



# Discovery of a rare hybrid specimen known as Maria's bird of paradise at the Staatliches Naturhistorisches Museum in Braunschweig

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## Abstract

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The discovery of a rare hybrid specimen of Maria's bird of paradise (*Paradisaea maria*, i.e., *P. guilielmi* × *P. raggiana augustaevictoriae*) in the ornithological collection of the Staatliches Naturhistorisches Museum in Braunschweig (SNMB) is reported. Until today only six male specimens (deposited in the natural history museums in Berlin and New York) and presumably one female have been identified in collections world-wide. The male specimen in Braunschweig corresponds well in its plumage colouration with an historical illustration and photographs of the original type specimen from the 19th century housed at the Berlin collection. It shows intermediate characteristics between both parental species, viz. the Emperor bird of paradise (*P. guilielmi*) and the Raggiana bird of paradise (*P. raggiana augustaevictoriae*). In addition, we try to elucidate the circumstances how this rare specimen of hybrid origin, which formerly belonged to the natural history collection of the factory owner Walter Behrens from Bad Harzburg, came to the SNMB. Our unexpected discovery highlights the importance to maintain, support and study also smaller private natural history collections, since they may house historical voucher specimens of high scientific value.

## Zusammenfassung

Es wird über die Entdeckung eines seltenen Exemplars des Hybrid-Paradiesvogels *Paradisaea maria* (d.h. *Paradisaea guilielmi* × *P. raggiana augustaevictoriae*), in der ornithologischen Sammlung des Staatlichen Naturhistorischen Museums in Braunschweig (SNMB) berichtet. Bis heute sind lediglich sechs männliche (aus den Museen in Berlin und New York) und vermutlich ein weibliches Exemplar in internationalen Naturkundesammlungen bekannt geworden. Das männliche Exemplar aus Braunschweig entspricht in seiner Gefiederfärbung einer historischen Abbildung und Fotos des ursprünglichen Typusexemplars aus dem 19. Jahrhundert, das sich im Berliner Museum befindet. Es zeigt deutlich intermediäre Merkmalsausprägungen zwischen den beiden Elternarten, dem Kaiserparadiesvogel (*P. guilielmi*) und dem Raggi-Paradiesvogel (*P. raggiana augustaevictoriae*). Die Umstände, wie dieser seltene Hybrid-Paradiesvogel, der ehemals Teil der Sammlung des Fabrikanten Walter Behrens aus Bad Harzburg war, in die SNMB-Sammlung gelangte, werden erläutert. Unsere unerwartete Entdeckung unterstreicht die Bedeutung, auch kleinere private naturkundliche Sammlungen zu bewahren, zu erhalten und zu erforschen, da sie historische Belegexemplare von hoher wissenschaftlicher Bedeutung enthalten können.

## Introduction

### Maria's bird of paradise

Hardly any other group of birds has ever since their first discovery exalted the imagination of people as the birds of paradise (family Paradisaeidae). Due to their mainly colourful and conspicuous plumage, birds of paradise have been most admired commodities since the early 16<sup>th</sup> century. They were discovered and specifically collected for the domestic demand in curiosities of natural history and exotics by European circumnavigators during their adventurous journeys to the Indo–Australian Archipelago (Stresemann 1954, Swadling 1996). Although known long before binary nomenclature was consistently used since the mid-18<sup>th</sup> century (Mužinić et al. 2009), the first bird of paradise species, which was formally described by Linnaeus (1758), was the Greater bird of paradise (*Paradisaea apoda*). In the following decades, more and more members of this fascinating bird family were discovered and described.

