Southeast Asian and Australasian Herpetological Collections from the Eighteenth and Nineteenth Centuries in the Zoological Museum of Berlin

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Abstract The Zoological Museum in Berlin (Museum für Naturkunde) houses one of the most extensive herpetological collections in Europe. Important material from Southeast Asia and especially the Indo-Australian Archipelago accumulated steadily following the museum's founding in 1810. The earliest parts of the collection, stemming from the natural history cabinets of Marcus Elieser Bloch, Friedrich Heinrich Graf von Borcke and others, are represented by eighteenth century material, mostly without specific locality. Throughout the early decades of the nineteenth century amphibians and reptiles reached Berlin from a number of collectors, both German and foreign. The most important of these were Fedor Jagor and Eduard von Martens, both contemporaries of Alfred Russel Wallace. Additional important material was obtained by exchange or purchase from museums and natural history dealers from across Europe. Among approximately 625 specimens from Southeast Asia catalogued into the Zoological Museum before about 1870 are specimens representing types of at least 44 nominal species of amphibians and reptiles. The majority of these were described by Wilhelm Peters, director of the Zoological Museum, whose later collaboration with Giacomo Doria in Genoa further strengthened the collection through the addition of many specimens from Sarawak. Berlin Southeast Asian collectors and localities are reviewed and the identity and status of confirmed and putative type material from the region is evaluated.

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1 Introduction

Alfred Russel Wallace's years in the Malay Archipelago (1854–1862) marked a period of herpetological exploration and discovery in the region. Much of this is associated with the activities European colonial empires extant at the time. Most notably, Britain in Malaya, Singapore, and North Borneo, and the Netherlands in the remainder of the islands of the Sunda Shelf and beyond. Portugal likewise had a foothold in East Timor, but conducted little fundamental zoological research in this period (Kaiser et al. 2011). France, a world leader in science of the period, was only beginning its involvement in Indochina, but herpetological material was obtained through private collectors and others.

Germany was not a colonial empire at the time of Wallace's travels, and indeed was not yet united as single European state, although the Kingdom of Prussia, with its capitol in Berlin, was certainly a major power. Nonetheless, German and especially Prussian contributions to the herpetology of Southeast Asia were not inconsequential. Specifically, collectors associated with the Zoological Museum of Berlin (ZMB, today the Museum für Naturkunde), were important in obtaining, naming, and documenting the amphibians and reptiles of the region. In this paper I review the contribution of Berlin herpetologists to our understanding of the herpetofauna until the mid-1860s. I include in the geographic area of consideration the mainland areas from Myanmar (Burma) east to Indochina and the Malay Peninsula and the islands of the Indo-Australian Archipelago as far as the Lesser Sundas and western New Guinea. I exclude the Philippines which, although well studied by Berlin-based naturalists (e.g., Fedor Jagor, Carl Semper), was not within Wallace's sphere of activity.

2 Methods

Data were obtained directly from the original hand-written catalogue of the ZMB herpetological collection compiled by Martin Carl Hinrich Lichtenstein (1780–1857), beginning in 1856 and continued by Wilhelm C.H. Peters (1815–1883; Fig. 1) until his death. Data regarding collector, original and type status was taken from this source and supplemented by information from the original published descriptions of new taxa and from published narratives of relevant voyages. This catalogue was initiated in conjunction with the preparation of the published list of Berlin herpetological holdings in the *Nomenclator Reptilium et Amphibiorum* (Lichtenstein and von Martens 1856) and replaced earlier lists of specimens which did not use a continuous numbering system for the entire collection. In the ZMB catalogue the first 3750 numbers were assigned to material already in the collection during the time of Lichtenstein's directorship (1813–1857) and the first 3706 of these were ordered by taxonomic group (see Bauer 1999 "1998" for a breakdown of numbers assigned to each group). From entry 3707 onwards specimens were entered as they were received or worked upon by Peters and others. At least 625 specimens among the first 7000

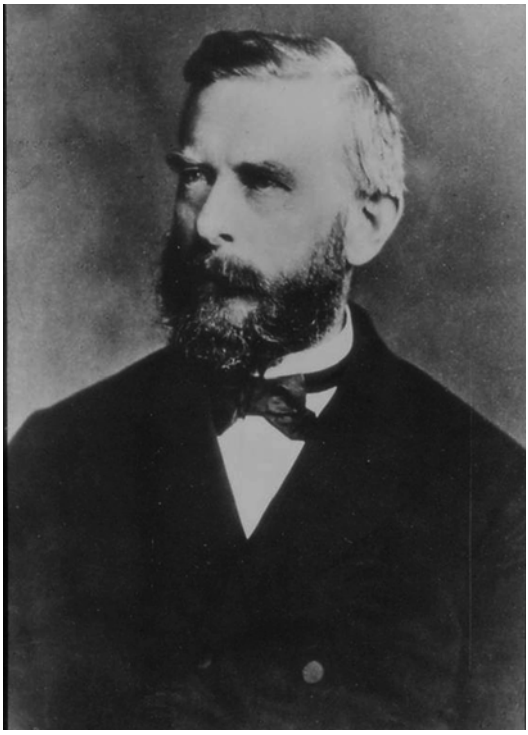

Fig. 1 Wilhelm Peters, during his period of directorship of the Zoological Museum in Berlin. Image courtesy of Hannelore Landsberg (Museum für Naturkunde Archiv)

ZMB registration numbers correspond to amphibians and reptiles from the area under consideration. This includes material accessioned through approximately 1870. Although this was chosen as an arbitrary cutoff, due to time lags in the registering of material, this date would allow for the inclusion of all or most specimens actually collected through the mid-1860s. However, some of this material was not described until considerably later, e.g. *Clemmys gibbera* (Peters 1874).

