NOTES ON FISH OF THE GENUS *DISCOGNATHUS* FROM INDIA AND PERSIA.

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(With Plates IX—XI.)

Although it is only a few months since I published notes on the Indian species of this genus,[1] a large amount of additional material is already available and I have been able to examine living specimens in districts so far apart as Seistan in Eastern Persia and the Nilgiri Hills in Southern India. The latter district is particularly important as it is the type locality for several of the forms described by Jerdon and Day. It is not yet possible to clear up all the difficulties concerning the Indian species and much more material is still necessary before the Assamese and Burmese forms can be adequately discussed, but I hope that these notes may lead to further investigation of the genus, which is a particularly interesting one from a biological point of view.

In my former notes I neglected to mention the species described by Tate Regan from the North Western Frontier of India under the name *Discognathus wanae*,[2] and I gave no reference to the Persian form described by Berg as *Garra persica*.[3] The latter is probably a local race of *D. lamta*, but the former seems to be a very distinct species.

Two species from South India have been brought to my notice too late to be discussed in this paper. They will be described shortly by Mr. C. R. Narayan Rao under the names *D. platycephalus* and *D. bicornutus*. These species must be attributed to Mr. Narayan Rao, but I have noted some of their more salient characters in the key to the species printed here. These characters he has demonstrated to me.

The genus as a whole falls into two sections, distinguished by the degree of differentiation of the adhesive disk behind the mouth on the ventral surface. Both these sections are found in Africa as well as in Asia and both extend into the Palaearctic part of the latter continent, but the most highly differentiated forms occur mainly in India and Malaysia, in which countries those with the simpler type of disk are practically absent. Among those in which the disk is best developed, a secondary differentiation occurs in

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[1] Annandale, *Rec. Ind. Mus.* XVI, pp. 113, 129 (1919).
[2] Tate Regan, *Ann. Mag. Nat. Hist.* (8) XIII, p. 263, fig. A (1914).
[3] Berg, *Ann. Mus. Zool. St. Petersbourg* XVIII, p. lxi (1913).

certain species in the naked chest and the specialization of the muscles of the thorax. In the following key I have made use of the first of these characters in my primary division and of the second in the first secondary division. It is possible that the two primary groups will have to be regarded ultimately as distinct genera.

Key to the Indian and Persian species of Discognathus.

I. Mental disk small, less than half as broad as head, without a specialized posterior border; margins of opercula meeting in the middle line well behind the disk.
  A. Disk very imperfectly differentiated, without free posterior border; barbels 4; chest covered with scales ... *D. adiscus.*
  B. Disk with posterior border free but lateral borders not so; barbels 4; chest covered with scales ... ... *D. wanae.*
  C. Disk with both lateral and posterior margins free; 2 barbels; the whole of the ventral surface naked ... *D. phryne.*

II. Disk large, more than half as broad as head, with a free lateral and posterior granular border, entirely or almost separating the opercular margins.
  A. Chest covered with scales, not much flattened; its muscles not highly differentiated.
    1. No barbels. *l.l.* 44 ... ... *D. imberbis.*
    2. 4 barbels. *l.l.* 36-41.
      a. Pupil of eye in middle or anterior half of head: eye usually visible from below; snout tuberculate in male but not forming a very distinct process.
        i. Opercular borders approaching one another at an obtuse angle on the ventral surface, widely separated by mental disk ... ... *D. lamta.*
        ii. Opercular borders approaching one another closely at an acute angle behind the mental disk; disk subcircular ... ... *D. gotyla.*
      b. Pupil of eye distinctly in posterior half of head; eye (except in *D. gravelyi*) invisible from below.
        i. Snout moderately rounded, more or less produced and tuberculate, at any rate in adult male, immediately in front of or outside nostrils.
          a. Snout forming a single free conical process in front of nostrils in all individuals; opercular borders approaching one another at an acute angle on the ventral surface; length of head nearly 5 times in total length ... ... *D. stenorhynchus.*
          β. Snout produced into a pair of conical processes, one outside each pair of nostrils ... ... *D. bicornutus.*
          γ. Snout produced in male only; its process single, usually shorter than in *α*; opercular margins nearly transverse and widely separated on ventral surface; length of head at least $5\frac{1}{2}$ times in total length ... *D. jerdoni.*
        ii. Snout bluntly pointed, never produced in front of or outside nostril; slightly retroverted at tip.
          α. Dorsal profile from tip of snout to behind dorsal fin forming an even rather high curve; depth of body 5 times in total length ... ... *D. gravelyi.*
          β. Dorsal profile nearly straight; that of head sinuous; depth of body (in adult) nearly 7 times in total length ... ... *D. elegans.*
          γ. Top of head obliquely flattened; profile of head and anterior part of body a slanting straight line ... *D. platycephalus.*
  B. Chest naked, flattened, with specialized muscles.

