SILUROID FISHES OF INDIA, BURMA & CEYLON.

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VI.—FISHES OF THE GENUS *Clarias* GRONOVIUS.

Günther[1] recognised four species of *Clarias* from India, Burma and Ceylon, *viz.*, *C. magur*, *C. teysmanni*, *C. brachysoma* and *C. jagur*. Day,[2] however, recorded five species from this region; of these three—*C. magur*, *C. teysmanni* and *C. jagur*—are the same as those listed by Günther. Day was doubtful regarding the validity of *C. brachysoma* and remarked: "Amongst the types of *C. brachysoma*, in the British Museum, the number of anal rays vary from 53 to 60, the fish appears to be similar to *C. Teysmanni*." A specimen obtained at Wynaad in Malabar was assigned by Day to *C. dussumieri* Cuvier and Valenciennes[3] and he described a new species, *C. assamensis*, from Assam. Both these forms were distinguished from the common Indian species, *C. magur*, by the form of the band of the vomerine teeth and their nature. In *C. dussumieri* (Day *nec* Cuvier and Valenciennes) the teeth are very obtuse, almost molariform, and form a continuous band; whereas in *C. assamensis* the teeth are globular and form two pyriform patches separated by a toothless space in the middle. Later, however, Day[4] discarded *C. jagur* as a separate species remarking that "*Macropteronotus jagur* of Hamilton Buchanan, Fish. Ganges, pp. 145, 374, appears to be a monstrosity of *Clarias magur*, in which the last few vertebrae have been accidentally lost or removed, and the new caudal fin has become continuous with the dorsal fin superiorly and the anal inferiorly."

I have examined a very large collection of *Clarias*, including several of Day's original specimens. Mr. P. E. P. Deraniyagala sent me a large collection, specially made for me, from Ceylon. Through the kindness of Mr. J. R. Norman information has been obtained regarding the distinguishing features of the types of *C. teysmanni* and *C. brachysoma*, now preserved in the collection of the British Museum of Natural History, London. The characters on which species are differentiated in this genus were tabulated with reference to the material in the Indian Museum with the following interesting results:

(i) In all the specimens examined, except one from Ceylon of *C. brachysoma*, including several hundreds in fresh condition in the Calcutta Fish Markets, the caudal fin was found to be distinct from the dorsal and the anal fins. The abnormal specimen from Ceylon is figured here. It shows the incomplete tail portion with the regenerated vertical fins. This supports Day's contention regarding *C. jagur*.

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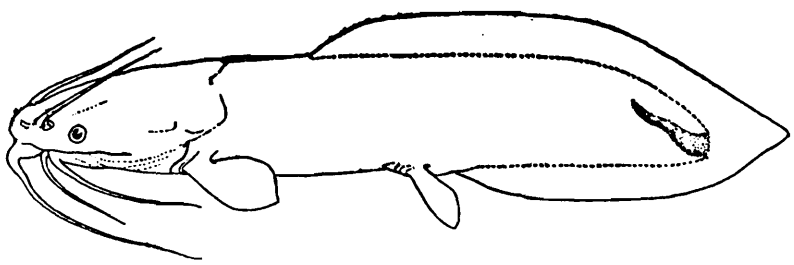
[1] Günther, *Cat. Fish. Brit. Mus.*, V, pp. 17-21 (1864).
[2] Day, *Fish. India*, pp. 484-486 (1877).
[3] Cuvier & Valenciennes, *Hist. Nat. Poiss.*, XV, p. 382 (1840).
[4] Day, *Faun. Brit. Ind. Fish.*, I, p. 115 (1889).

On referring to Hamilton's original notes on "Gangetic Fishes", it was found that *jagur* was obtained at Lakhipore in the Noakhali District.

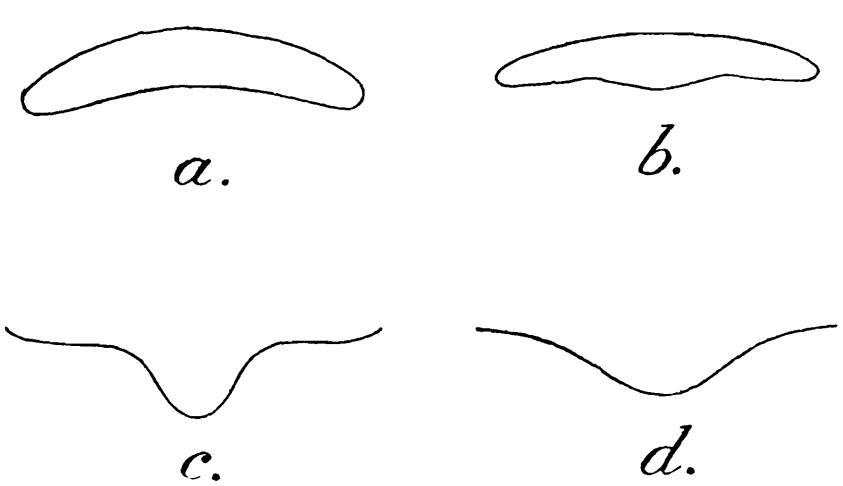


TEXT-FIG. 1.—Lateral view of an abnormal specimen of *Clarias brachysoma* Günther showing damaged tail region and regenerated vertical fins. ×⅔.

In the earliest known fish-manuscript of Buchanan[1] both the vernacular names "Magur" and "Jagur" are included under *Silurus batrachus* Linn. It would thus appear that Buchanan at first regarded the forms "Magur" and "Jagur" as pertaining to only one kind of fish, and considered this species to be the same as *Silurus batrachus* Linn. Later work has upheld the original determination of Buchanan.

It may be remarked that Bleeker (*vide* Günther, *op. cit.*, p. 19), observed an abnormal specimen of *C. melanoderma* in which the last rays of the dorsal and anal fins were united with the caudal. Deraniyagala[2] has also noted in the case of the common Ceylon species—*C. brachysoma*—that "specimens are frequently found with a regenerated caudal, which is then confluent with the dorsal and anal and lacks the hypural bones." In view of what is stated above I am definitely of the opinion that *C. jagur* is only an abnormality of *C. magur* (=*C. batrachus*).

(ii) The number of rays in the vertical fins varies considerably, and, therefore, no reliance can be placed on this character.



