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On the Provenance of the two large Gharials in the Display Collection of the Natural History Museum Vienna*

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Abstract. While exhibits in natural history museums have great value as display and teaching objects, they can also have a provenance that is fascinating and enlightening. One such example is the two, large gharial (*Gavialis gangeticus*) hides exhibited in the Natural History Museum Vienna. They were purchased in 1902 by Franz Steindachner, the then Intendant (Director), and impress with their enormous size of 453 cm and 543 cm, respectively. Although they have been in the museum's collections for 120 years, until recently very little was known about the origin of the two crocodiles and how they originally came to Vienna. During our provenance research, we were able to reconstruct considerable aspects of the path of the two unique specimens from South Asia via the famous animal trader Carl Hagenbeck and the Umlauff family business in Hamburg, Germany, to the Austrian capital. In addition, other large gharial specimens in European natural history museums from Umlauff are discussed and illustrated herein.

Key words: Provenance research, Natural History Museum Vienna, Carl Hagenbeck, Johannes Umlauff, trade in natural history items.

On the Importance of Exhibits in Natural History Museums

Exhibits in natural history museums can be divided into two categories: those that represent an animal or plant species — i.e., that function as an arbitrary example of a certain species — and those that also have a special characteristic, an individual history and provenance that makes them unique. While the latter specimens represent the vast majority of the scientific collections of natural history museums, most are not open to the public. In the best cases they have precise information on origin such as place of discovery, date, and collector's name. However, these data, which are essential for research, may be missing in the case of purely exhibition objects. Sometimes display items are not even real specimens of a species, but only (more or less) naturalistic casts or replicas, although they do nevertheless serve their representative purpose. In unfavorable cases, as often happened in the early days of natural history museums, the precise provenance information about an individual was lost on its way from nature to a museum collection. A scientific specimen is thus degraded to a mere display object. Here we attempt to reconstruct, as far as possible, the individual history of two large Indian gharials at the Natural History Museum Vienna (NHMW), a history which was largely unknown for over 120 years. In this way we hope to help them to achieve a higher scientific value.

The Indian Gharial – an Unusual Crocodile Species

Within the crocodiles (Crocodylia), the Indian Gharial or Gavial (*Gavialis gangeticus*) and the False or Sunda Gharial (*Tomistoma schlegelii*) are the only representatives of the family Gavialidae still living today (Willis et al. 2007, Oaks 2011). The species *G. gangeticus* was first scientifically described in 1789 by the Göttingen scholar Johann Friedrich Gmelin (1748–1804) in what he called the 13th edition of Carl von Linné's (1707–1778) "Systema Naturae". On the Indian subcontinent, this crocodile species is now only found in a few fragmented areas of the river systems of northern India and the Nepalese plains. Historically, gharials have inhabited major rivers from the Indus in Pakistan to the Ganges and Brahmaputra in Bhutan and Bangladesh, and possibly as far as the Irrawaddy in Myanmar. With an estimated population of less than 1000 reproductive individuals in the wild, the gharial is considered critically endangered by the IUCN (Lang et al. 2019). In addition to habitat destruction and alteration through dams and drainage, toxins, and contamination of the water bodies as well as persecution by humans are responsible for the acute threatened status of the species. Thanks to targeted conservation efforts, the population decline has been halted for several years and populations are slowly increasing again (Acharya et al. 2017). With their characteristic, strongly elongated snout and long, pointed teeth, gharials are primarily fish

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Fig. 1. The two large Indian gharials in Hall 28 of the Natural History Museum Vienna are among the most impressive exhibits in the reptile and amphibian exhibition. Very little was known about their origin until now. Photo: Alice Schumacher.

eaters. They are also the only crocodiles that show visible sexual dimorphism. The males have a bulbous thickening on the tip of their snout, which acts as a resonating body when they exhale in an impulsive manner and thus plays a role in intraspecific communication. This structure of the males is named after the North Indian word for a clay pot, ghara. The name of the animals themselves is also derived from this word. Griffith et al. (2023) call the Indian Gharial "the most functionally distinct crocodylian" because of its peculiarities.

The large Gharials in the Natural History Museum Vienna

The two gharials in Hall 28 of the NHMW are among the largest exhibits of this unique crocodile species worldwide (Figs. 1 and 2). Consequently, they are also listed among the "TOP 100" exhibition objects of the Natural History Museum (Ott et al. 2012: 171) and were mentioned 100 years earlier in "Brehms Tierleben", whose volume on amphibians and reptiles was edited by Franz Werner (1867–1939), the well-known zoologist of the University of Vienna (Werner 1912). On the occasion of the second visit of the Emperor Franz Joseph I (1830–1916) to the "Naturhistorisches Hofmuseum" on 28 February 1905, Franz Steindachner (1834–1919), the Intendant (Director) of the Museum, wrote in his annual report that "the occasion (...) was the inspection of some important recent acquisitions of the Hof Museum." Thus, after the ceremonial reception of the emperor, the first place visited was the octagon on the first floor, where the latest "ethnographic and other collection results (...) were put on temporary display. Afterwards, the large group of gharials, a gift from the court counsellor Steindachner, was also viewed" (Steindachner 1906).

The female is 453 cm long. The male, which has the characteristic bulge on the tip of its snout, measures 543 cm. Originally, both crocodiles were reported to be 420 cm and 530 cm long, respectively, but a measurement taken during the cleaning of their display case in June 2011 revealed a significantly greater total length, especially for the female. The two specimens bear the inventory numbers NHMW 32226 (male) and NHMW 32227 (female). The origin is only vaguely noted as "British India", the former British colonial empire of the Indian subcontinent, which existed until 1947 and included not only the Republic of India but also the present-day states of Pakistan, Bangladesh, Bhutan, and Myanmar. How the two stuffed specimens came to the Natural History Museum is largely unknown. The little information available states that the gharials entered the herpetological collection

Fig. 2. Portrait of the 5.43-metre-long male Indian gharial with the typical bulge on the tip of the snout. Next to these crocodiles, the Komodo dragon (*Varanus komodoensis*) in the background looks less impressive. Photo: André Koch.

in 1902 as a gift from Franz Steindachner (Grillitsch et al. 1996, Riedl-Dorn 1998). This information is also written in golden letters on the large display case. Steindachner (1903) himself mentions the two crocodiles briefly in his annual report for the year 1902, but without giving further details about their origin. In 1904 they were placed in the exhibition collection for the first time and initially found their place in the upper dome hall (Steindachner 1905), where they were viewed by the Emperor and his entourage the following year. Only later was the gharial group transferred to Hall 28 (Fig. 3), where amphibians and reptiles of the world are still on display today. The collector of the crocodiles is unknown, Steindachner himself did not travel to South Asia. Through numerous purchases, however, he was decisively responsible for the expansion of the collections. Unfortunately, important information on the provenance of the acquired specimens was often lost in this process (Kähsbauer 1959). And so, even in a historical guide book to the display collections of the Natural History Museum, no information is given on their origin (Kummerlöwe 1942).

About Captain Jürgen Johannsen and the Origin of the Vienna Gharials

But where do the new findings about the origin of the two Viennese gharials come from? During research for another publication (Koch 2021) on zoological relics of the controversial historical "Völkerschauen" (ethnological expositions), one of us (AK) came across the biography of Carl Hagenbeck (1844–1913, Fig. 4), the famous Hamburg animal trader, "Völkerschauen" organizer, and zoo director. In the chapter on "Small Adventures" we stumbled across the following passage (Hagenbeck 1909: 303): "Two hides of such animals [meaning the Indian Gharials] came into my possession fifteen years ago [see below], one was fourteen, the other sixteen feet long [i.e., about 425 cm and about 490 cm, if the English foot measurement of 30.48 cm is used as a basis for calculation, although the Hamburg foot measured only 28.6 cm [Mozhnik 1848], which would result in lengths of only 400 cm and 457 cm]. My traveler Johannsen, then first officer of a steamer, brought the hides to Hamburg and gave

Fig. 3. The historical postcard photo shows room 28 of the Natural History Museum before the installation of the two large Indian gharials, which took place sometime after 1904. For the display of the two extraordinary crocodiles, the middle display case, which already contained an older gharial hide hidden in the upper section, was replaced by a larger one. Photo: Archive for the History of Science of the NHMW.

them to the Umlauff company, from which I acquired them. In Vienna I later brought the two gharials to exhibition [see below about the exhibition at the Vivarium]; they are still in the Imperial Museum in Vienna."