1. Pectoral fins hardly longer than head, not nearly reaching ventrals ... ... *D. nasutus.*
2. Pectorals distinctly longer than head, nearly reaching ventrals ... ... *D. macrochir.*

SECTION I.—*Group of* Discognathus variabilis.

1863. *Discognathus* (*s.s.*), Bleeker, *Atl. Ichth.* III, p. 24.

In this group the adhesive apparatus on the ventral surface of the head is comparatively little differentiated, the snout projects little beyond it, and the general facies of the fish is less peculiar, the ventral surface being less flattened and the caudal peduncle more distinct. As Boulenger has pointed out in discussing an African species (*D. quadrimaculatus* [1]) belonging to the group, it has a close resemblance to the eastern Asiatic genus *Crossochilus*, a genus which, according to most recent authors, is not found west or north of the Malay Peninsula; but there is a distinct difference in the structure of the mouth and in particular of the lower lip.[2] In this section of *Discognathus*, as also in the other species, the jaws are much less sharp than in *Crossochilus* and are never horny or bony, but always cartilaginous and covered with a thin epithelium. The upper lip is joined to the lower lip directly by a frenulum, but the lower lip itself is vestigial, disappearing entirely in most species in the middle of the jaw, though in some, as in *D. phryne*, it is represented by a delicate fold of integument that may be extended over the whole jaw. The transverse band of tissue which stretches in many species across the anterior margin of the mental disk just behind the lower jaw appears to be quite distinct, as is shown by the condition in *D. phryne*, from the lower lip. It is this band of tissue, however, which is labelled *l.l.* in my figure on p. 114, *Rec. Ind. Mus.*, Vol. XVI. The snout does not appear to be produced or tuberculate in any of these species.

It is possible that *Discognathus* is derived from *Crossochilus* and that the species of the first section are closely related genetically to that genus. The geographical difficulty is not so great as might appear at first sight, for the species *Cirrhina latia* is closely related to *Crossochilus*, in which indeed it is placed by Günther [3] and Vinciguerra,[4] and the range of *Cirrhina latia* extends from Upper Burma to Baluchistan.

The eponymous species of this group is found in Palestine and Mesopotamia. The three discussed here occur in the extreme east of Persia or on the North West Frontier of India, while *D. quadrimaculatus* is recorded from various lakes and rivers in the upper watershed of the Nile and *D. vinciguerrae* (which, so far as I can judge from Boulenger's figure,[5] also belongs to the group) from the White Nile and the Upper Nile.

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[1] Boulenger, *The Fishes of the Nile*, p. 180 (1907).

[2] For an excellent figure of the mouth of *Crossochilus*, see Weber and Beaufort, *Fishes of the Indo-Australian Archipelago* III, p. 232, fig. 96 (1916).

[3] Günther, *Cat. Fish. Brit. Mus.* VII, p. 71 (1868). [90].

[4] Vinciguerra, *Ann. Mus. Stor. Nat. Genova*, (2) IX (XXIX), p. 280 (1889-

[5] Boulenger, *Fish. Nile*, p. 185, pl. xxxi, fig. 4 (1907), and *Cat. Fresh-w. Fish. Africa* I, p. 347, fig. 261 (1909).

Discognathus adiscus, sp. nov.

(Pl. x, fig. 2; pl. xi, fig. 1.)

