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ON TADPOLES FROM SIAM.

By Malcolm A. Smith, m.r.c.s., f.z.s.

With two Plates.

Index.

In the following paper, whilst describing some unknown tadpoles, I have taken the opportunity of reviewing many other known species, and of comparing my own observations upon them in Siam, with those of other naturalists both in this and in the neighbouring countries. I have also included some remarks upon the breeding habits of their parents. With two exceptions, *Rana kuhlii* and *R. cancrivora*, I have been able to keep and watch the development of all the species referred to.

I have never experienced the difficulty, which some seem to have had, in transporting certain tadpoles, in particular those of the genus *Microhyla*. The Engystomatid larvae are certainly more delicate than those with the Ranid type of mouth, but by taking precautions to

prevent their being "cooked" in the sun, and by not overcrowding them in their conveyance, I have always managed to bring most of them safely home. They have even survived a 200-kilometre journey by rail.

This year I succeeded, where I had hardly expected to, in bringing down the tadpoles of *Megalophrys montana* from the cool, fresh, mountain streams in the North, to the sultry plain of Bangkok. This was a three days journey, chiefly by train, and at almost the hottest time of the year. They travelled in an ordinary, large-mouthed, glass jar, provided with a string handle and thickly padded at the sides and below with straw or sacking. By keeping this always wet, the evaporation prevents the water inside from getting too warm, whilst the padding below helps to lessen the vibration when in the train.

The amount of knocking about that many of the tadpoles with the Ranid type of mouth will stand is quite remarkable, considering how soft all their structures are. I have seen them dropped off verandahs from a considerable height, jolted about in bullock-carts, and, worst of all, tossed on the backs of elephants for days together, yet most of them survived and seemed none the worse for it.

The literature quoted with each species refers to the tadpole only.

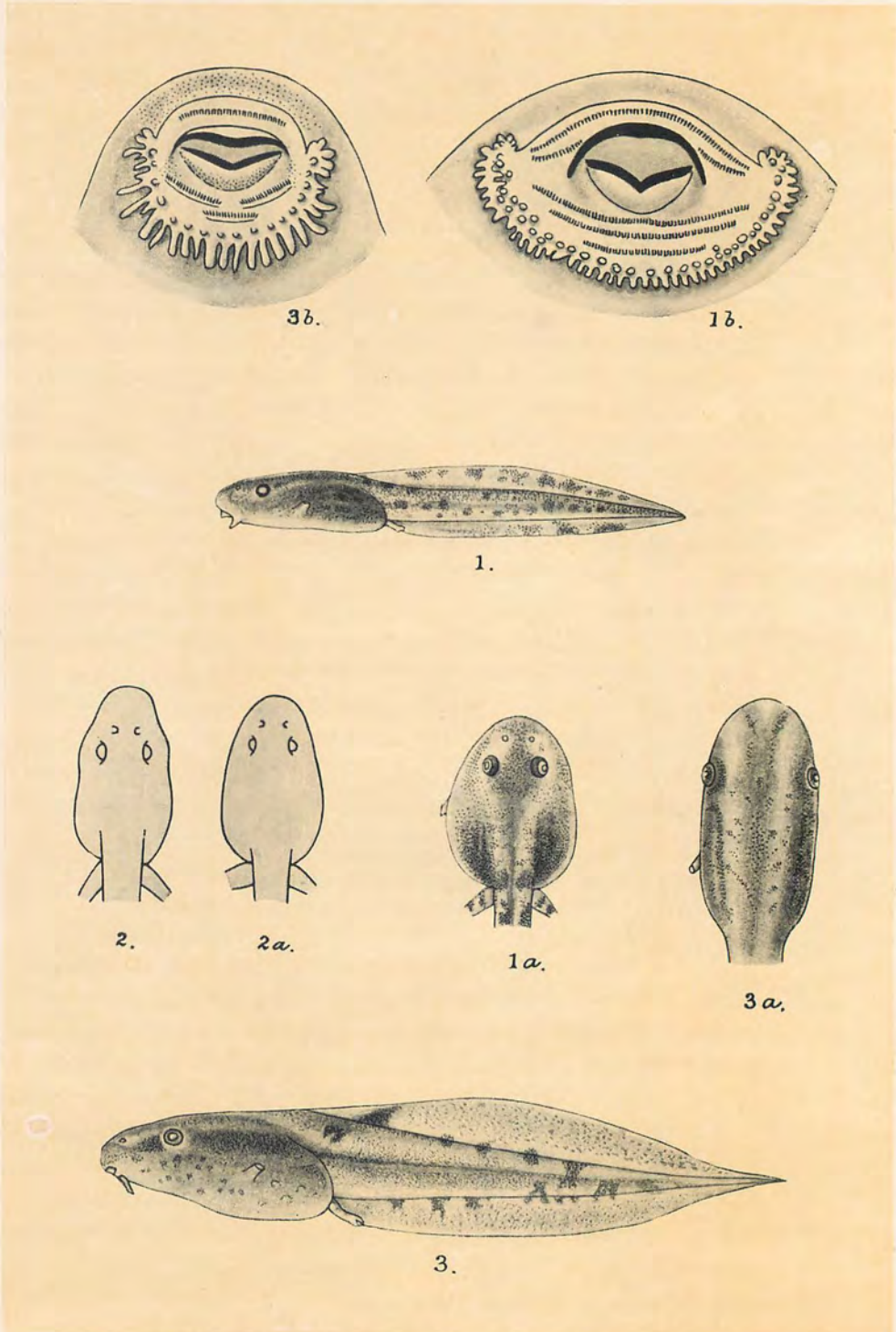
Rana kuhlii Dum. & Bib.