It is thus clear from these lines that the two specimens first arrived in Hamburg from South Asia, where they were acquired by Carl Hagenbeck around 1893 (see comments below about the purchase), because the first edition of Hagenbeck's memoirs "Von Tieren und Menschen" (Of Animals and Men) was published as early as 1908. The person named "Johansen", described as a "traveler", is Captain Jürgen Johannsen (1859–1940, Fig. 5), a native of North Schleswig, for whose name alternative spellings such as Jörgen Johansen exist. Zukowsky (1929, 1954) reports that Johannsen was called "Uncle Sahib" within the company; the Indians called him "Hannsen-Sahib" (G. K. L. 1940) — with Sahib being a respectful form of address. According to Hagenbeck (1909), Johannsen went to sea from the age of fourteen and travelled all the world's oceans during his long life. Since about 1890 he is said to have worked as a travelling animal catcher and buyer for Hagenbeck with a focus on India and Indonesia (Thode-Arora 1989). According to Dittrich & Rieke-Müller (1998), Carl Hagenbeck used the services of the "former ship's officer Jürgen Johannsen from 1901 onwards" in order to become more independent from his two half-brothers Gustav (1869–1947) and John Hagenbeck (1866–1940), who had already founded their own animal trading company in Colombo in 1894, in the procurement of wild animals from India and Ceylon (Sri Lanka). For example, Johannsen brought large shipments of Indian blackbucks (*Antilope cervicapra*) to Hamburg from 1901 onwards (Dittrich & Rieke-Müller 1998). Sokolowsky (1928) further mentions that "Captain Johannsen (...) carried out extensive transports of natives for display in Europe" and was "equally at home in India, in the Indian island world [i.e., present-day Indonesia], as in Africa".

In addition, Johannsen himself was apparently involved in the organization of at least two "Völkerschauen": in 1908 he prepared the "Ceylon Village" together with John Hagenbeck and in 1913 the "Burmese Show" (Thode-Arora 1989). Information on Johannsen is otherwise very sparse (K. Gille, pers. comm.). Further details about his life and work are only known from isolated reports. For example, a newspaper article from 1930 mentions that Captain Jürgen Johannsen, "Hagenbeck's oldest animal catcher", bought an adolescent Indian rhinoceros (*Rhinoceros unicornis*) from Nepal for the top price of about 60,000 Marks for the zoo in Stellingen (Anonymous 1930, see also Anonymous 1931). Besides a short description of the rare animal — the only one of its

Fig. 4. Carl Hagenbeck (1844–1913), the famous Hamburg animal trader, ethnological show organizer and zoo director, first exhibited the hides of the two large gharials in Vienna (among other places) before selling them to Franz Steindachner of the Natural History Museum Vienna in 1902.

Fig. 5. Jürgen Johannsen (1859–1940) worked as an animal trapper and buyer for the Hamburg-based companies Umlauff and Hagenbeck for decades from around 1890. It was through him that the two gharials arrived in Europe from the colony "British India" around 1893, before Franz Steindachner acquired them from Carl Hagenbeck. Photo: from Hagenbeck (1909).

kind in the whole of Europe at that time — it is also mentioned that Johannsen apparently took care of the rhinoceros "Nepali", which had become accustomed to him, even after his return to Hamburg. On an aside, "Nepali" achieved a certain fame in the Hanseatic city and beyond, because after the Second World War when it was to be shipped to London by the British, it vehemently refused to enter the transport box. As it later turned out, Jan Schild, the keeper at the time, had secretly smeared the box with tiger excrement. In later reports about the rhinoceros Johannsen's merit is no longer mentioned (Voß 1952, Niemeyer 1972). Instead, we learn from these sources that Lorenz Hagenbeck's (1882–1956) son Carl-Lorenz alias "Carlo" (1908–1948) acquired Nepali from the Maharajah of Nepal. Thus, Carl Hagenbeck's grandson, like his son Lorenz, also went on voyages with Captain Johannsen to acquire wild animals in Asia (see below). Incidentally, Nepali was taxidermied for the Zoological Museum of the University in Hamburg after her death in 1955 and is still exhibited there today (Glaubrecht 2018).

Hagenbeck's (1909) memoirs do not tell us anything concrete about the catcher of the gharials and their exact origin, but he writes that the aforementioned Johannsen told him the following: "Three years ago [i.e., probably in 1905], when he was travelling down the Brahmaputra on a large barge with a transport of elephants from Assam [in north-eastern India], he observed two gharials whose length he estimated to be at least twenty-five feet [which would correspond to 717.50 cm to 800 cm (!), depending on the length of the unit of measurement feet used (see above)]. He also shot at the animals without getting hold of them. Since the crocodiles had been hit, Johannsen offered the captain of the boat 300 rupees if he would stop so that the prey could be taken on board. But it was in vain, because of the strong current it was not possible to stop the vessel." So, although it remains speculative, Johannsen could also have killed the two Vienna gharials on a voyage on the Brahmaputra from north-eastern India through what is now Bangladesh to its mouth in the Bay of Bengal.

That Johannsen probably travelled this route regularly is evident from another source. Ludwig Zukowsky (1888–1965), who was employed for many years as scientific director in Hagenbeck's zoo, writes in his book about "Carl Hagenbeck's empire" (Zukowsky 1929), that Johannsen is said to have brought almost 800 elephants to Hamburg-Stellingen during his (circa 40 years) work for the Hagenbeck family (in this respect Leutemann [1887] remarks that until this year already about 300 elephants, mainly Asian, had passed through Hagenbeck's hands). Umlauff (undated) writes on this: Johannsen was "one of the best people for Hagenbeck, who brought large animal transports from all regions. Most of all he brought elephants. Never before has anyone imported so many elephants and also caught them himself as Captain Johannsen, in this he really beat the record." In this context, Brandes (1911) provides a detailed account of

Fig. 6. Johannes Umlauff (1874–1951) continued his father's trade in naturalia from 1912 and originally introduced Carl Hagenbeck to Captain Johannsen. The Umlauff company sold several gharial hides (among others) to the natural history museums in Vienna (see Figs. 1 and 2), Frankfurt (see Fig. 12) and Bucharest (see Fig. 13). Photo from Anonymous (1951).

Johansen's capture and taming of elephants, supplemented by photographs of the lengthy procedure. Niemeyer (1972) reports that "Hagenbeck's traveler Johannsen, who had become a Dane due to the new border demarcation [as a result of the First World War], [in 1922] brought 13 elephants, 300 monkeys and several carnivores from India. 22,000 citizens of Hamburg inspected the animals destined for America." It was the first large animal transport to return to Hamburg after the war. Among them were (live?) crocodiles (Hagenbeck 1955). Johannsen and other "travelers" also arranged extensive animal transports for the reopening of the Stellingen Zoo, (which had been closed since 1920), on 24 May 1924 (Niemeyer 1972: 256). In contrast to many other animal trappers such as Lorenzo Cas(s)anova, who was sent into the wide world on behalf of the Hagenbeck company from 1865 onwards and succumbed to a tropical disease (Hagenbeck 1909), Jürgen Johannsen seems to have survived these hardships relatively unscathed into old age. Carl Hagenbeck's younger brother Diedrich (1852–1873) also died prematurely of "black water fever" while hunting hippopotami in Zanzibar (Niemeyer 1972).