Southeast Asian material in Berlin can be divided by its sources. A small number of specimens stem from the early collections of the museum. Others were obtained through purchase or exchange with natural history dealers and other institutions. The majority, however, come from collectors acting directly or indirectly on the behalf of the Zoological Museum. The contributions of each of these sources will be treated in turn, with special emphasis on specimens that served as the types of new taxa.

3 Early Collections

The earliest Southeast Asian material in the collection stems from the foundational material of the museum. These are from the collections of Marcus Elieser Bloch (1723–1799), Friedrich Heinrich Graf von Borcke (1776–1825), and Johann Centurius Hoffmann Graf von Hoffmannsegg (1766–1849). Bloch's herpetological

material consisted of about 380 specimens, of which more than 200 are still present in the ZMB collection (Bauer 1999 "1998"; Günther 2001). It was obtained from collectors and correspondents from around the world, and included some material from tropical Asia, most significantly, the types of the skink *Lacerta serpens* [syn. *Lygosoma quadrupes* (Linnaeus 1766)], the only reptile described by Bloch (1776) himself and Bauer and Günther (2006; see Table 1). In addition, the holotype of *Draco fimbriatus* Kuhl 1820 was derived from Bloch's collection. Von Hoffmansegg's collection was not herpetologically rich, but it nonetheless did provide the type specimen for one species of Javan snake, *Dipsas hoffmanseggii* Peters 1867 [syn. *Boiga nigriceps* (Günther 1863)]. Graf von Borcke's herpetological collection was largely obtained, through a series of purchases, from the famous cabinet of Albertus Seba (1665–1736) (Bauer and Günther 2013, 2014), who illustrated many of his specimens in his *Thesaurus* (1734–1765). Other specimens from von Borcke's collection were figured by Merrem (1790). Merrem's (1790) figure of the "Unregelmäßige Natter" is based on ZMB 2583 and through the illustration this specimen serves as the holotype of both *Coluber irregularis* Bechstein 1802 and *Hurria pseudoboiga* Daudin 1803 [now *Boiga irregularis*] (see Bauer and Günther 2013 for an explanation of this complex connection). Other specimens may also have been the models for other Seba and Merrem images used as iconotypes, although their type status remains ambiguous (see Table 1, footnote 25). Most of the older herpetological material present in Berlin is associated with only the most basic data, and this is especially true of these foundational collections. Indeed, some specimens bear only the locality "Ostindien" or "Indien" and the only specific island locality given is Java. In no case are these specimens associated with a collector or collection date.

4 Exchanges and Purchases

Another category of specimens are those obtained through exchange or purchase from other museums. Under both Lichtenstein and Peters, the Museum carried out extensive exchanges with other leading institutions throughout Europe, as well as with smaller collections, chiefly in Germany. Material from the Indo-Australian Archipelago was obtained from Paris, London, Stockholm, Munich, Halle, and especially Leiden (Fig. 2). In some cases only the collection is noted as a source, but in others the responsible curator or director was specifically listed in the ZMB catalogue. Thus, Coenraad Jacob Temminck (1778–1858) and Hermann Schlegel (1804–1884) are often acknowledged for specimens from Leiden, Johann Georg Wagler (1800–1832) for early material received from Munich, Albert Karl Ludwig Gotthilf Günther (1830–1914) for material from London, and Séraphin Braconnier (1812–1884) for specimens from Paris. In the case of Leiden three specific collectors of the material are mentioned by name: Heinrich Kuhl (1797–1821), Eltio Alegondas Forsten (1811–1843) and Salomon Müller (1804–1863), all of whom were sent to the Dutch East Indies by Temminck to collect; of these only Müller returned alive to Europe (see Adler 2012).

Table 1 Herpetological taxa from Southeast Asia and the Indo-Australian Archipelago that entered the Zoological Museum Berlin (ZMB) collections before approximately 1865 and represented by confirmed or putative type material