In 1894, Anton Reichenow (1847–1941), then ornithologist and deputy director of the Museum für Naturkunde (= Museum of Natural History) in Berlin, described another new species, *P. maria*, based on a single male specimen from the Finisterre Mountain Range of the Huon Peninsula in north-eastern New Guinea, dedicating the species epithet to his wife Maria (the daughter of J. L. Cabanis, see below). Three years later, Reichenow (1897, pl. V) published an artistic plate of Maria's bird of paradise (Fig. 1). Some years earlier, Jean Louis Cabanis (1816–1906), then director of the Museum für Naturkunde in Berlin, had described two new species of birds of paradise (Cabanis 1888), viz. *P. guilielmi* and *P. augustae victoriae* (Fig. 2a, b), in honour of the last German Emperor and King of Prussia, Wilhelm II (1859–1941), and his wife Augusta Victoria of Schleswig-Holstein (1858–1921). Illustrations of both majestic birds of paradise were published the following year in volume 37, plates 1 and 2, of the *Journal für Ornithologie* (nowadays the *Journal of Ornithology*). While the Raggiana bird of paradise (of which the taxon *augustae victoriae* is considered a subspecies today) is widespread in the South and Northeast of Papua New Guinea, the Emperor bird of paradise is restricted to the Huon Peninsula, where it inhabits lower mountains and hills from ca. 450 m to 1,500 m. Below this altitude, *P. guilielmi* is replaced by the Raggiana bird of paradise in the East of its range, where both species occur sympatrically (Frith and Beehler 1998).

### Hybridisation in birds of paradise

Hybridisation between different bird species is a relatively common phenomenon. So far about 4,000 combinations of hybrid origin have been identified, about half of which are crossbreedings in captivity (Mc Charty 2006). According to this author, however, the total number of hybridisations in birds is estimated to be much higher, since hybrid specimens are usually difficult to identify.



**Figure 1.** Plate of the male hybrid bird of paradise *Paradisaea maria* from Reichenow (1897). Reproduced from the Biodiversity heritage library (<http://biodiversitylibrary.com/>).

For the family Paradisaeidae, with currently 42 recognized members (the last was described in 1992), so far 25 hybrid combinations have been identified (Table 1), most of which were described as separate species in the past (Fuller 1995, Frith and Beehler 1998, Lepage 2015). Based on the phylogenetic species concept even approximately 90 different species of paradisaeids were postulated by Cracraft (1992). This conceptual approach, however, is currently not accepted (Lepage 2015). Notably, Mayr (1945, 1963) assumed that one in every 20,000 wild specimens of birds of paradise is a hybrid (i.e. 0.005%), while for birds in general he considered only one in every 60,000 specimens to be of hybrid origin (i.e. <0.002%). Frith and Beehler (1998), however, judged Mayr's assumption "as no more than an informed guess". Among almost 5,000 voucher specimens of birds of paradise these authors examined, more than 88 male and merely three female hybrid specimens (i.e. about 2%) were identified (Table 1).

Reichenow (1901) himself was among the first authors to speculate about the putative hybrid origin of one of





**Figure 2.** Plates of *Paradisaea guilielmi* (A) and *P. raggiana augustaevictoriae* (B), the presumed parental species of *P. maria*, related to the original descriptions by Cabanis (1888). Reproduced from the Biodiversity heritage library (<http://biodiversitylibrary.com/>).

the species he himself had previously described (see also Rothschild 1898). Subsequently, Rothschild (1910) and Stresemann (1923: 40) suggested, that also *P. maria* is a hybrid form between *P. guilielmi* und *P. (raggiana) augustaevictoriae*. The latter discussed a second specimen from the Berlin museum (ZMB 951) that was allegedly collected by Dr Bürgers during the German Empress Augusta (now Sepik) River Expedition in 1912–1913. Subsequently, however, Stresemann (1925) corrected that the original label of this voucher specimen had been mixed up and that it was actually collected by H. Andechser, a planter from Singana, at the southern slopes of the Herzoggebirge (the Herzog mountains) south of Lae at the base of the Huon Peninsula. Later, Stresemann (1930a) even mentioned five specimens of Maria's bird of paradise, which he had examined in the ornithological collections in Berlin (the holotype ZMB 31049, Fig. 3) and Tring (UK), respectively. In the early 1930s, the four specimens from Walter Rothschild's (1868–1937) famous bird collection at Tring were sold to the American Museum of Natural History in New York (LeCroy 2014).