Johannsen's Work for the Hamburg Family Businesses of Hagenbeck and Umlauff

As Hagenbeck's (1909) own descriptions show, Johannsen also worked for the Hamburg-based company "J.F.G. Umlauff ", which traded internationally in naturalia and ethnographica (see also Thode-Arora 1992). The Umlauff family business in natural products goes back to the company founder Johann Friedrich Gustav Umlauff (1833–1889), who acquired a bathing establishment in Hamburg St. Pauli in 1859 and began selling curiosities from overseas (Thode-Arora 1992, Lange 2006). As the largest German overseas port, Hamburg offered the best conditions for this, which was further promoted by the emerging colonial policy from the 1880s onwards. As early as 1863, Johann Umlauff married Caroline Hagenbeck (1839–1918), a sister of Carl Hagenbeck, in his second marriage, which explains the close business relations of both Hanseatic family enterprises. Live animals imported by Hagenbeck that died prematurely were passed on to Umlauff, who in turn "stuffed" them and resold them to natural history museums or other interested parties (Leutemann 1887) — sometimes even as far as Mongolia (Hanelt et al. 2020). However, Umlauff also engaged its own animal trappers such as Johannsen, who were taught preservation and taxidermy skills in order to be able to transport hunted specimens safely to Europe, where they were further processed (Lange 2006). After moving into new exhibition rooms in Hamburg, the expanding company was given the name "J.F.G. Umlauff Naturalienhandlung und Museum" or "Museum Umlauff" or "Umlauffs Weltmuseum" [Umlauff's world museum] for short. In 1912, the various business areas of the Umlauff family, which included the sale of naturalia as well as the trade in ethnographica and shell products, were divided among Johann F. G. Umlauff's children. However, all three companies initially retained the name "J.F.G. Umlauff Naturalienhandlung und Museum". Johannes Umlauff (1874–1951, Fig. 6), a son of the company's founder, thus became the owner of the zoological branch of the business, which later traded under the name "Johannes Umlauff — Lehrmittel- und Naturalienhandlung" (G. V. B. 1944), until the business was destroyed during the Second World War (Thode-Arora 1992). However, individual specimens were still sold to natural history museums until at least 1950, as Niethammer (1954) mentions for the Museum Koenig in Bonn.

In his unpublished memoirs, a copy of which is in the Hagenbeck archives in Hamburg, Johannes Umlauff (undated: 30) describes how he once met the "1st officer Johannsen" on board the Bremen steamer "Drachenfels" and found "a loyal friend" in him. As a result, the latter initially brought fish from Bombay to Hamburg from his trips to India for Umlauff. Due to Johannsen's interest in animals, these deliveries became more and more extensive, as Umlauff continues. Apparently, the contact between Carl Hagenbeck and Johannsen came about through Johannes Umlauff himself (even if this is not mentioned in Johannsen's obituary, see e.g., G. K. L. 1940), because on the occasion of a "[...] large transport of animals, which D. "Drachenfels" had on board and had been purchased by my uncle Carl Hagenbeck, I introduced Johannsen [...] to my uncle." The steamer "Drachenfels" was in the service of the "Deutsche Dampfschifffahrts-Gesellschaft" [German Steamship Company, DDG] "Hansa" from Bremen from 1882, which "[...] established a regular liner service to Colombo (in Sri Lanka) and Calcutta at the end of 1888 with the founding of the Asiatische Linie" (Patzer 2005). According to this source, the DDG "Hansa" was the largest pure cargo shipping company in the world in 1914 with 66 steamers and one motor vessel.

The Purchase and first Display of the Indian Gharials in Vienna by Carl Hagenbeck

Another aspect mentioned by Carl Hagenbeck (1909: see above) in his memoirs is the exhibition of the two gharials before they reached the Natural History Museum Vienna. For another line of business of this famous businessman, which has hardly been illuminated so far, was the organization of reptile exhibitions, such as the one beginning on Easter Sunday, 1897 in the Vivarium in the Vienna Prater (Reiter 1999; Fig. 7). In the accompanying advertisement of 18 April 1897 in the newspaper "Wiener Caricaturen" [Viennese caricatures] about the "largest reptile exhibition in the world", "Risenkrokodile" [giant crocodiles] were announced among other things as a special attraction (Fig. 7). Since the name of the gharial was probably unknown to most people at that time, as it is today, it can be assumed that the two large gharials were hidden behind the attention-grabbing name "giant crocodiles", even though there are no more precise references to this. An eyewitness account, which probably refers to the gharial group, comes from Eduard Paul Tratz (1889–1976), the later founder and for many years controversial director of the Haus der Natur in Salzburg (Hoffmann & Lindner 2021). In his "Erinnerungen an die Kinder- und Jugendzeit" (Memories of Childhood and Youth), he describes the time he spent in Vienna from 1894 to 1898 and how, at a young age, he was captivated by the "Hagenbeck'schen Menagerie (...) and the specimen of a giant crocodile placed in the middle of the hall [of the Vivarium]. Around it were numerous small basins and containers filled with all kinds of reptiles, amphibians and fish" (Hoffmann & Lindner 2021: 799). Although Tratz only mentions one prepared giant crocodile in his personal memoirs, this inaccuracy could be due to the long time span of about 50 years between the experience and its recording in writing.

Regarding the original purchase of the two stuffed gharials by Carl Hagenbeck, some information was found in the company's historical account books, which survived World War II. Thus, in the volume for the years 1896 and 1897, on pages 464–465, there is a series of entries for the Vivarium in Vienna from 3 March to 17 September 1897 (Fig. 8). The first entry on page 464 lists, under running number 120, "2 ausgest[opfte]. Krokodile" [two stuffed crocodiles]. The prices are given as 300 and 700 Marks, respectively, accounting to a total of 1000 Marks (which today would correspond to just under 8,000 Euros). This high price already denotes that these crocodiles must have been something special. Although, unlike other entries, no scientific or common species name is mentioned, it is quite likely that the two large gharials are meant, as the date of purchase is only a few weeks before the opening of Hagenbeck's reptile exhibition at the Vivarium (see above). On the same page, for instance, there is an entry in the penultimate line about "2 ind[ische]. Krokodile" [2 Indian crocodiles], probably *Crocodylus palustris*, for 250 Marks in total, and on page 465 three entries about


Eröffnungs-Anzeige.

VIVARIUM

II. k. k. Prater, Hauptallee 1.

Direction: **Karl Hagenbeck.**

Eröffnung: Ostersonntag, 18. April 1897.

Grösste Reptilienausstellung der Welt

in künstlerisch ausgestatteten Käfigen.

60 Riesenschlangen von 6—28 Fuss Länge. Riesenschlangen mit Jungen. **Riesenkrokodile** und **Alligatoren** mit Jungen. Hunderte von **Schlangen, Echsen, Schildkröten, Frö-chen, Molchen** etc. in den verschiedensten europäischen und überseeischen Arten.

Geöffnet täglich von 9 Uhr Früh bis Abends.

Entree 30 kr., Kinder 15 kr. 325

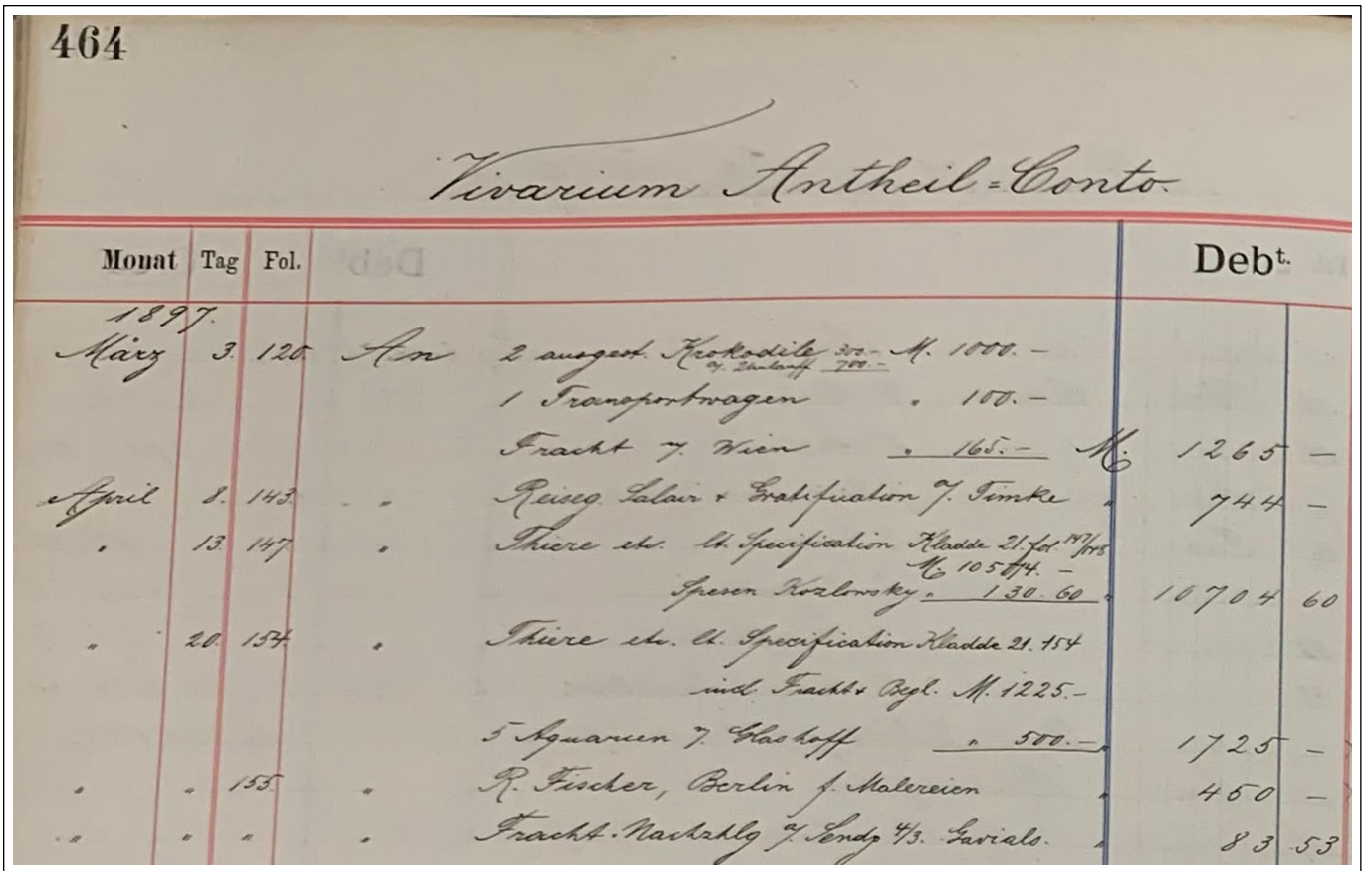
Fig. 7. The opening advertisement about Karl Hagenbeck's allegedly "largest reptile exhibition in the world" in the former so-called Vivarium in the Vienna Prater in the "Wiener Caricaturen" newspaper of 18 April 1897. Giant crocodiles ("Riesenkrokodile") were announced as a special attraction and probably referred to the two large gharials.

