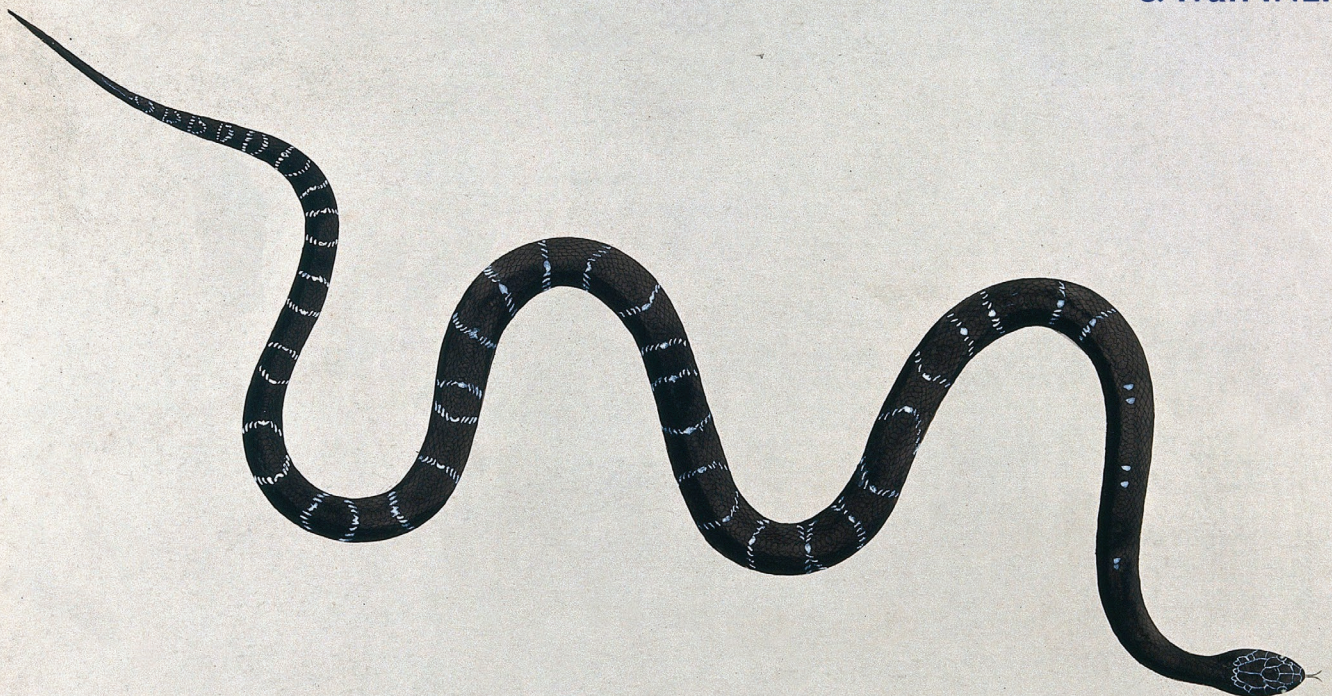


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Russell's (1796) illustration of the "Gedi Paragoodoo".

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ISSN (imprimé / *print*): 1280-9551/ ISSN (électronique / *electronic*): 1638-9387

# ***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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Submitted on 2 August 2023 | Accepted on 1 February 2024 | Published on 28 August 2024

[urn:lsid:zoobank.org:pub:FE787D7F-1C17-428A-866C-BEE99D0DDA84](https://zoobank.org/pub:FE787D7F-1C17-428A-866C-BEE99D0DDA84)

Denzer W., Meister M. & Ineich I. 2024. — *Boa latotecta* Hermann, 1804, a junior subjective synonym of *Bungarus caeruleus* (Schneider, 1801) (Serpentes, Elapidae), with comments on the types of the latter taxon. *Zoosystema* 46 (19): 505-511. <https://doi.org/10.5252/zoosystema2024v46a19>. <http://zoosystema.com/46/19>

