

lives on the surface of water, and as a rule, though not invariably, of still water, in the structure of its feet, more particularly of those of the two hinder pairs of legs. On these feet there is in *Gerris* a pair of slender, almost bristle-like claws, which are situated at the tip of the limb; some distance in front of them, on the lower surface, there is a large bristle, but there is no definite empodium and the whole structure is degenerate. In *Onychotrechus* the claws are real claws, of a horny consistency, curved towards the tips, sharply pointed and flattened from side to side; they are separated from the extremity of the limb by several strong bristles and small processes perhaps of a sensory nature; similar processes also occur just behind the claws, and between them protrudes a coiled band-like empodium. These structures deserve a more detailed examination. I refer to them here merely to indicate that the foot is modified in this genus to enable it to cling to slippery surfaces, while in *Gerris*,<sup>1</sup> which apparently does not use the claws of its hinder legs at all, they are degenerate. There is less difference between the anterior feet of the two genera, both of which probably use them for grasping prey, but even in these feet the claws of *Onychotrechus* are much stronger and larger than those of *Gerris*. These facts are illustrated in figures 8 and 9 on plate III, drawn on the same scale from insects of approximately the same size.

*Oligochaeta*.—Small white worms of the family Naiadae are abundant in damp algae on the cliffs.

The fauna of these cliffs, where they are wet with the spray of waterfalls, includes, therefore, highly modified forms among both the Mollusca and the insects. The latter are still imperfectly known, but there is every reason to think that a proper entomological investigation of the waterfalls would have great biological interest.

#### IV. SOME FROGS FROM STREAMS IN THE BOMBAY PRESIDENCY.

Only three species of frogs were found at the edge of the streams investigated at Medha and Khandalla. They are *Rana cyanophlyctis*, an undescribed race of *R. limnocharis* for which I propose the subspecific name *syhadrensis*, and an undescribed species of *Ixalus*, which I have called *I. bombayensis*. Both new race and new species are abundant in the Bombay Ghats. The *Ixalus* has been found in the North Canara, Satara and Poona districts, the race of *R. limnocharis* in the two latter and also in the Nasik district; neither form is known to occur at altitudes below 2,000 or above 4,000 feet.

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<sup>1</sup> I have seen a species of *Gerris* clinging to rocks at the edge of the Bhavani river by means of its anterior claws. It could not, however, run about on the slippery surface.



***Rana cyanophlyctis*, Schneider.**

This frog, one of the commonest species in the plains of India, is found only in the immediate neighbourhood of water. It is equally at home in puddles of rain-water, ponds and streams, but does not frequent the smaller mountain streamlets. So far as my own observations go, it is the only species that skips over the surface of the water as *R. limnocharis* is sometimes stated, I believed incorrectly, to do. The habit was first noted in literature by the Emperor Bābur<sup>1</sup> in the year 1525-1526. *R. hexadactyla* may have the same habit when young, but when full grown is probably, as Dr. Henderson points out in a letter, too heavy an animal.<sup>2</sup> *R. cyanophlyctis* is frequently seen in wells and in pools with a steep margin. In such conditions it floats on the surface of the water, but when a resting place is available it usually sits at the edge. When disturbed it gives a short leap, horizontally

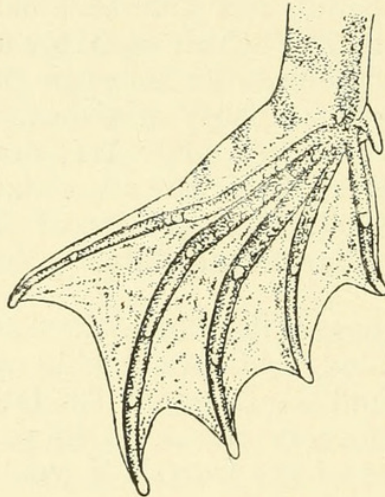


FIG. 2.—Hind foot of *R. cyanophlyctis* (enlarged).

rather than upwards, and strikes the surface of the water with its short, broad, slightly cup-shaped and stoutly webbed hind feet (fig. 2) at such an angle that it is again propelled forwards through the air for some inches; it then again strikes the water in the same way, and the manoeuvre may be repeated as many as seven times. When the impetus is exhausted, as it usually is after a couple of yards or at most 10 feet—the Emperor's observation was not strictly accurate—the frog dives obliquely forwards to the

<sup>1</sup> He says in his "Memoirs," "The frogs of Hindustan, though otherwise like those others (Tramontane) run 6 or 7 yards on the face of the water." See *The Memoirs of Emperor Bābur*, translated by Annette S. Beveridge, fasc. III, p. 503 (1918).