"westafrik[anische]. Krokodile" [West African Crocodiles], probably *Crocodylus suchus* or *Mecistops cataphractus*) ranging from merely 10 to 25 Marks per specimen. In comparison, four seals and a walrus, among others, purchased later that year to populate an artificial polar landscape in the Vivarium's courtyard (Reiter 1999), cost Hagenbeck 180 Marks and 3,000 Marks, respectively.

Regarding the presumed gharials, it is somewhat striking that that total sum was split into two amounts of money, which are written below each other, 300 above and 700 below. To the left of the 700 is noted "a/[n] Umlauff" [to Umlauff], which means that (at least) 700 Marks were paid to the company of J.F.G. Umlauff for the crocodiles. One possibility could be that the different prices stand for the female (300 Marks) and male specimen (700 Marks), respectively. On the other hand, the 300 Marks could represent Captain Johansen's share, even if this is not explicitly mentioned.

In addition, the next two lines of the account book show the costs for freight and the transport wagon for the presumed giant crocodiles, 100 and 165 Marks respectively, so that the total sum for these two specimens alone is 1,265 Marks. Remarkably, a few lines later, there is another entry, which clearly shows that the stuffed crocodiles were indeed gharials. Thus, for 20 April — only two days after the opening of the reptile exhibition — there is the entry: "Fracht-Nachzhlg a/ Sendg 4/3 Gavials" [additional freight payment to consignment of the gharials of 4 March] for 83.53 Marks. Although there is no entry for 4 March, it can be assumed that this line refers to the purchase of the stuffed crocodiles from the previous day. Perhaps they were sent from Hamburg to Vienna on 4 March or it is merely a minor inaccuracy.

Nevertheless, despite his well-known name and the various animal attractions such as the "giant crocodiles", Carl Hagenbeck was unable to prevent the bankruptcy of the Vi-


464

Vivarium Antheil = Conto.

Monat	Tag	Fol.			Debt.	
1897.						
März	3.	120	An	2 ausgest. Krokodile 3/3 - M. 1000. -		
				1 Transportwagen " 100. -		
				Fracht z. Vieh " 165. - M.	1265	-
April	8.	143	"	Reiseg. Salair + Gratification z. Timke "	744	-
"	13	147	"	Thiere etc. lt. Specification Kladde 21. fol. 147/148 M. 10574. -		
				Spesen Kwalowsky " 130. 60 "	10704	60
"	20	154	"	Thiere etc. lt. Specification Kladde 21. 154 incl. Fracht + Zoll. M. 1225. -		
				5 Aquarien z. Haschoff " 500. - "	1725	-
"	"	155	"	R. Fischer, Berlin f. Malereien "	460	-
"	"	"	"	Fracht-Nachzhlg z. Lendy 4/3. Lariats "	83	53

Fig. 8. Hagenbeck's historical account book for the years 1896 and 1897. On page 464, the first entry lists "2 ausgest[opfte]. Krokodile" (i.e., two stuffed crocodiles) for a total of 1000 Marks, which were transported to Vienna. Very likely these are the two large gharials. For further details see the text. Photo: Nigel Rothfels by courtesy Tierpark Hagenbeck Archive, Hamburg.

enna Vivarium in the Prater, which was built in 1873 on the occasion of the Vienna World's Fair (Werner 1901, Reiter 1999). In any case, it is quite conceivable that Franz Steindachner discovered the two "giant crocodiles" or gharials during their display in the Vivarium and subsequently acquired them from Carl Hagenbeck for the Natural History Museum Vienna because of their high show value.

Further unpublished Archive Material on the Viennese Indian Gharials

The undated typewritten manuscript by Johannes Umlauff is accompanied by a black and white copy of a photograph of two gharial hides (Fig. 9). As can be seen from the posture and external appearance, the group of gharials is without doubt the two Viennese crocodiles. The photograph must therefore have been taken before 1902, when the two specimens arrived at the Natural History Museum Vienna. Carl Hagenbeck's zoo grounds in Hamburg-Stellingen are rather out of the question as the place where the prepared crocodiles were photographed, because the "first zoo in the world without bars", whose patent he had applied for in 1896, was not opened to the public until 1907, even though extensive work had already begun on the grounds in 1902 (Hagenbeck 1909). Alternatively, it could be the Hagenbeck premises at Neuer Pferdemarkt in Hamburg city center, from where the animal trade was operated (K. Gille, pers. comm.), or an area of the Umlauff company, which carried out the taxidermy. Another possibility would be the Vienna Prater (see above). In any case, it is unlikely that the two precious specimens were kept outdoors for a long time. Presumably it was merely a provisional staging for which the two impressive gharials were positioned on straw or sod in order to photograph them as lifelike and attractive as possible for potential buyers.

Previously unknown Drawings of a record-breaking Gharial Skull

In addition to this remarkable historical photograph of the Viennese Indian gharial, Umlauff's manuscript also includes a sheet with two drawings of the head of a male specimen: a lateral portrait and a dorsal view (Fig. 10). In addition to the note that "the occiput of the skull is defective", the undated drawings also contain three length measurements. Thus, for the distance from the eyes to the tip of the snout 57 cm are given, for the "length of the oral fissure 71 cm" and for the "total length of the lower jaw [even] 85 cm". However, the total length of crocodile skulls is measured by default from

the tip of the snout to the posterior end of the cranial skull plate (Webb & Messel 1978). In the drawing of the male gharial, this point lies quite exactly between the angle of the oral fissure and the terminal point of the mandible (Fig. 10). The length of the skull is therefore about 78 cm. Thus, if the measurements given were correct, this specimen had the longest known skull of an Indian gharial! The previous record holder is in the Zoological State Collection in Munich and is given by Whitaker & Whitaker (2008) with a total length of 77.3 cm. Only two centimeters shorter than this specimen — namely 75.3 cm — is a gharial skull from the Muséum National d'Histoire Naturelle in Paris (MNHN). We do not have the skull measurements of the male specimen mentioned below, which is exhibited in the French capital and originally measured 5.40 meters in length (Fig. 11). The Museum Koenig in Bonn also has two extremely large gharial skulls, measuring 75 cm and 72.7 cm, respectively (Böhme 2021). The Munich specimen with the indication of origin "India" is listed by Whitaker & Whitaker (2008) as the third longest crocodile skull ever (the world's longest skull of this archaic reptile group with a total length of 84 cm is in the Natural History Museum in London and belongs to a *T. schlegelii*), although the extreme skull length of gharials due to their narrow, elongated snout does not suggest record values for the total body length of the respective individual. According to the body proportions of 1:5 to 1:6.5 calculated by Whitaker & Whitaker (2008) for the genus *Gavialis*, this would indicate a total length of the depicted animal of "only" 390 cm to 507 cm.