L. l. 36—38. D. 3/8. V 2/5.

This is a small species of slender habit. The dorsal profile from the tip of the snout to behind the dorsal fin is strongly and evenly arched; that of the caudal peduncle slightly concave. The ventral profile as far as the base of the caudal peduncle is convex. The head is of moderate size, its length contained about 5 to 5½ times in the actual total length. It is somewhat flattened above. The snout is rounded and smooth. It is shorter than the part of the head behind the eye. The nostril is situated nearer the tip of the snout than the eye. The eye is large and rather prominent; its length contained about 3½ times in the length of the head, and a little less than twice in the interorbital breadth; it is not visible from below. The pupil is situated near the middle of the head, and the upper margin of the eye near the dorsal profile. The mouth is large and almost straight. It is situated only a short distance behind the tip of the snout. The upper lip is well developed, covering the upper jaw, fringed at the margin and minutely granular. There are 4 short barbels. The lower lip properly so called is only developed at the sides and there is no transverse band of specialized structure behind the lower jaw, which is fully exposed. The mental disk is very imperfectly developed. It consists of a granular pad truncate or subtruncate in front, free at the sides, and more or less emarginate, but not free, posteriorly. The margins of the opercula meet at an acute angle on the mid-ventral line some distance behind it and the branchial openings extend well on to the ventral surface. The dorsal fin is nearly as high as the body. Its last undivided ray is cartilaginous and articulated. The pectorals, which do not nearly reach the ventrals, are rather narrow, pointed and distinctly shorter than the head. The caudal is long, distinctly lobed and with the lobes pointed. The scales are well developed but somewhat deciduous. They cover the whole of the body. There are 5½ scales between the lateral line and the dorsal, and 4 between the former and the ventral.

The pharyngeal bones and their teeth closely resemble those of *D. phryne* (*v. postea*), but the teeth are more slender.

The dorsal margin is pale bluish grey; there is a more or less distinct bluish mid-lateral streak, running from behind the head to the base of the caudal fin. The lower part of the head and sides and the ventral surface are yellowish-white.

Type-specimen, No. $\frac{97.6.3}{1}$ F, *Z.S.I.* (*Ind. Mus.*).

Distribution.—This fish is extremely abundant in small watercourses and pools in the plains of Seistan. We obtained specimens from the following localities:—Nasratabad, irrigation channel in Consulate garden; pool in the desert 5 miles south of Nasratabad; pools in stream-bed 12 miles north of Nasratabad; channels in the reed-beds of the Hamun-i-Helmand near Lab-i-

Baring, and channel leading out of the Hamun 12 miles east of Lab-i-Baring; small watercourse, Lutak, southern Seistan.

Habits.—*D. adiscus* is gregarious and always lives in large shoals. In the day-time it stays at the bottom, feeding apparently on algae, but in the evening I have seen shoals swimming on the surface. All the individuals we found in the Hamun, which were not numerous, were dead or dying, and we found enormous numbers in a moribund condition, in which they floated on the surface, in pools of very foul water in a stream-bed north of Nasratabad. We did not find the fish in any but still or slow-running water.

I have placed this species in the genus *Discognathus* with some doubt, but I do not know where else to place it. The mouth differs distinctly from that of both *Cirrhina* and *Crossochilus*, though the structure of the gill-openings resembles that found in these genera. Moreover, the mental disk, though poorly developed and differing in shape from that of other species, is present, and the general facies is not unlike that of *D. quadrimaculatus*. On the whole I think that the species must be accepted as an extremely primitive representative of *Discognathus*. If this be so, its *provenance*, together with that of the other primitive species *D. variabilis*, *D. phryne* and D. *wanae*, would suggest that the genus perhaps originated in South Western Asia. It is noteworthy that it does not occur in Central Asia, and possibly the African species that are apparently allied, may be degenerate rather than primitive. Without examininig specimens I cannot express an opinion on this point.

Discognathus wanae, Regan.[1]

"Depth of body 4 in the length, length of head $4\frac{1}{2}$ to $4\frac{2}{3}$. Snout rounded, nearly as long as postorbital part of head; diameter of eye 5 in length of head; interorbital region flat, its width nearly $\frac{1}{2}$ length of head. Width of mouth $\frac{1}{3}$ length of head; two barbels on each side, shorter than diameter of eye. Upper lip with minute papillae near the margin; lower very narrow; behind it a circular disc divided into a papillose anterior and a smooth posterior portion, and with only the posterior edge free. Dorsal III 7; origin equidistant from tip of snout and base of caudal; first or second branched ray longest, nearly as long as head. Anal II 5. Pectoral extending $\frac{3}{5}$ of distance from its base to pelvics, which nearly or quite reach vent. Caudal deeply emarginate. Greyish, mottled with darker.

"Five specimens, the largest 80 mm. in total length." (Tate Regan). Mr. Regan has kindly informed me that there are about 36 scales in the lateral line and that both back and belly are covered with scales smaller than those on the sides.

I have not seen this species, the description of which I quote in full. It was described from Waziristan in the hills of the

[1] Tate Regan, *Ann. Mag. Nat. Hist.* (8) XIII, p. 263, fig. A (1914).

North West Frontier of India and comes from the same geographical district as the species (*D. phryne*) next to be described.