<sup>2</sup> Since this was written I have been able to observe *R. hexadactyla* in Madras. The adult usually sits among weeds in the water, where its bright green colour conceals it to some extent. When disturbed it dives through the weeds but if they are too thick it skips feebly two or three times.



bottom. If this be soft it burrows into it with its fore feet, impelling itself forwards at the same time by vigorous kicks of its hind legs. It makes its way more or less completely into the mud or sand but does not attempt to go downwards. After remaining buried or half buried for a few minutes, it backs from its temporary burrow and rises cautiously to the surface. If no danger threatens it then swims ashore. I have often seen a frog dive direct into the water from a stone or rock and then leap out and skip two or three times. When living at the edge of a stream it dives against the current, and often has difficulty in reaching the bottom. Its swimming stroke is, however, very powerful; it is the only frog with the habits of which I am acquainted that habitually swims upstream.

*R. cyanophlyctis* is abundant at the edge of the Yenna at Medha and also at that of ponds and of the larger streams, where they traverse fairly level ground, at Khandalla. It evidently prefers pools or streams of which the bottom is soft. It appears rapidly in isolated temporary pools and must make its way overland by night; I have never seen it except at the edge of water by day.

***Rana limnocharis*, subsp. *syhadrensis*, nov.**

This is a dwarfed race akin to the subsp. *niligiraca* but of much smaller stature and with the hind limbs as a rule shorter. The first finger hardly extends beyond the second; the hind feet are as in the typical form except that the webbing is slightly less extensive and the tibio tarsal articulation reaches the anterior border of the eye or a point between it and the tip of the snout. The dorsal surface is grey with black spots sometimes with a reddish suffusion; a narrow pale mid-dorsal line is often present; the ventral surface is white; with the whole of the throat black in the adult male. The length does not exceed 3.5 cm.

*Measurements in millimetres.*

			(type)	
			♂	♀
Snout to vent	..	..	27	31.5
Length of head	..	..	11	12.5
Width of head	..	..	9.5	11
Snout	..	..	4.5	6
Eye	..	..	3.4	3.4
Interorbital breadth	..	..	2.8	3
Tympanum	..	..	1.7	2
Fore limb	..	..	13.2	16
1st finger	..	..	4	5
2nd finger	..	..	3.8	4.5
Hind limb	..	..	42.7	45.8
Inner metatarsal tubercle	..	..	2	2.3
Middle toe	..	..	11	12



*Type-specimen*.—Rept. No. 19764, Z.S.I. (*Ind. Mus.*).

*Geographical Range*.—This little frog is abundant in the hills and elevated valleys of the middle region of the Bombay Presidency. I have examined specimens from several places in the Satara district at altitudes between 2,000 and 4,000 feet; also from Khandalla (2-3,000 feet) in the Poona district and from Igatpuri (2,000 feet) in the Nasik district. Apparently the typical *R. limnocharis* is absent from these localities.

***Ixalus bombayensis*, sp. nov.**

(Plate I, fig. 1).

Tongue with a free pointed papilla, often inconspicuous, in the anterior part of the median line. Snout rounded, as long as or a little longer than the orbital diameter; canthus rostralis distinct; loreal region concave; nostril much nearer the tip of the snout than the eye; eye very large and prominent; *interorbital space broader than the upper eyelid*; tympanum small, hidden. Fingers free; *toes not more than one third webbed*; disks and sub-articular tubercles moderate; a fairly large but by no means prominent oval inner metatarsal tubercle; outer toes slightly fringed. The hind limb being carried forward along the body, the tibio-tarsal articulation reaches the eye. *Skin more or less distinctly rugose<sup>1</sup> above, bearing small, scattered pointed warts or tubercles; upper eyelid tubercular*; throat and chest smooth; belly coarsely granular; a fold from the eye to the shoulder; a low ridge, sometimes broken up into a series of tubercles, on the mid-dorsal line of the head. The adult male with a very large gular pouch.