TEXT-FIG. 2.—Form of vomerine tooth-band and of occipital process in *Clarias teysmanni* Bleeker and *C. brachysoma* Günther. After sketches supplied by Mr. J. R. Norman. Diagrammatic.

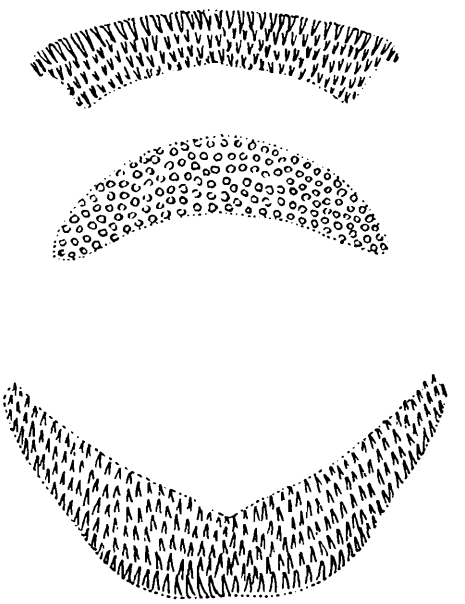
a. Vomerine tooth-band of *C. teysmanni*; *b*. Vomerine tooth-band of *C. brachysoma*; *c*. Occipital process of *C. teysmanni*; *d*. Occipital process of *C. brachysoma*.

(iii) Mr. J. R. Norman compared the specimens of *C. teysmanni* and *C. brachysoma* in the British Museum and found that the specimens from

[1] Hora, *Journ. As. Soc. Bengal* (N. S.), XXVII, 1931 p. 133 (1933).
[2] Deraniyagala, *Ceylon Journ. Sci.* (B) XVI, p. 279 (1932).

Ceylon listed by Günther under *teysmanni* are identical with the types of *brachysoma*. Further, he found that *teysmanni* from the East Indies is distinct from *brachysoma* of Ceylon. He says, " We have 7 specimens from Ceylon and 6 from the East Indies. The chief differences appear to be that *brachysoma* has a larger head[1] (4 to $4\frac{1}{3}$ in the length[2], instead of $4\frac{1}{3}$ to 5), the occipital process is broader and distinctly more obtuse,[3] the shape of the vomerine band of teeth is rather different, the frontal fontanelle is longer and narrower, and the distance between the occipital process to the dorsal fin origin is $2\frac{1}{4}$ to $2\frac{4}{5}$ in that from the former to the end of the snout instead of $1\frac{1}{2}$ to 2" I have verified these differences by comparing the specimens of *teysmanni* from Siam and Perak with a large number of specimens in the collection of the Indian Museum referred to this species from Ceylon. There are variations in detail, but the differences in the size of the head and the shape of the vomerine teeth differentiate very clearly *teysmanni* from *brachysoma*. The above observations show that there is an insular form of *Clarias* restricted to Ceylon and that *C. teysmanni* is restricted to the East Indies and the adjacent countries to the north.

(iv) *Clarias dussumieri* Cuv. and Val. from Pondicherry, and Malabar, was regarded by Günther as a *species inquirendum*. Jerdon[4] had found

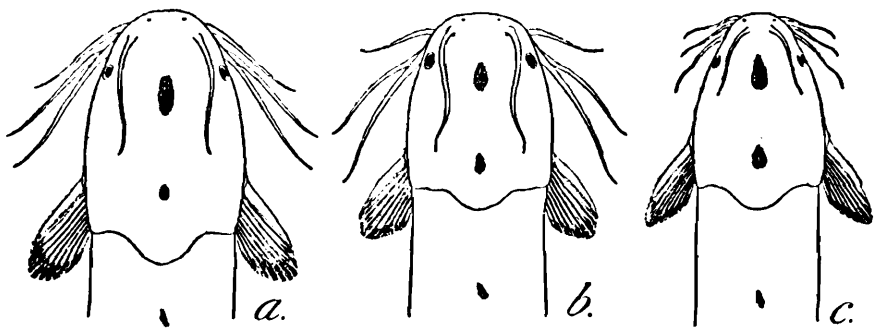


TEXT-FIG. 3.—Dentition of the type-specimen of *Clarias dayi*, sp. nov. ×4.

it fairly common in the tanks and ditches of Malabar but Day (*op. cit.*, 1877) was able to procure only one specimen (7 inches long) from Wynaad. Day also stated that " It appears to agree with Bleeker's Malay form " [*C. melanoderma* =*C. melasoma*]. The common species of Malabar is the same as that found in other parts of India and the collection before me leaves little doubt that Cuvier and Valenciennes' *C. dussumieri* is synonymous with *C. batrachus* (Linn.). Day's Wynaad

[1] Length of head is taken to the end of the occipital process.
[2] Length means length of fish without caudal.
[3] Mr. Norman found this character to be variable.
[4] Jerdon, *Madras Journ. Litt. & Sci.*, XVI, p. 342 (1849).

specimen is totally different. It not only possesses an externally serrated pectoral spine and molariform vomerine teeth, but its head is

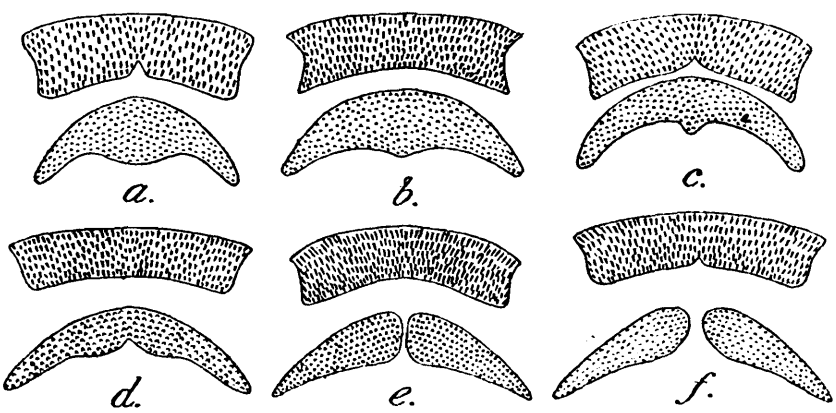


TEXT-FIG. 4.—Dorsal surface of head and anterior part of body up to commencement of dorsal in the 3 species of *Clarias* from India, Ceylon and Burma.

a. Clarias batrachus (Linn.). ×⅜; *b. Clarias brachysoma* Günther. ×⅜; *c. Clarias dayi*, sp. nov. ×½.

considerably narrower, more or less pointed, the barbels are relatively shorter and the distance between the occipital process and the dorsal fin is 2⅓ in that from the former to the end of the snout. It represents a species not hitherto described and I propose for it the name **Clarias dayi,** sp. nov. It is abundantly distinct from Bleeker's *C. melanoderma* and belongs to the group of species in which the commencement of the dorsal fin is at a considerable distance from the termination of the head, *e.g., C. brachysoma, C. teysmanni,* etc.