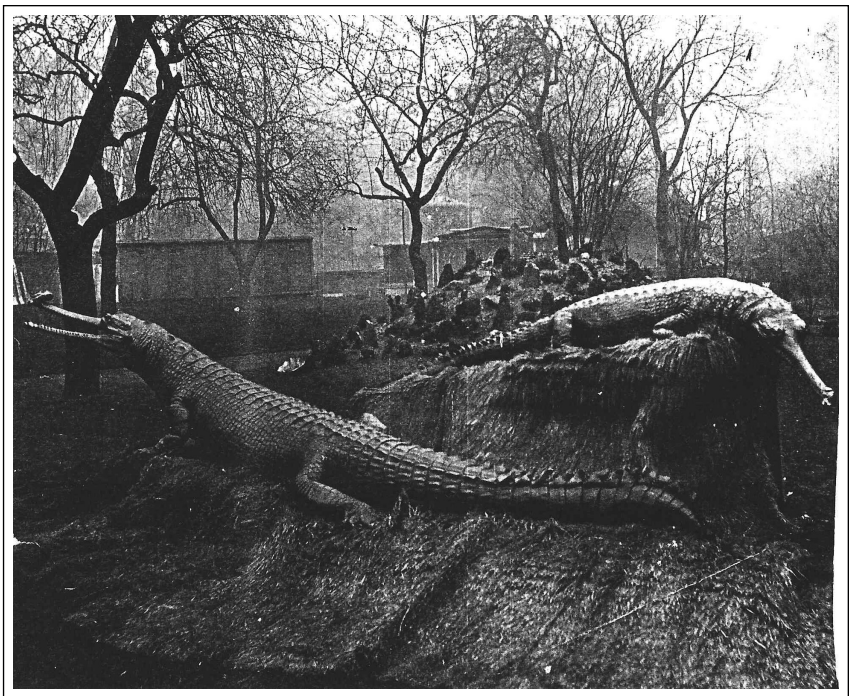


Fig. 9. Copy of a photograph of the two (freshly set up?) gharials enclosed with the memoirs of Johannes Umlauff in the Hagenbeck archive in Hamburg. The photo was probably taken between about 1893 and 1902, most likely in Hamburg or Vienna, before the extraordinary specimens were sold by Carl Hagenbeck to the Natural History Museum in Vienna. Photo: Tierpark Hagenbeck Archive, Hamburg.

A certain "Dr. R. Ewald" is given as the author of the remarkable drawings, but at first, we were unable to find information about a person with this name. Only when insights into the extensive correspondence file of the Umlauff company from the Museum für Naturkunde in Berlin were made possible a few months later, we found a mention of the "Scientific Assistant Dr. R. Ewald", who was responsible for the processing of preserved bird heads, in a typewritten letter from Johannes Umlauff (1922), dated 1 February 1922. A follow-up letter dated 3 February 1922, dealing among other things with the identification of reptiles, amphibians, and fish for the preparation of sales lists, is signed with "für Johannes Umlauff i[n]. V[ertretung = on behalf of]. Dr. R. Ewald" (Ewald 1922). The determination of the material was again the responsibility of the scientific assistant. It has not yet been possible to clarify when Mr. Ewald started working for Johannes Umlauff's company. However, it seems unlikely that he was already working for the Hamburg company at the end of the last century, when the two large gharials were prepared there before they reached Austria. On a side note, Friedrich Siebenrock (1853–1925) helped the Umlauff company with the identification of turtles and crocodiles during his work as curator of the NHMW (Steindachner 1907).

The discrepant dimensions of the male gharial in the Natural History Museum Vienna also speak against the specimen drawn by Ewald being the Viennese crocodile. Its head measures 63 cm from the eye to the tip of the snout on the left and 62.5 cm on the right, the oral fissure 79 cm, and the lower jaw even 86 cm. With an average value of 82.5 cm, as described above, it thus has a slightly longer skull than the specimen shown (Fig. 10), which correlates with its total length of 543 cm and corresponds to a ratio of 1:6.58. This size ratio is slightly above the values of 1:5 to 1:6.5 determined by Whitaker & Whitaker (2008) for gharial. It thus remains unclear to which specimen Ewald's drawing is referring and to which museum it was finally sold.

In addition, a discovery in the Archive for the History of Science of the NHMW is worth mentioning. In the minutes of the director's records for the year 1895, the following is noted under the item "Subject" in business number 385 of 14 June: "J.F.G UMLAUFT [sic] in Hamburg offers a gharial hide for sale. Under the item "Erledigung" it simply says: "Hofrath Steindachner notified." Steindachner's decision in this matter, however, is not documented in the minute book, and Umlauff's letter can no longer be found in the archives. Consequently, it is unclear whether there is merely a mistaken reference to only one hide (just as the company name was

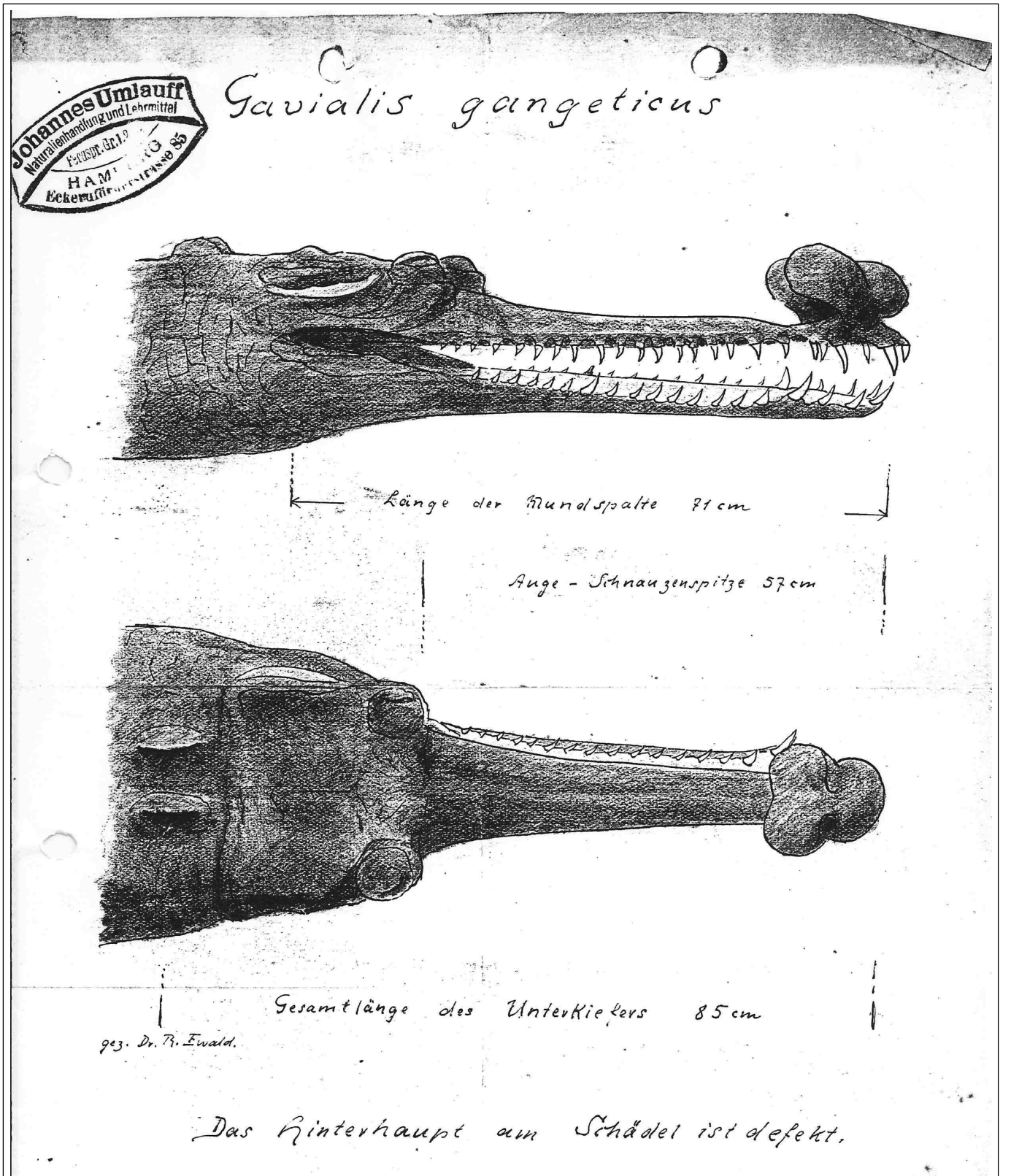


Fig. 10. A copy of two undated drawings of the head of a male gharial, also enclosed with the manuscript by Johannes Umlauff. The author "Dr. R. Ewald" worked as a scientific assistant for Umlauff. Due to deviating length measurements (see text), this is not the male gharial in Vienna. The drawn specimen, whose whereabouts are unknown, had an estimated total length of 390 cm to 507 cm. Photo: Tierpark Hagenbeck Archive, Hamburg.