Discognathus phryne, sp. nov.

(Pl. x, fig. 3; pl. xi, fig. 2.)

D. 3/7. A. 2/5. L. l.36-39. L. t.5/5-6.

This species is apparently allied to *D. variablis*, Heckel, from which it differs in proportions and in its naked chest and back. Like *D. variabilis* it has only two barbels.

The size is small and the habit rather stout. The length of the head, the greatest depth of the body and the length of the caudal fin are approximately equal and are contained from $4\frac{3}{4}$ to $5\frac{1}{4}$ times in the complete total length. The dorsal profile is sinuous but nowhere strongly arched, rising in an almost even low curve from the tip of the snout to the anterior margin of the dorsal fin. The abdomen is convex. The snout is blunt and rounded and projects slightly beyond the mouth. Secondary sexual characters were not observed on the heads of specimens captured in winter. The nostrils are large and situated nearer the eye than the tip of the snout. The eye is small, its length being contained 3 to 5 times in the length of the head; it is lateral in position, its upper margin approaching the upper profile, and is situated near the middle of the length of the head. The upper lip is comparatively narrow and indistinctly fringed. The mouth is large and broadly arched. The lower lip is represented by a narrow, linear flap of tissue; posterior to this there is a transverse, minutely tuberculate band, obliquely truncate at either end and much narrower than the anterior flap; it is about as long as the upper lip. Posterior to this again lies the true mental disk, which is smooth and by no means highly developed. It is somewhat lozenge-shaped in the adult fish and considerably broader than long; its posterior and lateral margins are free. In shape and proportions it is somewhat variable. There is a small, blunt barbel at each angle of the mouth; its size is variable and it is sometimes reduced to a mere tubercle. There is no trace of anterior barbels. The dorsal fin starts considerably nearer the base of the caudal than the tip of the snout and slightly in front of the ventrals. Its undivided rays are soft and slender and the last, which is almost as long as the head, is articulated in its distal third. The pectorals are a little shorter than the head and do not nearly reach the ventrals when adpressed; they are set obliquely on the side of the body. The caudal peduncle is not clearly marked off. The caudal fin is large, distinctly cleft and with the two halves subequal or equal and bluntly pointed.

The scales are rather small. There is a relatively broad middorsal streak which is entirely bare and so also are the chest and abdomen. The muscles of the chest, however, are not highly specialized. The lateral scales are deciduous. In the young those

beneath the lateral line are poorly developed. The lateral line is conspicuous.

The pharyngeal bones are broad and very convex. They each bear twelve teeth, but the second tooth of the outer row is very short, though broad, and almost hidden by the others. The formula appears to be 6.3.3/3.3.6, but the teeth are very closely congregated and the rows difficult to distinguish. The teeth are fairly long and slender but shorter than those of *D. adiscus*, sharply pointed (except the second of the outer row) and slightly retroverted at the tip, which is obliquely truncate.

The colouration varies with the environment, but the scales, the upper part of the cheeks, the operculum and the dorsal surface of the head and body are always minutely speckled with black, and the specks are always more numerous on the back and on the top of the head than elsewhere. In individuals from very clear water they are so numerous as to give these regions a blackish colour. Larger black spots are sometimes present on the upper part of the sides, and a narrow blackish vertical bar can usually be distinguished on the distal end of the caudal peduncle. The ventral surface and the lower part of the head are white. The iris is speckled like the scales. The fins are colourless. In the young there is a bluish mid-lateral streak running along the body.

Type-specimen, No $\frac{97.8.7}{1}$ F., *Z.S.I.* (*Ind. Mus*) (from Seistan).

Distribution.—This species is very abundant in the hill country of Baluchistan at altitudes between 5,000 and 6,000 feet. A single specimen was taken by Mr. S. W. Kemp and myself, with many of *D. adiscus*, in an irrigation channel at Nasratabad, Seistan.

Habits.—*D. adiscus* is gregarious and lives as a rule among algae on the bottom of slow-running water-channels and pools. In the outflow of the Kushdil Khan reservoir in the Pishin district north of Quetta large numbers were observed opposite the places where water flowed in from underground sources. The weather was very cold at the time and this water was warmer than that which came from the reservoir. The fish were feeding on a green filamentous alga.

The species seems, as already stated, to be closely related to *D. variabilis*, Heckel, and is doubtless the one referred to by Zugmayer[1] as intermediate between that form and *D. lamta*. It is almost certainly identical with the *D. variabilis* mentioned in the editorial note prefixed to Tate Regan's account of fish from Seistan in *Journ. As. Soc. Bengal*, (n.s.) II, p. 8 (1906).