(v) Day's *C. assamensis* is distinguished from *C. batrachus* by the disposition and form of the vomerine teeth, which are obtuse, and are



TEXT-FIG. 5.—Upper dentition of 6 specimens of *Clarias batrachus* (Linn.) showing variations in the nature of vomerine tooth-bands.

a. Specimen from Calcutta. ×2; *b.* Specimen from Moulmein. ×2⅗; *c.* Specimen from Inlé Lake, S. Shan States, Burma. ×1⅗; *d.* Specimen from Dibrugarh, Assam. ×3; *e.* Specimen from Assam. ×2⅖; *f.* Specimen from Assam. ×3.

situated in two pyriform patches. My examination of the extensive material of *C. batrachus* has shown that the vomerine teeth are not exactly villiform but are somewhat blunt as compared with the teeth of the jaws proper. The vomerine teeth are generally arranged in a broad crescentic band which is considerably wider than the maxillary band, but sometimes the band is narrower; the latter condition is commonly seen in specimens from Upper Assam and Northern Burma. Usually the vomerine teeth form a continuous band, but in some specimens, from widely separated localities, the band is partially or completely interrupted in the middle so that in extreme cases the teeth become

arranged in two pyriform bands. In very young specimens the teeth are few and arranged in two narrow, transverse patches.

Attention may here be directed to the fact that Bleeker (*vide* Günther, *op. cit.*, p. 19) also observed two specimens of *C. melanoderma* in which the band of vomerine teeth was divided into two by a toothless space in the middle.

In view of the above observations I am convinced that Day's *C. assamensis* cannot be regarded as distinct from the very variable and widely distributed *C. batrachus*.

Silurus anguillaris Russell,[1] *Clarias marpus* Cuv. & Val.[2] and *C. punctatus* Cuv. & Val.[3] are rightly regarded as synonyms of *C. batrachus*, of which *Macropteronotus magur* Ham.[4] is also a synonym.

In view of what is stated above, only three species of *Clarias* can be recognised from India, Burma and Ceylon. These may be distinguished by the following key :

A. Distance between tip of snout and end of occipital process *more than* 4 times the distance between dorsal fin and occipital process	*C. batrachus* (Linn.).
B. Distance between tip of snout and end of occipital process *less than* 3 times the distance between dorsal fin and occipital process	
a. Snout broad, pectoral spine *roughened* externally, nasal barbel longer than half length of head to end of occipital process	*C. brachysoma* Gthr.
b. Snout pointed, pectoral spine *serrated* externally, nasal barbel shorter than half length of head to end of occipital process	*C. dayi*, sp. nov.

Clarias dayi is known from the Wynaad hills, *C. brachysoma* from Ceylon and *C. batrachus* from India, Ceylon, Burma, the Malay Archipelago and beyond.

VII.—FISHES OF THE GENUS *SILURUS* LINNAEUS.

Earlier ichthyologists gave a very wide interpretation to the genus *Silurus*, but Bleeker[5] restricted it for forms like *Silurus glanis* Linn., and separated the other species assigned to it into a number of distinct genera.

Bleeker included *Silurus* in the subfamily Siluriformes and defined it as follows :

" Dentes maxillis palatoque. Cirri 6, supramaxillares 2, inframaxillares 4. Dentes maxillis pluriseriati. Caput depressum. Dentes vomero-palatini in vittam bipartitam dispositi. Oculi inferne liberi. Nares posteriores valvula claudendae, anterioros brevi-tubulatae. Pinna analis cum caudali unita. B. 15 vel 16. V. 1/10 vel 1/11. D. 4. P. 1/16."

At the same time he proposed the genus *Parasilurus* for *Silurus japonicus* Schl. (=*S. asotus* Linn.) and separated it from *Silurus* on the following characters : (i) One pair of mandibular barbels instead of two,

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[1] Russell, *Fish. Vizag.*, II, p. 53 (1801).
[2] Cuvier & Valenciennes, *Hist. Nat. Poiss.*, XV, p. 378 (1840).
[3] Cuvier & Valenciennes, *Hist. Nat. Poiss.*, XV, p. 384 (1840).
[4] Hamilton, *Fish. Ganges*, pp. 146, 374 (1822).
[5] Bleeker, *Versl. Akad. Amsterdam.*, XIV, p. 393 (1862); *Ned. Tijdschr. Dierk.*, I, p. 114 (1863).

(ii) Eyes free instead of subcutaneous and (iii) Vomerine teeth in a continuous transverse patch instead of being interrupted. Both Günther[1] and Day[2] did not consider these differences of generic value.

I have examined specimens of the type species of both the genera and, with the exception of the number of mandibular barbels (4 in *Silurus* and 2 in *Parasilurus*), have not found any difference of generic value between them. In the case of *S. asotus*, Günther (*loc. cit.*) found that " Some of the specimens show a distinct interruption in the middle of the band of vomerine teeth, whilst in others the bands are confluent." I have found similar variations of vomerine teeth in the case of the common Indian *Silurus*, *S. cochinchinensis*. To separate genera on the number of mandibular barbels[3] only in fishes in which this structure is presumably undergoing degeneration seems hardly justified, and I have, therefore, refrained from attaching much importance to this character in the case of Indian Silurid fishes.

Under the genus *Silurus*, Günther did not include any species from India with a sufficient degree of certainty. He observed, however, that *Silurichthys berdmorei* Blyth may probably be identical with *Silurus cochinchinensis*. In the case of *S. malabaricus*, which he included under *Silurus* with a querry, he remarked: " It is doubtful whether this species belongs to the genus *Silurus*, the short description given by Valenciennes having been taken from specimens in a bad state of preservation." In any case Günther, judging from the information published in his *Catalogue*, had no specimen of *Silurus* from Indian waters. Day[4] recorded *S. afghana* and *S. cochinchinensis* from India and described a new species from Wynaad[5]—*S. wynaadensis*. The former two species possess 2 mandibular barbels, while *wynaadensis* has 4 and is thus a typical *Silurus*.