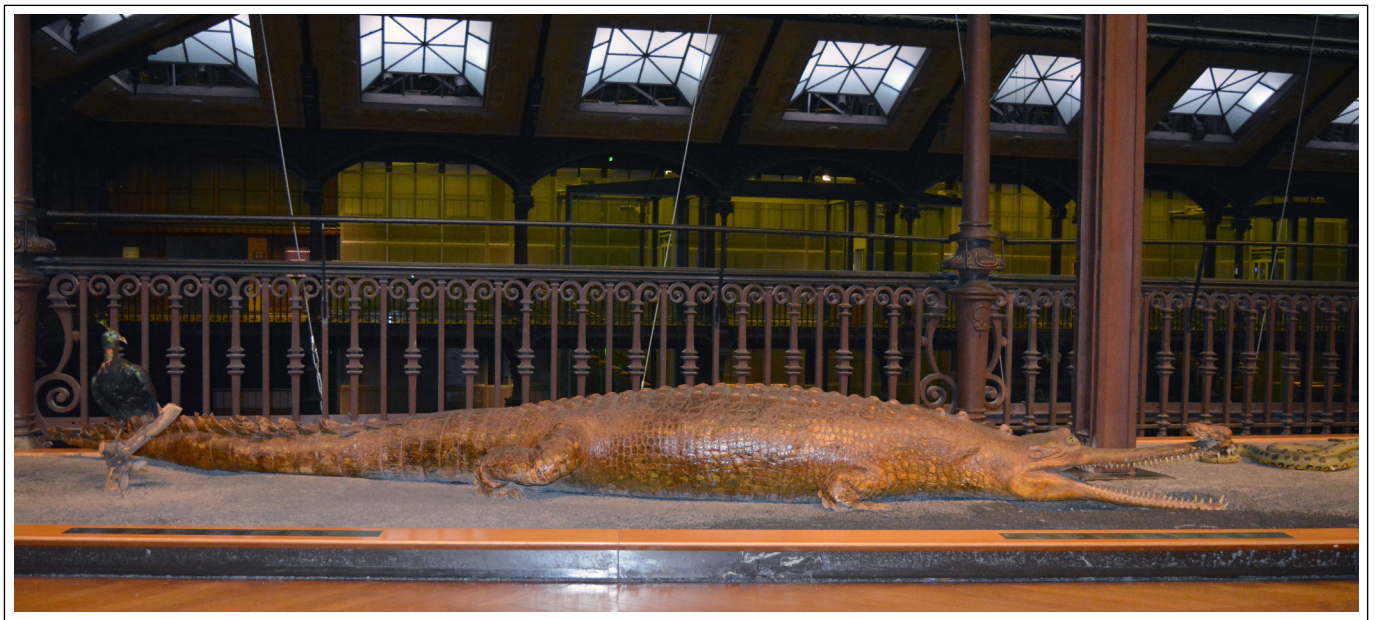


Fig. 11. The largest Indian gharial (MNHN-RA-0.7581) in the Muséum National d'Histoire Naturelle in Paris dates from the first half of the 19th century and is said to have originally been 5.40 meters long. Since the tip of the tail is now missing, the specimen only measures 5.15 meters today. Photo: Annemarie Ohler.

misspelled) or whether it is actually the large gharial group that Steindachner acquired from Carl Hagenbeck in 1902 at his own expense. However, it is more likely that it could be another gharial specimen that was already purchased by Steindachner before the large group. For in the database of the herpetological collection two other adult Indian gharials are listed (NHMW 562 and NHMW 1978), which are noted as donations of the then intendant Steindachner; the length of the second specimen is given as 353 cm.

In a historical photograph of Hall 28 from 1890 in Krenn et al. (2021), the elongated snout of an Indian gharial is clearly visible. A comparison with the postcard shown in Fig. 3 shows that this specimen can also be seen there in the middle display case. Whether, and if so, which of the two crocodiles mentioned above it is, is unclear, but in any case, it does not come into consideration for the offer from the year 1895. However, this at least proves that the Indian gharial was already displayed in the Natural History Museum before the large group was set up, which is not surprising in view of its morphological uniqueness. In addition, the note in the file documents that the Umlauff company offered (at least) one prepared gharial for sale to the NHMW as early as 1895. Further letters in the historical archives of the NHMW attest to the decades-long business relationship between the Hamburg trading company and the Viennese museum (for further details see below).

More Indian Gharials in (non-)European Natural History Museums

When researching the two Hanseatic trading companies Hagenbeck and Umlauff, it became clear to us that the two Viennese gharials were not the only specimens of this extraordinary crocodile species sold by the Umlauff company to European natural history museums. Carl Hagenbeck (1909), who is known to have already done at least one lucrative business with these crocodiles, writes: "The traveler [i.e., Jürgen Johannsen] took with him on a new journey to India the order to keep a lookout for large gharials and to bring back at least the hides." Elsewhere, the Hanseatic animal trader boasts that in the course of his life "more than 2000 crocodiles have passed through [his] hands". However, this phrase probably does not refer to Indian gharials, because Hagenbeck (1909) also admits: "I have tried to import young specimens [of the Indian gharial] on various occasions, but they have all perished on the journey". He considered it hardly feasible to catch and transport adult specimens. Accordingly, there are, for example, no gharials on a price list from 1883 printed in Leutemann (1887: 39ff), although several Indian elephants and numerous alligators, probably *Alligator mississippiensis* from North America, are offered therein.

In this context, it is interesting to note what Johannes Umlauff (undated: 31) states: "Capt. Johannsen had the good fortune to trade two huge gharials [handwritten addition of the word "skins"] (the sacred Ganges crocodile) from an old Radja in Bombay, when he went up the Ganges to catch animals. There were two huge skins, one specimen was 8m from head to tail, and the other 7.50m. We had never seen such large specimens [see the note at the end of the article]. As they were little tanned and very difficult to work with, I had them prepared in our workshop. After completion, I immediately sold them ~~an das Senkenbergesche~~ [sic] ~~Institut, Frankfurt a.M., Geheimrat Prof. zur Strassen.~~ [= to the Senckenberg Institute (Museum), privy councilor Prof. zur Strassen; handwritten deletion in the manuscript with the following substitution:] Pracht Exemplare an Prof D: Antipa Bukarest

— 19 —

schrank fallen zwei besonders starke Krokodile auf: das im ganzen tropischen Afrika und auf Madagaskar häufige Nilkrokodil (Crocodylus vulgaris Cuvier; Abb. 16) und der indische Gavial (Gavialis gangeticus Gmelin; Abb. 17). Durch die stark verlängerte, schmale Schnauze mit dem knolligen Aufsatz ist der Gavial unter den etwa 20 gegenwärtig lebenden Krokodilarten entschieden die sonderbarste.

Abb. 16.

Abb. 17.

Zum Schluß müssen wir noch auf ein Reptil in dem gleichen Schrank hinweisen: auf die berühmte Brückenechse (Sphenodon punctatus Gray; Abb. 18), die einzige noch lebende Art der

Fig. 12. Drawing of a male Indian gharial (SMF 8082) over four meters long from Umlauff, which was exhibited in the Senckenberg Museum in Frankfurt until the Second World War and became a victim of the bombings. Photo: from Mertens (1925).

