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ON THE TAXONOMIC STATUS OF *LEPIDOCEPHALUS THERMALIS* (VALENCIENNES) IN RELATION TO *LEPIDOCEPHALUS GUNTEA* (HAMILTON) (COBITIDAE)

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ABSTRACT

Tilak and Husain (1981) have recently made a detailed study of the Indian species of the genus *Lepidocephalus* and during this study, clearly differentiated *Lepidocephalus guntea* and *Lepidocephalus thermalis* on the basis of the pattern of scalation of the head and body in addition to a large number of other features ; these authors treated them as valid species. In the meanwhile, Babu Rao and Yazdani (1980) have relegated *L. thermalis* to the synonymy of *L. guntea* on rather weak grounds. A reassessment of the taxonomic features of both these species has been done in this paper in the light of the statement made by Babu Rao and Yazdani (1980) and brought out trenchant differences between these species in a large number of their features such as the shape of snout and mental lobes, barbels, length of head, depth of body, shape of the caudal peduncle, shape of the pectoral fin, lepidosis on head and body, colouration etc., indicating an independent specific status for these species. *L. thermalis* is, therefore, taxonomically valid and a species independent from *L. guntea*.

INTRODUCTION

Hamilton (1822) described *Cobitis guntea* and *C. balgara* from ponds and freshwater rivers of Bengal and Kosi river respectively. The two species were found conspecific by subsequent authors (Banarescu and Nalbant, 1968 ; Srivastava, 1968 ; Menon, 1974 ; Tilak and Husain, 1975, 1981 ; etc.). Day (1878) considered *balgara* as a subspecies of *Lepidocephalus guntea* while Guenther (1868) treated them at a specific level. The present authors (Tilak and Husain, 1975, 1981) considered *L. guntea* as the female and *balgara* as the male of the same species. During a recent study, the present authors (Tilak and Husain, 1981) while studying the Indian species of the genus *Lepidocephalus* Bleeker, treated *L. thermalis* (Valenciennes) as a separate species well differentiated from *L. guntea* (Hamilton).

Babu Rao and Yazdani (1980) pointed out that colouration of body is highly variable in this group of fishes and might be associated with the habitat. This statement holds good for both the species, *L. guntea* and *L. thermalis* and each of these two species has separately a range of variability in colouration. The range of variation of colouration, when taken along with other taxonomic characters of each species, serves as a good specific character. Babu Rao and Yazdani (1980) contended that the scales in these species are very minute, deciduous and difficult to count, when present. It is

true that the scales are minute but they are not deciduous, rather embedded in the skin ; they might appear to be absent or deciduous, if not carefully examined. They can even be counted, when examined under a stereo-microscope. On the contrary, the distribution of the scales on the head and body has been discovered by the present authors (1981) as an important taxonomic character.

Since the present authors have already clearly differentiated *L. guntea* and *L. thermalis* on the basis of the pattern of scalation on the head and the body in addition to a large number of other features, it is felt that relegating of *L. thermalis* to the synonymy of *L. guntea* is not valid. Babu Rao and Yazdani (1980) have probably not understood the exact taxonomic limits of the two species because of the earlier descriptions of the species being deficient in details. In view of this, it has been felt desirable to re-evaluate the taxonomic status of these two species through a study of the vast material of the species collected from different parts of India. The present study brings on record a large number of important points of difference between the two species.

Observations

The vast amount of material of *L. guntea* and *L. thermalis* has been studied here and the differences in their morphometry have been given in a table (Table 1) and the points of their difference are enumerated below.

Table 1. Showing morphometric measurement in *Lepidocephalus guntea* and *L. thermalis*