Silurus malabaricus Valenciennes[6] is definitely known to belong to the genus *Callichrous*, while it is now possible to discuss the precise specific limits of the other species.

The differences between *S. afghana* and *S. cochinchinensis*, as indicated in Günther's descriptions, may be tabulated as follows:

S. afghana.	*S. cochinchinensis.*
1. D. 2; A. 70; P. 1/13.	D. 4; A. 62; P. 1/11.
2. Anal and caudal slightly continuous.	Anal and caudal close together, but separate.
3. Vomerine teeth in a very narrow, uninterrupted, curved band.	Vomerine teeth forming a band, which is a little interrupted in the middle.

It should be remembered that Günther had only one specimen of each species. An examination of a large series of specimens in the Indian Museum has given the following results with regard to variations in the above noted characters.

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[1] Günther, *Cat. Fish. Brit. Mus.*, V, p. 32 (1864).

[2] Day, *Fish. India*, p. 480 (1877).

[3] Recent work on the embryology of *Silurus asotus* (Atoda, *Dolutsugaku Zasshi*, XLVII, p. 228, 1935; Kimura, *Journ. Shanghai Sci. Inst.* Sec. 3, III, p. 105, 1935) has shown that in the younger stages there are 4 mandibular barbels. In the course of growth, however, one pair of these barbels is absorbed.

[4] Day, *Proc. Zool. Soc. London*, p. 523 (1869); *Fish. India*, p. 481 (1877).

[5] Day, *Proc. Zool. Soc. London*, p. 237 (1873).

[6] Cuvier & Valenciennes, *Hist. Nat. Poiss.*, XIV, p. 353 (1839).

The dorsal fin is very small and enveloped in thick skin. In well preserved specimens the full compliment of rays can be made out only with great difficulty, while in lacerated specimens, especially from Cochin-China and the Mergui Archipelago, the rays can be counted with ease. The number of rays varies from 2 to 4 and in two adult specimens from the Naga Hills the dorsal fin is totally absent.[1]

The number of rays in the anal fin varies from 50 to 78, but in the pectoral fin the number is 13, besides a strong spine.

The anal and caudal fins are united, but not broadly confluent.

The vomerine teeth may form a continuous or discontinuous band, separated by a narrow or a wide interval. The condition of these teeth is thus similar to that noted by Günther for *Silurus asotus* (*vide supra*).

The study of the material in the Indian Museum has convinced me that the two species cannot be regarded as distinct. At my request

TEXT-FIG. 6.—Upper dentition of 3 specimens of *Silurus cochinchinensis* Cuv. & Val. from Lower Burma, showing variation in the nature of maxillary and vomerine tooth-bands. ×2½.

Mr. J. R. Norman very kindly compared the type of *S. afghana* with Günther's specimen of *S. cochinchinensis*. He confirms my views and states "I have carefully compared the type of *S. afghana* with the specimen identified by Günther as *S. cochinchinensis* and fully agree that, apart from the vomerine teeth, these are identical. I fully believe that the two species are synonymous, always provided that Günther's has been correctly identified" The specimens in the Indian Museum are from Lower Burma (Mergui Archipelago and Tenasserim), Upper Burma (Akyab, Myitkyina District), Naga Hills, Khasi Hills and Eastern Himalayas. It is not unlikely, therefore, that Günther's specimen from Cochin China was correctly identified. A specimen from the Myitkyina District was sent to Dr. Pellegrin for comparison with the type of *S. cochinchinensis*. He observed that in the type of *S. cochinchinensis* the vomerine bands of teeth are interrupted, and the dorsal fin equals half the length of the head, whereas in the Myitkyina specimen the vomerine teeth are in a continuous band and the dorsal fin in very rudimentary, about one-fifth the length of the head. In all other respects he found the two specimens absolutely identical. I have already shown that the vomerine teeth and the dorsal fin vary considerably in this species.

Günther based his description of *S. afghana* on a specimen 5 inches long in Mr. Griffith's collection and gave its locality as Afghanistan. From the geographical distribution of the species, as known at present, it seems highly improbable that the original specimen was collected in Afghanistan. A reference to Mr. Norman on this point brought the following reply: "I am unable to give you the precise locality of

[1] Hora, *Rec. Ind. Mus.*, XXXVIII, p. 319 (1936).

Griffith's specimen which formed the type of Günther's *Silurus afghana*. I have turned up the original register, but no details are given there. The old label on the bottle simply says 'Affghan'"

In the general list of specimens contained in Griffith's collection (*Calcutta Journ. Nat. Hist.*, II, pp. 573-575, 1842), McClelland has indicated the species of which examples were sent "to the Museum at the India House" by placing the number of specimens despatched in Roman numerals after the names. This list shows that McClelland sent specimens of three species of "Silurus", *S. indicus* McClelland (one specimen), *S. glanis* Auct. (one specimen) and *S. boalis* Buch. (three specimens). The specimen of the first species is listed by Günther (*loc. cit.*, p. 46) under *Callichrous chedra* Ham., and the specimens of the last species (p. 37) under *Wallago attu* (Bl. & Schn.). It would thus appear that the specimen doubtfully referred by McClelland to *S. glanis* served as the type of *S. afghana*. Unfortunately the precise locality of this example is not indicated by McClelland but it is well known that Griffith made extensive collections in Assam, the Punjab and Afghanistan. No specimen of *Silurus* (*sensu stricto*) has since been found in north-western India and Afghanistan, while Günther's species is fairly common in streams below Darjeeling, Assam and Burma. It seems reasonable, therefore, to presume that there may have been some mixing up of localities in the case of the type-specimen of *S. afghana*. I[1] indicated the possibility of such a mixing up in the case of two species of *Nemachilus* which were stated to have come from Assam but which in reality belong to the Afghanistan fauna. It would, therefore, not be wrong to assume that the type of *S. afghana* was probably collected in Assam and not in Afghanistan.