Museum, Frankfurt a.M., Senkenbergisches Institut." Thus, it is evident from these corrected memoirs that at least two other large gharial specimens were delivered by the Umlauff company to the natural history museums in Bucharest and Frankfurt.

The former Indian Gharial of the Senckenberg Museum in Frankfurt

Our enquiry with colleagues at the Senckenberg Museum in Frankfurt (SMF) revealed that a large specimen did indeed exist there, formerly acquired by "J[ohannes]. Umlauff" (Mertens 1943). In the annual report of the Senckenbergische Naturforschende Gesellschaft [SNG, Senckenberg Natural History Research Society] for 1914, the said gharial is mentioned as a "gift from Dr. Oscar Löw-Beer" (1878–1938), a benefactor and member of the SNG's directorate (Kramer 1967), with a length of over four meters and the announcement that it "will later form one of the ornaments of our [display] collection" (Anonymous 1916). Löw-Beer, who had made his fortune in the chemical industry, had himself undertaken a business trip to India and Sri Lanka in 1912 and collected naturalia there (Anonymous 1920), but had obviously not brought a gharial with him. Mertens (1943) also lists three gharial skulls in the Frankfurt collection (SMF 28132, 28133, and 40144), which were acquired by Johannes Umlauff in 1939 and 1940.

Otto zur Strassen (1869–1961), whose name was crossed out in Umlauff's manuscript (see the quotation above), had been museum director in Frankfurt since 1909 and was very probably Umlauff's negotiating partner for the purchase of the gavial. This business relationship is clearly documented at the latest in connection with another spectacular specimen. It is a large Anaconda skin from Brazil, which Umlauff sold to Senckenberg in 1925 for 100 Marks and which was probably set up in an extraordinary manner by taxidermist Christian Kopp (1893–1952) on site (Becker 2020). The South American giant snake is depicted in the critical phase of devouring with a Capybara in its maw (Becker & Lotzkat 2019).

The gharial specimen acquired for the Senckenberg Museum in 1914 was given the inventory number SMF 8082 and, according to the corresponding index card, was exhibited in the "Schaus[ammlung = display collection]." Mertens (1925), who reports on "the reptiles [...] in the Senckenberg Museum's display collection", only depicts the drawing of a male adult gharial (Fig. 12); not, however, the recently acquired anaconda. It thus remains open whether the gharial from the exhibition is depicted, as most of the other reptiles on display are shown in photographs. The same drawing is also found in the museum guide from 1935 (Anonymous 1935).

Neither in Mertens (1943) nor on the corresponding index card of the specimen in the herpetological collection is the alleged origin of the crocodile from Umlauff's memories, i.e., the river Ganges, noted. Instead, the word "destroyed!" is subsequently added to the index card in biros, since the Senckenberg specimen was apparently destroyed in 1944 during the partial destruction of the museum during the bombing of Frankfurt (Schäfer 1967). Mertens (1967) only mentions in general terms that the war losses affected "mainly some beautiful showpieces", while the herpetological research collection was largely spared due to removal from storage.

The Gharials of the National Museum of Natural History "Grigore Antipa" in Bucharest

The following could be found out about the other gharials, which according to Umlauff (undated) were sold to the Natural History Museum in Bucharest. According to the Romanian colleagues, there are three old specimens in the collection — a juvenile, a subadult, and an adult female specimen (Fig. 13) — as well as three invoices from the Umlauff company from the years 1907, 1908, and 1911 in the archive, which list two gharials as well as a skull; the latter, however, at a price of 140 Marks, is crossed out in pencil and annotated with "Nu", Romanian for no. The gharial skull is accordingly not in the Bucharest collection. On the homepage of the Muzeul Național de Istorie Naturală "Grigore Antipa" (MGAB), the only information about the scientific collections is that the then director "Grigore Antipa [1867–1944] led an intense activity to bring to the museum valuable collections — exotic, rich, and diverse material. For this purpose, he contacted specialized companies from abroad (Austria, Germany) with a

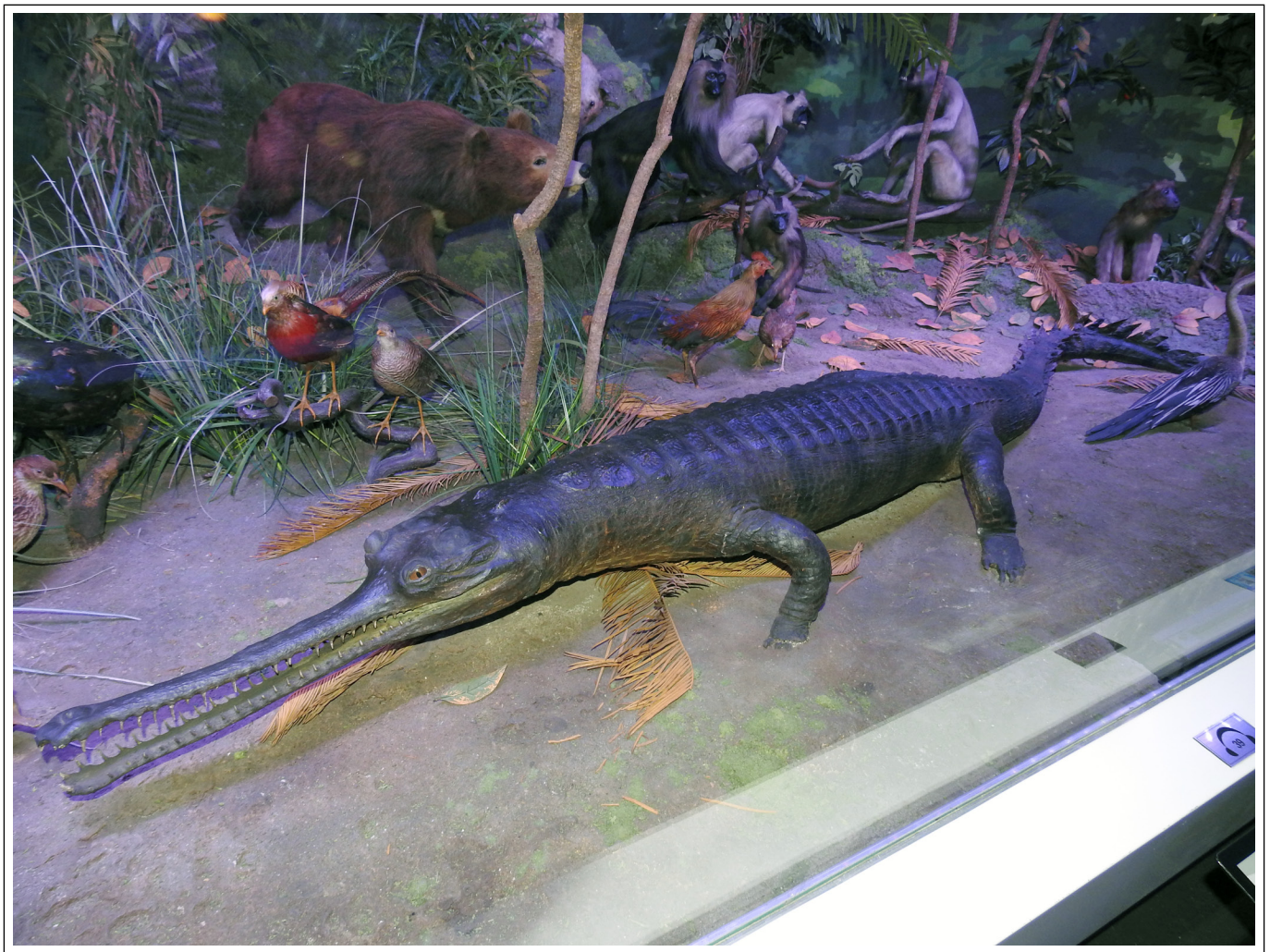


Fig. 13. The largest of three gharials (MGAB HER 7123) in the Muzeul National de Istorie Naturală "Grigore Antipa" in Bucharest, a female. It probably also comes from the company Umlauff from Hamburg and measures 312 cm. Photo: Alexandru Iftime.

view to making acquisitions." In the course of these efforts to increase the collections, the second gavial from Umlauff's memoirs mentioned above, as well as another specimen from Hamburg, most likely arrived in the Romanian capital. On the preserved invoices from 1907 and 1908, both taxidermied specimens are listed at 400 Marks each. The largest of the three specimens, a female (MGAB HER 7123, Fig. 13) measuring 312 cm in length, is displayed together with the juvenile gharial (MGAB HER 7088) in a diorama in the museum's permanent exhibition, while the middle-sized crocodile (MGAB HER 7106) is kept in the scientific collection and is only used for temporary special exhibitions.