Morphometric measurements	*L. guntea* (Hamilton)	*L. thermalis* (Valenciennes)
(1) Length of head/width of head	1.50-1.78	1.82-2.09
(2) Total length/depth of body	5.66-7.00	7.46-9.71
(3) Standard length/depth of body	4.69-5.84	6.00-6.67
(4) Length of head/depth of body at anal origin	1.11-1.35	1.51-1.80
(5) Length of head/length of pectoral (male)	0.89-0.95	1.00-1.16
(6) Distance between pectoral & ventral fins/length of pectoral fin (male)	1.46-1.66	1.83-1.84
(7) Standard length/Length of pectoral fin (male)	4.63-5.18	5.12-5.20
(8) Length of head/Length of ventral fin (female)	1 36-1.50	1.54-1.76
(9) Distance between ventral & anal fins/length of ventral fin (female)	2.06-2.30	1.80-1.88
(10) Length of head/length of ventral fin (male)	1.11-1.32	1.44-1.64
(11) Standard length/length of ventral fin (male)	6.17-6.46	7.36-7.37
(12) Length of head/anal fin height (male)	1.15-1.32	1.37-1.64
(13) Total length/length of caudal fin	5.82-6.18	5.11-5.71
(14) Standard length/length of caudal fin	4.82-5.18	4.11-4.71
(15) Standard length/height of caudal peduncle	7.07-8.16	9.09-10.00
(16) Total length/distance between ventral & anal fins	4.00-4.59	5.08-5.44
(17) Standard length/distance between ventral & anal fins.	3.35-3.83	4.11-4.42
(18) Total length/postventral distance of body	2.31-2.56	2.66-2.92
(19) Height of caudal peduncle/length of ventral fin (female)	1.00-1.04	0.79-0.92
(20) Depth of body/length of pectoral fin (female)	1.22-1.38	0.86-1.07

(1) **Snout :** In *L. thermalis*, the snout is compressed and skinny so as to form a narrow ridge dorsally and pointed anteriorly (similar to that of *L. annandalei* Chaudhuri). In *L. guntea*, on the other hand, the snout is moderatly compressed, fleshy and obtuse in front. (Figs. 1a, 2a, 3a, 3b)

(2) **Mental lobes :** The shape of the mental lobes is different in the two species. In *L. thermalis*, each lobe is like an oval nodule whose tip is produced into a minute thread-like structure. In *L. guntea*, the mental lobes are extensive, fleshy, subdivided into 2-3 lobules, each produced into stumpy