A dubious taxon phenotypically very similar to *P. maria* is *P. duivenbodei* described by Ménégaux (1913a, b). Until today, it is known only from a single male specimen, the holotype MNHN 863, in the Muséum National d'Histoire Naturelle in Paris. It has "(...) brown upper-tail coverts not marked with straw yellow streaking and its flank plumes are more yellow than red (...)" (Frith and Beehler 1998). Walter Rothschild had examined the type specimen in Paris and expressed his doubt about the taxonomic validity of *P. duivenbodei* to his French colleague. In turn, Ménégaux (1913c) again discussed in detail the minor morphological differences of his new species as compared with obviously closely-related birds of paradise such as *P. maria*. Finally, he concluded that *P. duivenbodei* should be retained until further evidence would prove the opposite since only three specimens of *P. maria* were known at that time. Also Stresemann (1923) considered the taxon *duivenbodei* a synonym of *P. maria*. Today, however, it is considered a hybrid between *P. guilielmi* and *P. minor finschi* (Frith and Beehler 1998, see Table 1). The origin of the holotype is un-

**Table 1.** Summary of known hybrid specimens of birds of paradise in international museum collections. In few cases, different hybrid forms have been identified (and described) twice based on the same parental species combination, but apparently with varying influence of each species involved. \*A third specimen, the holotype, was destroyed during WWII; # The hybrid status is uncertain. > Minimum number of specimens known. Data derived from Frith and Beehler (1998).

Parental species combination	Hybrid species name	No. of known specimens	
		males	females
Intrageneric hybrids			
<i>Astrapia mayeri</i> x <i>A. stephaniae</i>	‘ <i>Astrachia barnesi</i> ’	> 12	
<i>Paradisaea guilielmi</i> x <i>P. raggiana augustaevictoriae</i>	‘ <i>Paradisea maria</i> ’	> 6	(1#)
<i>Paradisaea guilielmi</i> x <i>P. minor</i>	‘ <i>Paradisea duivenbodei</i> ’	1	
<i>Paradisaea raggiana augustaevictoriae</i> x <i>P. raggiana intermedia</i>	‘ <i>Paradisaea granti</i> ’ and ‘ <i>P. apoda subintermedia</i> ’	1	
<i>Paradisaea raggiana salvadorii</i> x <i>P. rudolphi margaritae</i>	‘ <i>Paradisea bloodi</i> ’	1	
<i>Paradisaea raggiana augustaevictoriae</i> x <i>P. minor finschi</i>	‘ <i>Paradisea mixta</i> ’	> 4	
<i>Paradisaea raggiana salvadorii</i> x <i>P. minor finschi</i>	unnamed	only through observations	
<i>Paradisaea apoda novaeguineae</i> x <i>P. raggiana salvadorii</i>	‘ <i>Paradisea apoda luptoni</i> ’	numerous	
<i>Cicinnurus magnificus</i> x <i>C. regius</i>	‘ <i>Diphyllodes gulielmi III</i> ’	> 25	
<i>Cicinnurus regius</i> x <i>C. magnificus</i>	‘ <i>Cicinnurus lyogyrus</i> ’ and ‘ <i>C. goodfellowi</i> ’	> 3	
Intergeneric hybrids			
<i>Astrapia nigra</i> x <i>Epimachus f. fastuosus</i>	‘ <i>Epimachus astrapioides</i> ’ and ‘ <i>Astrapimachus ellioti</i> ’	1	
<i>Epimachus f. fastuosus</i> x <i>Astrapia nigra</i>	‘ <i>Epimachus ellioti</i> ’	2	
<i>Paradigalla carunculata</i> x <i>Epimachus f. fastuosus</i>	‘ <i>Pseudastrapia lobata</i> ’	1	
<i>Paradigalla carunculata</i> x <i>Lophorina s. superba</i>	‘ <i>Loborhamphus nobilis</i> ’	3	
<i>Epimachus fastuosus</i> x <i>Lophorina superba</i> <i>feminina</i>	<i>Epimachus fastuosus atratus</i> x <i>Lophorina superba</i> <i>feminina</i>	1	
<i>Parotia sefilata</i> x <i>Lophorina superba</i>	‘ <i>Parotia duivenbodei</i> ’	2	
<i>Paradigalla carunculata</i> x <i>Parotia sefilata</i>	‘ <i>Loborhamphus ptilorhis</i> ’	1	
<i>Lophorina superba</i> x <i>Cicinnurus magnificus</i>	‘ <i>Lamprothorax wilhelminae</i> ’	3	
<i>Parotia carolae</i> x <i>Lophorina superba</i>	‘ <i>Lophorina superba pseudoparotia</i> ’		1
<i>Parotia l. lawesii</i> x <i>Paradisaea rudolphi margaritae</i>	unnamed		1
<i>Ptiloris intercedens</i> x <i>Lophorina superba</i> <i>minor</i>	‘ <i>Paryphephorus (Craspedophora) duivenbodei</i> ’	2*	
<i>Seleucidis melanoleuca</i> x <i>Paradisaea minor</i>	‘ <i>Paradisea mirabilis</i> ’	5	
<i>Ptiloris m. magnificus</i> x <i>Paradisaea m. minor</i>	‘ <i>Janthothorax bensbachi</i> ’	1	
<i>Seleucidis melanoleuca</i> x <i>Ptiloris magnificus</i>	‘ <i>Craspedophora mantoui</i> ’ and ‘ <i>C. bruyni</i> ’	> 12	
<i>Cicinnurus m. magnificus</i> x <i>Paradisaea m. minor</i>	‘ <i>Neoparadisea ruysi</i> ’	1	
Number of known hybrid specimens in total		> 88	3