Family	Original name	Author	Current name	Source	Locality	ZMB type(s)
Bufonidae	*Hylaplesia borbonica*	Tschudi (1838)	*Leptophryne borbonica*	Leiden	Java	Syntype: ZMB 4487[a]
Bufonidae	*Bufo claviger*	Peters (1863)	*Ingerophrynus claviger*	von Martens	Benkulu, Sumatra	Lectotype: ZMB 4863[b]; Paralectotypes: ZMB 37322
Dicroglossidae	*Phrynoglossus Martensii*	Peters (1867)	*Occidozyga martensii*	von Martens	Bangkok	Holotype: ZMB 5645
Dicroglossidae	*Rana brevipalmatta*	Peters (1871)	*Fejervarya brevipalmata*	purch. Cutler	Pegu[c]	Holotype: ZMB 6130 (not located)
Microhylidae	*Diplopelma disciferum*	Peters (1867)	*Microhyla achatina*	Mus. Halle	Java	Lectotype: ZMB 4434[d]
Microhylidae	*Phrynomantis fusca*	Peters (1867)	*Callulops fuscus*	von Martens	Amboina	Syntypes: ZMB 5648 (2 specimens)
Microhylidae	*Calohyla sundana*	Peters (1867)	*Metaphrynella sundana*	Hooft via von Martens	Pontianak, Borneo	Syntypes: ZMB 5635 (2 specimens)
Ranidae	*Hyla chalconotus*	Schlegel (1837)	*Hylarana chalconota*	Leiden	Java	Syntypes: ZMB 4462[e] (2 specimens)
Ranidae	*Hyla erythraeus*	Schlegel (1837)	*Hylarana erythraea*	Leiden	Banca	Syntype?: ZMB 4463[f]
Ranidae	*Polypedates raniceps*	Peters (1871)	*Hylarana raniceps*	von Martens/Doria	Pulo Matjan, Borneo	Paralectotypes: ZMB 5020, ZMB 54894[g]
Ranidae	*Limnodytes celebensis*	Peters (1872a)	*Hylarana celebensis*	Leiden, coll. Forsten	Manado, Celebes	Holotype: ZMB 5745
Rhacophoridae	*Polypedates Mackloti*	Peters (1871)	*Buergeria buergeri*	Schlegel	Java[h]	Holotype: ZMB 3157

(continued)

Table 1 (continued)

Family	Original name	Author	Current name	Source	Locality	ZMB type(s)
Rhacophoridae	*Hyla aurifasciata*	Schlegel (1837)	*Philautus aurifasciatus*	Leiden, coll. S. Müller	Java	Paralectotype: ZMB 4465[i]
Geoemydidae	*Clemmys* (*Heteroclemmys*) *gibbera*	Peters (1874)	*Orlitia borneensis*	von Martens	Pulo Matjan, Borneo	Holotype: ZMB 5022
Trionychidae	*Emyda scutata*	Peters (1868)	*Lissemys scutata*	purch. Gerrard	Pegu	Holotype: ZMB 6029
Agamidae	*Draco fimbriatus*	Kuhl (1820)	*Draco fimbriatus*	Bloch	Java	Holotype: ZMB 713[j]
Agamidae	*Otocryptis* (*Aphaniotis*) *fusca*	Peters (1864)	*Aphaniotis fusca*	Japan Expedition	Malacca	Holotype: ZMB 5032
Agamidae	*Otocryptis* (*Japalura*) *nigrilabris*	Peters (1864)	*Phoxophrys nigrilabris*	von Martrens	Pulo Matjan, Borneo	Holotype: ZMB 5023 (not located)
Dibamidae	*Typhlosaurus Martensii*	Peters (1864)	*Dibamus novaeguineae*	von Martens	Ternate	Syntypes: ZMB 5026, 5027 (not located)
Lacetidae	*Tachydromus sexlineatus* var. *aeneofuscus*	Peters (1863)	*Takydromus sexlineatus*	von Martens	Bangkok	Holotype: ZMB 4534
Scincidae	*Chelomeles sumatrensis*	Bleeker (1860)	*Larutia sumatrensis*	Bleeker	Agam, Sumatra	Syntype: ZMB 4055[k]
Scincidae	*Euprepes* (*Mabuya*) *samoensis var. moluccensis*	Peters (1864)	*Emoia sorex*	von Martens	Moti	Holotype: ZMB 5104
Scincidae	*Euprepes* (*Riopa*) *punctatostriatus*[l]	Peters (1864)	*Lygosoma bowringii*	Jagor	Singapore	Holotype: ZMB 7013
Scincidae	*Heteropus Schlegelii*	Peters (1864)	*Carlia leucotaenia*	von Martens/ Leiden	Amboina/Timor	ZMB 4951[m]/ZMB 4981 (2 specimens)

Scincidae	*Lacerta serpens*	Bloch (1776)	*Lygosoma quadrupes*	Bloch	Ostindien	Syntype: ZMB 1276[n]
Scincidae	*Zonurus novae Guineae*	Schlegel (1834)	*Tribolonotus novaeguineae*	Leiden, coll. Müller	Neu Guinea	Syntype?: ZMB 4474[o]
Typhlopidae	*Typhlops flaviventer*	Peters (1864)	*Ramphotyphlops flaviventer*	von Martens	Ternate	Holotype: ZMB 5029
Typhlopidae	*Typhlops nigro-albus*	Duméril and Bibron (1844)	*Argyrophis muelleri*	Paris	Sumatra	Syntype?: ZMB 4114[p]
Cylindrophiidae	*Tortrix rufa* var. *Celebica*	Schlegel (1844)	*Cylindrophis melanotus*	Leiden	Celebes	Holotype?: ZMB 4049[q]
Colubridae	*Calamaria maculolineata*	Peters (1863)	*Calamaria margaritophora*	Gaymans via von Martens	Kepahiang, Sumatra	Holotype: ZMB 4884
Colubridae	*Calamaria vermiformis*	Duméril et al. (1854)	*Calamaria lumbricoidea*	Paris	Java	Syntype?: ZMB 4118[r]
Colubridae	*Coluber irregularis*	Bechstein (1802)	*Boiga irregularis*	von Borcke	“Indien”	Holotype: ZMB 2583[s]
Colubridae	*Dendrophis formosus*	Boie (1827)	*Dendrelaphis formosus*	Leiden	Padang	Syntype?: ZMB 4047[t]
Colubridae	*Dipsas drapiezii var. bancana*	Peters (1867)	*Boiga drapiezii*	Müller via von Martens	Banca	Holotype: ZMB 4543
Colubridae	*Dipsas hoffmanseggii*	Peters (1867)	*Boiga nigriceps*	von Hoffmansegg	Java	Holotype: ZMB 2585
Elapidae	*Calliophis furcatus var. nigrotaeniatus*	Peters (1863)	*Calliophis intestinalis lineata*	Gaymans via von Martens	Kepahiang, Sumatra	Syntypes: ZMB 4885, ZMB 4906 (not located)
Elapidae	*Hydrophis tenuicollis*	Peters (1873)	*Hydrophis cyanocinctus*	Wessel	Java	Holotype: ZMB 5727