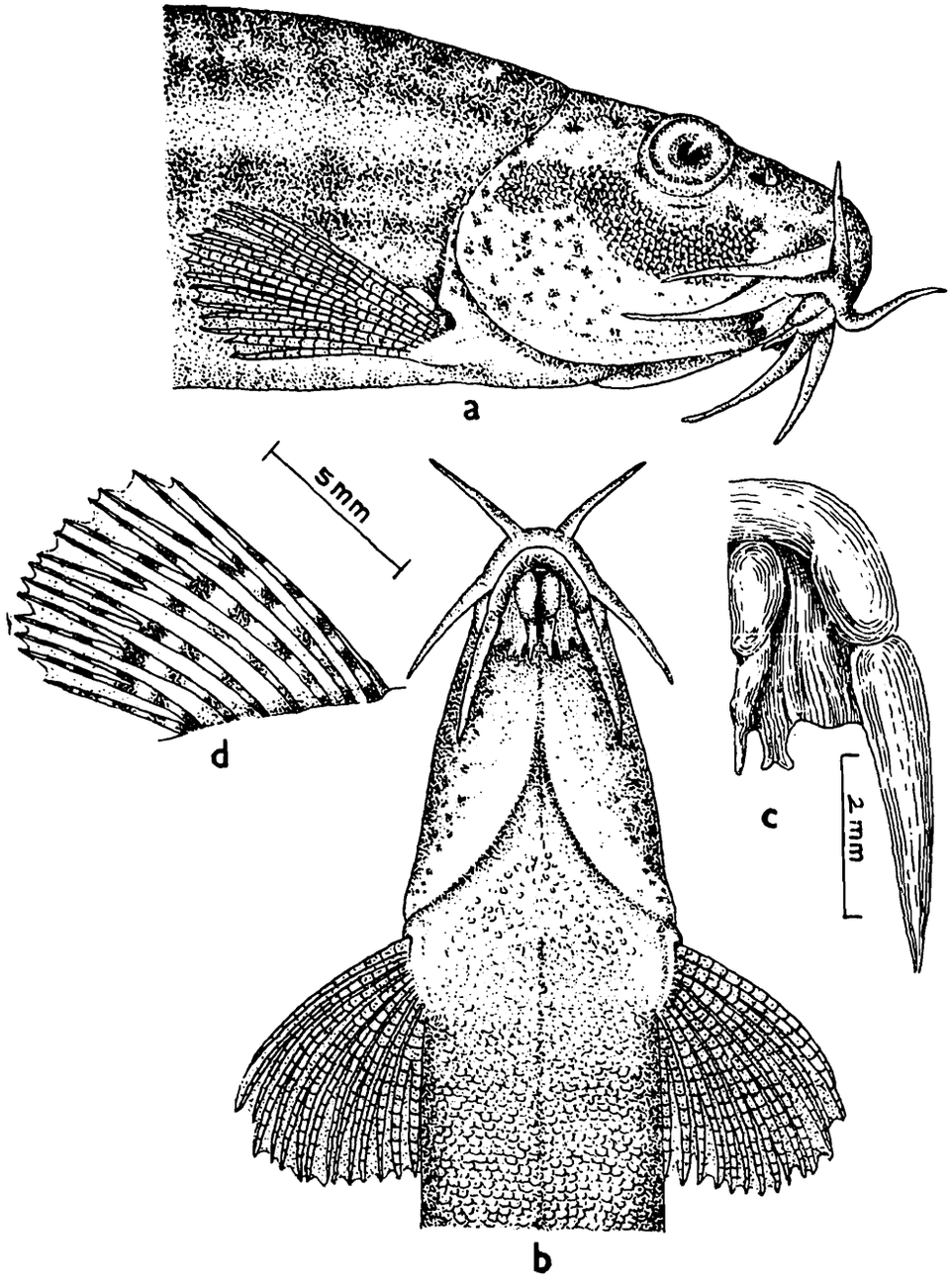

Fig. 1. *Lepidocephalus guntea* (Hamilton)
(a) lateral view of head and anterior part of body (b) Ventral view of head and anterior part of body (c) mental lobe and maxillo-mandibular barbel (enlarged view) (d) dorsal fin