certain, since it was received from the well-established Dutch merchant Maarten Dirk van Renesse van Duivenbode (1804–1878), a trader of birds and other naturalia on Ternate, Moluccas, in the Dutch East Indies (Frodin 2007). Notably, three hybrid forms of birds of paradise have been named after him (Table 1). Allegedly, the sole specimen of *P. duivenbodei* was collected by a person called M. Seng near Yaour (= Yaur; Frith and Beehler 1998 assumed that it originated from [Mois or Meos] Waar Island) in Geelvink (today's Cenderawasih, which means bird of paradise in a local language) Bay in north-western New Guinea (Ménégaux 1913a, c). Stresemann (1930a, b) had already speculated that it actually originated from the Huon Peninsula of north-eastern Papua New Guinea, the distribution range of *P. guilielmi*.

In the course of the reorganisation and re-conception of parts of the permanent exhibitions at the Staatliches

Naturhistorisches Museum in Braunschweig (= State Natural History Museum in Brunswick), a random bird of paradise specimen (which received the new collection number SNMB N49068), labelled as *Paradisaea maria*, was selected from the ornithological collections in order to enrich the new show depot which shall demonstrate the representation of a traditional natural history museum of the 19<sup>th</sup> century. During the literature search to gather specific information about this bird of paradise, it turned out that *P. maria* is a rather rare hybrid taxon with only few known specimens world-wide. Therefore, the intention of this contribution is to provide information about the existence of further specimens of this hybrid bird of paradise in German natural history collections and to trace back the way how one of them finally arrived at the natural history museum in Brunswick.





**Figure 3.** The holotype (ZMB 31049) of *Paradisaea maria* Reichenow, 1894, in dorsal, lateral, and ventral view. Photos by H. J. Goetz (Museum für Naturkunde, Berlin).

## Material and methods

In order to confirm the identification attached to voucher specimen SNMB N49068 it was compared with photographs of the ZMB holotype of *P. maria* (ZMB 31049) and naturalistic illustrations from Reichenow (1897) and those of similar birds of paradise (see Figs. 1–2 and those in Frith and Beehler 1998).

Collection acronyms are as follows:

AMNH: American Museum of Natural History, New York, USA; MNHN: Muséum National d'Histoire Naturelle, Paris, France; SNMB: Staatliches Naturhistorisches Museum (State Natural History Museum), Brunswick, Germany; ÜMB: Überseemuseum (Overseas Museum) Bremen, Germany; ZMB: Museum für Naturkunde (Museum of Natural History, formerly Zoologisches Museum, i.e. Zoological Museum), Berlin, Germany.

## Results

### The newly discovered specimen(s) of Maria's bird of paradise

The original scientific determination attached by the specimen's label (Fig. 4) as *Paradisaea maria* could be

confirmed during our investigations. The assigned German vernacular name (translated as carmine red bird of paradise), however, does not exist for any *Paradisaea* species (e.g. see appendix in Apel et al. 2011). Only *P. rubra* is commonly known as the Red bird of paradise but it is morphologically distinct from the remaining species of the genus (Frith and Beehler 1998). Until today, only six males and presumably one female (AMNH 679107) of *P. maria* have been identified in natural history museums world-wide (Frith and Frith 2010 mention eight specimens): Two specimens are deposited in the ZMB collection in Berlin and four in the AMNH collection in New York (Frith and Beehler 1998, see details above). They originate from Sattelberg (the Saddle Mountain near Finschhafen) and the Finisterre Mountains on the Huon Peninsula of Papua New Guinea, respectively.

