

## REDISCOVERY OF *GLYPHIS GANGETICUS*: DEBUNKING THE MYTHOLOGY OF THE SUPPOSED “GANGETIC FRESHWATER SHARK”

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### ABSTRACT

The carcharhinid shark *Glyphis gangeticus* (Müller & Henle 1839) was described from fresh waters of the Ganges based upon an erroneous interpretation of the locality data provided by August Lamare-Picquot. A hitherto uncited expeditionary report, LAMARE-PICQUOT (1835), reveals that the type locality upon which the name *gangeticus* was based is in the lower Sundarbans south of Kulna and relatively near to the sea, in what is now Bangladesh. The entire area is strongly tidal, and the water is brackish, not fresh. The species has never been documented in fresh waters in the Ganges or elsewhere. *Carcharhinus (Prionodon) siamensis* Steindachner 1896, known only from the holotype collected in the mouth of the Rangoon River, is identified here as a probable junior synonym of *G. gangeticus*. Its type locality is an essentially marine habitat. Numerous specimens of *G. gangeticus* recently collected or observed by the author are reported from marine habitats in the Bay of Bengal in Bangladesh and Myanmar. There appear to be no authenticated records of any shark species (let alone of any shark attacks on humans) in the fresh waters of the Ganges River.

Key words: August Lamare-Picquot, *Carcharhinus leucas*, *Carcharhinus siamensis*, Hooghly, Keedreepoor Canal, man-eating sharks, tiger shark

### INTRODUCTION

The supposed presence of sharks living in the fresh waters of the Ganges basin that sometimes attack and kill humans is unsubstantiated. There is no authentic or verifiable documentation of the occurrence of *Carcharhinus leucas*, *Glyphis gangeticus*, or any other dangerous or harmless shark species in the Ganges. Old records of sharks from the “Ganges”, culled mainly from newspaper accounts, probably all involve either the Hooghly River near Calcutta or gross misidentifications. The Hooghly is a distributary of the Ganges, tidal for much of its length and brackish for many miles inland from its mouth in the Bay of Bengal about 50 mi south of Calcutta. The Ganges basin includes the Brahmaputra River and all of its tributaries.

*Glyphis gangeticus* apparently is the commonest large ground shark presently found in the Bay of Bengal. There is no evidence of an historical decline in the range of the species or in its population numbers. It is not critically endangered or even threatened. It should be referred to as “a common groundshark in the Bay of Bengal” rather than as “the endangered freshwater shark of the Ganges.” Like other large sharks living in the shallow

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muddy waters of the Bay of Bengal, including the tiger shark *Galeocerdo cuvieri*, *G. gangeticus* apparently feeds to a large extent on sting-rays (Dasyatidae). Reports of its being a man-eater, mostly from the older literature, evidently are based on confusion with species such as the tiger shark.

The so-called "Gangetic shark" has had a minor historical role. It is at least partly responsible for the use of the adjective "Gangetic" in the English language. The 1913 edition of Websters Dictionary cites "Gangetic shark" as an example of the use of the word. One of the earliest reforms passed by the British government of India was to forbid the sacrifice of children to sharks in the mouth of the Hooghly River (the Hooghly flows through Calcutta). This act occurred during the administration of Lord Richard Wellesley, Governor-General of Bengal from 1798 to 1805 (MOREHOUSE, 1994: 73). As to the habit of sharks feeding on humans in the Hooghly downstream from Calcutta and in the Bay of Bengal, it would be surprising if this did not commonly occur even now. In 1864, the Sanitary Commissioner of Bengal, Mr. Strachey, reported that more than 5,000 corpses were thrown into the Hooghly at Calcutta every year, 1,500 of them from the General Hospital (*op cit.*: 268). Human remains, together with those of dogs and cattle, presumably still form an important part of the food chain of sharks and other fishes in the Bay of Bengal. Shark attacks do occur in the coastal waters of India, as documented in the Shark Attack Files maintained at the Smithsonian Institution for the U.S. Office of Naval Research. These files, however, do not provide any documentation for shark attacks in the fresh waters of the Ganges. Sharks do not feed on the partially burned corpses that are thrown into the Ganges at Benares because there are no sharks there. These human remains probably are fed upon by catfishes, especially of the genus *Rita*.

The famous but poorly known shark *Glyphis gangeticus* has been misrepresented repeatedly beginning with its original description in 1839, when its type locality was incorrectly reported and it was misleadingly named. The myths about this species include:

1. That it is an endemic species restricted to fresh water in the Ganges.
2. That it is a threatened, endangered, or possibly extinct species.
3. That it is a man-eater.

This paper should clear up much of the confusion and misunderstanding about one of the world's most enigmatic sharks. The deposit of freshly collected material of *Glyphis gangeticus* in museum collections (Musée National d'Histoire Naturelle, Paris; Australian Museum, Sydney) makes them available for comparison with unnamed or unidentified species of *Glyphis* from Australia and New Guinea (LAST & STEVENS, 1994: 259–260; COMPAGNO & COOK, 1995: 70) and from Borneo (FOWLER, 1997; FOWLER *ET AL.*, 1999: 264–266, fig. 3).

**Museum acronyms.**—The following abbreviations or acronyms for museums in which specimens of *Glyphis gangeticus* are deposited appear in this paper:

- BMNH, The Natural History Museum, London;
- MNHN, Musée National d'Histoire Naturelle, Paris;
- SAM, South African Museum, Johannesburg;
- ZMB, Zoological Museum, Berlin;
- ZSI, Zoological Survey of India, Indian Museum, Calcutta

REDISCOVERY OF *GLYPHIS GANGETICUS*

Some years ago, giving credence to reports that *Glyphis gangeticus* was a rare and possibly endangered shark species restricted to fresh water in the Ganges basin, I decided to look for it in the field. This quest was combined with searches for freshwater stingrays and collection of freshwater fish species generally.

My first serious effort to find fresh specimens of *Glyphis* was made at Patna and Varanasi (Benares) on the Ganges River in India in April and May, 1996. Visits to local fish markets produced no reports of sharks. Experienced members of the fishing village of Patna (on the bank of the Ganges next to the bridge) were questioned on several occasions about the presence of sharks and stingrays in the parts of the Ganges in which they habitually fished. They were divided as to the presence of stingrays but unanimously agreed that there were no sharks. All of the fishermen were familiar with sharks and rays from having seen them in Calcutta or in television programs.