TILAK & HUSAIN PLATE I

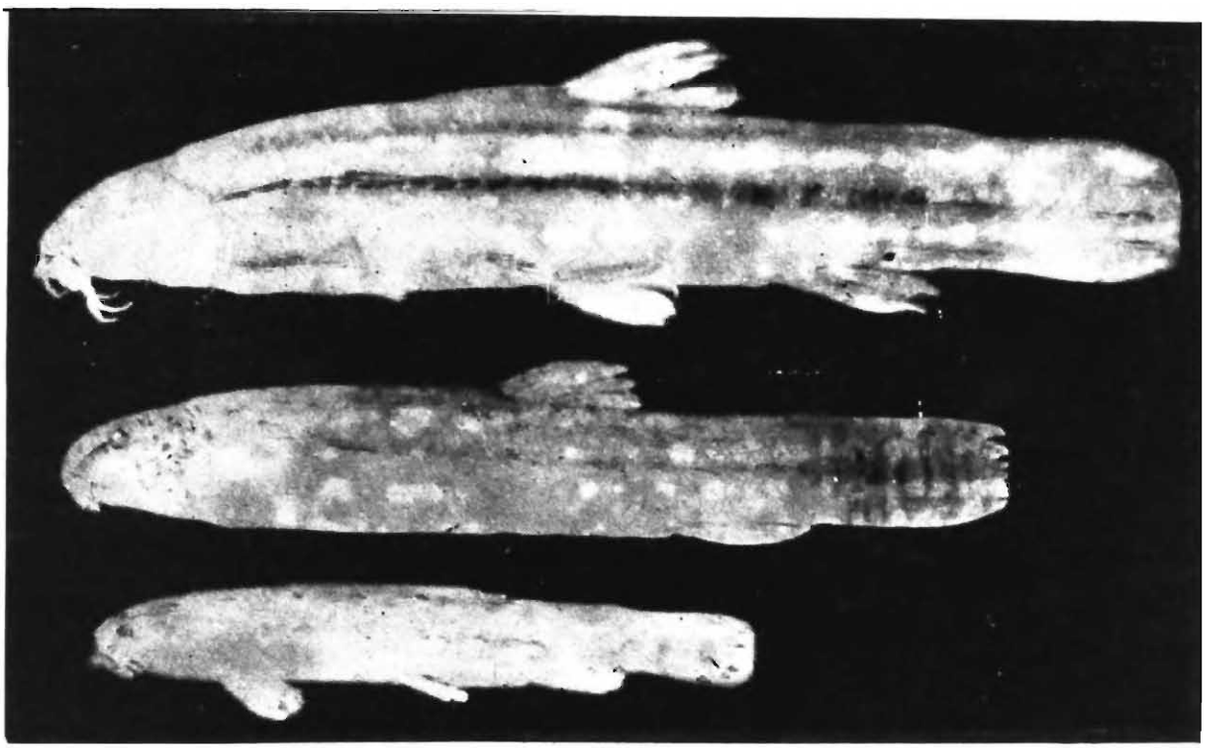

Fig. 1. *Lepidocephalus guntea* (Hamilton)
Top is male and the rest are female

TILAK & HUSAIN PLATE II

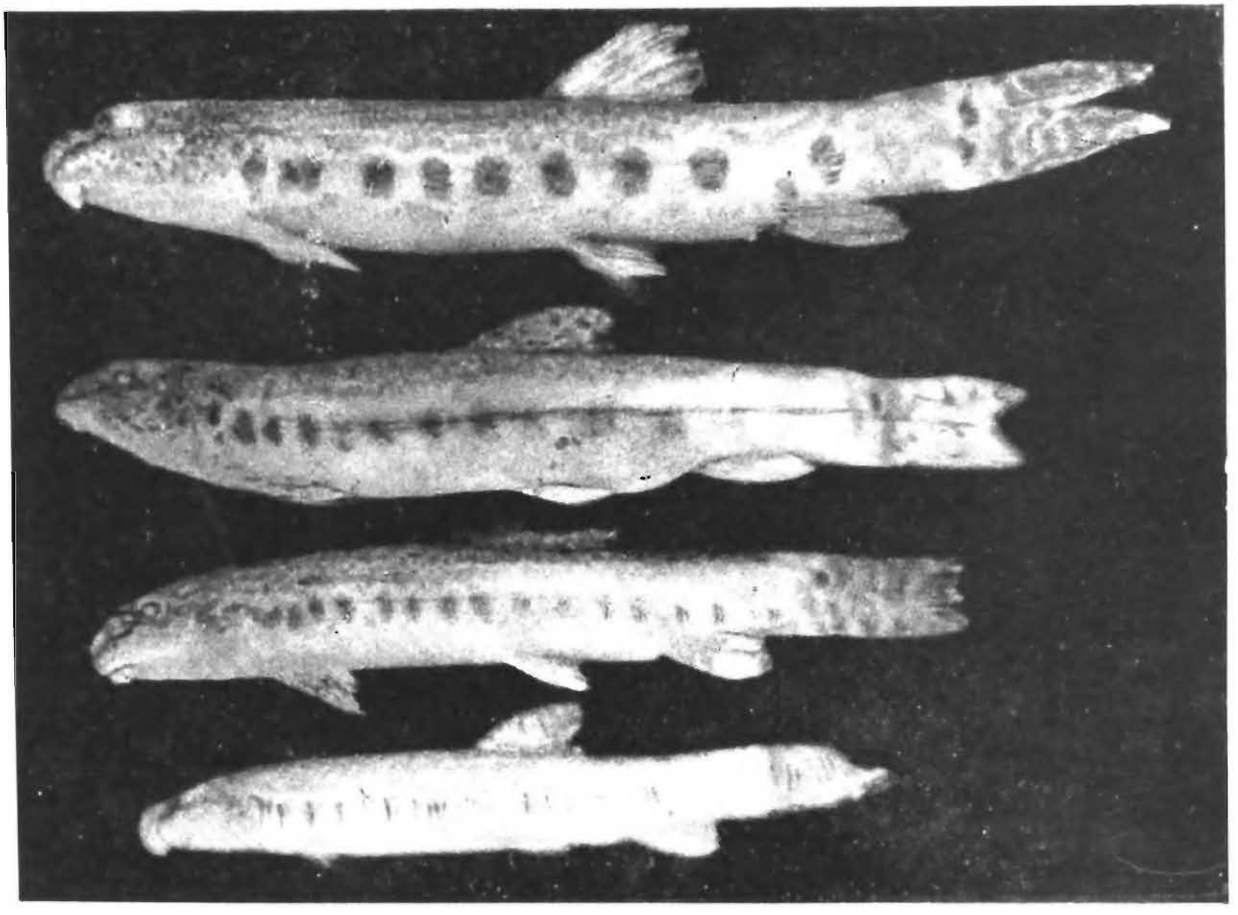

Fig. 2. *Lepidocephalus thermalis* (Valenciennes)