The stuffed specimen is mounted on a branch with a wooden socket and labelled Karminroter Paradiesvogel, Männchen, *Paradisaea maria*, Neuguinea (= carmine red bird of paradise, male, *Paradisaea maria*, New Guinea). The information written with black ink on the underside of the pedestal is as follows: "*Paradisaea maria* Rchw. Neu-Guinea Köper Docke u. Co. Bremen C. N. 3423". With a pencil "Weber det[ermined]." is added vertically at the side with an arrow pointing from the last line of words, which is covered by a white label, to the first



**Figure 4.** The male specimen SNMB N49068 of *P. maria* in the Staatliches Naturhistorisches Museum in Braunschweig. The information written on the underside of the pedestal in black ink is as follows: “*Paradisea maria* R[ei]ch[eno]w. Neu-Guinea [= New Guinea] Körper Locke u. Co. Bremen C. N. 3423. Weber [?] det. [?]”. The white label written with pencil, which partly sticks above the former ink writing, reads as follows: “Real. Kat. 13143 *Paradisea maria* Richw. ♂ Deutsch-N.-G. Eing. N° 3423” (= Realia Catalogue No. 13143, *Paradisea maria* Reichenow, ♂, German New Guinea, Entrance No. 3423). Photos by M. Forthuber.

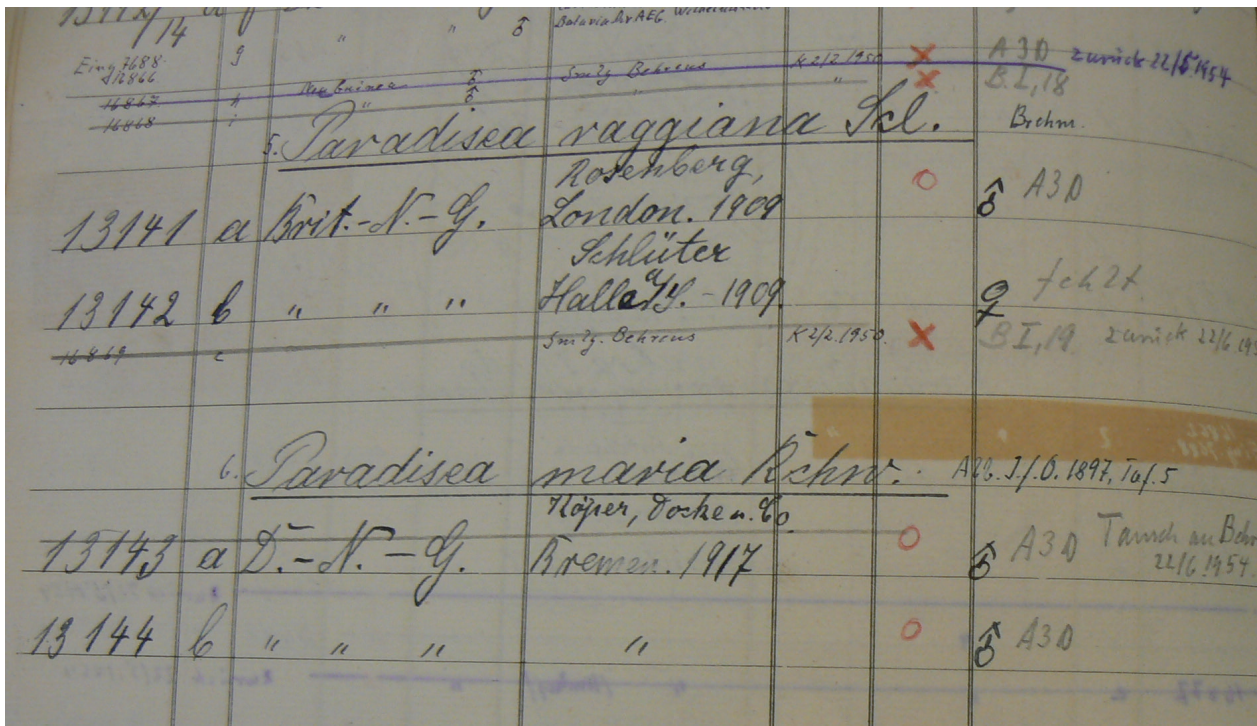
line with the species name. This additional label reads as follows: “Real. Kat. 13143 *Paradisea maria* Richw. ♂ Deutsch-N.-G. Eing. No. 3423” (= Realia Catalogue No. 13143, *Paradisea maria* Reichenow, ♂, German New Guinea, Entrance No. 3423) (Fig. 4).