I have not done any fieldwork in the Brahmaputra portion of the Ganges basin. So far as I have been able to determine there are no records of any elasmobranchs from the Brahmaputra or any of its freshwater, non-tidal tributaries. Dasyatidae or whiptailed stingrays might be expected to occur there. It is not inconceivable that sharks are present in the Brahmaputra, but, as in the case of the Ganges River, there do not seem to be any reliable records.

In Bangladesh, in May–June of 1996, I asked about the presence of sharks and stingrays in the fresh waters of the Ganges basin in the vicinity of Mimesingh. Fishermen and fisheries biologists were familiar with freshwater stingrays but not with freshwater sharks. Dr. Ataur Rahman, formerly Director-General of Fisheries, and other fisheries officers in Dacca, insisted that there were no shark species in the fresh waters of Bangladesh. Following their suggestions, I decided to continue my search for living *G. gangeticus* at the coastal cities of Chittagong and Cox Bazar. On 1 June 1996, with Manmatha N. Sarkar of the Department of Fisheries office in Cox Bazar, I observed a freshly caught adult female *G. gangeticus*. The fish, about 2.8 m total length, had already been finned (Fig. 3). The jaws were purchased and cleaned, but rainy weather for the next five days prevented them from drying properly and they rotted. The jaws were thrown away, but most of the teeth were saved (now CAS 216840). The fishermen who landed this fish said that they obtained it from another boat and therefore did not know exactly where it had been caught, but that it was definitely caught in the sea. They indicated that this would probably be the last shark brought in that year, because the fishing season for sharks had ended due to increasingly rough weather and dangerous seas. On June 6, 1996, again accompanied by M. Sarkar, I purchased a dry set of small *G. gangeticus* jaws from a tourist shop on the beach near Cox's Bazar (now CAS 216839).

During a visit to the Naturhistorisches Museum Wien in September 1997 I examined the holotype of *Carcharhinus siamensis*, described from the mouth of the Rangoon River. The specimen had been missing but was located by curators Ernst Mikschi and Helmut Wellendorf. There was no label with it. Presumably the bottle originally had a hand-written label attached to the outside by glue and this label had been eaten by cockroaches. The specimen was identified by us as *G. gangeticus* by comparing it with the original description. It had the same total length, 63 cm, and agreed closely with nearly all other measurements and statements about the holotype. (In one or two instances where the specimen did not

agree with the original account, it seemed that there was a mistake in the account; see Appendix 2.

I then started to search for *G. gangeticus* in Myanmar, first in Yangon and Mergui, and then in Sittway (Rakhine district on the Bay of Bengal). Results were negative in Mergui and Yangon except for one set of *G. gangeticus* jaws in a shop in Yangon but no information as to place of capture. In Sittway, however, where there is a strong local community of Muslim shark fishermen, *G. gangeticus* is caught far more often by local fishermen than any other shark species. In addition to observing several freshly caught fish in the Sittway market and other markets in Rakhine, I examined a large number of dried jaws of *G. gangeticus* caught by Sittway shark fishermen.

During March–May 2004 I observed 8 freshly caught whole specimens in Sittway and other markets in Rakhine (formerly Achab) district on the Bay of Bengal coast of Myanmar. The largest of these, a male about 2.8 m long, was seen in the Sittway market. Its jaws and claspers were obtained. Three other specimens from Sittway market, all under 1 m, were females (Fig. 7). One of these is now deposited in the Australian Museum and another in the Musée National d'Histoire Naturelle. The third one rotted and was thrown away. In addition I examined over 200 dried jaws of *G. gangeticus* reportedly caught in March and the first half of April 2004 by Muslim shark fishermen of Sittway (most of them living in Setyone Su Quarter of Sittway). According to the fishermen some of the jaws were from sharks caught near Sittway, but most of them came from Indian waters up to three days sailing-time distant. It was not possible to obtain information more precise than this about the source of any of the dried jaws. Nine sets of dried jaws were obtained. These specimens are reported upon below.

In contrast to the dried jaws of more than two hundred *G. gangeticus*, a total of less than 50 dried jaws was found belonging to all other shark species. These represented at most four or five species, including *Galeocerdo cuvieri*. There were no jaws of *G. glyphis*.

### *Glyphis* Agassiz 1843

*Glyphis* AGASSIZ, 1843: 243 (type species by absolute tautonymy *Caracharias* (*Prionodon*) *glyphis* MÜLLER & HENLE 1839; COMPAGNO, 1988: 328)

### *Glyphis gangeticus* (Müller and Henle 1839)

Figures 1–9

*Carcharias* (*Prionodon*) *gangeticus* MÜLLER & HENLE, 1839: 39, pl. 13 (type locality given as “Im Ganges, 60 Stunden oberhalb des Meers bei Hougly”)

?*Carcharias murrayi* GUNTHER, 1883: 137, fig. (type locality “Kurrachee, India” = Karachi, Pakistan; holotype lost; GARRICK, 1982: 188; COMPAGNO, 1988: 332)

*Carcharias* (*Prionodon*) *siamensis* STEINDACHNER, 1896: 229 (type locality “Mundung des Rangoon-flüss”) new synonymy

*Glyphis siamensis* (Steindachner 1896) GARRICK, 1982: 188; COMPAGNO, 1999: 483

**Type material examined.**—ZMB 4474, holotype of *G. gangeticus*, 184 cm male, skin (claspers intact but jaws now missing), see discussion of type locality below; MNHN 1141,

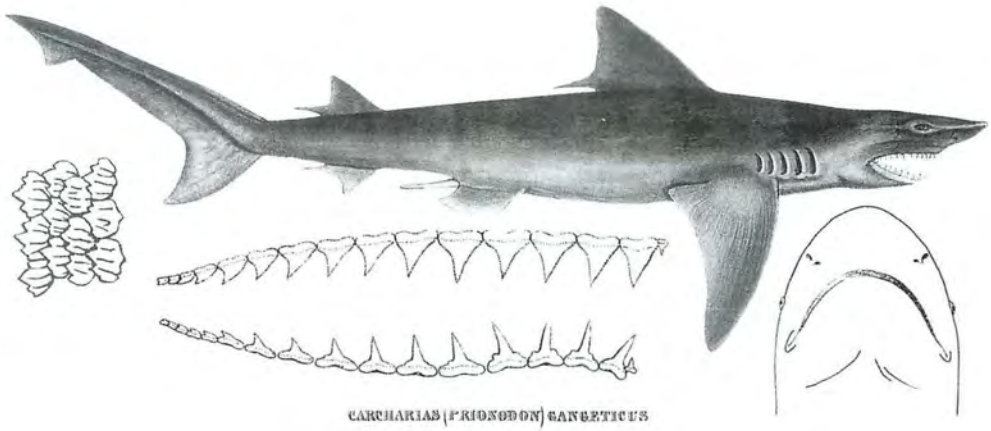


Figure 1. *Glyphis gangeticus*. Original illustration from MÜLLER & HENLE, 1839.