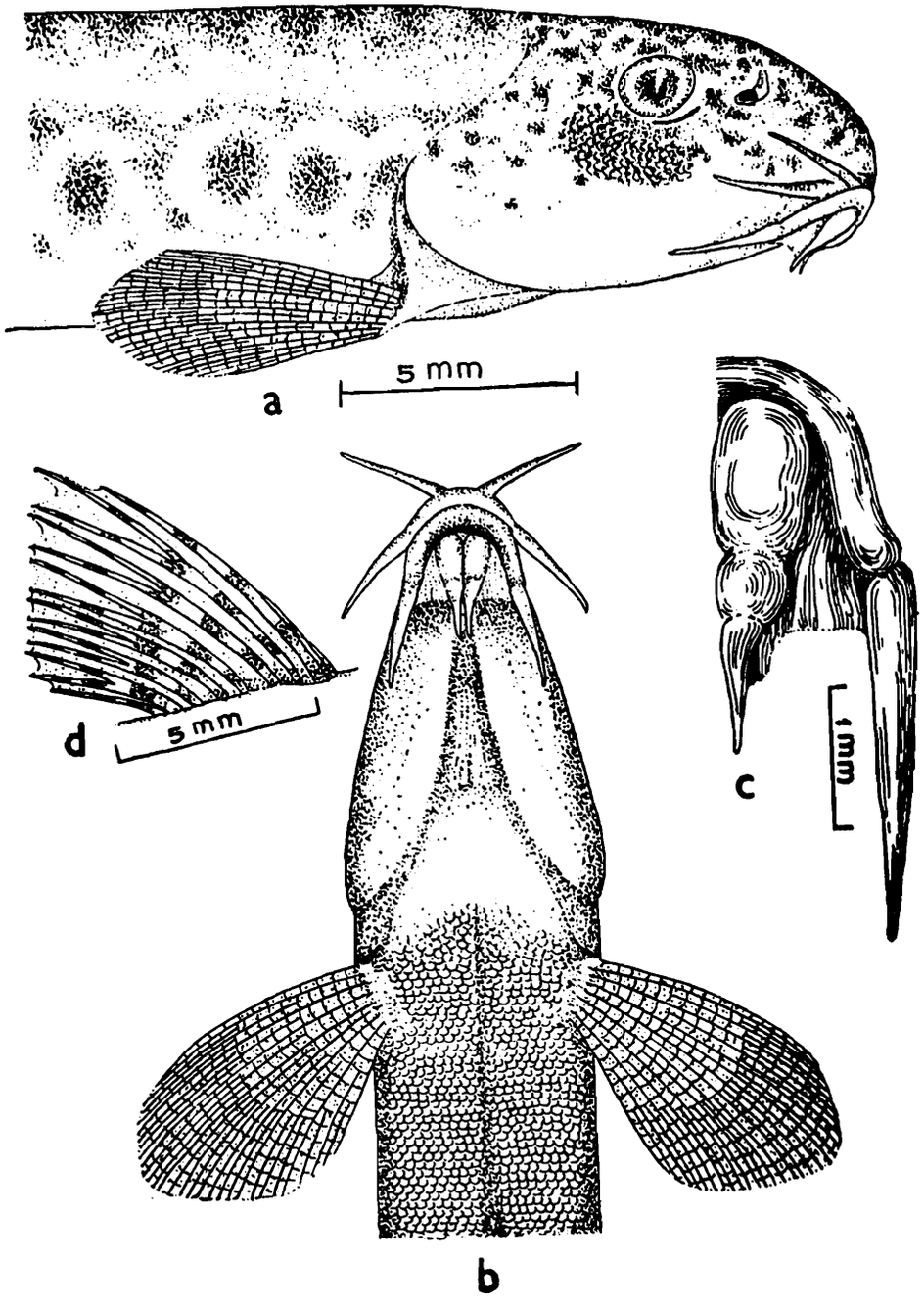

Fig. 2. *Lepidocephalus thermalis* (Valenciennes)
(a) lateral view of head and anterior part of body (b) ventral view of head and anterior part of body (c) mental lobe and maxillo-mandibular barbel (enlarged view) (d) dorsal fin

projections and the inner edge of each mental lobe is directed ventrally. (Figs. 1c, 2c)