Since the specimen lacked an N-number as is typical for the Braunschweig natural history collection since 1871, when chosen for the new exhibition, a search in the SNMB inventory catalogues was not successful. Due to the reference to the city of Bremen on the underside of the socket, we thus contacted the Überseemuseum, to inquire whether the specimen formerly belonged to their ornithological collection and this time our request received a positive response (M. Stiller, pers. comm.). From the information available the following circumstances can be reconstructed: Obviously, specimen SNMB N49068 formerly belonged to the collection of the Überseemuseum in Bremen, where it was registered in 1917 under

the entrance number 3423 together with a second specimen of the same taxon and the same attached information (Fig. 5). Both specimens had the catalogue numbers [ÜMB] 13143 and [ÜMB] 13144 (not examined). The latter specimen, a bird skin indicated by a “b” in the entrance catalogue for “Balg”, which means skin (in contrast to the letter a meaning “aufgestellt” = mounted for the other specimen), is still present in the ÜMB collection (M. Stiller, pers. comm.).

Specimen SNMB N49068 (Fig. 4), a male with unknown origin and collector (but see discussion below), shows intermediate character traits in plumage colouration between both parental species. Thus, large parts of head and throat are highly-iridescent dark green (vs. green colouration extending almost on entire head and breast in *P. guilielmi* and being limited to the throat in *P. raggiana*), with the eyes being largely bordered by the green colouration (vs. being entirely encompassed in *P.*





**Figure 5.** Catalogue page from the Überseemuseum in Bremen with the entries of two specimens of *P. maria* (catalogue numbers 13143 and 13144), the former of which was, probably among others, exchanged with Walter Behrens on 22 June 1954 and which is now SNMB N49068 at the Braunschweig collection. Both male specimens were transported to Bremen by the trading company Köper, Docke u. Co. in 1917. Photo by M. Stiller.

*guilielmi* and merely touched anteriorly in *P. raggiana*). The narrow yellow collar separating the green throat from the brown upper breast as seen in *P. raggiana* is missing in *P. guilielmi* and only faintly visible laterally in *P. maria*. Bright yellow colouration of rear part of head and nape extends onto mantle and upper part of wings. Remaining upper wing plumes are medium brown as are the lower breast and belly, while the upper wings and belly are dark brown, the latter merging white, in *P. guilielmi*. In turn, *P. raggiana* has medium brown upper wing plumes, while the belly is light brown coloured. Elongated, filamental flank plumes are crème-coloured washed light brown in *P. maria* vs. mostly white with little yellow ventrally and light brown with apricot orange ventrally in *P. guilielmi* and *P. raggiana*, respectively.

## Discussion

### Possible origin and collector of the specimens

The person called Weber, who, according to the writing under the pedestal, probably determined the specimen as *P. maria*, was Adolf Weber (according to Roselaar 2003, his initials were G. A. Weber), a former technical assistant and later inspector of the ornithological collection of the Überseemuseum (then called the Municipal Museum for Natural History, Ethnology, and Trade) in Bremen (Duncker 1953). After the First World War he reorganized the entire bird skin collection (Abel 1970).

The name Köper, Docke & Co. refers to a former export-import company based in Bremen and which obviously transported the specimens from the former German colony in Northeast New Guinea (the so-called Kaiser-Wilhelmsland which existed until the First World War) to the harbour of Bremen. Although the collector's name is unknown, it seems likely that both birds of paradise were hunted or acquired by the former director of the museum, Hugo Schauinsland (1857–1937), who visited among others also New Guinea during his journey to Asia and the Pacific in 1913 to 1914 (Backmeister–Collacott et al. 2007). Due to the difficulties in global trade activities accompanying the First World War, it is known that some overseas collections amassed by Schauinsland arrived at the museum with a delay of several years. Although his material was usually transported back home free of charge by the Bremen-based North German Lloyd shipping company (Backmeister–Collacott et al. 2007), it seems reasonable that Köper, Docke & Co. managed at least this transport during the difficult years of war.