Figure 2. *Glyphis gangeticus*. Syntype, ZMB 4471, "Im Ganges, 60 stunden oberhalb des meers bei Hougly" [sic], collected by A. Lamare-Picquot. a, dried skin held by curator Hans-Joachim Paepke; b, close-up of claspers.

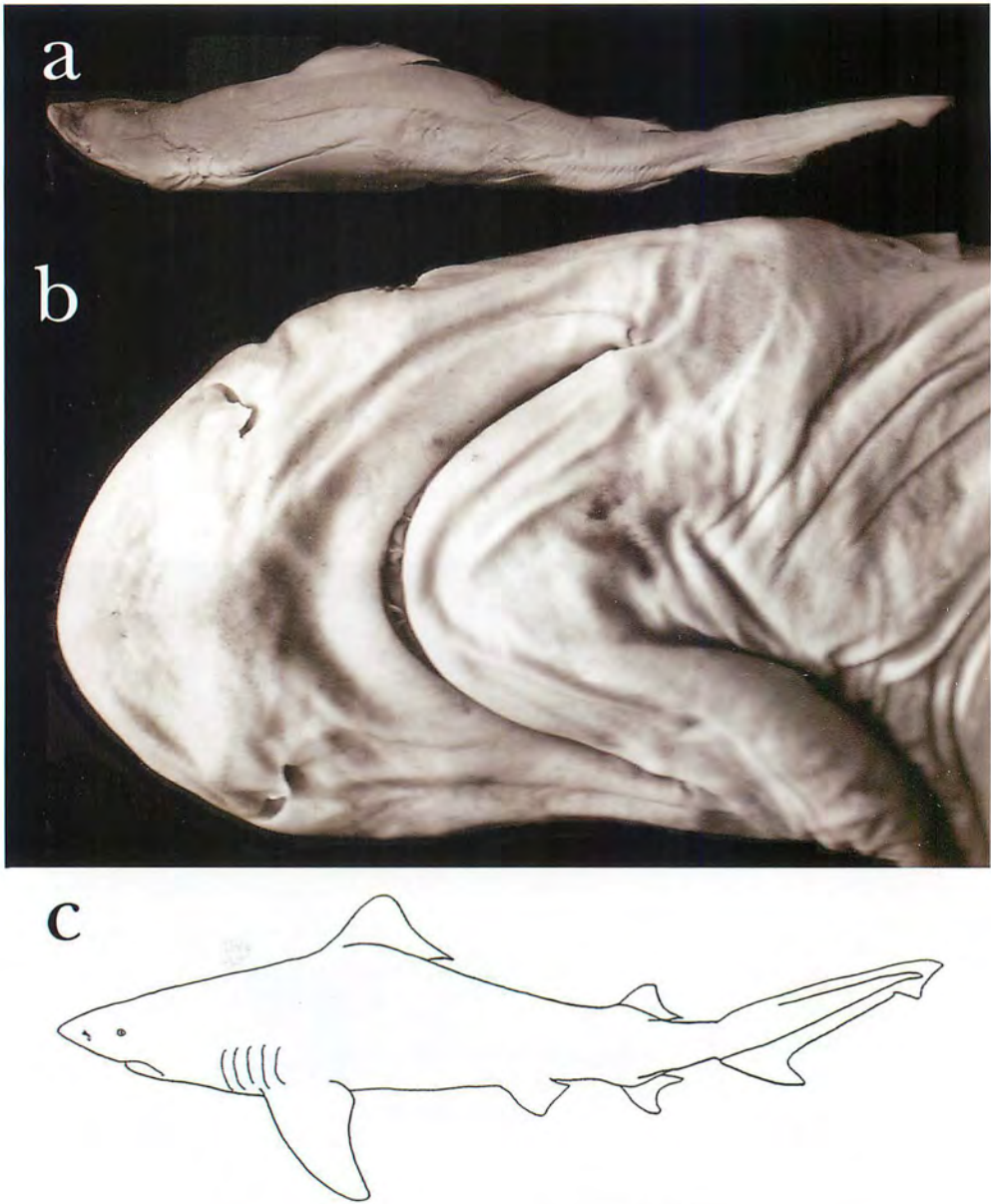


Figure 3. *Carcharhinus siamensis* steindacher 1896, 630-mm holotype from mouth of Rangoon River (NHW 61379). a–b, photographs by Helmut Wellendorf; c, drawing by author. This nominal species is identified here as a junior synonym of *G. gangeticus*.



Figure 4. *Glyphis gangeticus*, ca 2.8 m total length, landed at Cox Bazar, Bangladesh, 1 June 1996. This was the last shark of the fishing season. On the day it was caught the winds changed making it too dangerous for the fisherman to continue fishing. The shark already was finned when found by M. N. Sarkar who is holding it (see Figs. 5–6).