(3) **Barbels :** The barbels are thick and longer than eye diameter in *L. guntea*. In *L. thermalis*, the barbels are fine and comparatively much smaller than those of the former i.e. equal to or smaller than eye diameter.

(4) **Head :** In similar sized specimens, the head is comparatively longer in *L. thermalis* than that of *L. guntea*. The

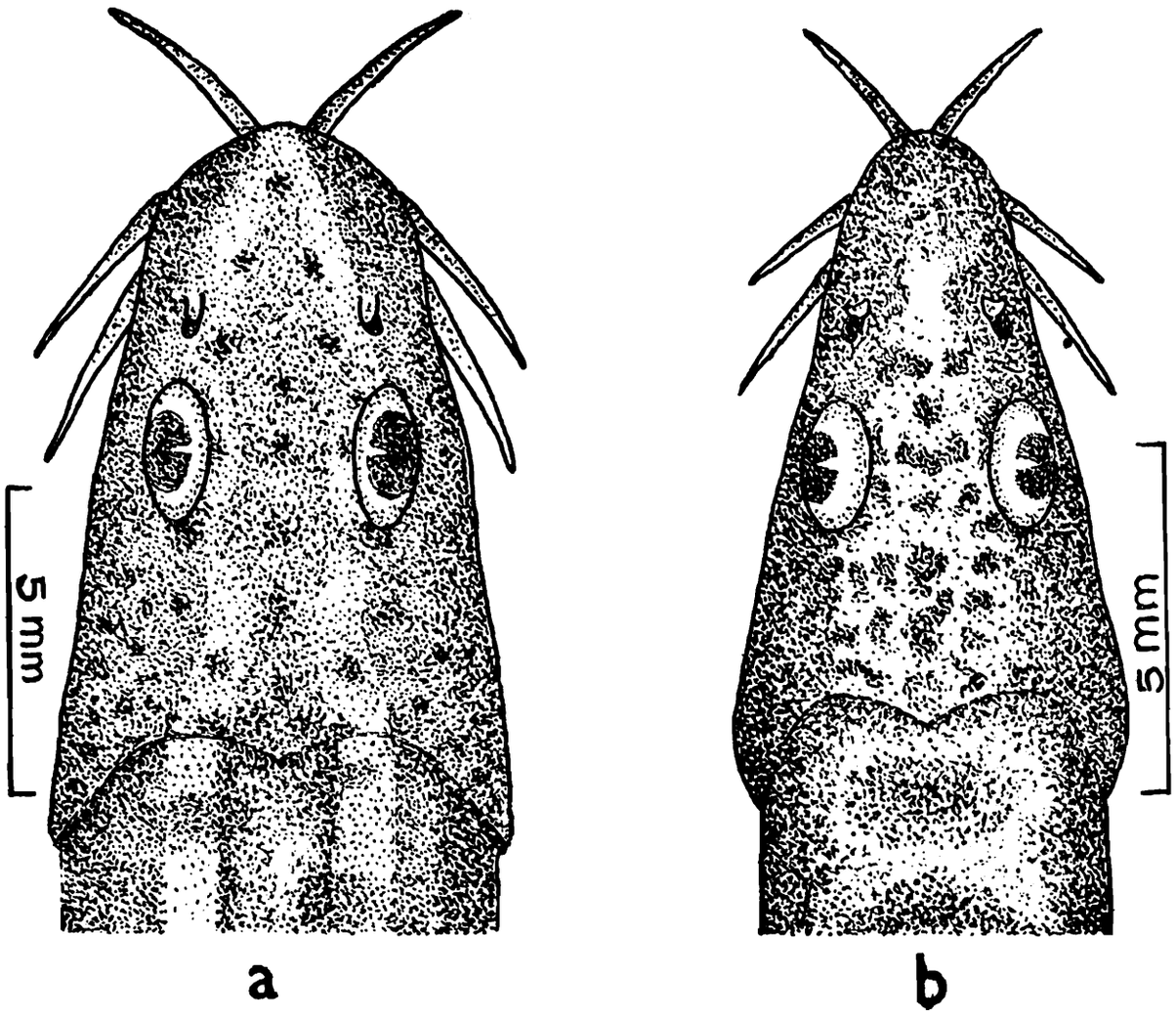

Fig. 3. (a) Dorsal view of head of *L. guntea* (Ham.) (b) Dorsal view of head of *L. thermalis* (Val.)

maximum of the range of variation in the proportion of head to the total or standard length in *L. thermalis* overlaps the lowest of the same range in *L. guntea* (5.57-6.28 in total length and 4.48-5.12 in standard length in *L. thermalis*, 5.88-6.80 in total length and 4.91-5.71 in standard length in *L. guntea*).

(5) **Depth of body :** *L. guntea* is a deep bodied fish while *L. thermalis* is comparatively more streamlined. The depth of body is 5.56-7.00 times in total length and 4.69-5.84 in standard length in *L. guntea* while it is 7.46-9.71 in total length and 6.00-6.67 in standard length in *L. thermalis*. (Plates I, II).

(6) **Caudal peduncle :** The caudal peduncle is narrower in *L. thermalis* and somewhat squarish in *L. guntea*. The least height of the caudal peduncle is always less than its length in *L. thermalis* (1.06-1.50) while it is equal, less or slightly more in *L. guntea* (0.93-1.22) (Pl. I, II).

(7) **Dorsal fin :** In *L. thermalis*, the anteriormost branched rays are almost 2 times longer than the last ray of the same fin.

When the fin is adepressed against its base, the anterior rays completely cover the tips of the last rays. The upper margin is obliquely truncate. In *L. guntea*, the anterior rays are comparatively shorter, being less than 2 times the length of the posteriormost ray. When adepressed, the anterior rays do not completely cover the tips of the posteriormost rays of the same fin. The upper edge of the fin is convex. (Figs. 1d, 2d)