## **ABSTRACT**

The Musée zoologique de Strasbourg (MZS) holds the late 18th century collection of Jean Hermann. Among the herpetological specimens we discovered a specimen that Hermann had described as *Boa latotecta* in a posthumous publication edited by his son-in-law Frédéric-Louis Hammer. Morphometrics and an examination of pholidosis facilitated comparisons with its original description and with relevant species included in the genus *Bungarus* Daudin, 1803. We conclude that MZS Oph0612 is unequivocally the holotype by monotypy of *Boa latotecta* Hermann, 1804 and that the binomen is a junior synonym of *Bungarus caeruleus* (Schneider, 1801). We also add some clarifications about the composition of the type series of the latter taxon.

## **KEY WORDS**

Snake,  
nomenclature,  
synonymy,  
holotype.

## **RÉSUMÉ**

*Boa latotecta* Hermann, 1804, un synonyme subjectif junior de *Bungarus caeruleus* (Schneider, 1801) (Serpentes, Elapidae) et quelques commentaires sur les types de ce dernier taxon.

Le Musée zoologique de Strasbourg (MZS) conserve la collection historique de Jean Hermann datant de la fin du XVIII<sup>e</sup> siècle. Nous y avons localisé un spécimen qu'il avait décrit comme *Boa latotecta* dans une publication posthume mise en forme par son gendre Frédéric-Louis Hammer. Les données morphométriques et l'écaillage de ce spécimen ont permis de le comparer à sa description originale et avec les autres espèces du genre *Bungarus* Daudin, 1803 auquel il doit être rattaché. Nous concluons que le spécimen MZS Oph0612 constitue de façon non équivoque l'holotype par monotypie de *Boa latotecta* Hermann, 1804 et que ce binôme est un synonyme junior de *Bungarus caeruleus* (Schneider, 1801). Nous précisons également le contenu de la série-type de ce dernier taxon.

## **MOTS CLÉS**

Serpent,  
nomenclature,  
synonymie,  
holotype.

## INTRODUCTION

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

More importantly Sunagar et al. (2021) recovered a sister clade to *Bungarus caeruleus sensu stricto* that showed a considerable genetic distance to the remaining members of the group and was described as a new species named “Whitaker’s krait” in honour of Romulus Whitaker, an American-Indian conservationist and herpetologist (Whitaker 1989). Shortly afterwards Dubois et al. (2021) discussed the Sunagar et al. (2021) publication in view of nomenclatural availability of the new taxon and concluded that the name presented therein was unavailable under the rules of the *International Code of Zoological Nomenclature* (ICZN 1999; hereafter, the *Code*). Firstly, Sunagar et al. (2021) was published in an online-only journal and the authors did not register their new species with Zoobank, and secondly the authors did not provide a description or definition of the taxon as prescribed in Article 13.1.1 nor did they fix a holotype or syntypes for the new taxon as laid out in Article 16.4.1 of the *Code* (ICZN 1999). More recently Wüster & Kaiser (2023) pointed out that Sunagar et al. (2021) also failed to take relevant historical material into account that potentially includes senior synonyms of their proposed species. One of the species Wüster & Kaiser (2023) listed was “*Boa latotecta* Hermann in Boie, 1827”. In order to shed further light on this issue we searched among the Hermann specimens still present in the collections of the Musée zoologique de Strasbourg (MZS) and rediscovered the specimen of *Boa latotecta* on which the description was based. We here discuss its original description and provide taxonomically relevant data for the specific allocation of its holotype. We also discuss the composition of the type series of *B. caeruleus*.

## MATERIAL AND METHODS

Meristic and morphometric data were recorded from MZS Oph0612, the type specimen of *Boa latotecta*. Measurements were taken to the nearest millimeter using a ruler and scale counts were performed by placing a fine needle at every tenth scale.