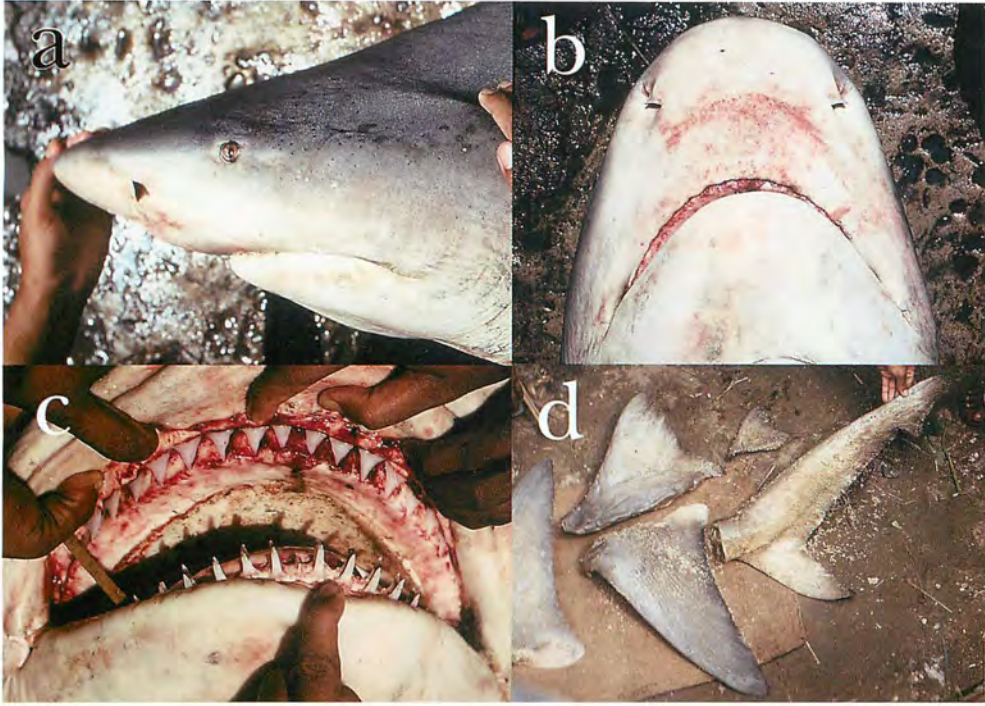


Figure 5. *Glyphis gangeticus*, Cox Bazar (see Fig. 4).



Figure 6. *Glyphis gangeticus*, Cox Bazar jaws and teeth (see Figs. 4–5).



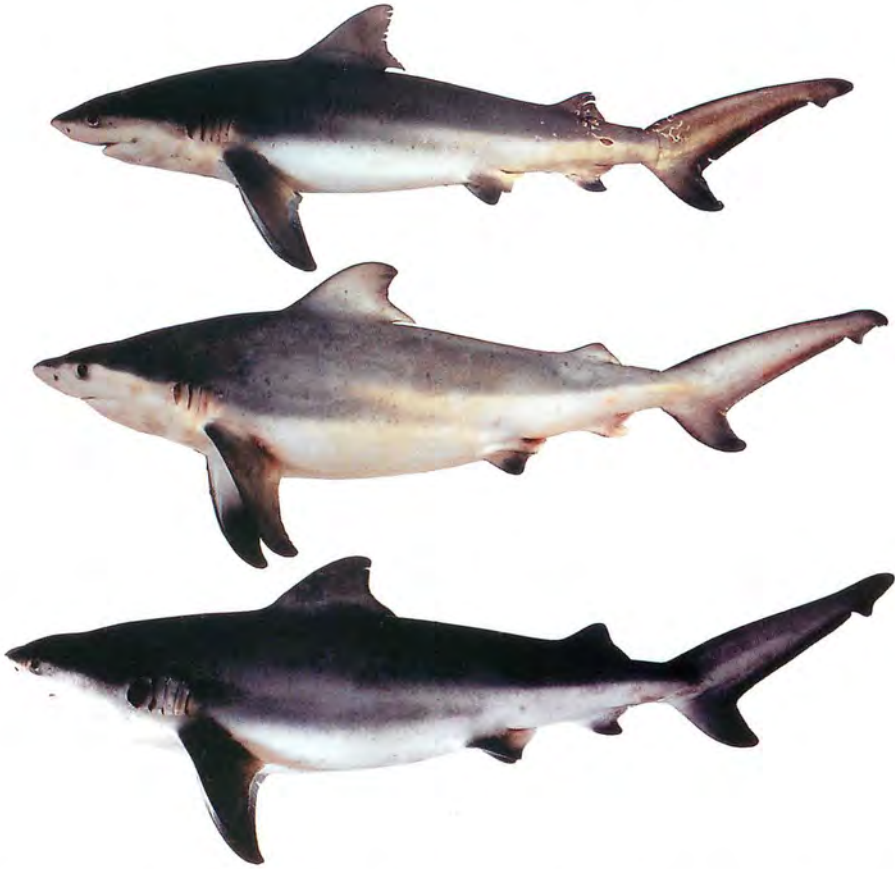


Figure 7. *Glyphis gangeticus*. Three fresh caught specimens obtained from Sittway market. They reportedly were caught in marine waters of the Bay of Bengal.

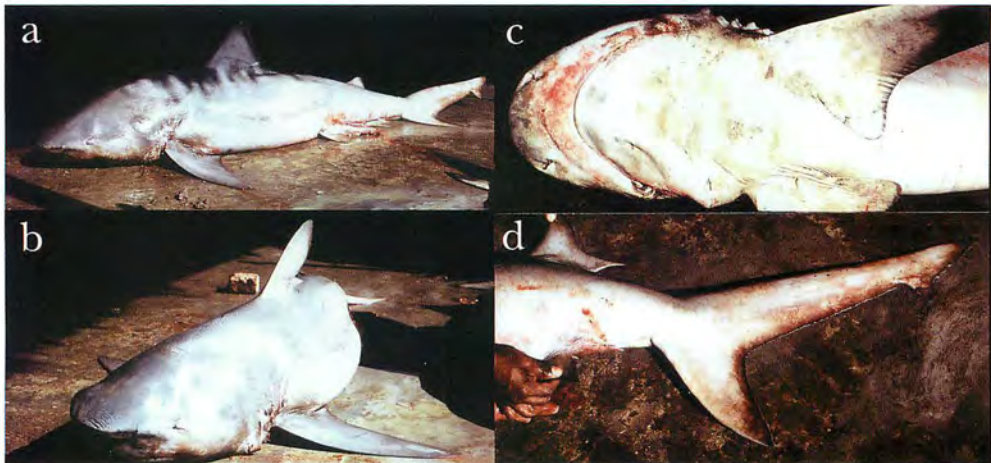


Figure 8. *Glyphis gangeticus* at Sittway market (see Fig. 9).