Babu Rao and Yazdani (1980) have mentioned 7-8 branched rays in the dorsal fin and 6-7 branched rays in the anal fin in *L. guntea*. In the present study, it has been observed that there are only 6-7 branched rays in the dorsal fin and 5 in the anal fin.

(8) **Pectoral fin :** In *L. thermalis*, the tip of the second branched ray is slightly produced and therefore, the pectoral fin appears fusiform. In *L. guntea*, the second branched ray is also longest but not produced. The expanse of the fin in *L. guntea* is much wider than that of *L. thermalis*. Accordingly, there is difference in the shape of this fin of the two species. In males of *L. guntea*, the pectoral fin is longer than the head while it is not so in *L. thermalis* (Figs. 1b, 2b)

(9) **Caudal fin :** The caudal fin is emarginate in *L. thermalis*, although there are a few examples where the caudal fin is cut square with pointed corners. In *L. guntea*, on the other hand, the caudal fin is convex or cut square with rounded corners. (Pls. I, II)

(10) **Lepidosis :** The scales are minute and embedded in the skin ; they are imbricately arranged. Those of *L. guntea* are comparatively longer than those of *L. thermalis*. Accordingly, there are 25-30 rows of scales between the base of the anal fin and middorsal sides of the body in *L. guntea* and 30-37 rows in *L. thermalis*. On the head, scales are absent except for a semilunar patch posterior to the suborbital spine and below the posterior margin of eye in *L. thermalis* and a large suborbital patch together with a small patch of scales on the upper part of operculum which may sometimes be contiguous with the suborbital patch in *L. guntea*. The opercular patch of scales is absent in *L. thermalis*. The scales on the ventral side of head extend beyond the isthmus in *L. guntea* while they may or may not do so in *L. thermalis*. (Figs. 1a, b, 2a, b).