Day[2] regarded *S. afghana* as distinct from *S. cochinchinensis* and separated them on the number of rays in the anal fin and the nature of the vomerine dentition. For *S. afghana* he gives Afghanistan and Darjeeling as the localities, while the distribution of *S. cochinchinensis* is given as "The hill ranges above Akyab, Tenasserim from whence Major Berdmore sent a specimen to the Calcutta Museum, and Cochin China" At first he[3] referred Darjeeling specimens to *S. cochinchinensis*, then he[4] proposed a new species for them and ultimately called them *afghana*. This would indicate that Day was not quite sure about the precise specific limits of his specimens from Darjeeling. Day also observed that Jerdon presented some specimens to the British Museum "the largest of which is about 7·2 inches in length, the locality is not stated but they probably came from either the Cashmere or Assam regions." While examining Indian material of *Nemachilus* in the collection of the British Museum I[5] found a large number of specimens presented by Dr. Jerdon. These came from the Darjeeling Himalayas and Assam, and it seems likely that his specimens of *Silurus* also came from the same region.

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[1] Hora, *Journ. As. Soc. Bengal*, (N. S.) XXIV 1928, pp. 481-484 (1929).
[2] Day, *Fish. India*, p. 480 (1877).
[3] Day, *Proc. Zool. Soc. London*, p. 711 (1871).
[4] Day, *ibid.*, p. 239 (1873).
[5] Hora, *Rec. Ind. Mus.*, XXXVII, p. 66 (1935).

The type of Blyth's *Silurichthys berdmorei*[1] is now preserved in the Indian Museum (Cat. No. 481). It is in a fairly good state of preservation except that the dorsal and the caudal fins are damaged. It agrees entirely with other specimens of *Silurus cochinchinensis.*

In 1861, Peters[2] described two new genera of Indian fishes from specimens collected by Westermann in 1847. No definite locality is mentioned though they are stated to have come from the " Ganges " The generic and specific limits of his first species—*Pterocryptis gangelica*[3], a Silurid fish—are very little understood ; while his second species—*Acanthocobitis longipinnis,* a Cobitid fish—has been assigned to the genus *Nemachilus* and included in the synonomy of *N. pavonaceus* (McClelland) by Day.[4] Both Peters and Günther[5] regarded the latter species as a very close ally of the form described by McClelland. The above remarks would seem to indicate that Westermann collected his specimens somewhere in Assam or the Eastern Himalayas and this view receives further support from the fact that *Pterocryptis gangelica* is, as is explained below, a synonym of *Silurus cochinchinensis.*

In describing *Pterocryptis,* Peters only mentioned that his genus can easily be distinguished from *Cryptopterus* Bleeker[6] by its anal fin being continuous with the caudal fin. In the account of the species he mentions that the vomerine teeth form a continuous band which lies parallel to the maxillary teeth. The eyes are situated between the 1st and 2nd third of the length of the head. The maxillary barbels do not quite reach the pectoral fin while the mandibular barbels reach the end of the gill-cover. There are stated to be 12 branchiostegal rays and the fin formula is given as :

P. 1/12 ; D. 2 ; V 1/9 ; A. 75 ; C. 15 (branched rays).

The total length of the type of *P. gangelica* is 95 mm., length of head 14 mm., breadth of head 9 mm., depth of body 10 mm. and the distance between the lower jaw and the anal fin 33 mm.

Günther (*loc. cit.*, p. 44) included Peters' species under *Cryptopterus,* but placed it in a distinct group characterised by " Anal united with caudal " Day,[7] however, assigned *Pterocryptes* to the synonomy of *Callichrous* and in the description of *C. gangeticus* remarked : " I have not procured this species in India, my nearest approach to it being *C. Sindensis.*" I have examined the type of *C. sindensis* and found that the union of the anal and the caudal fins is due to the regeneration of the caudal portion of the fish after some injury. In *Callichrous* the anal and the caudal fins are always distinct. Moreover, in *Callichrous* the depth of the body is never below one-sixth of the total length of the fish. The dorsal fin, though short, is fairly distinct and contains 4 to 5 well defined rays. These characters show that *Pterocryptes gangelicus* cannot belong to the genus *Callichrous.* On the other hand, its short description agrees very closely with specimens of *Silurus cochinchinensis*

[1] Blyth, *Journ. As. Soc. Bengal,* XXIX, p. 156 (1860).
[2] Peters, *Monatsb. K. Preuss. Akad. Wiss. Berlin,* p. 712 (1861).
[3] It is probably a misprint for *gangetica.*
[4] Day, *Fish. India,* p. 614 (1877).
[5] Günther, *Cat. Fish. Brit. Mus.,* VII, p. 348 (1868).
[6] Bleeker, *Ichth. Arch. Ind. Prodr.* I, Siluri, p. 283 (1858).
[7] Day, *Fish. India,* p. 476 (1877).

and I have not the least hesitation in regarding the two species as absolutely identical.

From the above it is clear that the genus *Silurus* is represented in Indian waters by two species—*S. wynaadensis* Day with four mandibular barbels from Wynaad and *S. cochinchinensis* Cuvier and Valenciennes with two mandibular barbels from the Eastern Himalayas, Assam and Burma. If the number of mandibular barbels is to be considered a character of generic importance, the generic name *Parasilurus* Bleeker will have to be replaced by *Pterocryptes* Peters.

VIII.—Fishes of the genus *Callichrous* Hamilton.

Hamilton in his "Gangetic Fishes" (p. 149, 1822) proposed the subgenus *Callichrous* for five species of *Silurus*, *viz.*, *S. pabda*, *S. canio*, *S. duda*, *S. chechra* and *S. pabo*, and remarked that "species for this tribe of fishes are rather handsome, and have little or nothing of that lurid appearance by which many kindred species are distinguished. They are all very rich fine-flavoured food, and grow to from nine to twelve inches in length" No other generic diagnosis was given. Swainson[1] recognised *Callichrous* as a distinct genus and defined it as follows:

"Head large, depressed; mouth large, not vertical; dorsal fin close to the head; anal fin excessively long; vent close to the pectoral; caudal fin forked."