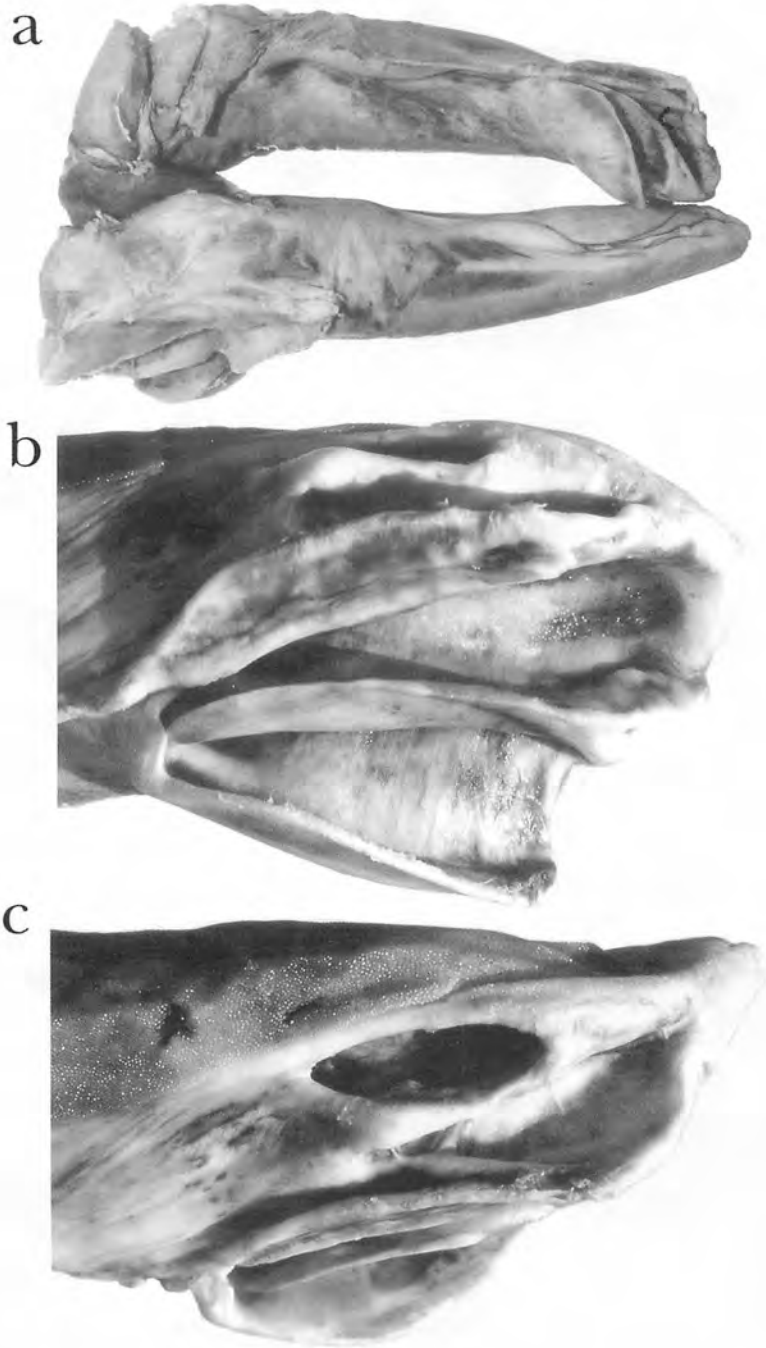


Figure 9. *Glyphis gangeticus*, Sittway market (see Fig. 8), claspers. a, both claspers, dorsal view, b–c, distal end of right clasper (b, dorsal view; c, lateral view) (compare with Fig. 2c).

paratype of *G. gangeticus*, Bengale, Belanger (see DUMERIL, 1865: 354); NHW 61379, holotype of *Carcharias (Prionodon) siamensis*, immature male, 630 mm total length, "Mundung des Rangoon-flüss", 1895 or 1896 (found without name or locality data in NHW fish collection in September 1997).

**Non-type material examined.**—**Whole specimens:** ZSI 8067, 610 mm, female, ZSI (Calcutta) F. 8067, 610 mm, newborn female, Hooghly River, J. Anderson, 4 April 1867 (this specimen was first identified as *G. gangeticus* by COMPAGNO, 1984: 508); CAS 216841, 715 mm TL, Bangladesh, Bay of Bengal, ca 1990, Department of Fisheries, Bangladesh (gift to Tyson R. Roberts arranged by A. Aatur Rahman) (although there was no precise collection data, fisheries staff insisted that this specimen came from a marine locality; they also insisted that no sharks occur in fresh water in Bangladesh); AMS I.43504-001, 863 mm female, Myanmar, Sittway market, May 2004, Tyson R. Roberts; MNHN, 798 mm female, Myanmar, Sittway market, May 2004, Tyson R. Roberts; **jaws or teeth, claspers:** CAS 216839, Bangladesh, Cox's Bazar, tourist shop on the beach, 6 June 1996, Tyson R. Roberts (jaws 230 mm wide; upper tooth rows 15-2-15, lower tooth rows 16-1-16); CAS 216840, teeth only from female ca 2.8 m female, Bangladesh, Cox's Bazar, market, 1 June 1996, Tyson R. Roberts and M. N. Sarkar (according to the fishermen this fish was caught in the open sea not far from shore); uncat., set of jaws and claspers of 415 mm wide from 236 cm mature male, Sittway market, 22 March 2004, Tyson R. Roberts; uncat., 8 sets of jaws, 115–369 mm wide, Myanmar, Setyone Su Quarter, Sittway, April 2004, Tyson R. Roberts.

**Original descriptions of *G. gangeticus* and *C. siamensis*.**—The journals in which the original descriptions of *G. gangeticus* and *C. siamensis* occur are seldom found outside the older institutional libraries in Europe and North America. They apparently are not present in any institutional libraries in South Asia or Southeast Asia. The descriptions are reproduced as Appendices 1 and 2.

**Type locality of *Glyphis gangeticus*.**—A literal translation of the purported type locality of *Glyphis gangeticus* would be "In the Ganges, 60 leagues above the sea by the Hooghly." "Stunden," the usual meaning of which is "hours", is interpreted as "leagues." A league is based upon the distance traveled in an hour, either by foot or conveyance. The distance involved would depend on whether the travel was by land or by water. It varied greatly in different countries. While 3 miles is sometimes given as an average or typical distance of a league, Oxford English Dictionary, second edition, 1989, quotes a mid-seventeenth century source ("Blundevil, 1595; 1636") as follows: "The French league containeth two of our miles, the Spanish league three, and the common league of Germany four, and the great league of Germany five of our miles."