(continued)

Table 1 (continued)

Family	Original name	Author	Current name	Source	Locality	ZMB type(s)
Elapidae	*Naja* (*Hamadryas*) *scutata*	Peters (1861)	*Notechis scutatus*	Jagor	Java[u]	Holotype: ZMB 2815 (lost)
Elapidae	*Stephanohydra fusca*	Tschudi (1837)	*Aipysurus fuscus*	Schönlein	Celebes[v]	Holotype: ZMB 2824
Homalopsidae	*Hydrodipsas elapiformis*	Peters (1859)	*Cantoria violacea*	Jagor	Sarawak, Borneo	Holotype: ZMB 2492
Homalopsidae	*Hypsirhina* (*Eurostus*) *Jagorii*	Peters (1863)	*Enhydris jagorii*	Jagor	Siam	Holotype: ZMB 4746
Natricidae	*Styporhynchus truncatus*	Peters (1863)	*Tropidonophis truncatus*	von Martens	Dodinga, Djololo/ Wahai, Ceram	Syntypes: ZMB 4883, ZMB 67263 (ex ZMB 4883)[w]
Natricidae	*Tropidonotus maculatus*	Peters (1871)	*Amphiesma petersii*	Hallmann	Ostindien	Syntype: ZMB 7008[x]
Pareatidae	*Asthenodipsas malaccana*	Peters (1864)	*Asthenodipsas malaccanus*	Baumgarten	Malacca	Holotype: ZMB 5041

[a]Other types in Leiden (Gassó Miracle et al. 2007); this specimen not previously noted as having type status
[b]Lectotype designated by Bauer et al. (1995). Other paralectotype: FMNH 73840 (ex ZMB)
[c]Locality probably in error (Boulenger 1905)
[d]Lectotype designated by Bauer et al. (1996). Paralectotype(s): Halle
[e]Other types in Leiden (Gassó Miracle et al. 2007); these specimens not previously noted as having type status
[f]Other types in Leiden (Gassó Miracle et al. 2007) and Paris (Ohler and Mallick 2003 "2002"); this specimen not previously noted as having type status. Doubtful, as "Banca" is not among the stated type localities
[g]Lectotype and another paralectotype in Genoa; designation by Capocaccia (1957)
[h]If the synonymy of Ahl (1931) is correct, the locality associated with the type is in error as the species is endemic to Japan
[i]Other types in Leiden (Gassó Miracle et al. 2007). Lectotype designated by Bossuyt and Dubois (2001)
[j]Denzer et al. (1997) considered ZMB 713 as a holotype and ZMB 712 (exchanged to CAS in 1924) as a paratype. However, 712 was obtained from Temminck in Leiden after Kuhl's description, which is based on a single Berlin specimen
[k]At least one other syntype is in BMNH. Authorship of this name is often attributed to Günther (see Bauer et al. 2003)
[l]The title of Peters' paper uses the epithet *punctatolineatus* and the holotype is listed as such in the ZMB catalogue

[m]ZMB 54382–86 are listed as originally part of 4591 in the ZMB catalogue, however the description explicitly notes only two specimens each from Amboina and Timor (Bauer et al. 2003)

[n]There were originally two syntypes of *L. serpens* but it is uncertain if the second ever entered the ZMB collection, as the description predates the founding of the museum by several decades (Bauer et al. 2003; Bauer and Günther 2006)

[o]Brygoo (1985) and Bauer et al. (2003) identified possible syntypes in several collections, but it is difficult to determine the extent of the original type series

[p]McDiarmid et al. (1999) considered MNHN 6991 as the holotype of this taxon, however, it is clear that the description is based on three specimens. ZMB 4114 is consistent with the type data and may have been an exchanged syntype. Bauer et al. (2002) considered its status as a type questionable

[q]From the type description the number of type specimens cannot be determined. McDiamrid et al. (1999) considered the type(s) as unlocated. Although it is unclear why the type would be in Berlin, rather than Leiden, the ZMB catalogue indicates this specimen as the type. Bauer et al. (2002) considered its status questionable

[r]Duméril et al. (1854) mention many specimens of this species in Paris. The ZMB specimen is likely an exchanged specimen from this series