Besides the five species for which Hamilton used this name, Swainson referred to it *Silurus boalis* Ham. and *S. bimaculatus* Bloch. In 1862, however, Bleeker[2] defined the genus properly with *Callichrous pabda* Hamilton as its type. At the same time he included *Ompok* Lacépède and *Pseudosilurus* Bleeker[3] in its synonomy. The genus thus restricted was defined as:

"*Silurini*. Pinna dorsalis bene evoluta, hymenophora, spina ossea nulla. Dentes maxillis palatoque. Cirri 4, supramaxillares, inframaxillares. Oculi velati. Dentes maxillis pluriseriati setacei. Dentes vomerini in thurmas 2 distantes dispositi. Pinna caudalis biloba. B. 11 ad 15".[4]

This definition was somewhat amplified in his *Atlas Ichthyologique* (II, p. 84, 1862) and only *Pseudosilurus* was given as its synonym. In the discussion Bleeker erroneously thought that Hamilton had included *Silurus boalis* and *S. garua* among *Callichrous*. A year later Bleeker[5] in his "Systema Silurorum Revisum" again regarded *Ompok* Lac. synonymous with *Callichrous*. Günther[6] agreed with Bleeker, but regarded *Silurodes* Bleeker also as its synonym. Though *Ompok* as a genus is not included by Günther under *Callichrous*, its type-species is given in the synonomy of *C. bimaculatus*. Day[7] gave a much wider interpretation to *Callichrous* and included in its synonomy *Ompok* Lacép., *Kryptopterichthys* Blkr., *Micronema* Blkr., *Phalacronotus* Blkr., *Hemisilurus* Blkr., *Silurodes* Blkr., *Pseudosilurus* Blkr., *Silurichthys* Blkr., and

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[1] Swainson, *Nat. Hist. Fish.*, etc., II, p. 306 (1839).
[2] Bleeker, *Versl. Akad. Amsterdam*, XIV, p. 395 (1862).
[3] Bleeker, *Ichth. Arch. Ind. Prodr.*, i, Siluri, p. 253 (1858).
[4] The definition is drawn from the diagnostic characters given in the synoptic table of the Siluroid genera.
[5] Bleeker, *Ned. Tijdschr. Dierk.*, I, p. 115 (1863).
[6] Günther, *Cat. Fish. Brit. Mus.*, V, p. 45 (1864).
[7] Day, *Fish. Ind.*, p. 475 (1877); *Faun. Brit. Ind. Fish.* I, p. 129 (1889).

Pterocryptes Peters. Weber and de Beaufort [1] have shown that *Silurichthys*, *Silurodes*, *Hemisilurus* and *Cryptoperus* (=*Kryptopterichthys*, *Micronema* and *Phalacronotus*) may be regarded as good genera, sufficiently distinct from one another and from *Callichrous*. I agree with this view though the difference between *Silurodes* and *Callichrous* is not of sufficient generic value as not only genera but species are known among Siluridae in which the vomerine teeth may be continuous or discontinuous. In the case of *Silurus cochinchinensis* I (*vide supra*, p. 353) have shown that such a condition can be regarded within the range of individual variation. As no species of *Silurodes* has so far been found in India, it is not possible to remark on its precise generic limits. I have shown in an earlier note that *Pterocryptes* Peters and *Parasilurus* Bleeker are synonymous with *Silurus* Linn. (*vide supra*, p. 355). *Pseudosilurus* is undoubtedly a synonym of *Callichrous* as repeatedly pointed out by Bleeker himself. The validity of the generic name *Ompok*, which has priority over *Callichrous* and, in the present state of our knowledge is known to be synonymous with it, may now be considered.

The genus *Ompok* was briefly characterized by Lacépède[2] as follows: "Des barbillons et des dents aux mâchoires; point de nageoires dorsalis; une longue nageoire de l'anus." Accompanying this short description are the figure and description of the type-species—*O. siluroides*, but both are very poor. The figure shows the following features which, if relied upon, indicate that the species cannot belong to *Callichrous*:

i. Total absence of dorsal fin.
ii. Rounded caudal fin.
iii. Small eyes above the level of the angle of the mouth.

Judging from the figure alone, the species would appear to resemble *Apodoglanis* Fowler[3] known from Borneo, except that the latter lacks the ventral fins. But very fortunately the type-specimen of *Ompok siluroides* was examined by Valenciennes[4] with the following results given under *Silurus bimaculatus* Bloch:

"C'est sur un poisson appartenant à ce groupe, et probablement à cette espèce, mais très-mal conservé, et encore plus défiguré par le dessinateur, que M. de Lacépéde a établi son genre *Ompok* et son espèce *Ompok siluroïde* (tom. V, pag. 50; et tom VI pl. 1, fig. 2) le Muséum possède encore l'individu qui lui o servi; il est desséché en herbier, et j'ai retrouvé la dorsale, qui était repliée par derrière et avait échappé ainsi à l'auteur. C'est l'absence prétendue de cette nageoire qui avait fourni le caractère du genre, lequel, par conséquent, tombe de lui même.

"Cet individu a soixante-trois rayons à l'anale et la caudale divisée; mais ses autres caractères ne peuvent être déterminés."

Bleeker[5] also discussed the validity of the genus *Ompok* and came to the conclusion that—

"Le nom d'Ompok aurait droit de priorité sur ceaux de Callichrous et de Pseudosilurus, mais ne reposant qui sur une erreur et n' étant qu'une reproduction mutilée nom malais Limpok, j'ai cru devoir n'adopter que le nom proposé par l' auteur des Poissons du Gange".

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[1] Weber & de Beaufort, *Fish. Indo-Austral. Archipel.*, II, p. 207 (1913).
[2] Lacépède, *Hist. Nat. Poiss.*, V, p. 49 (1803).
[3] Fowler, *Proc. Acad. Nat. Sci. Philadelphia*, p. 463 (1905).
[4] Cuvier & Valenciennes, *Hist. Hat. Poiss.*, XIV, p. 362 (1839).
[5] Bleeker, *Atlas Ichthyol*, II, p. 85 (1862).

Later authors did not question these views and even Weber & de Beaufort (*op. cit.*, p. 207) in accepting the genus *Callichrous* remark that Lacépède's diagnosis of the genus *Ompok* is erroneous. Jordan [1] has, however, disagreed with all the previous workers and thinks that *Ompok* should replace *Callichrous*. He assigns no reasons for this change. American ichthyologists are now frequently using the name *Ompok* in preference to *Callichrous*, but in view of the evidence adduced above the change does not seem to be justified.