SECTION II.—*Group of* Discognathus lamta.

1838. *Platycara*, McClelland, *Journ. As. Soc. Bengal*, VII, (2), p. 944.

This group is certainly more highly developed than that of *D. variabilis*. The mental disk is always relatively large and is a

[1] Zugmayer, *Abh. Bayerisch. Ak. Wiss. Math.-phys. Klasse* XXVI (6), p. 24 (1913). These specimens were from the Pishin River in northern Baluchistan. There are two Pishins in Baluchistan, the one north of Quetta and one, referred

highly specialized structure consisting essentially of three parts—an anterior transverse band of soft tissue covered with minute tubercles, a central almost cartilaginous disk with a smooth surface, and a posterior and lateral free border of soft tuberculated integument. It is therefore a much more efficient organ of adhesion. In all the Indian forms with which I am acquainted the disk completely separates the antero-ventral margins of the opercula, but Gray and Hardwicke in their "*Illustrations of Indian Zoology*" figure these borders in *D. gotyla* as meeting behind the disk (Vol. I, pl. lxxxviii, fig. 3) and this also appears to be the case in certain African forms. In specimens I assign to *D. gotyla* the borders nearly meet. In the Indian forms the snout, either in the adult male or in both sexes, is tuberculate and often produced between or outside the nostrils.

In the Indian species the number of rays in the dorsal fin and of scales in the lateral line as a rule affords little or no assistance in specific diagnosis.

The fish of this group are mostly tropical, but a local race of *D. lamta* is found as far north as Palestine, while either *D. jerdoni kangrae* or a closely allied form inhabits mountain streams in the Aden hinterland. In Africa species are found in the Nile valley, in the great African lakes and in the eastern waters of Abyssinia. In Asia the range of the group extends from Palestine to Yunnan, Southern India and Borneo. It seems to have its headquarters in the hill country of Southern India and Assam, but the Assamese species or races have not been investigated since the time of McClelland. In streams at the base of the Nilgiris I found four distinct species.

Discognathus lamta, Day [1].

1919. *Discognathus lamta,* Annandale, *Rec. Ind. Mus.* XVI p. 114, text-fig. 1 and p. 131, pl. ii, figs. 1, 1*a*.

Dr. Chaudhuri has recently taken specimens of this species near Seringapatam in Mysore. They differ slightly from North Indian specimens, but I have not sufficient material to establish their racial identity.

Discognathus persicus (Berg.).

"*Garra persica,* Berg, sp. n.[2]

"*Discognathus lamta* (*non* Ham. Buch.) Nikolsky, *Ann. Mus. Zool. St Petersbourg*, IV, 1899, p. 411 (No. 11706,11707).

D II 7, A II 5, 11.35 $\frac{4}{3\frac{1}{2}}\frac{}{4}$37.

11707. River Bampur in Eastern Persia. N. Zarundy 1898, 15–27. VII (6).

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to by W. T. Blanford in his "*Zoology and Geology of Eastern Persia,*" in Persian Baluchistan some little distance inland from the Arabian Sea.

[1] Buchanan's *Cyprinus* (*Garra*) *lamta* was probably, from its habitat, identical with McClelland's *Platycara nasuta* (1838) rather than with the *D. lamta* of authors. It is, however, impossible to establish this with absolute certainty.

[2] Berg, *Ann. Mus. Zool. St. Pétersbourg* XVIII, p. lxi (1913).

11706. Kiabad in Zirkuh (Eastern Khorassan). N. Zarundy 1898, 3.V (1).

" Near *Garra lamta* (Ham. Buch.), from which differs in having 7 branched rays in dorsal (in *lamta* Ham. Buch. 8, as much in *crenulata* Heck., *rufa* Heck., *obtusa* Heck.). Lower lobe of caudal shorter than head. Total length 75 mm.

" Barbels 4, very short, uppers $\frac{1}{2}$ diameter of eye, lowers $\frac{2}{5}$. Pupil in the second half of the head. Ventrals below anterior $\frac{1}{3}$ of dorsal. Snout projecting strongly beyond mouth. Upper lip well developed, not fringed. Width of the mouth less than $\frac{1}{2}$ length of head, rather equals the interorbital width. Caudal peduncle $1\frac{1}{2}$ - $1\frac{2}{3}$ times as long as deep. Eye supero-lateral, not visible from below. Depth of body 5·0–4·6 in its length (without caudal), head 4·5–4·3. Diameter of eye 4·1–4·0 in the length of head, 1·8 in the interorbital width. Pectorals 5·0–4·8 in the length of body (without caudal). Belly covered with scales. 4–5 round black spots on the dorsal near its base. A dark vertical bar on the caudal peduncle near the base of the caudal. Snout of breeding males with numerous conical horny tubercles.