(11) **Colouration :** *Lepidocephalus guntea* (Pl. I, Figs. 1a, 1d)

The colouration of the body is highly variable and differs with age, size and sex. In young individuals, the ground colour is sandy yellow. Along the lateral sides of the body, there is a series of nearly 10-12 dark grey spots connected with one another through a very thin dark band. As the fish grows in size, the lateral spots also grow in size and tend to fuse with one another. Just above the lateral dark spots and the band, there is another thinner dark band parallel to it and separated from it as well as the colouration of the back by a band of the ground yellowish colour. The dorso-lateral dark band is infuscated with dark spots in the female and clear in the adult male. As a result of the stippling of the ground colour in the female and its absence in the adult male, the yellow colour band in the latter is very bright and prominent. This difference is correlated with the lengthening of the pectoral fins and ossification of the innermost two rays of this fin in adult males ; in the female, the pectoral fin is comparatively smaller and there is no

ossification of the inner rays of this fin. The intensity of the lateral band in the male and that of the continued row of spots of the lateral band in the female is increased by the presence of a sub-dermal dark band.

A light band, edged with dark, runs on the dorsal side between the head and the origin of the dorsal fin. On the sides of this band as well as on the body behind the dorsal fin, there are distant transversely disposed dark stripes which are sometimes almost completely submerged with the general dark pigmentation. There is a minute black spot on the upper half of caudal base. There are 6-7 rows of spots on the dorsal fin and a similar number on the caudal fin. The pectoral, ventral and anal fins are lightly stippled. The ventral sides of head and body are uniformly pale or yellowish. There is a dark stripe extending from the antero-ventral side of the eye to the lateral side of the snout tip. The dorso-lateral side of the head is reticulated and the pigmentation is submerged under a thick epidermal layer. Barbels are also pigmented.

Lepidocephalus thermalis (Pl. II, Fig. 2a, 2d)

The ground colour of the body is yellowish. There are 12-15 (6-7 predorsal, 2 subdorsal, 4-6 postdorsal) spots on the middorsal surface of the body. There are 11-15 squarish, rectangular, triangular or oval spots on the lateral sides of the body. These spots are encircled by a ring of yellowish ground colour. The subdermal colour band, running below these spots, is thin. The lateral spots are never confluent. Similar spots may be present on the dorsal side of the body. The dorso-lateral part of the body between the back and lateral row of spots is reticulated with small spots although in some specimens, there is an indication of the presence of a thin light yellowish band in this region. There is a row of small spots below the lateral row of spots. The ventral side of body is yellowish. The dorsal fin bears 6-7 rows of spots. There are 5-6 complete '<' shaped bands on the caudal fin. The upper and lower extremities of this fin bear 2-3 additional bands which remain discontinous due to emarginate nature of this fin. The pectoral, the ventral and the anal fins are stippled with fine dots which are, in some cases, differentiated into bands particularly in the anal fin. There is a vertical dark spot at the base of the upper part of the caudal fin ; it is surrounded by a white ring. The dorsal and lateral sides of the head bear small irregular spots which invariably get connected with one another in an irregular manner forming a reticulation. The colouration of the dorsal sides of the head is much clearer than that of *L. guntea*. There is a dark streak, running between the anterior edge of the eye and the side of the tip of snout.

REMARKS

Babu Rao and Yazdani (1980) stated that Day (1878) has based his description of *L. thermalis* on young examples which according to them could be young of *L. guntea*. On the contrary, Day (op. cit.) has clearly mentioned that he found 2,500 eggs in a female specimen of *L. thermalis*, indicating thereby that his materal consisted of adult examples. The statement of Babu Rao (1980) in this respect is, therefore, a misquotation.

The material of *L. thermalis*, studied here, has been from Poona and Periyar lake and

river (Kerala). The large number of differences mentioned above clearly indicate that *L. thermalis* is a species independent from *L. guntea*.

Sexual Dimorphism : There is a marked sexual dimorphism in both *L. guntea* and *L. thermalis* (Day, 1865, 1878 ; Nalbant, 1963 ; Banarescu and Nalbant 1968 ; Tilak and Husain, 1975, 1981). The last two pectoral rays are ossified and fused proximally to form a vertical ridge in the male. This ridge is not formed in the female. Babu Rao and Yazdani (1980) were doubtful about the sexual dimorphism in these species. The pectoral fin is longer than the head in the male while it is not so in the female.

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