Measurements provided in Hermann (1804) came from his original catalogue (now missing) and manuscript that had been compiled several years earlier from around 1770.

Consequently measurement units were still in agreement with the prevailing French standard system before 1795 – the time of introduction of the metric system in France – and are here adjusted accordingly: 1 pied/foot (Latin *pes*) = 324.8 mm; 1 pouce/inch (Latin *pollex*) = 27.07 mm.

Throughout his publication we will place the taxon proposed incorrectly by Sunagar et al. (2021) as “Whitaker’s krait” and present manuscript names in quotation marks to clarify that these respective names are nomenclaturally not available and not made available in this publication. Additionally, these names are not italicized.

Specimen examined: Holotype by monotypy. “America septentrionali” [North America], ex errore; before 1778; formerly Ramsay collection; MZS Oph0612.

## ABBREVIATIONS

*Used in the text*

MBS	the number of midbody scale rows;
SC	the number of subcaudal scales, excluding the cloacal plate and terminal tail scute;
SVL	snout-vent length;
TL	tail length;
V	the number of ventral scales, counted from the first enlarged subgular (preventral) scale to the cloacal plate (excluded from count).

*Collection*

MNHN	Muséum national d’Histoire naturelle, Paris;
MZS	Musée zoologique de Strasbourg;
NHMUK	Natural History Museum, London;
ZMB	Zoologisches Museum Berlin, now Museum für Naturkunde, Leibniz-Institut für Evolutions- und Biodiversitätsforschung, Berlin.

## 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 of *Boa latotecta*, in reference to a work by Friedrich Boie, who listed *Boa latotecta* as a synonym of *Bungarus caeruleus* (Schneider, 1801) without any further description. The original text (Boie 1827: 552) reads: “*Boa latotecta* Herm. ist zu Folge des Straßburger Exemplars diese Species” [*Boa latotecta* is according to the Strasbourg specimen this species]. Boie’s brother Heinrich visited the Strasbourg museum and examined the herpetological collection (see remark under *Crotalus rhombifer*; Boie 1827: 562). Based on his experience in his position at the Rijksmuseum van Natuurlijke Historie in Leiden, The Netherlands, with snakes from the Asian realm, H. Boie concluded that *Boa latotecta* was conspecific and consequently synonymous with *B. caeruleus*. Without further information provided in F. Boie’s (1827) publication “*Boa latotecta* Hermann in F. Boie, 1827” was only published as a junior subjective synonym of *B. caeruleus* and would constitute a *nomen nudum* in the sense of Art. 12 of the *Code* (ICZN 1999), were it not for an earlier publication by Hermann in 1804.

Jean (or Johann) Hermann (1738-1800) (baptized Johannes Herrmann [sic]; see Bour *et al.* 2017) studied medicine and had a strong interest in natural history. He accumulated a collection of specimens from all over the world for his private cabinet that contained more than 200 specimens of amphibians and reptiles (Lescure *et al.* 2009). In herpetology, Hermann is renowned for the original description of *Malpolon monspessulanus* (Hermann, 1804) and a species named in his honour, Hermann's Mediterranean Tortoise, *Testudo hermanni* Gmelin, 1789. A neotype was recently described for the first species since its type could not be found again but the holotype of the second could be located in Strasbourg's collection (Bour *et al.* 2017). Hermann's cabinet was sold after his death to the City of Strasbourg and served as the basis for the collection of the MZS. Nowadays only a few herpetological specimens originally from Hermann's collection are still extant in the collection, including nine snakes. Among these specimens we discovered an elapid snake (MZS Oph0612) that was shelved under the name *Bungarus candidus*. Unfortunately, historical labels no longer exist and it is unclear who provided that identification. This may have been Lewis Henry Gough (1882-1945) who briefly worked as an assistant in the Strasbourg collection in the beginning of the 20th century and who published two notes about the snakes in the collections of the Zoological Institute of the University of Strasbourg, when the city was under German governance (Gough 1902, 1903). Further facts that point into this direction are an additional label that gives "Bengalen" (German for Bengal, commonly used as the name for India) as the origin of the specimen and the prevailing classification of *Bungarus* species at that time. Gough most likely identified the specimen according to the latest taxonomic treatment available to him, which was that of Boulenger (1896), who regarded the Indian *B. caeruleus* as a subspecies of *B. candidus*.