Noteworthy, in the ornithological collection catalogue another potential hybrid bird of paradise specimen is mentioned. It is listed as “presumably a hybrid between *Paradisea maria* and *P. guilielmi*” and belongs to the zoological material collected at Friedrich-Wilhelms-hafen (nowadays Madang, the capital of the Papua New Guinean province of the same name) during the above mentioned expedition of Hugo Schauinsland (M. Stiller, pers. comm.). Another collector of zoological specimens

for the museum was Ludwig Cohn (1873–1935). He also travelled around New Guinea before the outbreak of the First World War and could likewise have been the collector of the two birds of paradise (Abel 1970). But apart from the collector's identity and exact origin of the specimens, the question remains how and when one of these extraordinary hybrid birds of paradise became part of the natural history museum in Brunswick.

### How the hybrid bird of paradise came into the SNMB collection

According to an entry in the catalogue of the Überseemuseum in Bremen (Fig. 5), the specimen was exchanged with a person named Behrens on 22 June 1954. The same person had donated a collection of birds of paradise to the Bremen museum in 1950, but four years later all specimens plus the voucher specimen in question together with additional specimens were returned to Behrens (M. Stiller, pers. comm.). Duncker (1953) specified this by mentioning that Behrens' bird collection was on loan at the Überseemuseum in the early 1950s. Some of these specimens, particularly birds of paradise and species lacking in the museum collection, were purchased from the owner.

So who was this person called Behrens with an interest in birds of paradise? Based on our investigations it is most likely that Walter Behrens (1892–1964) from Harlingerode at the northern base of the Harz Mountains is meant. Behrens, who was the owner of a factory for wooden boxes, became a member of the German Ornithological Society in 1940 (DOG 1940), and also possessed a private natural history collection (Knolle 2015, Knolle and Peinemann 2015). Since the late 1950s, parts of his collection were exhibited at the newly established local natural history museum Haus der Natur (= house of nature) in Bad Harzburg (Knolle 2015), to which Harlingerode administratively belongs since 1972. The remaining specimens of the collection were stored in the museum's attic and in Behrens' private house (Anonymous 1961). In 1961, these 1,300 (or according to Knolle 1,800) specimens were transferred into the possession of the city of Goslar, the neighbouring municipality of Bad Harzburg. There, three years later and only a few weeks before Walter Behrens' death on 26 November 1964, about half of the specimens were exhibited in the second newly founded local natural history museum called Haus der Tiere – Exoten (= house of animals – exotics) (Giesecke 2013). The other half were stored behind the scenes and were meant to be exchanged with the specimens on display from time to time. Most probably, in one of these two museums the mounted hybrid belonged to the specimens on display, as birds of paradise, among many other animals, were mentioned as highlights of the museum exhibitions in several newspaper articles (e.g., Anonymous 1964).

The museum in Bad Harzburg was temporarily closed in 1975 (Hevers 2008). It re-opened with a changed concept and reorganized exhibitions. Further on, only native species from northern Germany were displayed under the title Wald und Wild im Naturpark Harz (= forest and game

