 of the Code (ICZN 1999),
- 24 were it not for an earlier publication by Hermann in 1804.

1 Jean (or Johann) Hermann (1738-1800) (baptized Johannes Herrmann (sic); see 2 Bour et al. 2017) studied medicine and had a strong interest in natural history. He 3 accumulated a collection of specimens from all over the world for his private 4 cabinet that contained more than 200 specimens of amphibians and reptiles 5 (Lescure et al. 2009). In herpetology Hermann is renowned for the original description of Malpolon monspessulanus (Hermann, 1804) and a species named in 6 7 his honour, Hermann's Mediterranean Tortoise, Testudo hermanni Gmelin, 1789. A 8 neotype was recently described for the first species since its type could not be 9 found again but the holotype of the second could be located in Strasbourg's 10 collection (Bour et al. 2017). Hermann's cabinet was sold after his death to the City 11 of Strasbourg and served as the basis for the collection of the Musée zoologique de 12 la ville de Strasbourg. Nowadays only a few herpetological specimens originally 13 from Hermann's collection are still extant in the collection including nine 14 specimens of snakes. Among these specimens we discovered an elapid snake (MZS 15 Oph 0612) that was shelved under the name *Bungarus candidus*. Unfortunately, 16 historical labels do no longer exist and it is unclear who provided that 17 identification. This may have been Lewis Henry Gough (1882-1945) who briefly 18 worked as an assistant in the Strasbourg collection in the beginning of the 20th 19 century and who -according to two of his publications (Gough 1902, 1903)- made a 20 revision of the snakes contained in the Collections of the Zoological Institute of the 21 University of Strasbourg, when the city was under German governance. Further 22 facts that point into this direction are an additional label that gives "Bengalen" 23 (German for Bengal) as the origin of the specimen and the prevailing classification 24 of *Bungarus* species at that time. During Gough's time Strasbourg was under 25 German governance and the specimen was identified most likely according to the

1 latest taxonomic treatment available to Gough which was that of Boulenger (1896)

2 who regarded *B. caeruleus* as a subspecies of *B. candidus*.

3 There exists, however, a manuscript that came into the possession of Hermann's 4 son-in-law Frédéric-Louis Hammer (1762-1837) and that contains further clues as 5 to which species the specimen MZS Oph0612 belongs. The manuscript contains a 6 compilation of herpetological specimens from Hermann's collection and provides 7 the descriptions of several new species among them Malpolon monspessulanus and 8 a snake that Hermann intended to name *Boa fusca*. The manuscript was published 9 posthumously in 1804 in an edited version by F.-L. Hammer (Hermann 1804). 10 Within this publication Hermann (1804: 272) briefly described a specimen under 11 the name *Boa latotecta* that bears all the necessary characters of a species of the 12 genus *Bungarus* (see below) as previously noted by Boie (1827). 13 Hermann (1804) stated that he had received the specimen from the Ramsay 14 collection (Edinburgh, Scotland) in 1778. The geographic provenance of the 15 specimen was not clear and Hermann assumed that it had originated in North 16 America. The original description of *Boa latotecta* in Hermann (1804: 272) reads 17 as follows:

18

"260 = 210 + 50. Crassities bipollicaris. Longitudo tripedalis. Venter sordide
albus, dorsum fuscum; lineae transversae aut semicirculi dorsales albi per paria
divergentes. Squamae medii dorsi latiores, transversae aut lato hexagonae. Ex
Ramsayanis Edinburgi 1778. An ergo ex America septentrionali, unde ille ante
mortem multa acceperat."

["260 = 210 + 50. Two inches thick. Three feet long. Belly dirty white, back
brown; transverse lines or dorsal semicircles diverging [alternating?]in pairs. Mid-

dorsal scales wider, transverse or broadly hexagonal. From [the] Ramsay
 [collection] of Edinburgh in 1778. Or, therefore, from North America, from where
 he had received much [many items] before his death."] (our translation).