In *Callichrous* the anal fin is long and may be free (several species) or just united with the caudal (*C. leiacanthus*) which is always forked. *Callichrous sindensis* Day[2] is an exception in these respects. In this species the anal fin is said to be broadly united with the caudal, which has a curved, entire margin. The type-specimen is now preserved in the collection of the Indian Museum and its careful examination shows that the caudal portion of the fish is regenerated after some injury. It seems likely that the tail fin along with a small portion of the tail was bitten off by another fish and that, during regeneration, the anal fin became extended round the injured part. This would also account for the smaller number of anal rays (47) in this specimen. Deraniyagala [3] has also observed that in the case of certain Ceylonese specimens of *C. bimaculatus* the caudal fin " is at times found to be regenerated and is then confluent with anal."

Other important characters mentioned by Day for *C. sindensis* are that the cleft of the mouth is very oblique, the lower jaw is very prominent and the eye is situated rather above the angle of the mouth. These features of the specimen are due to the fact that it is somewhat pug-headed. Pug-headedness is not uncommon among Siluroid fishes, and I have found such examples in a number of species. In view of the above I am of opinion that *C. sindensis* Day represents an abnormal, pug-headed specimen of *C. bimaculatus* (Bloch).

It has been shown above (*vide supra*, p. 355) that *Callichrous gangeticus*, as recognised by Day, is a synonym of *Silurus cochinchinensis* Cuvier and Valenciennes.

Besides the two species referred to above there are five others recognised by Day, *viz.*, *C. bimaculatus*, *C. pabo*, *C. macrophthalmus*, *C. malabaricus* and *C. pabda*. Of these *C. pabo* can readily be distinguished from all others by its short maxillary barbels, not exceeding the length of head. In practice it has been very difficult to distinguish the other species precisely, especially when one has a large series of specimens for examination.

The first species that can be definitely assigned to this genus was described and figured by Bloch [4] as *Silurus bimaculatus* from Tranquebar. Among its characteristics he mentioned (i) projecting lower jaw, (ii) strong pectoral spine bearing teeth on its inner surface, (iii) anal fin long with 67 rays and (iv) tail fin yellow with voilet tips, upper surface of head and body voilet while the remaining parts are silvery.

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[1] Jordan, *Genera of Fishes*, pp. 65, 114 (1917).
[2] Day, *Fish. India*, p. 476, pl. cx, fig. 1 (1877).
[3] Deraniyagala, *Ceylon Journ. Sci.*, (B), XVI, p. 278 (1932).
[4] Bloch, *Ausländ. Fische*, VIII, p. 24, pl. ccclxiv (1794).

The figure shows the maxillary barbels extending considerably beyond the commencement of the anal fin.

Lacépède's[1] *Ompok siluroides* from Batavia, as emended by Cuvier and Valenciennes (*vide supra*, p. 257) is now definitely included in the synonymy of *Callichrous bimaculatus* (Bloch).

Hamilton[2] referred 5 species from " Bengal " to his genus *Callichrous* which he distinguished from one another as follows :

(i) *C. pabda.*—Pectoral spine smooth, anal with 54 rays, sides clouded with irregular black spots, longitudinal yellow stripe above lateral line, dark mark above pectorals, maxillary barbels extending beyond pectorals.

(ii) *C. canio.*—Pectoral spine smooth, anal with 69 rays, sides silvery, maxillary barbels " reach almost to the middle of the fish. " The main difference from *C. pabda* is that the sides are not clouded.

(iii) *C. duda.*—Pectoral spine smooth, anal with 73 rays, maxillary barbels " reach almost to the middle of the fish" This species " differs in nothing from the *canio* except in the number of rays in the fin behind the vent."

(iv) *C. chechra.*—Pectoral spine indented behind, anal with 67 rays, " cloud-like spots on the sides, but without the yellow stripe along the sides that the *pabda* has. On each pectoral fin is a large black spot." Maxillary barbels " reach to the end of the back fin."

(v) *C. pabo.*—Pectoral spine " much stronger than in the *Pabda*", the hind part being indented on the edge ; anal with 73 rays, colour silvery with green gloss above and purple gloss below ; maxillary barbels shorter than head.

Hamilton himself recognised the great similarity between all the species, especially among the first four. He also indicated in the case of *C. canio* that it had " a very strong resemblance to the *Silurus bimaculatus* of Bloch ", but the " tips of its tail fin are not black, a circumstance to which Bloch's fish owes its name. Besides, in Bloch's fish the first ray of each pectoral fin is a very strong indented prickle."

It is clear from the above that in differentiating species of this genus considerable reliance has been placed on colouration, nature of the pectoral spine, number of rays in the anal fin and the length of the maxillary barbels. As is well known, colouration in fishes varies considerably with the environmental conditions. Silvery specimens of a species may be found in clear waters, whereas in the specimens of the same species living in a pond over-grown with vegetation the sides are often clouded. The black tips of the caudal in Bloch's drawing of *S. bimaculatus* certainly represent a very exaggerated type. This fin is, in certain cases, edged with grey along the posterior margin. Day[3] noticed that " dark tipped caudal fins are not rare in Madras though uncommon inland." I have examined a young specimen 14 mm. long from Poona in which the tips of the caudal fin are greyish. The shoulder spot may be absent or present, when present it may be dumble-shaped but sometimes its anterior or posterior half is only clear. Day demonstrated that for *C. bimaculatus* and *C. pabda* no reliance can be placed on the number

[1] Lacépède, *Hist. Nat. Poiss.*, V, p. 50, pl. i, fig. 2 (1803).
[2] Hamilton, *Fish. Ganges*, pp. 149-154 (1822).
[3] Day, *Fish. India*, p. 477 (1877).

of rays in the anal fin and on the nature of the pectoral spine to separate species of this genus. My examination of a large number of specimens in the collection of the Indian Museum has enabled me to confirm these views. The length of the maxillary barbels also varies considerably. I am of opinion that besides *C. pabo* there is only one other very variable species of this genus—*C. bimaculatus*—found in Indian waters, though its range extends as far east as Java, Sumatra and Borneo.