Were Gharial Hides also sold to North America?

The interest in the impressive crocodiles from South Asia was apparently not limited to Europe alone. Thus, we learn from the biography of Lorenz Hagenbeck (1955), Carl Hagenbeck's second son, that he was sent by his father on his first mission to India in 1903 to buy various wild animals, including gharials. Hagenbeck Junior (1955) writes: "[...] I was already looking forward to going up the Brahmaputra with a native crocodile hunter after loading our transport, because we [— presumably he and Captain Johannsen —] had, among other things, the task of shooting two of the huge Indian gharials, those enormous pointed-snouted crocodiles that reach a length of eight to ten meters, for an American museum." However, Lorenz Hagenbeck's joy over the upcoming hunting trip lasted only a short time, because, as he continues to write, soon afterwards he received a telegram from his father in Hamburg with the strict order to "immediately load the transport on the steamer 'Ehrenfels'. The rest is taken over by Walter Ebert (another of Hagenbeck's animal trappers, see e.g., Zukowsky (1929) and Marben (1939)), who arrives in Calcutta a fortnight later." Whether gharial hides were nevertheless sold to America at a later date is not mentioned in the published sources (Hagenbeck 1909, 1955). Enquiries to major US natural history museums in New Haven (Yale Peabody Museum), Chicago (Field Museum), Washington (National Museum), Pittsburgh (Carnegie Museum), San Francisco (California Academy of Sciences) and

New York (American Museum) were unsuccessful or have not yet been answered. The US database VertNet also lists no gharials by Umlauff. The American Museum in New York only has "2 Chilean frogs (*Eupsophus*) collected 1885 by Umlauff, exchanged from the Naturhistorisches Museum Vienna in 1925" (David Dickey, writ. comm. 2023).

Johannes Umlauff's record-breaking Length Data for Indian Gharials

In this regard, the length specifications of 7.5 meters and 8 meters for the two specimens in Frankfurt and Bucharest, which are reproduced from Umlauff's manuscript, should be discussed once again. Obviously, these measurements are a gross exaggeration, because in one report, the Senckenberg specimen is given as being only over four meters long (Anonymous 1916). Johannes Umlauff's tendency to inaccuracies and exaggerations has already been pointed out elsewhere (Thode-Arora 1992: 146). On the other hand, Lorenz Hagenbeck (1955), as quoted above, also wrote that gharials would reach a total length of eight to ten meters. Perhaps Umlauff and Hagenbeck were referring to Captain Johannsen's gharial sightings on the Brahmaputra (see above). To what extent these observations correspond to so-called "sailor's yarn" must be left open. In contrast to the saltwater crocodile (*Crocodylus porosus*, see Fukuda et al. 2018, Ziegler et al. 2019), no Indian gharial with a length of more than six meters has been verified to date. Whitaker & Whitaker (2008), however, assume that this Asian crocodile species can certainly reach a length of over six meters.

According to William Temple Hornaday (1854–1937), the founding director of the Bronx Zoo in New York, who vividly describes in a travelogue the hunting of gharials on the river Jumna (Yamuna), a tributary of the Ganges, in 1877 and 1878, there is supposedly a stuffed specimen of "20 feet, 7 inches" length, i.e., the equivalent of 6.27 m (Hornaday 1885: 54) in the Paris Museum of Natural History. And indeed, a large male gharial (MNHN-RA-0.7581, Fig. 11) is exhibited in the Grande Galerie de l'Evolution [= Great Gallery of Evolution] of the MNHN, but its length is currently "only" 5.15 m (https://science.mnhn.fr/institution/mnhn/collection/ra/item/0.7581); however, the tail tip is missing. Thus, the specimen is slightly longer than the largest historical specimen in the Natural History Museum in London, which has a total length of five meters (Boulenger 1889). Interestingly, Duméril & Bibron (1836: 139) give 5.40 meters for the longest male in Paris at the time (in 1987, according to internal notes, the specimen measured only 5.30 meters), which was sent to France from Bengal, i.e., northern India, by Alfred Duvaucel (1793–1824), a stepson of George Cuvier (1769–1832); a female in the Paris collection is only slightly shorter, write Duméril & Bibron (1836), but no such specimen is listed in the MNHN's online database.

The Legacy of the Umlauff and Hagenbeck Companies at the NHMW

Even if not all questions about the Viennese Indian gharials could be answered beyond doubt, their provenance is now somewhat better documented. For example, there is still the question of what happened to the crocodiles in the almost 10 years between about 1893 and 1902 after they arrived in Hamburg from South Asia? Were they immediately prepared and exhibited in Umlauff's own trade museum? Or did Carl Hagenbeck acquire them shortly after they were prepared and exhibit them himself in the premises of his animal trade business and/or during the reptile shows that had been held at different locations since 1878? Further research in the Hagenbeck archives in Hamburg or in historical newspapers of the Hanseatic city and elsewhere could possibly provide answers.
A search in the database of the herpetological collection reveals that the two Indian gharials in the Natural History Museum in Vienna are not the only specimens that come from the Hanseatic animal trade companies Umlauff and Hagenbeck. While the name "Hagenbeck" is noted only 22 times under origin or collector, there are over 250 specimens in the collection with the indication "Umlauff". However, the names of the actual animal trappers and buyers, of whom Jürgen Johansen was probably one of the most successful (see above), are only mentioned in very few cases; the geographical origin of the specimens is also usually only given at country level, which reduces their scientific value. Especially descriptions of new species based on voucher specimens without a precise and traceable locality can cause problems for later research and possible protection of the species (see e.g., Koch, C. et al. 2019). Presumably, the other vertebrate departments and exhibition areas of the Natural History Museum also hold further specimens that originally arrived in Vienna from all over the world via Hamburg. It is to be hoped that their provenance is better documented than that of the two large Indian gharials, whose origin we were able to clarify here by a lucky coincidence. Thus, these two special crocodile specimens exemplify the close international ties between the Natural History Museum Vienna and natural history dealers such as the two Hanseatic firms of Umlauff and Hagenbeck in the late 19th and early 20th centuries.

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Ewald. We are indebted to Hilke Thode-Arora (Munich) for literature on Carl Hagenbeck and to Clemens Radauer (Vienna) and Klaus Gille (formerly Tierpark Hagenbeck Archive, Hamburg) for further information about Jürgen Johannsen. The late Mr. Gille also kindly made digital copies from Johannes Umlauff's unpublished manuscript for us. Likewise, Leonie Kircher (Berlin), Yvonne Reimers (Berlin), and Catharina Winzer (Hamburg) were helpful in finding a photograph of Johannes Umlauff. Linda Mogk, Joachim Scholz, and Udo Becker (all from Frankfurt), Wolfgang Böhme (Bonn), Alexandru Iftime and Tiberiu Sahlean (both Bucharest), Mario-Dominik Riedl (Vienna), Annett Heine (Dresden Zoo), as well as Annemarie Ohler and Jérôme Courtois (both Paris) actively supported us with literature references as well as photos and information about the gharial hides in the respective museum collections. Alice Schumacher (NHMW) kindly took photos of the two Viennese Indian gharials. Melina Haring and Robert Illek (both NHMW) are thanked for their help in measuring the two exhibits. Access and support to sources from the NHMW's Archive for the History of Science was kindly provided by Andrea Zaremba and Martin Krenn. We thank Aaron Bauer (Villanova) for pointing out a large specimen at Yale Peabody Museum to us, of which Gregory J. Watkins-Colwell (New Haven) kindly provided photos and information. We thank David Dickey and David Kizirian (both New York) for information about gharial specimens under their care and Rachunliu G. Kamei and Joshua Mata (both Chicago), Lauren Scheinberg (San Francisco), and Jennifer Sheridan (Pittsburgh) for their replies to our requests. In addition, we would like to thank Sandra Miehlbradt (formerly of the Museum für Naturkunde Berlin) for providing us with the Umlauff documents from the museum's historical department. Finally, helpful comments that improved the current manuscript were kindly made by David Blackburn.

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