[s]This same specimen also serves as the holotype of *Hurria pseudoboiga* Daudin 1802. Both Bechstein and Daudin linked their new names to the same figure by Merrem (1790), which in turn has been determined to be based on ZMB 2583 (see Bauer and Günther 2013). In addition, several other Berlin specimens are plausible matches to illustrations by Seba (1735–1765) that served as iconotypes of other taxa: ZMB 727, Java, *Draco volans* Linnaeus 1758; ZMB 2506, "Ostindien," *Coluber horridus* Daudin1803 [syn. *Homalopsis buccata* (Linnaeus 1758)]. However, as a definite match between these specimens and the plates cited in the descriptions cannot be confirmed with any certainty these specimens can be considered putative types at best. Three von Borcke specimens of *Naja naja* (Linnaeus 1758) are putative matches for the iconotypes of as many as six different nominal taxa (see Bauer and Günther 2013, Table 1). However, this species only reaches the periphery of the region under consideration (Myanmar) and it is much more likely that the specimens (ZMB 2795–2797), which have the locality "Ostindien," originated from further west

[t]A specimen in Leiden (RMNH 877) has been identified as the probable holotype (Vogel and van Rooijen 2007; Wallach et al. 2014). Although Boie's description gives details for only a single specimen, it is not possible to determine if there were additional types, thus the status of this Berlin specimen is questionable

[u]Locality probably in error; species is believed to be an Australian endemic. Rawlinson (1991) designated a neotype (NMV D47618)

[v]Cogger (1975) considered the type locality as a probable error; the species is known with certainty from western Australian waters

[w]Bauer et al. (1995) incorrectly listed ZMB 5031 as an additional type following the ZMB catalogue, but this specimen has a different provenance (Ceram) and only two Dodinga specimens are noted in the description

[x]ZMB 7105 and MSNG 30085(2) are additional syntypes collected by Doria in Sarawak

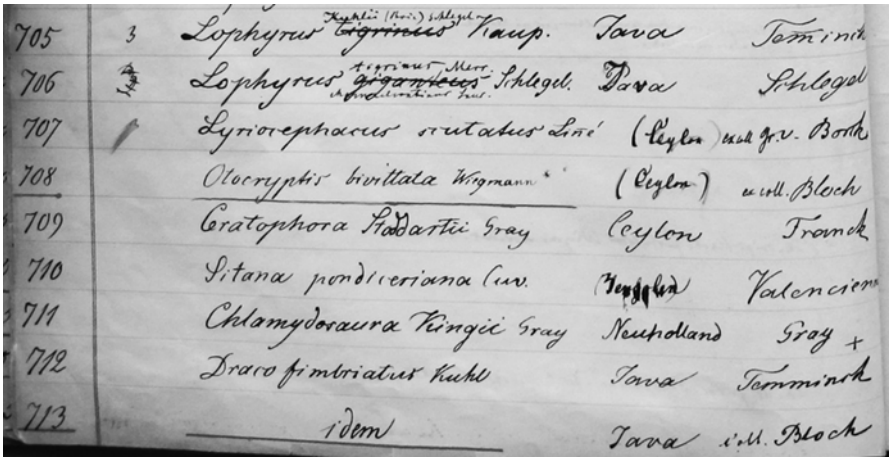

Fig. 2 Excerpt from the Zoological Museum of Berlin herpetological collection catalogue showing the entries for several specimens from Java, including the type of *Draco fimbriatus* from the Bloch collection, and several exchanged specimens obtained from Temminck and Schlegel in Leiden

Among the types from the region, 13 taxa were based on exchanged material, some of which was described by Lichtenstein or Peters, and others which are syntypes of taxa described earlier by Schlegel, Boie, or Tschudi (Leiden) or by Duméril, Bibron and Duméril (Paris). Not surprisingly, given the Dutch control of the Malay Archipelago, the majority of exchanged specimens, including the majority of exchanged types, came from Leiden (see Table 1).

Other specimens were obtained by purchase from commercial natural history dealers. These establishments were common in the period and the practice of purchasing scientific material of interest was widespread among natural history museums. One source of specimens for Berlin was the Museum Godeffroy in Hamburg which, despite having a curator and publishing its own journal, existed in part as a money-making venture. Its published catalogues were, in large part, price lists of specimens available for purchase (Evenhuis 2007). It had been founded in 1861 by Johann Cesar Godeffroy VI, whose family ran a shipping business and had extensive overseas contacts, particularly in the Pacific (Spoehr 1963; Scheps 2005). At least eight additional dealers also sold material to Wilhelm Peters, among them the famous firms of Carl Ludwig Salmin in Hamburg and Edward Gerrard in London. Additional suppliers included J. G. W. Brandt (Hamburg), Gustav Adolph Frank (Amsterdam), Ludwig Parreys (Vienna), Carl Wessel, E. Cutler (London), and Keitel [?]. Although the majority of these specimens are not of particular importance, at least one specimen, purported to be a type, collected in Cambodia by Henri Mouhot (1826–1861), the French naturalist and explorer of Indochina, was purchased via Gerrard. Mouhot's travels were sponsored by the Royal Geographic Society and the Zoological Society of London and important parts of his collections were also purchased by the British Museum (Günther 1912).

5 Major Collectors

Two major collectors are chiefly responsible for the Southeast Asian herpetological specimens that reached Berlin in Wallace's time. The first was Andreas Fedor Jagor (1816–1900). Chiefly an ethnographer, he led expeditions to the region in 1857–61, 1873–1876, and 1890–1893. ZMB herpetological material from Jagor is present from Java, Thailand, Melaka and Singapore (as well as Hong Kong, the Philippines and other areas). His first expedition, which generated the specimens discussed here, was nearly 5 years in length and began in Singapore, Malacca and Java, from which most of his herpetological material was derived (Jagor 1866). His later trips were also chiefly to the Indo-Australian Archipelago.