There exists, however, a manuscript that came into the possession of Hermann's son-in-law Frédéric-Louis Hammer (1762-1837) that contains further clues to which species MZS Oph0612 might belong. The manuscript contains a compilation of herpetological specimens from Hermann's collection and provides the descriptions of several new species, among them *Malpolon monspessulanus* and a snake that Hermann intended to name "Boa fusca". The manuscript was published posthumously in 1804 in a version edited by Hammer. In this publication (Hermann 1804: 272) the specimen named "Boa fusca" in Hermann's manuscript is briefly described under the name *Boa latotecta* that bears all the necessary characters of a species in the genus *Bungarus* (see below), as previously noted by Boie (1827).

Hermann (1804) stated that he had received the specimen from the Ramsay collection (Edinburgh, Scotland) in 1778. The geographic provenance of the specimen was not clear, and Hermann assumed that it had originated in North America. The original description of *Boa latotecta* in Hermann (1804: 272) reads as follows:

"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).

The editor (F.-L. Hammer) added a note explaining why he had changed the manuscript name "fusca" of Hermann's original unpublished text to *latotecta*: "Nomen fuscae quod autor dederat, mutatum quia in museo Geversiano, p. 10. n.° 90. hoc nomine jam alia occurrit, et substitutum aliud a squamis dorsi latis depromptum." [The name fusca that the author had dedicated, [was] changed because it already occurred in the Geversian museum, p. 10. no. 90. and [was] replaced by another taken from [referring to] the broad scales on the back] (our translation)]. The Latin adjective "latotecta" means "covered / roofed (tectus) with broad (latus) scales", referring to the enlarged vertebral scale row. The term "museo Geversiano" refers to a publication by Meuschen (1787) where the author had compiled the content of Abraham Gevers' Kabinet van Natuurlijke Zeldzaamheden [cabinet of natural curiosities]. On page 10 a new species named "Boa fusca" was very briefly described with the words "maculis nigris albo marginatis" [white bordered black spots]. As this description does not contain sufficient information to identify the species without a traceable type, the name *Boa fusca* Gevers in Meuschen, 1787 has to be considered a *nomen dubium* according to Art. 12 of the Code. While this name is still available for nomenclatural purposes, it has no bearing on the case discussed here as the short description provided in Meuschen (1787) is clearly not concerned with *Boa latotecta* but another species instead. It should also be noted that several of Meuschen's publications have already been placed on the index of unavailable works in zoology (ICZN 1954a, b).

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 SC = 49 (without counting the tip of the tail) and V = 209 (including three preventrals, but without counting the cloacal plate), a result nearly identical to that of Hermann (1804). For species identification, SC = 50 excludes *Bungarus ceylonicus*, because in this species the number of subcaudal scales are in the range of SC = 32-42. According to Smith's (1943) diagnoses for species of the genus *Bungarus*, the subcaudal scale counts of MZS Oph0612 are within the range of the remaining three species of the *B. caeruleus* group, namely *B. sindanus* (V = 220-237; SC = 49-52), *B. walli* (V = 196-208; SC = 50-55), and *B. caeruleus* (V = 194-234; SC = 42-52), but our ventral scale count (V = 209) does not show any overlap with that of *B. walli* or *B. sindanus*. In pholidosis *B. caeruleus* additionally differs from *B. sindanus* as well as from *B. walli* in the