I found this frog exceedingly common upon Doi Nga Chang, N. Siam, haunting the streams, and hiding by day beneath the stones in the water. I have obtained it also on the hills south of Prae, but the elevation there is not so great, and it appears to be far less common.

DESCRIPTION OF THE TADPOLE.

Head and body. Length 1½ times its breadth, considerably flattened both above and below, snout rounded. Nostrils midway between the tip of the snout and the eyes. Eyes about 1½ times as far apart as the nostrils, looking as much upwards as outwards, the portion of the head visible on their outer sides when viewed from above equal to half the interocular space. Spiraculum sinistral, nearer the eye than the vent, not prominent in life. Anus dextral.

Tail. Four times as long as deep, tip bluntly pointed, crests



1. Rana kuhli. 2. Rana rugulosa. 3. Rana macrodactyla.

rather low, upper a little deeper than lower, not extending on to the back.

Mouth. Small, on the ventral surface; shortish papillae at the sides and below. Beak broadly edged with black. Upper lip with a long, continuous row of teeth, followed by a second, broadly interrupted. Lower lip with three continuous rows, or the upper one narrowly interrupted; the lowest row about half the length of the first or second, which are subequal.

Dimensions. Total length, 45; head and body, 16; depth of tail, 7 mm.

Colour (in life). Olive above speckled with blackish, below nearly colourless (in spirit, whitish).

Numbers of these tadpoles in all stages of development, and young ones which had left the water, were obtained upon Doi Nga Chang early in March, at between 700 and 1,000 metres elevation. In company with them were the larvae of *Megalophrys montana* and *M. pelodytoides*.

Rana rugulosa Wiegm.

Rana tigrina, Flower, P.Z.S., 1899, p. 892, pl. LIX.
Rana rugulosa, Annandale, Mem. Asiat. Soc. Bengal, VI, p. 126, fig. 2 and pl. VI (1917).

I have obtained two distinct forms of this tadpole in Bangkok, one with a long snout and elongated body, the other with a shorter snout and more rounded body. This variation is quite independent of age, and the figures given, showing the difference, have been drawn from fully grown examples. Flower's illustration is evidently from the shorter form, where the length of the body is about $1\frac{1}{2}$ times its width. In the longer form it may be nearly twice its width. A somewhat similar difference in form has been figured by Annandale for the tadpole of the closely allied *R. tigrina*, showing the variation in the position of the nostril. It will be observed that the position of the nostril with regard to the eye does not alter, the variation being in the length of the snout beyond, the greater portion of which, being absorbed in the completion of development, has no anatomical value in after life.