" Eastern Persia." (Berg).

Discognathus jerdoni (Day).

(Pl. ix, figs. 1, 2; pl. xi, fig. 3).

1849. *Gonorhynchus Gotyla*, Jerdon (*nec* Gray), *Madras Journ. Lit. Sci.* XV, p. 309.
1867. *Garra Jerdoni*, Day, *Proc. Zool. Soc. London*, p. 288.
1878. *Discognathus Jerdoni*, Day, *Fish. Ind.* II, p. 528, pl. cxxii, fig. 6.
1889. *Discognathus jerdoni*, Day, *Faun. Brit. Ind. Fish.* I, p. 247.

This species is remarkable for its stout facies and very short, broad head, which differs considerably so far as the shape of the snout is concerned in the two sexes. The dorsal profile behind the snout is very nearly straight in the male and only slightly arched in the region of the dorsal fin in the female.[1] The snout is rounded and much longer, especially in the male, than the part of the head behind the eye. The nostril is very much nearer the eye than the tip of the snout. The eye is relatively large, especially in the male, in which its length is contained in the length of the head about 5 times and in the interorbital breadth twice. In the female the length of the eye is contained at least $5\frac{1}{2}$ times in the length of the head and from $2\frac{1}{4}$–3 times in the interorbital breadth. The branchial openings extend on to the ventral surface, but on the sides do not reach much more than half way up the head In the female the snout is smooth and very slightly concave in lateral profile. In the male it is traversed by two semicircular grooves. The first of these, which is deep and undercut though narrow, lies a short distance in front of the nostril, while the second is about equidistant from the first and from the tip of the snout. The short projection

[1] Day's figure (*Fish. Ind.*, pl. cxxii, fig. 6) is taken from a badly preserved specimen.

caused by the first groove bears several spiny tubercles and there is a short row of smaller horny tubercles on each margin of the second groove. The upper lip is broad, concealing the upper jaw, granular and minutely fringed. There is a narrow semicircular transverse granular band in front of the disk, which is transverse and more strongly arched anteriorly than posteriorly. Behind the disk there is a broader semicircular free border. There are four short tentacles. The opercular margins are almost transverse on the ventral surface. The chest is flattened but scaly and without specialized muscles. The dorsal fin is not so high as the body. Its last undivided ray is moderately stout and it has nine or ten rays in all. The pectorals are broad and expanded and have the outer ray flattened. They are shorter than the head and their base is oblique. The scales are large. There are 3 or $3\frac{1}{2}$ above the lateral line and the same number between it and the ventral. The colour varies with the environment. Specimens from the Bhavani River at the base of the Nilgiris are very dark olivaceous on the sides and back and white on the ventral surface. All the fins are greyish but the pectoral fins have white borders. The rays of the caudal are white but the middle third of the membrane is blackish. In a specimen from a small muddy stream running into the Bhavani the colours are much paler, but there is no dark mid-lateral streak and no spot behind the operculum.

The largest specimen I have seen, an adult male from near Mettapolaiyam, is 184 mm. long.

The species is common in the Bhavani River near the base of the Nilgiris both before and after the stream leaves its gorge. It lives in places where the stream-bed is rocky and the current strong. Jerdon found it in the Manantoddi as well as the Bhavani and Day records it also from the Wynaad. I have seen a small and probably immature specimen which seems to belong to the species from the Nasik district of the Bombay Presidency.

Subsp. **kangrae**, Prashad.

1878. *Discognathus lamta*, Day, *Fish India* II, p. 528 (in part), pl. cxxiii, figs. 1, 1*a*.

1919. *Discognathus kangrae*, Prashad, *Rec. Ind. Mus.* XVI, p. 163, figs. 1, 1*a*.

This form seems to be no more than a local race of *D. jerdoni*, distinguished by its longer head and smaller eye.

Capt. Donald, Warden of Fisheries in the Punjab, has recently presented to the Indian Museum through Dr. Baini Prashad, a series of specimens from hill-streams in the Kangra valley. They establish the fact that the fully developed adult male is identical with the form figured by Day in the plate cited.