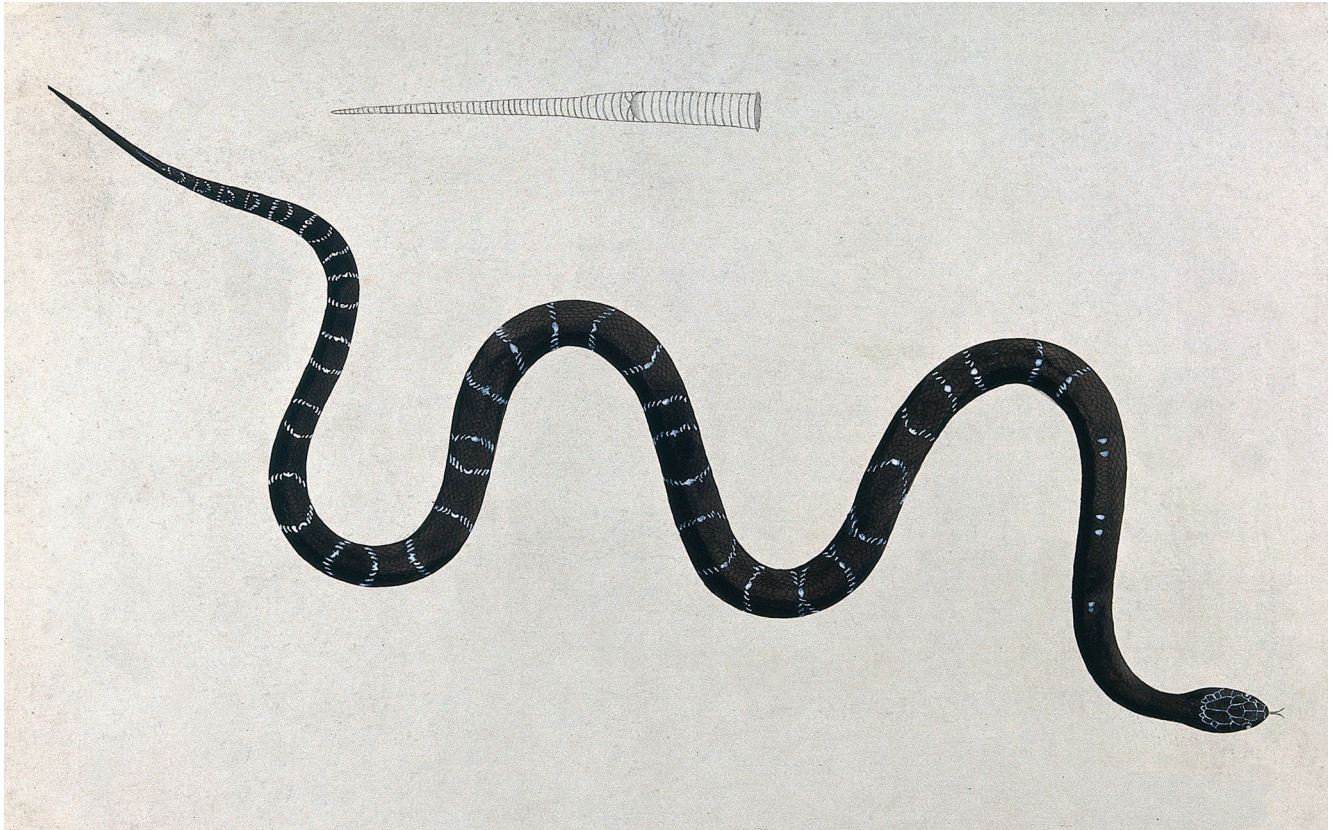


FIG. 1. — Russell's (1796) illustration of the "Gedi Paragoodoo"; the specimen depicted is one of the syntypes of *Pseudoboa caerulea* Schneider, 1801.

number of MBS (15 vs 17-19). Hermann's specimen (MZS Oph0612) has 15 MBS, and in conjunction with the number of subcaudal and ventral scales consequently must represent *B. caeruleus* as previously noted by Boie (1827).