The second collector was Eduard Karl von Martens (1831–1904; Fig. 3) (see Adler 2012 regarding the correct version of his name). Von Martens was chiefly a malacologist. He was trained at the universities of Tübingen and Stuttgart, and received his doctorate from the former institution in 1855. He became an assistant (1856), and later (1859) curator of invertebrates at the Zoological Museum in Berlin. Eventually he became a professor (1874) and director of the Museum (1887). As a young man he travelled on the ship *Thetis* on the Prussian Expedition to East Asia (1860–1862)—also known as the "Japan Expedition"—a mission to open up trade with east Asia and, secondarily, to collect scientific material for study. The *Thetis*

Fig. 3 Eduard von Martens, the most important contributor of Indo-Australian herpetofauna to the Berlin Museum in the early 1860s. Portrait from the late nineteenth century from Meissner (1901)

reached the Sunda Straits in July 1860, spent September 1860 through February 1861 in Japan, and carried on to China, Taiwan, the Philippines, Celebes, Java and Siam. However, von Martens left the *Thetis* in March 1862 in Singapore following a disagreement with Friedrich Albrecht Graf zu Eulenberg, leader of the expedition, and continued his own explorations and collecting in the Indo-Australian Archipelago, visiting Java, Banka, Sumatra, Celebes, the Molukkas (Ternate, Amboina, Banda group), Timor, Flores, and Borneo. He spent more than 3 months each on Sumatra and Borneo and eventually returned to Germany in December 1864 (Meissner 1901; Hoppe 1990).

In contrast to most of the other early herpetological material present in Berlin, that collected by von Martens is typically accompanied by rather specific (for the time) collecting localities. Von Martens (1876) provided this information in an extensive "Verzeichniss der gesammwlten oder beobachteten Wirbelthiere," in which 147 reptiles and 32 amphibians (125 and 16, respectively, from the present area of consideration) were recorded. By this time nearly all the herpetological novelties from the trip had already described by Peters, who had helped obtain support for the zoological work of the expedition. Peters also had worked up the mammals and fishes of the expedition, while Jean Louis Cabanis (1816–1906), the curator of ornithology in Berlin, took responsibility for the birds.

In some cases von Martens served as a conduit for collections made by others he encountered in his travels. They were noted by von Martens in his book and usually also by Wilhelm Peters in his descriptions and in the ZMB catalogue entries. These collectors (names and titles and areas of collection as given by von Martens 1876) were: Capt. Müller (Banka), Dr. Rebentisch (Java), Dr. Wienecke (Atapupu, Timor), Cressonnier (Batavia), Dr. z'Hooft (Pontianak, Borneo), Dr. Mock (Banka), Major de Kock (Batavia, Bandong), Dr. Greiner (Malang, Java), Markwald (Siam), Dr. Gaymans (Kepahiang and Tibingtingi, Sumatra), Dr. Beyen (Wahai, Ceram), Dr. von Richthofen (Ostküste des Golfs von Siam), Dr. Hubus (Singkawang and Sambas, Borneo), Thiess (Bangkok), Dr. Broers (Tibingtingi, Sumatra), Commodore Sundewall [naval commander of the Prussian expedition] (Java), Dr. Tressling (Sambas, Borneo), Gersen (Muara-Enim, Sumatra), Foremann (Benkulen, Sumatra), Ducosta (Bangkok), Otto Schottmüller [Gardner on the Eulenberg Expedition] (Anjer), Dumont (Bengkayang, Borneo), and Dr. Schneider (Banka). Dr. Johswich, surgeon on the *Thetis*, apparently donated material directly to the Zoological Museum, as he is listed in the ZMB catalogue as a donor, but is not included in von Marten's list as a contributor to his collections.

Not all of von Martens specimens appear in the ZMB catalogue and it is likely that duplicate specimens may have been exchanged to other institutions, and some listings may have been sight records only. In addition to localities noted based in the ZMB catalogues, von Martens also recorded herpetological material from Simaharadscha, Siam; East Coast of the Gulf of Siam; Bukit-tima near Singapore; Batjan; Adenare; Surabaya, Java; Kajeli, Buru; Batu-lubar on Danau-Sriang Lake, Borneo; Pomangkat, Borneo; and Maros, Celebes.

In addition to Jagor and von Martens, other collectors were Hugh Cuming (1791–1865) a British field collector who traveled to Singapore and Malacca in the 1830s and Pieter Bleeker (1819–1878), a Dutch ichthyologist and herpetologist who amassed collections from throughout the Indo-Australian Archipelago from his base in Java. Cuming established a natural history dealership in London in 1839 and presumably the Berlin specimens were obtained from him by purchase. Bleeker also sold his collections, with much of the herpetological material going to the British Museum, although it is unclear if his specimens in Berlin were donated or purchased. Specimens from Rodolfo Amando Philippi (1808–1904), a Berlin-trained professor in Kassel who is most well-known for his work after his emigration to Chile in 1851 and from Johann Lukas Schönlein (1793–1864), a noted physician, were donations of material they had received rather than collected themselves. Additional material was derived from a diversity of other collectors and donors, most of which are not readily identifiable beyond their designations given in the ZMB catalogue: Drs. Arndt, Dirksen, and Hellmann, Lieutenant Berendt, W. Baumgarten, Bekker, Beyerhaus, Göring, Kleinwoorth, Meyer, Nagel, and Schweigger.