Taking the locality description provided by MÜLLER & HENLE 1839 as literally true, and using the German equivalents of league of 4 or 5 miles, would place the type locality of *G. gangeticus* 240–300 mi upriver from the mouth of the Hooghly, and actually in the Ganges mainstream, properly speaking. Such a locality, however, is demonstrably erroneous. The original locality data, in French, was incorrectly translated into German, and the value of the league it referred to was probably only 2 miles. The evidence for this will now be presented.

### August Lamare-Picquot and the Original Collection of “the Ganges shark”

The type locality and other collection data of the holotype and single paratype of *G. gangeticus* has been a source of confusion about this species ever since it was reported, erroneously on several points, as “im Ganges, 60 Stunden oberhalb des Meers bei Houghly gefangen. Ein Exemplar trocken in Zoologischen Museum in Berlin, durch Lamare Picquot, ein Exemplar in Paris (in Weingeist).”

Taken literally, the statement just quoted indicates that both type specimens were collected in the Ganges River. Only the dry skin of the large syntype was collected by Lamare-Picquot, and he did not collect it in the Ganges River, nor did he record locality information in German.

Lamare-Picquot published a hitherto overlooked account of the trip on which he evidently collected *Glyphis gangeticus* (Lamare-Picquot, 1835). An original copy of this rare document is in the Bibliotheque Centrale of the MNHN. Before citing relevant parts of it, a brief account of the life, travels, and collections of Lamare-Picquot is in order.

August Lamare-Picquot (also spelled Lamarre-Picquot), was born at Bayeux, France, in August, 1785 and died there in 1873. For many years he was a Voyageur-Naturaliste of the Musée d’Histoire Naturelle in Paris. He was a pharmacist in Mauritius in 1815. His travels took him to l’isle Bourbon, Madagascar, and India. Upon returning to Paris in 1830 he arranged the sale of his extensive zoological collections, ethnographic objects, and antiquities. Much of his zoological collections including fish except elasmobranchs apparently were given or sold directly to the Musée d’Histoire Naturelle, but his ethnographic and some zoological collections including all of his sharks (along with the eventual holotype of *Glyphis glyphis* and syntype of *G. gangeticus*) were auctioned and wound up mostly in the Berlin Museum. His sharks specimens, obtained from many Indian Ocean localities, apparently were all reported upon by MÜLLER & HENLE, 1839. Two accounts of his travels and collections were published prior to the collections being auctioned, in *Le Moniteur Universel* (Paris) for 5 mai 1831, pp. 923–924 and for 1 juin 1831, p. 1056.

An account of his third trip to the Sundarbans, on which he almost certainly collected the holotype of *G. gangeticus* and perhaps also that of *G. glyphis*, was privately published by Lamare-Picquot in 1835. This description of his trip apparently was added as an afterthought or postscript to an article in which he defended his [probably erroneous] views on cobra venom against the criticism of Constant Dumeril. The following extracts, translated from French, provide a detailed idea of the conditions under which *G. gangeticus* was first collected. Imperfect though the information is on the precise locality, it provides a clear indication that the holotype of *G. gangeticus* was collected not in the Ganges or in the Hooghly, but rather in the lower Sundarbans or estuarine mangrove of the Ganges south of and probably not far from Kulna. It seems certain that the syntype of *G. gangeticus* was collected on this trip. Most likely it was obtained at the big [unidentified] island where Lamare-Picquot and his men collected and prepared large specimens of rhinos, tigers, crocodiles, and many other things. The possibility that it was obtained somewhere else en route to Kulna or even in Kulna itself cannot be excluded but it was definitely not collected in the Hooghly or in the Ganges above Calcutta.

When I undertook a third voyage in the southernmost part of the Sundarbans (“Sunderbunds ou Sundries”), my purpose was to increase my zoological collections with some of the animals populating the vast solitudes of this country... After starting preparations at

Chandranagore (“Chandernagore”), where I resided, and making final arrangements in Calcutta, I left there on 2 November 1828. Two large boats, each with five sailors, carried the provisions with everything necessary, together with nine Portuguese Indian, and Muslim hunters and preparators, and two domestic servants. Leaving Calcutta, I headed for the *Keedreepoor* Canal (“canal de *Keedreepoor*”, his italics), which serves for communication between the eastern branches [i.e., deltaic distributaries] of the Ganges and the Hooghly. After five days of navigation I had penetrated into the islands I wished to explore...

Returning from a short hunting trip I noted that my hunters, Indians and Portuguese born in Bengal, were discouraged. The cause was that they were traveling in places with enormous tigers, buffalo, and crocodiles, and that they also feared thieves who hid in the area after having robbed travelers going and coming from Dacca to Calcutta.

After four nights in the wild forests, by the preparations for hunting that I made, the men were discouraged by the frightful groaning of the hosts of wild animals in the forest. In vain I tried to restore their morale when their courage was needed. For the moment, I had to abandon the project of hunting in these quarters, and to go up one of the main channels of the Ganges, *towards the north, to reach Kulna* [my italics], the great bazaar located between Calcutta and Dacca. There I hoped to find men accustomed to dangerous hunts. After having set down my conditions and engaging six determined men, all armed by English rifles and poisoned arrows, I loaded them onto a third boat, and directed myself, with my small flotilla, towards the waterways I had left five days before... I soon had word of rhinoceros in the vicinity and made preparations to shoot them, at an island where tigers were very common, *some sixty leagues distant from Calcutta* (“*éloignée plus de soixante lieus de Calcutta*”)... (p. 57).

The hunt, which lasted for 49 days of hunting, danger, and fatigue, and all sorts of preparation and conservation of zoological specimens (“*mes animaux*”), resulted in two hornless rhinoceros [regarded by Lamare-Picquot as a new species]; a Royal Bengal tiger; three *Axis* (cerf moucheté); five crocodiles belonging to two species; four tiger-cats of two species; two boar; six monkeys of two species; ten monitors (Tupibnambis, *Varanus vittatus*); two species [*sic*]; several other species of lizards, snakes, turtles, diverse mollusks; and one hundred and thirty-three birds...(p. 64).