Hermann (1804) provided a total length for *Boa latotecta* of three feet which according to the measurement system at his time accounts for approximately 975 mm. Our measurement of MZS Oph0612 yielded a total length of 1063 mm, a difference of 88 mm or slightly above 8%. Such a difference would typically exclude the specimen MZS Oph0612 from being identical with the specimen of *Boa latotecta* that Hermann had at hand. However, we would like to note that Hermann (1804) typically only stated the length in full feet (not counting inches) with the exception of very small snakes, whose length he gave in inches (pollices), or *Malpolon monspessulanus*, whose length he gave as feet decimals "duorum pedum et dimidii" [two and a half feet] (our translation).

The Archives de la Ville et de l'Eurométropole de Strasbourg holds under the number 88 Z 26c (folio 704) a manuscript by E.-L. Hammer where he compiled and annotated the content of Hermann's cabinet after it had been transferred into the collection of the MZS. The manuscript is entitled "*Notes manuscrites de Jean Hermann et Frédéric Louis Hammer sur l'histoire naturelle, Catalogue des reptiles et classement par familles*" (Fig. 1). Under the taxon name *Boa latotecta* there is among other references one to Russell (1796) who published the first illustration of a *Bungarus caeruleus* under the name "Gedi Paragoodoo"

(Fig. 2). The Strasbourg specimen has completely faded and does not show any colour or pattern (Fig. 3) but the reference to Russell and Hammer's remark "convient avec le Bong.[are] bleu de Russell" [agrees with the blue krait of Russell] (our translation) permits to infer that the colour pattern shown on Russell's plate reflects the original colour pattern as seen by Hermann and Hammer. But most importantly Hammer provided a more precise measurement of the specimen. He gave the total length as "3 pieds 3p.". The term "3p." stands for "3 pouces" (or 3 inches), which amounts to another 81 mm. Adding this to the 3 feet (975 mm) reported by Hermann (1804) the total length comes to 1056 mm and thus is nearly identical to our measurement of 1063 mm. The tail length is stated by Hammer as "5 pouces" or 5 inches (135 mm) and again agrees well with our measurement of TL = 143 mm.

Taking our scale counts and near identical measurement into account we conclude that MZS Oph0612 constitutes the holotype by monotypy of *Boa latotecta* Hermann, 1804 and that this specimen taxonomically agrees with *Bungarus caeruleus* in agreement with Schneider's (1801) description and Boie's (1827) view. The name *Boa latotecta* Hermann, 1804 is therefore a junior subjective synonym of *Bungarus caeruleus* (Schneider, 1801) and is nomenclaturally available. The type locality can not be defined and needs to be given as "America septentrionali" [North America], even though it is clear that the specimen is an elapid snake with a range restricted to South Asia.