6 Southeast Asian and Indo-Australian Material

Exclusive of the extremely vague localities of "Indien" and "Ostindien" associated with some of the earliest Berlin collections, the material from Southeast Asia and the Indo-Australian Archipelago represented in the ZMB collection until the time of Wallace is listed below:

6.1 Mainland Southeast Asia

Burma [Myanmar] (32 specimens): Mergui (8); Pegu (23); Rangoon [Yangon] (1).
Siam [Thailand] (56 specimens): Bangkok (37); Chartaboum (1); Phetchaburi (3); Si Maha Racha (1); unspecified (14).
Cambodia (1 specimen).
Cochinchina (2 specimens).
Malacca (44 specimens) Malaccafluß (1); unspecified (43).
Singapore (16 specimens).

6.2 Indo-Australian Archipelago

"Indische Archipel" (7 specimens): Sunda Inseln (5); Sundasee (1); unspecified (1).

6.2.1 Greater Sundas

Java (249 specimens): Anjer = Anyer [Banten] (2); Bandung [West Java] (2); Batavia = Jakarta [Special Capital Region] (4); Buitenzorg = Bogor [West Java] (1); Malang [East Java] (3); Pasuruan [East Java] (1); Samarang = Semarang [Central Java] (7); unspecified (229).
Sumatra (31 specimens): Agam (1); Bengkulu (5); Luburaman (3); Padang (1); Lahat (3); Kepahiang (9); Muara Enim (1); Tibingtingi (4); unspecified (4).
Borneo (63 specimens): Sarawak (15); Sambas (4); Sintang (3); Mandhor (1); Lempai (1); Pontianak (15); Banjarmasin (2); Bengkayang (3); Pulau Matjan (7); Singkawang (1); unspecified (11).

6.2.2 Sahul

Celebes [Sulawesi] (13 specimens): Gorontalo (2), Manado (1); unspecified (11).
Bangka (32 specimens): Muntok (4); unspecified (28).
Maluku Islands
Molukka (1 specimen).
Halmahera (1 specimen): Dodinga [South Jailolo, West Halmahera] (1).
Moti (3 specimens). Ceram [Seram] (7 specimens): Elpaputih Bay (2); Wahai (4); unspecified (1).
Ambon (32 specimens).
Bacan (1 specimen).
Ternate (7 specimens).
Lesser Sundas
Timor (23 specimens): Kupang (6), Atapupu (6); unspecified (11).
Flores (2 specimens): Larantuka (2).

6.2.3 New Guinea

New Guinea (3 Specimens)

Predictably for the period, the greatest number of specimens was derived from Java, which had a long established European presence and was a point of call for nearly all collectors in the region. Modest collections from Borneo and Sumatra and smaller islands in the Dutch East Indies largely reflect the activities of von Martens as well as exchanges from Leiden, whereas those from Siam and Malacca stem, in part, from Jagor's voyage. Burmese material was mostly purchased, some through the Museum Godeffroy. Nearly all specific localities within islands reflect the precision of von Martens' records. For the time period the geographic coverage is quite comprehensive, except for Indochina.

7 Type Specimens

Putative types of at least 44 herpetological species in Berlin are based on Southeast Asian or Indo-Australian material collected during or prior to the period of Wallace's activity in tropical Asia. Twenty-eight of these were described by Wilhelm Peters, of which 16 were based on von Martens' material, and 3 on Jagor's material. Sixteen species descriptions were based on material obtained from other museums: Paris, Halle, and especially Leiden, and these were described by Schlegel, Boie, Duméril and Bibron, Tschudi, and Bleeker, as well as by Wilhelm Peters. While there is no question about the type status of material representing species described by Peters, it is often difficult or impossible to verify the type status of specimens described by others and subsequently received through exchange. In the mid-nineteenth century, prior to the formal establishment of the International Code of Zoological Nomenclature, the type concept was often loosely interpreted. Corresponding curators may have intentionally or inadvertently claimed that material was part of a type series when it was not, or the term "typical" may have been intended to indicate only that a specimen was similar to the named form (i.e., not a "variety").

Two taxa described from the region are unambiguously extralimital and, therefore, despite their published type localities cannot have been derived from the region under consideration. The types of *Hoplobatrachus reinhardtii* (Peters 1867) = *Pelophylax nigromaculatus* (Syntypes: ZMB 5900, ZMB 62987 [ex ZMB 5900]) were described from material from the specimen dealer Carl Wessel as being from "Malacca oder China." However the species does not occur in tropical Asia and the type locality was restricted to "China" by Liu (1950). The holotype of *Simotes semicinctus* Peters 1862 (ZMB 4553) was presumably obtained from the "Mission Barman" and has a published type locality of "? Borneo." This name was long forgotten, but was subsequently considered a valid species of *Oligodon* (Wallach and Bauer 1997), before being synonymized with *Coronella austriaca*, a European species, by Tillack et al. (2008).