There is no specific mention of fish or sharks but this is the only place in the entire narrative where a locality is mentioned in terms of leagues or lieu, and this is the one that says “*éloignée plus de soixante lieus de Calcutta.*” Presumably it is this information that accompanied Lamare-Picquot’s specimen of *G. gangeticus* to Berlin, and that Müller and Henle subsequently misinterpreted. Using the French value for the league of two miles would place Lamare-Picquot’s locality just south of Kulna and only about 50 mi inland from the Bay of Bengal. All of the rivers and creeks there are strongly tidal. The account of Lamare-Picquot’s collecting trip, privately published in Paris, probably was unknown to them. The small syntype of *G. gangeticus*, associated perhaps unintentionally with the name of “Lamare Picquot” by Müller and Henle, was not collected in the same locality as the holotype. It supposedly was collected some years later by Belanger (DUMERIL, 1865: 354). Belanger traveled extensively in Bengal. Most of his fish specimens are marine.

A specimen of *G. gangeticus* should be in the Senckenberg Museum in Frankfurt (RUEPPELL, 1852: 37; DUMERIL, 1865: 354) but it is at least temporarily misplaced (Friedhelm Krupp, pers. commun., 3 Jan 2005). It was probably collected by McClelland around 1840. Edward Blyth (1860) reported seeing numerous *G. gangeticus* 7 feet long in Calcutta fish markets; apparently he did not preserve any specimens. (BLYTH, 1860).

### *Glyphis gangeticus* in Sittway and Rakhine

I worked in Sittway and the Rakhine District of Myanmar on the Bay of Bengal coast of Myanmar from 20 March through 3 May 2004, or a total of 45 days. Visits to fish markets in Sittway and other localities, during the peak fish marketing hours (usually 7–9 a.m.) were made on 30 days (the other 15 days were devoted to fieldwork in freshwater areas where the collecting methods and other opportunities to capture or observe sharks were nil). A total of eight freshly caught *G. gangeticus* were observed at three of the five markets visited on six of the 23 market days.

These observations may be summarized as follows:

Market place	Sittway	Kyaukdaw	Mrauk-U	Myebon	Kantaungyi
Days visited	23	1	4	1	1
<i>G. gangeticus</i>	5	0	0	2	1

*Glyphis gangeticus* were observed in Sittway market on 22 March, 22 April (2), 1 May, and 3 May; in Myebon on 23 April (2); and in Kandaungyi on 26 April. Fish sold in Sittway may be caught in local marine and estuarine waters but also from Bangladesh and Indian national waters as far as three or four sailing days distant from Sittway. All fresh fish I observed in Sittway market are from marine or strongly estuarine areas. All fishermen questioned in this regard insisted that all sharks marketed in Sittway are caught in marine habitats and not in fresh water. Sharks reportedly are rarely caught in large tidal rivers such as the Kaladan as far upstream as Kyaukdaw. At this point the Kaladan it still very broad and strongly tidal. According to local people sharks do not occur in the Kaladan at Paletwa (near the limit of tidal influence) or farther upstream. Sharks are occasionally seen in Mrauk-U market but I did not see *G. gangeticus* or any other sharks on the days I visited. This important market, with many visitors and buyers from distant places, attracts fish from as far as Sittway which it is connected to by rapid boat transport. Myebon and Kantaungyi are of more interest because the *G. gangeticus* seen in these much more isolated and distant markets were in very fresh condition and the sellers insisted that they had been caught in near-by marine waters.

**Tooth counts of *G. gangeticus* jaws obtained at Sittway.**—The following tooth counts were obtained from the series of nine dried jaws obtained by the author at Sittway market and Setyone village in March–April 2004 (greatest width of dried jaws, numbers of teeth in upper jaw left side/right side/lower jaw left side/right side):

- 1) 118 mm, 15/1/15//16/1/16 (donated to BMNH)
- 2) 227 mm, 16/1/17//16/1/15
- 3) 242 mm, 15/0/15//15/0/15
- 4) 325 mm, 14/0/14//13/1/15
- 5) 335 mm, 15/0/15//16?/1/16
- 6) 360 mm, 15/0/14//16/1/15
- 7) 345 mm, 15/1/14//16/1/16
- 8) 369 mm, 14/0/15//15/1/16 (donated to SAM)
- 9) 415 mm, 14/1/14//15/1/15 (from 236 cm mature male obtained at Sittway market, 22 March 2004).

## ACKNOWLEDGMENTS

Monette Veran kindly hand-carried one specimen of *G. gangeticus* from Bangkok to Paris, and Sarah Fowler two sets of the jaws (one for BMNH and one for SAM) from Bangkok to London. The author's recent fieldwork in Myanmar has been funded by grants from the Smithsonian Tropical Research Institute and from Chester Zoological Gardens and the North of England Zoological Society. This paper was written in the Center for Conservation Biology at Mahidol University, Salaya campus, Thailand, and in the Raffles Museum for Biodiversity Research at the National University of Singapore. Permission to collect and export specimens for scientific study was facilitated by the Myanmar Department of Fisheries, particularly Deputy Director U Hla Win.

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**Appendix 1.** The original description of *Glyphis gangeticus* (Müller & Henle 1839):

Schnautze sehr kurz und stumpf. Naslöcher mitten zwischen Maul und Schnautzenspitz. Maul wenig konvex. Augenspalten sehr klein.

Zähne im oberkiefer gleichschenklisch, gerade, beide Ränder etwas nach innen konvex, der aussere Rand stärkere, an den hinteren Zähnen einem Absatz bildend, auf beiden Seiten gleich gezähnelte, die vorderen wenig länger, als sie an der Grenze des Schmelzes breit sind. Die Zähne des unterkiefers gerade, schmal, deutlich gezähnelte ist. Im Ober- und Unterkiefer ein kleiner Mittelzahn, halb so lang als die nächsten, konisch, ungezähnelte, nicht schneidend. Zahl der Zähne 31/31.