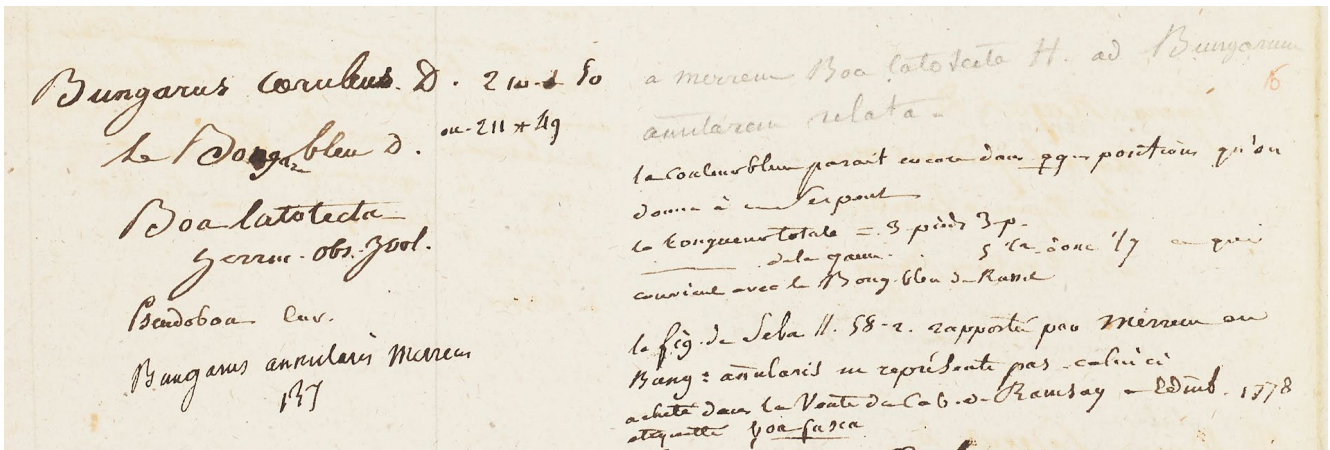


FIG. 3. — Handwritten notes on *Boa latotecta* Hermann, 1804 by F. L. Hammer. Several notes were added at a later time by subsequent curators.



FIG. 2. — Dorsal view of MZS Oph0612, holotype of *Boa latotecta* Hermann, 1804.

## DISCUSSION

The rediscovery and identification of the holotype by monotypy of *Boa latotecta* closes the gap in type material related to species considered synonymous with *Bungarus caeruleus*. Taking our results into account the current synonymy of *Bungarus caeruleus* (Schneider, 1801) looks as follows:

### *PSEUDOBOA CAERULEA* SCHNEIDER, 1801: 284

Syntypes. “India orientali” [east India]; before 1801; formerly Bloch collection; ZMB 2787. India (“Vizagapatam, Boni etc., Masulapatam”; 1781-1787; P. Russell leg.; specimen depicted in Russell (1796: 1-2, pl. 1). Specimen without locality and collection data in Schneider (1801), untraceable, probably lost.

### *BOA LINEATA* SHAW, 1802: 356

Syntype. India (“Vizagapatam, Boni etc., Masulapatam”; 1781-1787; P. Russell leg.; specimen depicted in Russell (1796: 1-2, pl. 1). Further syntypes not unambiguously identifiable.

### *BOA LATOTECTA* HERMANN, 1804: 272

Holotype by monotypy. “America septentrionali” [North America], ex errore; before 1778; formerly Ramsay collection; MZS Oph0612.

### *BUNGARUS ARCUATUS* DUMÉRIL, BIBRON & DUMÉRIL, 1854: 1272

Syntypes. Bengal (India); without further data; formerly Museum Leiden [Rijksmuseum]; MNHN-RA-0.3952. Pondichéry [now Puducherry], India; 1834-1839; Perrotet leg.; MNHN-RA-0.7686. Malabar (India); 1816-1840; Dussumier; MNHN-RA-0.7687. Indes Orientales (East Indies ex errore, probably east India); 1822-1825; Lesson; MNHN-RA-0.7688.

For his description, Schneider (1801) apparently had two specimens at hand, one without locality and a scale count of  $V = 230$  and  $SC = 40$ , and a second specimen from the Bloch collection originating in “India orientali” [east India] with a scale count of  $V = 192$  and  $SC = 45$ . The first specimen is considered lost, but Bloch’s specimen was rediscovered in

the herpetological collection of the Berlin museum (ZMB 2787; Bauer 1998).