5 The editor (F.-L. Hammer) added a note explaining why he had changed the 6 manuscript name "fusca" to latotecta: "Nomen fuscae quod autor dederat, 7 mutatum quia in museo Geversiano, p. 10. n.º 90. hoc nomine jam alia occurrit, et 8 substitutum aliud a squamis dorsi latis depromtum.[The name fusca that the 9 author had dedicated, [was] changed because it already occurred in the Geversian 10 museum, p. 10. no. 90. and [was] replaced by another taken from [referring to] the 11 broad scales on the back]". The Latin adjective "latotecta" means "covered (tectus) 12 with broad (latus) scales", referring to the enlarged vertebral scale row. The term 13 "museo Geversianum" refers to a publication by Meuschen (1787) where the 14 author had compiled the content of Abraham Gevers' Kabinet van Natuurlijke 15 Zeldzaamheden [cabinet of natural curiosities]. On p. 10 a new species named "Boa 16 fusca" was very briefly described with the words "maculis nigris albo marginatis" 17 [white bordered black spots]. As this description does not contain sufficient 18 information to identify the species without a traceable type, the name "Boa fusca 19 Gevers in Meuschen. 1787" has to be considered a nomen dubium according to Art. 20 12 of the Code.

The numbers that were provided by Hermann (1804) at the beginning of the description of *Boa latotecta* represent the number of ventral scales (V = 210) and the number of subcaudal scales (SC = 50), respectively. Our count of ventral and subcaudal scales in MZS Oph0612 yielded <u>SC = 49 (without counting the tip of the</u> tail) and V=209 (including 3 preventrals, but without counting the cloacal plate), a

1	result nearly identical to that of Hermann (1804). For species identification the
2	number of subcaudal scales (SC = 50) excludes <i>Bungarus ceylonensis</i> , because in
3	this species the number of subcaudal scales are in the range of SC = 32-42. The
4	subcaudal scale counts of MZS Oph0612 are according to Smith (1943) within the
5	range of the remaining three species from the Bungarus caeruleus group, namely
6	Bungarus sindanus (V = 220-237; SC = 49-52), B. walli (V = 196-208 ; SC = 50-55)
7	and <i>B. caeruleus</i> (V = 194-234; SC = 42-52), but our ventral scale count does not
8	show any overlap with that of <i>B. walli</i> or <i>B. sindanus</i> . In pholidosis <i>B. caeruleus</i>
9	additionally differs from <i>B. sindanus</i> as well <i>as B. walli</i> in the number of midbody
10	scale rows (MBS) (15 vs. 17-19). Hermann's specimen (MZS Oph0612) has 15 scale
11	rows around midbody and in conjunction with the number of subcaudal and
12	ventral scales consequently represents <i>Bungarus caeruleus</i> as previously noted by
13	Boie (1827).
14	Hermann (1804) provided a total length for <i>Boa latotecta</i> of three feet which
15	according to the measurement system at his time accounts for approximately 975
16	mm. Our measurement of MZS Oph0612 yielded a total length of 1063 mm, i.e. a
17	difference of 88 mm or slightly above 8%. Such a difference would typically
18	exclude the specimen MZS Oph0612 from being identical with the specimen of Boa
19	latotecta that Hermann had at hand. However, we would like to note that Hermann
20	(1804) typically only stated the length in full feet (not counting inches) with the
21	exception of very small snakes where he gave the length in inches (pollices) or
22	Malpolon monspessulanus where he gave the length also as feet decimals "duorum
23	pedum et dimidii [two and a half feet]".
24	The Archives de la Ville et de l'Eurométropole de Strasbourg holds under the

25 number 88 Z 26c (folio 704) a manuscript by F.-L. Hammer where he compiled and