Die erste Rückenflosse fängt an, gerade wo die Basis der Brustflosse aufhört, ihre Basis ist grösser als die Distanz zwischen der ersten Rückenflosse und gleicht dem Abstand der zweiten Rücken- von der Schwanzflosse. Die After flosse ist von derselben Gestalt und Grösse, wie die Rückenflosse; sie ist um die doppelte Länge der Insertion der Bauchflossen von den Bauchflossen entfernt; die Distanz zwischen Bauch- und Afterflosse is nicht ganze zwei Mal so gross, als die Distanz zwischen After- und Schwanzflosse. Die zweite Rückenflosse steht gerade über der Afterflosse. Die Winkel sämtlicher vertikalen Flossen sind spitz, die hintern Winkel etwas in eine Spitze verlängert, die Ränder tief ausgeschnitten. Brustflossen sehr lang,  $1\frac{1}{2}$  mal so lang als breit, beide Winkel spitz, der äussere Rand ausgeschnitten.

Farbe oben und unten graubrun, unten heller.

Schuppen dreieckig.

Länge  $5\frac{1}{2}$  Fuss. Körper zum Schwanz wie 6:5.

Von der Schnautzenspitz bis zur Mitte der Nasloche	2"	—
Von da zum Maul	2"	—
Vom Maul zum After	29"	6"
Vom After zur Afterflosse	9"	—
Basis zur Afterflosse	3"	6"
Höhe derselben	2"	6"
Von der Afterflosse bis zur Schwanzflosse	4"	—
Länge der Schwanzflosse	17"	6"
Von der ersten Rückenflosse zur Bauchflosse	7"	—
Basis der ersten Rückenflosse	9"	—
Höhe derselben	7"	—
Basis der zweiten Rückflosse	5"	—
Höhe derselben	3"	—
Lange der Brustflossen	14"	6"
Breite derselben	8"	6"
Distanz der Naslöcher	6"	6"
Breite des Mauls	8"	—

Fundort. Im Ganges, 60 Stunden oberhalb des Meers bei Hougly gefangen.

Ein Exemplar trocken in zoologischen Museum im Berlin, durch Lamare Piquot, ein Exemplar in Paris (in Weingeist).



## Appendix 2.

The only specimen ever identified as *Carcharias (Prionodon) siamensis* Steindachner 1896 is the holotype. Given the unusual history of the holotype and the confusion surrounding the identification of this species the original description (STEINDACHNER, 1896: 229–230) may be reproduced here. My comments or measurements are given in brackets. Since the original account was not accompanied by any figures, photographs and a drawing of the holotype also are provided (Fig. 3). It is unfortunate that Steindachner chose the name “*siamensis*” for this species. The type locality, the mouth of the Rangoon River, is in Myanmar, formerly known as Burma. It was never a part of Thailand (formerly Siam).

*Caracharias (Prionodon) siamensis* n. sp.

1 Ex., mas, 63 cm [630 mm] lang.

Schnauze breit, stumpf gerundet. Die Entfernung des Schnauzenspitze von der Mitte des vorderen Mundrandes ist mehr als  $1 \frac{1}{3}$  mal in der Breite der Mundspalte zwischen den Mundwinkeln enthalten. Eine der inneren Narinen-winkel verbindende Horizontallinie liegt fast 2 mal näher zum vorderen Schnauzenende als zur Mitte des vorderen Mundesrandes. Eine tiefe, halbmond-förmige Grube nächst den Mundwinkeln. Lippenfalte vorhanden.

Kieferzähne ähnlich wie bei *Carch. pleurotaenia* Blkr., die oberen regelmässig dreieckig, gleichschenkelig, seitlich deutlich gezähnt, die unteren sehrshlank, spitz, seitlich sehr undeutlich gezähnt, auf einer breiten ungezähnten Basis sich erhebend. Kieferzähne 29/29 [I counted 15/1/15 upper and 16/1/16 lower jaw teeth for a total upper and lower tooth count of 31/33; the outermost small teeth could be overlooked easily]. Auge sehr kleine. Die Höhe der ersten kiemenspalte gleicht c. der Hölfte, die der letzten nur  $\frac{1}{3}$  einer Schnauzenlänge.

Pectorale ziemlich stark entwickelt, dreieckig, mit schwach convexem oberen und stärker concaven hinteren Rande. Der untere hintere Winkel der Pectorale ist ein rechter, der obere spitz die allgemeine Form der Flosse ist somit gedrungen sichelartig. Oberer Rande der Pectorale 3 mal länger als der untere. Die erste Dorsale liegt näher zur Basis der Pectorale als zu der der Ventrals. Die Basislänge der ersten Dorsale ist c.  $1 \frac{3}{4}$  mal in der Entfernung des vorderen Schnauzenendes von der Letzten Kiemenspalte enthalten und übertrifft bedeutend die Höhe der Flosse, welche c. einer Schnauzenlänge gleicht. Nach hinten ist die 1. Dorsale wie die 2. Und die Anale in eine Spitze ausgezogen. Der oberer Winkel der 1. Dorsale ist ein stumpfer, an der Spitze gerundet, der hintere obere Flossenrand sehr schwach concav. Die 2. Dorsale ist nicht bedeutend stärker entwickelt als die anale und beginnt ein wenig vor dieser. Der hintere Rand der 2. Dorsale ist ferner schwächer concav als der der Anale. Der Abstand der 2. Dorsale von der 1. ist  $3 \frac{1}{4}$  mal grösser als die Basislänge der 2. Dorsale. Die Länge der Caudale ist mehr als  $3 \frac{3}{5}$  in der Totallänge enthalten. Der hintere Rand der Schwanzflosse ist schräge nach unten und vorne abgestutzt, die Länge des vorderen Randes des sichelförmigen unteren Lappens c.  $2 \frac{1}{2}$  mal in der Gesamtlänge der Flosse enthalten.

Schuppen kleine, mit 3 Kielen an der Aussenfläche, von denen jeder nach hinten in eine zahnartige Spitze ausläuft.

Entfernung der Schnauzenspitze von der hintersten Kiemenspalte 14.4 [14.4] Cm., Schnauzenlänge 4.6 [4.5] Cm., Augenlänge 4.4 [5.4–5.6] Mn., Basislänge der 1. Dorsale 7.8 [7.8] Cm., Höhe derselben 5.1 [5.1] Cm., Länge der Caudale 17 Cm [167.5 mm], Länge der Pectorale 11.5 [11.3 maximum] Cm.

Oben und seitlich bleifarben, Bauchseite und nächstgelegener Theil der Rumpfseiten gelblichweiss. Caudale nächst den Winkelspitzen etwas dunkler, shwärzzlichgrau, doch ohne dunklen Fleck. Pectorale und Ventrale schmutzig gelblichweiss.