In his description, Schneider also referred to the specimen depicted in Russell's illustration of the "Gedi Paragoodoo" or "Paata Poola" (Russell 1796: pl. 1), which consequently constitutes the third syntype for *Pseudoboa caerulea*. The specimen in Russell's illustration also constitutes a syntype of *Boa lineata* Shaw, 1802, a junior synonym of *Pseudoboa caerulea* Schneider, 1801. Both taxa are based on the same illustration. Russell (1796) and later Shaw (1802) mentioned additional specimens and reported variations in colouration such that the specimen depicted in Russell (1796) cannot be seen as the holotype by monotypy of *Boa lineata*. The Natural History Museum, London (NHMUK) holds two sets of skins identified as *Bungarus caeruleus* that were donated (and possibly collected) by Patrick Russell (1727-1805). One set of five skins entered the collection in 1837 (NHMUK 1837.9.26.34-38, labelled as *Bungarus semifasciatus*) and a second set of four skins registered in 1904 (NHMUK 1904.7.27.10, NHMUK 1904.7.27.41, NHMUK 1904.7.27.54, NHMUK 1904.7.27.88). Unfortunately, none of these skins can be assigned unambiguously to Russell's illustration (see Bauer 2015; Bauer *et al.* 2015).

Wallach *et al.* (2014) reported a lectotype designation for *Bungarus caeruleus* by Klemmer (1963: 279) with the type locality restricted to "Vizagapatam, Indien" [Vishakhapatnam, Andhra Pradesh, India], a locality where Russell arrived in December 1781 with his family and where he stayed for seven years (Bhaumik 2023). The lectotype mentioned by Wallach *et al.* (2014) is a "737 mm specimen described and illustrated by P. Russell (1796: 1-2, pl. 1)". This corresponds to the "Gedi Paragoodoo" of Russell who reported a length of "two feet five inches" (= 737 mm). However, this lectotype designation and restriction of the type locality is invalid according to Art. 74.5 of the *Code*. Klemmer (1963: 279) did not use the term lectotype or any term related to type material of *Bungarus caeruleus*. He did not even refer directly to Russell's (1796) original description. Klemmer (1963) only stated that the type locality was "Vizagapatam". From this statement it could be inferred that Russell's "Gedi Paragoodoo" illustrated on his plate 1 represents a type, as Russell mentioned that the species was "not uncommon at Vizagapatam". But even this type locality restriction would be incorrect as Russell (1796: 2) also mentioned specimens from "Boni" and "Masulapatam". While a lectotype designation for *Pseudoboa caerulea* and subsequent type locality restriction would be very useful for taxonomic studies this has not been accomplished so far; but most likely it will be necessary to do since the genus *Bungarus* is much more speciose than previously suspected and new species are described (see Chen *et al.* 2021). Consequently, three specimens, namely ZMB 2787, the second specimen from Schneider's original description (considered to be lost), and the specimen depicted in Russell (1796: pl. 1) all have to be treated as syntypes. In a future taxonomic study of the *Bungarus caeruleus* species group, it will be necessary to designate a lectotype as the unique name-bearing specimen of *Pseudoboa caerulea* Schneider, 1801.

Duméril *et al.* (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-0.3952 (Bengal, Mus. Leyde) and MNHN-RA-0.7686-88 (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/institution/mnhn/collection/ra/item/list?full\\_text=Bungarus+arcuatus](https://science.mnhn.fr/institution/mnhn/collection/ra/item/list?full_text=Bungarus+arcuatus)).

Any future revision involving a new description of a taxon related to the *Bungarus caeruleus* species group therefore needs to take into account the type material of *B. caeruleus*, *B. latotecta*, and *B. arcuatus*, as already pointed out by Wüster & Kaiser (2023). The current version of the *Code* (ICZN 1999) does not permit to name a new taxon solely based on differences in gene composition, which is what was carried out by Sunagar *et al.* (2021). But even in this case the authors would have to take the gene sequences of *caeruleus* and its subjective synonyms into account. Morphologically, *Bungarus caeruleus* is currently only defined unambiguously through ZMB 2787, the only remaining syntype, which has unfortunately a no more precise location than "India orientali", a term that may refer to the eastern part of the Indian subcontinent or possibly to the Indomalayan realm.

## Acknowledgements

We thank Hinrich Kaiser and an anonymous reviewer for their comments on an earlier version of this manuscript.

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Submitted on 2 August 2023;  
accepted on 1 February 2024;  
published on 28 August 2024.