1 annotated the content of Hermann's cabinet after it had been transferred into the 2 collection of the Musée zoologique de la ville de Strasbourg. The manuscript is 3 entitled "Notes manuscrites de Jean Hermann et Frédéric Louis Hammer sur 4 l'histoire naturelle, Catalogue des reptiles et classement par familles" (Fig. 1). Under 5 the taxon name *Boa latotecta* there is among other references one to Russel (1796) 6 who published the first illustration of a *Bungarus caeruleus* under the name "Gedi 7 Paragoodoo" (Fig. 2). The Strasbourg specimen has completely faded and does not 8 show any colour or pattern (Fig. 3) but the reference to Russell and Hammer's 9 remark "convient avec le Bong.[are] bleu de Russell [agrees with the blue krait of 10 Russell]" permits to infer that the colour pattern shown on Russell's plate reflects 11 the original colour pattern of Hermann's specimen. But most importantly Hammer 12 provided a more precise measurement of the specimen. He gave the total length as 13 "3 pieds 3p.". The term "3p." stands for "3 pouces" (or 3 inches) which amounts to 14 another 81 mm. Adding this to the 3 feet (975 mm) reported by Hermann (1804) 15 the total length comes to 1056 mm and thus is nearly identical to our 16 measurement of 1063 mm. The tail length is stated by Hammer as "5 pouces" or 5 17 inches (135 mm) and again agrees well with our measurement of TL = 143 mm. 18 Taking our scale counts and near identical measurement into account we 19 conclude that MZS Oph0612 constitutes the holotype by monotypy of *Boa latotecta* 20 Hermann, 1804 and that this specimen taxonomically agrees in colouration and 21 scalation with *Bungarus caeruleus* according to Boie (1827) who regarded it as a 22 synonym of *B. caeruleus*. The name *Boa latotecta* Hermann, 1804 therefore has to 23 be regarded as a junior subjective synonym of *Bungarus caeruleus* (Schneider, 24 1801) and is nomenclaturally available. The type locality can not be restricted and 25 needs to be given as "America septentrionali" [North America], albeit that the

species is clearly an elapid snake which is restricted in its distribution to South
 Asia.

4	DISCUSSION
5	The rediscovery and identification of the holotype by monotypy of Boa latotecta
6	closes the gap in type material related to species considered synonymous with
7	Bungarus caeruleus. In the current herpetological literature (see Wallach et al.
8	2014) the synonymy of <i>Bungarus caeruleus</i> (Schneider, 1801) looks as follows:
9	
10	Pseudoboa caerulea Schneider, 1801: 284
11	Boa lineata Shaw, 1802
12	<i>Boa latotecta</i> Hermann, 1804: 272
13	Bungarus arcuatus A.M.C. Duméril, Bibron & A.H.A. Duméril 1854: 1272
14	
15	For his description Schneider (1801) had apparently two specimens at hand,
16	one without locality and a scale count of V = 230 and SC = 40 and a second
17	specimen from the Bloch collection originating in "India orientali" [east India] with
18	a scale count of V = 192 and SC = 45. The first specimen is considered lost, but
19	Bloch's specimen was rediscovered in the herpetological collection of the
20	zoological museum in Berlin and is registered under ZMB 2787 (Bauer 1998).
21	In his description, Schneider also referred to the specimen depicted in Russell's
22	illustration of the "Gedi Paragoodoo" or "Paata Poola" (Russell 1796, pl. 1) which
23	consequently constitutes the third syntype for Pseudoboa caerulea. Russell's
24	illustration also constitutes the holotype by monotypy of <i>Boa lineata</i> Shaw, 1802, a
25	junior objective synonym of Pseudoboa caerulea Schneider, 1801 as both taxa are