Both confirmed and questionable types are presented in Table 1, with footnotes flagging cases of uncertainty or other noteworthy issues. In addition to these, there are a number of additional cases of Southeast Asian or Indo-Australian specimens incorrectly noted as types in the ZMB catalogue. These are briefly noted here to avoid any future confusion:

Both Wilhelm Peters, in his annotations in the ZMB type catalogue, and Denzer et al. (1997) considered ZMB 5678 as a paratype of *Dilophyrus mentager* Günther 1861. The specimen is from Chartaboum, Siam and was collected by Henri Mouhot. However, Mouhot's collections were sold through the dealer Gerrard and it appears likely that this specimen was not seen by Günther, whose type in the BMNH would have been purchased separately.

The Berlin catalogue lists ZMB 1298 (two specimens) as types of *Tropidolepisma kuhlii* Lichtenstein and von Martens 1856 from Timor and received from Leiden. This is a *nomen nudum*, however, and Lichtenstein and von Martens attribute author-

ship to Schlegel. This is probably a shelf name that was never published. The relevant specimens are referable to *Eutropis carinata* (Schneider 1801).

ZMB 4049 is indicated in the catalogue as a type of *Typhlops multilineatus* Schlegel 1839 (= *Ramphotyphlops multilineatus*) obtained from Leiden and collected from Ceram. However, the type locality of this species is in western New Guinea and a single holotype (MNHN 1067) has been identified in Paris (McDiarmid et al. 1999; Wallach et al. 2014).

ZMB 3816, from Amboina, purchased from the natural history dealer Parreys, is listed in the ZMB catalogue as the type of *Leptophis doleschalii* Jan. However, this is not the name of a described species. The specimen is referable to *Chrysopelea rhodopleuron*.

The Berlin catalogue lists ZMB 4048 as a type of *Dipsas pallida* (= *Boiga irregularis* Bechstein 1802) with authorship attributed Schlegel. However, the species was actually described by Jan (1863), who acknowledged the name as a Schlegel manuscript or shelf name. Jan explicitly mentions that his specimens were from Breslau (Wrocław) and Neuchatel, thus the Berlin specimen cannot be one of the types.

The Berlin catalogue lists ZMB 1542 and ZMB 67257 (ex ZMB 1542) as types of *Xenodermus javanicus* (Reinhardt 1836) from the collection of von Hoffmansegg (although the annotation indicates "ex orig. *Xenodermus javanicus* Dum. Bibr. Erpet. gén. ref."). However, the original description (Reinhardt 1836) makes it clear that there was but a single holotype (given as ZMUC R5941 by Reinhardt (1997) and as ZMUC 5481 by Wallach et al. (2014)). This distinctive snake was subsequently commented upon by Wiegmann (1837) and a Berlin specimen from the collection of Graf von Hoffmansegg, was mentioned by Reinhardt (1843) as having been subsequently obtained. In fact, as noted by Peters (1867), von Hoffmanegg's collections are among the founding collections of the Berlin Museum. Thus, although the Berlin material is not part of the type series, it actually predates the Copenhagen holotype, which was not collected until 1834.

8 Later Collections

The Berlin Museum's involvement in the herpetology of Southeast Asia, and especially the Indo-Australian Archipelago expanded dramatically after the era of Wallace. Beginning in 1871, Wilhelm Peters began publishing on material from the region collected by the Marquis Giacomo Doria (1840–1913), founder of the Museo Civico di Storia Naturale in Genoa. This resulted in numerous descriptions starting with those from Doria's own travels (Peters 1871), then those of both Doria and Odoardo Beccari (1843–1920) in Sarawak (Peters 1872c). Ultimately, Peters coauthored with Doria a major work, one of his longest and one of very few with a coauthor, describing the extensive material collected by Beccari, D'Albertis and Bruijn in the Malay Archipelago (Peters and Doria 1878). Herpetological material from Doria's initial expedition to the Indo-Australian Archipelago (1865–1868) began arriving in Berlin in the late 1860s and material was still being accessioned

until the time of Peters' death in 1883. In all, hundreds of specimens, including type material of more than 40 species, were added to the Berlin collection through this fruitful collaboration. There were also publications based on the collections of Adolf Bernhard Meyer (1840–1911) made in 1870–1871 in Gorontalo, Sulawesi and the Togian Islands (Peters 1872a, b). Peters also published on material collected on the 1874–1876 expedition of SMS *Gazelle*, which also included specimens from the region, particularly Timor, Amboina and New Guinea (Peters 1876).

9 Conclusions

Despite Germany's lack of a colonial empire in Asia, an important collection of herpetological specimens from the Indo-Australian Archipelago and adjacent regions was amassed at the Zoological Museum in Berlin by the middle of the nineteenth century. This was derived from a diversity of sources, including historical collections, the donations of many individuals—most significantly Eduard von Martins, and judicious purchases and exchanges with other institutions. The collection is of special note and value because of the many type specimens it contains, some stemming from each of the major sources noted. Although the sources of the type material are varied, the majority of type descriptions are the work of one man, Wilhelm Peters, who dominated German herpetology in the second half of the nineteenth century and under whose directorship the Berlin Museum grew to be one of the leading collections in Europe (Bauer et al. 1995).

Alfred Russel Wallace is the most well-known explorer and collector of the Malay Archipelago of his generation and his contributions to the development of evolutionary thought and other fields clearly elevate him among his contemporaries. However, his activities in the region were complemented by those of other, less acclaimed travelers. Collectively, the fruits of their labors provided context to the more fragmentary information gathered by earlier researchers and served as the foundation for the modern understanding of biodiversity and ecological and evolutionary processes in tropical Asia.

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