Cuvier and Valenciennes[1] described a number of new species in the genus *Silurus* from India which are now referred to *Callichrous*, *viz.*, *S. malabaricus*, *S. anastomus*, *S. mysoricus* and *S. microcephalus*. The description of the first species was based on small, badly preserved specimens collected from Malabar, the second species was described from Bengal and differenciated from *S. bimaculatus* by the fact that " a l'épine pectoral plus grêle, et quelques rayons de moins à l'anale." The species from Mysore was characterised as : " à tête plus plate et à corps plus elongé, plus comprimé que dans le *S. bimaculatus*, mais dont la caudale se partage de même en deux lobes pointus " The last species was described from Bengal and with the exception that its head is contained 7 times in the length of the body, was stated to be closely allied to the form from Mysore. The descriptions of these species were based on insufficient material and without a proper understanding of the forms described by Hamilton. Moreover, the diagnostic characters are such that they fall within the range of individual variations. The four species of Cuvier and Valenciennes are, therefore, regarded by me as synonyms of Bloch's *S. bimaculatus*.

Silurus langhur Heckel[2] from Kashmir is undoubtedly synonymous with *Callichrous bimaculatus*, the distinguishing characters given by its author have no specific value. In the figure the anal fin is shown just approaching the base of the caudal fin. Probably on this character Günther[3] assigned this species to the genus *Silurichthys*.

McClelland[4] described *S. indicus* from the Punjab and remarked : " This species is called Puftah at Loodianah, and is the same as the Puftah of Bengal, and identical with *Silurus canio*, *S. duda* and *S. chedra* (*sic*) of Buchanan, which would seem to be but varieties of a widely, diffused and common species." In the circumstances one fails to see why a new name was proposed by McClelland for the *Paftah* of the Punjab. The species is synonymous with *Callichrous bimaculatus* (Bloch).

In describing *Pseudosilurus macrophthalmus* from Tenasserim, Blyth[5] indicated its close resemblance to *C. pabda* Ham., but remarked that it is " proportionally less deep and more elongated, with eye of twice the diameter, and the lower jaw closing evenly with the upper, or very nearly so, though protruding when the mouth is open ; maxillary cirri much longer, reaching far beyond the more developed pectorals." Günther (*loc. cit.*, p. 45) included this species under *Callichrous* as a doubtful form, but Day[6] regarded it a valid species, with *Callichrous*

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[1] Cuvier & Valenciennes, *Hist. Nat. Poiss.*, XIV, pp. 353, 363-365 (1839).
[2] Heckel, *Fische aus Caschmir*, p. 82, pl. xii, figs. 5 & 6 (1838).
[3] Günther, *Cat. Fish. Brit. Mus.*, V, p. 36 (1864).
[4] McClelland, *Calcutta Journ. Nat. Hist.*, II, p. 583 (1842).
[5] Blyth, *Journ. As. Soc. Bengal*, XXIX, p. 156 (1860).
[6] Day, *Fish. India*, p. 478 (1877).

notatus Day from Burma as its synonym. He remarked that *C. macrophthalmus* " is closely allied to *C. bimaculatus*, but has a larger eye, a narrow band of palatine teeth, much longer pectoral fins and maxillary barbels." He extended the range of the species to Madras and Assam and obsrved that " The only objection to uniting the Madras with the Assam and Burmese form is that the former has P. 1/12-13, the latter P. 1/15. The shoulder spot is not so well marked, and the dorsal fin not so developed in the Madras variety." Vinciguerra[1] had great difficulty in separating *C. macrophthalmus* from *C. bimaculatus* and from the Burmese specimens at his disposal he drew up a table of characters to differentiate the two species. Some of the characters noted for *C. macrophthalmus* are even contradictory to the original definition of the species. In determining specimens from Manipur, Assam, I[2] had the same difficulty. A study of the material in the collection of the Indian Museum has convinced me that Blyth's species cannot be regarded as distinct from the form described by Bloch.

Güther's[3] *C. ceylonensis* seems to differ from *C. bimaculatus* by the position of the blackish blotch above the pectoral which is " remote from the head " in the latter and " immediately behind the gill-opening " in the former. As remarked above this cannot be regarded as a character of sufficient value for separating the two species ; *C. ceylonensis* is, therefore, regarded as a synonym of *C. bimaculatus*.

Cryptopterus latovittatus Playfair[4] is, as pointed out by Day, a *Callichrous* in which the mandibular barbels appear to have been either overlooked or may have been absent.[5] Its description leaves no doubt that it is synonymous with *C. bimaculatus*.

Day has himself included his *C. egertonii*[6] in the synonymy of *C. pabda* which is regarded here as identical with *C. bimaculatus*.

Day described *C. nigrescens*[7] from Burma but later he[8] regarded it as a variety of *C. pabo* and remarked that " it was clouded all over with fine dark spots, and had black tips to the caudal lobes, and nine ventral rays." Prashad and Mukerji[9] also recorded coloured specimens of *C. pabo* from the Myitkyina District, but observed that in their specimens the pectoral spine is distinctly serrated internally. The two forms, no doubt, represent colour variations of the same species.

From the above analysis of the diagnostic characters of the various species of *Callichrous* described from India, it seems clear that only two valid forms can be recognised—*C. bimaculatus* (Bloch) with the maxillary barbels always considerably longer than the head and *C. pabo* Hamilton with the maxillary barbels always considerably shorter than the head. The latter species is rather rare and mainly confined to north-eastern India and Burma, while the former is very widely distributed in south-eastern Asia.

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[1] Vinciguerra, *Ann. Mus. Civ. Stor. Nat. Genova*, (2), IX, pp. 201-205 (1890).
[2] Hora, *Rec. Ind. Mus.*, XXII, p. 178 (1921).
[3] Günther, *Cat. Fish. Brit. Mus.*, V, p. 46 (1864).
[4] Plyfair, *Proc. Zool. Soc. London*, p. 16 (1867).
[5] Day noted that in a young specimen of *C. nigrescens* " mandibular cirri were absent, but it was evidently the same species " (*Proc. Zool. Soc. London*, p. 617, 1869).
[6] Day, *Proc. Zool. Soc. London*, p. 710 (1871).
[7] Day, *Proc. Zool. Soc. London*, p. 616 (1869).
[8] Day, *Fish. India*, p. 478 (1877).
[9] Prashad and Mukerji, *Rec. Ind. Mus.*, XXXI, p. 177 (1929).