Discognathus stenorhynchus (Jerdon).

(Pl. ix, fig. 3; pl. xi. fig. 4).

1848. *Gonorhynchus stenorhynchus*, Jerdon, *Madras Journ. Lit. Sci.* XVI, p. 310.

This species is closely related to *D. jerdoni*, but can be distinguished at once by the structure of the snout and by its relatively longer head. The snout, *in both sexes and at all ages*, is greatly produced in front of the nostrils, forming a regular conical forwardly-directed process, which however does not extend as far forward as the actual tip. As in *D. jerdoni*, this process is formed by a semicircular groove which passes below it. It bears at its free extremity two rows of spiny tubercles. There is a second groove some distance in front of the first which transforms the actual tip of the snout into a second process, which is directed forwards and slightly upwards and bears a number of small spiny tubercles on its posterior surface. The dorsal fin is rather less high than in *D. jerdoni* and the two larger unbranched rays are thicker and stouter. A third (anterior) unbranched ray may be present or absent. The pectoral fins are relatively short and narrow, rounded at the tip and oblique. The chest is not so flat as in *D. jerdoni*. The scales are rather smaller, though of the same number in the lateral line. There are $3\frac{1}{2}$ between the lateral line and the dorsal fin and $2\frac{1}{2}$ or 3 between the former and the ventral.

The colour of fresh specimens is as follows:—the sides and back pale yellowish above changing to pink below. All the fin-rays are somewhat infuscated and there is a row of dark spots along the base of the dorsal fin. An obscure dark mid-lateral line extends from behind the head on to the caudal fin. The iris is golden yellow. The colours have faded considerably in specimens in spirit.

I have examined thirteen specimens, the largest of which is 90 mm. long. The snout is produced in individuals less than two inches long.

Distribution.—This fish is only known from the base of the Nilgiri Hills. My specimens were taken in a small muddy stream (the Nierolay) which runs into the gorge of the Bhavani River some 12 miles above Mattapolaiyam in August.

Discognathus gotyla (Gray and Hardwicke).

(Pl. x, fig. 1; pl. xi, fig. 6).

1832. *Cyprinus gotyla*, Gray & Hardwicke, *Ill. Ind. Zool.* I, pl. lxxxviii, figs. 3, 3*a*.

1867. *Garra gotyla*, Day, *Proc. Zool. Soc. London*, p. 288.

This little species is also closely related to *D. jerdoni*, but the eyes are in the middle of the head, the head is large and the structure of the snout is different. The three specimens I have examined are perhaps not fully adult, but the secondary sexual characters are fairly well developed. The length of the head is contained in the total length a little more than five times. The eye is very large, its length being contained a little more than four times in the length of the head. The dorsal profile of the head is convex in the female. In the male there is a short process between the nostrils, bearing several relatively large spiny tubercles. The

anterior semicircular groove on the snout is not strongly developed. The mental disk is subcircular and of very large size. It is completely surrounded by a granular border. The opercular and preopercular margins are adherent on the ventral surface. The former approach one another at an acute angle and almost meet behind the disk. The dorsal fin is higher than the depth of the body. The pectorals are large and pointed and have the outer ray somewhat expanded. They are nearly as long as the head.

The colour is dark olivaceous with traces of several paler longitudinal streaks on the caudal peduncle. There is a dark spot behind the operculum and a dark median streak on the caudal fin. The ventral surface is pale.

Day states that the species grows as long as $5\frac{2}{5}$ inches. My specimens are about 50 mm. long.

Distribution.—Day states that the species is abundant at the base of the hills in the Bhavani River but rarer in the Sigur. I took two males and a female in the Nierolay stream at the base of the Nilgiris in August, with a number of specimens of *D. stenorhynchus* and one of *D. jerdoni*.

Discognathus elegans, sp. nov.

(Pl. ix, fig. 4; pl. xi, fig. 5).

This species is distinguished by its elongate form and by the structure of the snout, which bears numerous patches of horny tubercles but is not produced between or outside the nostrils.