Colouration variable; dorsal surface dark brown or grey speckled with black, sometimes almost entirely occupied by a large dicebox-shaped mark of pinkish buff edged and speckled with black; a dark pale-edged cross-bar often present between eyes; sides dark, spotted and blotched with dull yellow; a large black and lemon-yellow mark in front of the groin in adults; limbs pale grey more or less irregularly cross-barred with black; hind part of thighs mottled with black and dull yellow; ventral surface greenish-yellow suffused with black.

Length not exceeding 3 cm.

*Type-specimen*.—Rept. No. 18782, Zool. Survey of India (*Ind. Mus.*), from Castle Rock.

*Geographical Range*.—Hills of the Bombay Presidency from N. Canara (Castle Rock) to the Satara (Khas) and Poona (Khandalla) districts at altitudes between 2,500 and 4,000 feet.

The species is closely allied to *I. flaviventris*, Boulenger,

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<sup>1</sup> In the specimen figured on pl. I it is smoother than usual. This specimen is the only fully developed adult male in the series examined.



whose description of that species I have followed closely, italicizing the more important differences. I have examined a large series of specimens.

*I. bombayensis* is common at Khas (where it occurs with *I. glandulosus*) and Khandalla; Mr. Kemp found a single specimen at Castle Rock. It is evidently nocturnal in habits and in the daytime its pupil is often reduced to a very narrow transverse slit. It hides under stones in damp places at the edge of small streams and in cracks in rocks kept wet by the spray of waterfalls.

#### V. NOTES ON FRESHWATER FISH MOSTLY FROM THE SATARA AND POONA DISTRICTS.

Fish of the following species were collected in the Yenna at Medha in February and March:—

<i>Euglyptosternum saisii</i> (Jenkins).	<i>Barbus malabaricus</i> , Jerdon.
<i>Lepidocephalus thermalis</i> (C. & V.)	<i>Barbus kolus</i> , Sykes.
<i>Nemachilus botia</i> (Ham. Buch.).	<i>Barbus ticto</i> , Day.
<i>Nemachilus savona</i> (Ham. Buch.).	<i>Rasbora daniconius</i> (Ham. Buch.).
<i>Nemachilus anguilla</i> , sp. nov.	<i>Barilius bendelisis</i> (Ham. Buch.).
<i>Psilorhynchus tentaculatus</i> , sp. nov.	<i>Danio aequipinnatus</i> (McCl.).
<i>Discognathus lamta</i> (Ham. Buch.), Day.	<i>Chela boopis</i> , Day.
<i>Cirrhina reba</i> (Ham. Buch.).	<i>Mastacembelus armatus</i> (Lacép.).
	<i>Ophiocephalus gachua</i> , Ham. Buch.
	<i>Gobius bombayensis</i> , sp. nov.

About several of these fish, having put on record their occurrence in the head waters of the Kistna, I have nothing further to say.

In small hill streamlets at Khandalla I obtained three species of fish:—*Nemachilus evezardi*, Day; *Psilorhynchus tentaculatus*, sp. nov. and *Discognathus nasutus* (McCl.). These I have already discussed at some length (pp. 113–117).

In addition to my own collection I have before me some interesting specimens of *Barbus* from the Satara district, sent me by Mr. C. D. McIver of the Public Works Department, a very keen student of the local fish-fauna. To these I shall refer, and with them to an interesting specimen of the same genus recently sent to the Indian Museum from Gauhati on the Brahmaputra by Mr. T. R. Phookun on behalf of the late Chief Commissioner of Assam.

I shall also discuss the Indian species of the genus *Discognathus*, so far as the material at my disposal permits me to do so.



Annandale, Nelson. 1919. "Some Frogs from Streams in the Bombay Presidency." *Records of the Indian Museum* 16, 121–125.

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