1	based on the same illustration. The NHMUK collection in London holds two sets of
2	skins identified as Bungarus caeruleus that have been collected/donated by Patrick
3	Russell (1727-1805). One set of five skins entered the collection in 1837 (NHMUK
4	1837.9.26.34-38, labelled as <i>Bungarus semifasciatus</i> ) and a second set of four skins
5	in 1904, namely NHMUK 1904.7.27.10, NHMUK 1904.7.27.41, NHMUK
6	1904.7.27.54 and NHMUK 1904.7.27.88. Unfortunately, none of these skins could
7	be assigned unambiguously to Russell's illustration which therefore serves as the
8	iconotype of <i>Pseudoboa caerulea</i> (see Bauer 2015, Bauer et al. 2015).
9	Wallach et al. (2014) reported a lectotype designation for <i>Bungarus caeruleus</i> by
10	Klemmer (1963: 279) with the type locality restricted to "Vizagapatam, Indien"
11	[Vishakhapatnam, Andhra Pradesh, India], a locality where Russell arrived in
12	December 1781 with his family and where he stayed for seven years (Bhaumik
13	2023). The lectotype mentioned by Wallach et al. (2014) is a "737 mm specimen
14	described and illustrated by P. Russell (1796: 1-2, pl. 1)". This corresponds to the
15	"Gedi Paradoogoo" of Russell who reported a length of "two feet five inches" (=
16	737 mm). However, this lectotype designation and restriction of the type locality is
17	invalid according to Art. 74.5 of the Code. Klemmer (1963: 279) did not use the
18	term lectotype or any term related to type material of <i>Bungarus caeruleus</i> . He does
19	not even refer directly to Russell's (1796) original description. Klemmer (1963)
20	only stated the type locality as "Vizagapatam". From this statement it could be
21	inferred that Russel's "Gedi Paradoogoo" represents a type as Russell mentioned
22	that the species is "not uncommon at Vizagapatam". But even this type locality
23	restriction would be incorrect as Russell (1796: 2) also mentioned specimens from
24	"Boni" and "Masulapatam". While a lectotype designation for <i>Pseudoboa caerulea</i>
25	and subsequent type locality restriction would be very useful for taxonomic

1 studies this has not been accomplished so far but most likely will be necessary to 2 do since the genus *Bungarus* is much more speciose than previously suspected and 3 new species are described (see e.g. Chen et al. 2021). Consequently three 4 specimens, namely ZMB 2787, the second specimen from Schneider's original 5 description (considered to be lost) and the specimen depicted in Russell (1796, pl. 6 1) have <u>all</u> to be treated as syntypes. In a future taxonomic study of the *Bungarus* 7 caeruleus species group it will probably serve the cause best if ZMB 2787 will be 8 designated as the lectotype and consequently the unique name bearing type of 9 Pseudoboa caerulea Schneider, 1801.

A.M.C. Duméril, Bibron & A.H.A. Duméril (1854) described another synonym of *B. caeruleus, Bungarus arcuatus* based on seven syntypes in the collection of the
Paris museum, four of which are still extant and registered under MNHN-RA 3952
(Bengal, Mus. Leyde) and MNHN-RA 7686-88 (respectively Pondichéry, coll.
Perrotet; Malabar, coll. Dussumier; and East Indies, coll. R.P. Lesson). For all four
specimens detailed photographs are publically accessible on the museum's
website (https://science.mnhn.fr).

17 Any future revision involving a new description of a taxon related to the Bungarus caeruleus species group therefore needs to take the before mentioned 18 19 type material of *B. caeruleus*, *B. latotecta* and *B. arcuatus* into account as pointed 20 out by Wüster & Kaiser (2023). The current version of the Code (ICZN 1999) does 21 not permit to name a new taxon solely based on differences in gene composition as 22 this was carried out by Sunagar et al. (2021). But even in this case the authors 23 would have to take the gene sequences of *caeruleus* and its subjective synonyms 24 into account. Morphologically *Bungarus caeruleus* is currently only defined

1	unambiguously through ZMB 2787, the only remaining syntype which has
2	unfortunately a no more precise location than "India orientali (east India).
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7	FIGURE CAPTIONS
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9	FIGURE 1 Russell's (1796) illustration of the "Gedi Paradoogoo"; one of the
10	syntypes of <i>Pseudoboa caerulea</i> Schneider, 1801.
11	
12	FIGURE 2 Handwritten notes on <i>Boa latotecta</i> by F.L. Hammer. Several notes were
13	added at a later time by subsequent curators.
14	
15	FIGURE 3 Dorsal view of MZS Oph0612, holotype of <i>Boa latotecta</i> .
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