The dorsal and ventral profiles of the body and the tail are nearly parallel and the depth of the body is contained more than six times in the total length. The head is short and rather narrrow, its length being contained nearly six times in the total length. The snout is more than twice as long as the part of the head behind the eye. Its dorsal profile is concave, the posterior transverse groove found in certain other species between the nostrils being represented by a broad depression. There is a narrow anterior transverse groove, which extends backwards on the sides of the head nearly as far as the anterior margin of the eye. There are about seven groups of horny tubercles on the snout, but some of them may coalesce or be subdivided. The nostril is very much nearer the eye than the tip of the snout. The eye is of moderate size, invisible from below. The snout is rounded in ventral view. The upper lip, which is fringed and granular, is relatively small, exposing both jaws. There are four very small barbels, those at the angle of the mouth being almost vestigial. The mental disk is transverse and lens-shaped. There is a narrow band of granular tissue in front of it and it is surrounded on three sides by a broad granular free border, which is slightly emarginate near the angle of the jaw on each side. The opercular borders are practically transverse on the ventral surface and are widely separated. The chest, and indeed the whole ventral surface, is flat but scaly and without specialized muscles. The dorsal fin is higher than the depth of the body; its

undivided rays are weak. The pectorals are as long or very nearly as long as the head, pointed and not much expanded. The ventrals, the anal and the two lobes of the caudal are also elongate and pointed. The scales are rather small. There are $4\frac{1}{2}$ between the lateral line and the dorsal and $3\frac{1}{2}$ between the former and the ventral. The number in the lateral line is the same as in other Indian species of the group.

The colour is dark olivaceous without definite markings. The ventral surface is yellowish-white The fins are infuscated, but the paired ones have a pale border.

This is the largest species of the genus with which I am acquainted. The type-specimen is 216 mm. long and the local fishermen state that individuals one cubit long are sometimes captured.

Type-specimen, No. $\frac{9798}{1}$ F, *Z.S.I.* (*Ind. Mus.*).

Distribution.—I have seen this species only from the gorge of the Bhavani River at the base of the Nilgiris, where it was taken with *D. jerdoni* in August. I have examined six specimens.

D. elegans is related to *D. gravelyi* from Burma, but the form is more elongate, the snout is tuberculate and there are considerable differences in the structure of the mental disk. From *D. platycephalus*, Rao it is distinguished by its more elongate form and more convex head. *D. ceylonensis* (Bleeker)[1] seems to be an allied species.

ADDENDUM.

The True Cyprinus lamta *of Buchanan.*

Dr. B. L. Chaudhuri has kindly drawn my attention to a quotation from Buchanan's manuscript notes which casts some light, in conjunction with the same author's original figure of "Cyprinus godiyari," on the identity of his *Cyprinus lamta*.

This quotation will be found on page 81 of Day's volume on the fisheries and botany of Bengal in Hunter's *Statistical Account of Bengal* (1876). He says, quoting Buchanan, "the *Godiyári* is another small Cyprinus found in the same places," *i.e.* in small streams among rocks in the Bhagalpur district; while in a footnote to the name *Godiyári* he adds, apparently on his own authority, "*Cyprinus lamta*, Ham. Buch. Fish. Ganges, p. 343, and MS. drawings No. 105, as *Cyprinus godiyari*."

Buchanan's MS. drawing No. 105 is still in the possession of the Asiatic Society of Bengal. It comprises three figures, one a finished coloured drawing[2] of the whole fish, the others outlines of the dorsal view and of the ventral surface of the head. These figures represent a species unknown to me but apparently allied to

[1] *Garra* (*Garra*) *ceylonensis*, Bleeker, *Versl. en Meded. Afd. Natuurk.* XV p. 239 (1863).

[2] McClelland gives a rather poor reproduction (sufficiently accurate in essentials) of this drawing in *Asiatic Researches* XIX, pl. xliii, fig. 2 (1839).

D. nasutus. Possibly it is *D. macrochir* (McClelland), but the figure of the head is unfinished and shows very little detail. The figure is labelled "Cyprinus godyari" in Buchanan's handwriting. The species figured is *not* the *D. lamta* of Day's *Fishes of India* and of subsequent authors. If we are to accept Day's identification on this occasion, the *D. lamta* of his later works will have to receive some other name; but the only point in favour of this is the fact that Buchanan himself was of the opinion that the Lamtá of the Gorakhpur district was identical with the Godiyári of the Bhagalpur district (*op. cit.*, p. 103). Considering the universal confusion of species that has followed, it is by no means improbable that Buchanan himself did not distinguish them clearly and that his *Cyprinus lamta* was, as I have suggested elsewhere, a composite group rather than a single species. It must be remembered that Day, who had himself collected different forms of *Discognathus* in the Bhavani River (where at least four quite distinct species occur), failed in the end to recognize their diversity. The only way in which the point can be settled is by a thorough ichthyological survey of the small streams of the Bhagalpur and Gorakhpur districts.

July 21st, 1919.