in the Harz Mountains nature park) (Knolle 2015). The fate of the remaining and exotic specimens of the Behrens collection is unknown, but in this regard Hevers (2008) mentioned that the bird collection of Karl Fuest (1857–1938), originally exhibited in Wolfenbüttel castle since 1929 and transferred to the Haus der Natur in Bad Harzburg in 1956, was donated to the State Natural History Museum in Braunschweig in 1975. Perhaps also various of Walter Behrens' specimens were included in this transfer but this is not recorded. Alternatively, they were translocated to the Haus der Tiere in Goslar or deposited in the museum's attic. A few years later, however, by the end of December 1982, also the museum in Goslar was closed due to financial reasons and low visitor numbers (Anonymous 1982). In another newspaper article, dated 11 October 1983, the fate of the natural history collection is discussed (Anonymous 1983). According to this report, 2,000 specimens (700 molluscs, 150 mammals and 1,150 birds) should have been transferred to the natural history museum in Braunschweig as a permanent loan. It is likewise mentioned that besides the Braunschweig museum also the Landesmuseum (= State Museum) in Hannover was interested to buy the collection, but this plan failed due to the financial situation of the state of Lower Saxony (Anonymous 1983). Already in 1961, Professor Steininger, the former head of the natural history section at the State Museum in Hannover, had emphasized the high value of the Behrens collection (Anonymous 1961). Obviously, the transfer to Braunschweig was not, or only partly, realized, since no records thereof exist in the museum's catalogues and archives (Ahrens 2004) and we were unable to locate any further specimens from Walter Behrens' former private collection. The reason for this might be the fact that (some of) his specimens lacked personal collection numbers and labels as is the case in the hybrid bird of paradise which only shows the original information from the Bremen Überseemuseum.

There are, however, several specimen labels with reference to Walter Behrens and the Haus der Natur in the collection and archives of the State Museum in Hannover. Additionally, there exists a correspondence concerning a loan request between Behrens and Ernst Schäfer, the former curator at the museum (C. Schilling and A. Böhme, pers. comm.). Therefore, it is also reasonable that Maria's bird of paradise may have been exchanged with or donated to the Braunschweig collection after it had been transferred from Goslar or Bad Harzburg to Hannover. Since the specimen was not assigned a SNMB collection number when it came to Braunschweig, it was first inventoried on 13 October 2014, when it was chosen for the new permanent exhibition. Although some speculations remain how the hybrid bird of paradise finally entered the SNMB collection, the whereabouts of Walter Behrens' famous natural history collection could (at least partly) be answered by our investigations and we hope to stimulate further research into this forgotten private collection. The following details which we were able to gather while writing up this article, demonstrate that the private collection of Walter Behrens indeed contained valuable and rare specimens.



## The importance of small and private natural history collections

Walter Behrens was a dedicated collector of natural history specimens with good connections to various museums, such as Bremen (see above) and Moscow (Anonymous 1964). But unfortunately, we were unable to find any specific publications by himself or another author about his private collection. Merely several articles in local newspapers report about their extent and mention some details. Thus, it is reported that the collection contained among others one specimen each of the extinct Tasmanian Tiger (*Thylacinus cynocephalus*) and the Passenger Pigeon (*Ectopistes migratorius*) (Anonymous 1961, 1964). While it is recorded that the latter specimen, which Walter Behrens had once purchased from an unaware Czech for merely 10 Deutschmarks, was eventually auctioned in 1957 for 22,000 Deutschmarks (Anonymous 1964), the thylacine is neither in the collection in Braunschweig nor in Hannover. Soon, however, it turned out that this male taxidermied specimen was sold to the natural history museum in Münster in 1962, where it still exists next to a second specimen from the University of Münster (S. Sleightholme, pers. comm.). In addition, Duncker (1953) mentioned several specimens of rare or extinct bird species from the Behrens' collection such as the Huia (*Heteralocha acutirostris*) and the Ivory-billed Woodpecker (*Campephilus principalis*).

These prominent specimens together with our unexpected find of a rare hybrid bird of paradise in the Staatliches Naturhistorisches Museum in Braunschweig highlight the importance of Walter Behrens' collection. It represents a nearly forgotten example of a small natural history collection and demonstrates the need to support and maintain also such private (museum) collections since they often house specimens of high scientific value for various research topics (e.g., Steinheimer 2003, Casas-Marce et al. 2012, Winker and Withrow 2013, Koch et al. 2017). Often, however, taxonomically well-trained staff and financial resources to appropriately maintain and study these minor and mainly local, but nevertheless essential collections are limited, putting the long-term existence of rare and valuable voucher specimens at risk. This is particularly true in developing countries (Cracraft 2000, Paknia et al. 2015). But also, for instance, in Europe, which has a long and rich tradition of natural history collections (Greuter et al. 2005, Romano et al. 2015, Beck 2018), this huge cultural world heritage is sometimes threatened due to neglect and needs more attention (Kovar-Eder and Niedernostheide 2014, Andreone 2015).

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