Concerning the armature of the mouth Flower remarks (p. 893), "inside the upper lip are five series of fine, black teeth; the first

series is uninterrupted, the second slightly interrupted by the individual teeth being 'grouped with intervals' about the centre of the line; the remaining series are broadly interrupted." In nearly all the specimens which I have examined the second series is also uninterrupted, and I believe the normal dental formula for the upper lip to be 2:3+3 and not 1:4+4. Where I have seen the second row interrupted in the manner apparently referred to by Flower, it has been due to erosion of the teeth at that point, a not unlikely thing to happen in a creature of such active habits.

The tadpole may attain a size considerably larger than he mentions, and specimens of 65-70 mm. in total length, with a head and body of 25, are not uncommon.

I have obtained them throughout the rainy season between July and October, from pools and ponds where the water is usually fairly deep. They are predacious, and like their parents, that will readily devour other frogs, feed for choice, at any rate in captivity, upon other tadpoles. A really hungry individual will bolt its victim whole, but the more usual method is to seize its prey by the belly, catching it from below, and then to suck out the abdominal contents, after which the body is dropped. In this way a well grown tadpole will dispose of ten to fifteen others, the size of *Microhyla ornata*, in the course of a day.

Rana cancrivora Gravenh.

Rana tigrina, var. *angustopalmata*, van Kampen, Webers Zoolog. Ergebn., Bd. IV, p. 389 (1907).
Rana tigrina, id., Natuurk. Tijdsch. Ned.-Ind. LXIX, p. 33 (1909).
Rana cancrivora, Annandale, Mem Asiat. Soc. Bengal VI, p. 128 (1917).

To Dr. Annandale belongs the credit for having at last assigned this frog its true place in scientific literature; and it was a great pleasure to me to obtain the larvae so soon after the publication of his article, and to compare them with Van Kampen's description of Java specimens.

Mine were collected near the mouth of Chumpon River (Pen. Siam), where this frog was very common, and from Koh Lak, a little further north, at the end of June. Some of them, with their tails still incompletely absorbed, had just left the water, and it is from these that the diagnosis has been made.

The only important point in which my specimens differ from Van Kampen's is in the length of the third or lowest series of teeth in the lower lip. He states that this row is much shorter than the one above—the length of the interval without the papillae; in mine, however, it is nearly as long as the one above and at least three times as long as the interval without papillae. In colouration they agree very well, but mine have a proportionately shorter tail.

Total length, 37 ; head and body, 15 mm.

Rana limnocharis Wiegm.

Van Kampen, Natuurk. Tijdsch. Ned.-Ind., LXIX, p 35 (1909) ; Smith, Journ. Nat. Hist. Soc Siam, II, p. 165 (1916); Annandale, Mem. Asiat. Soc. Bengal, VI, p. 133, fig. 2 and pl. VI (1917).

I have obtained the tadpoles of this frog in February (the middle of the dry season), as well as throughout the rains from July to November. Annandale has figured the mouth-parts from a specimen obtained in Madras. It differs from the Siamese form, and also that of Java (*vide* Van Kampen) in that the papillae are complete along the under lip. In all the specimens that I have examined there is a well marked gap or space in the middle, devoid of papillae.

Rana macrodactyla (Günther).

This frog inhabits the padi-fields and swampy places in and around Bangkok, and for some reason has a curiously local distribution. I know of some half dozen spots from where I can obtain as many specimens as I wish, but the rest of the country, although not differing apparently in any way, seems to be entirely devoid of them.

DESCRIPTION OF THE TADPOLE.

Head and body. Length twice its breadth, somewhat flattened both above and below, snout rounded. Nostrils nearer the tip of the snout than the eyes. Eyes looking almost entirely outwards, hardly any of the head visible on their outer sides when viewed from above ; twice as far apart as the nostrils. Spiraculum sinistral, equidistant between the eye and the vent, long and prominent in life. Anus dextral.

Tail. Three and a half times as long as deep, tip pointed. Crests moderate, upper 1½ to 2 times the depth of the lower, not extending on to the back.

Mouth. On the ventral surface. Beak narrowly edged with

black. Lips with short papillae at the sides and long ones below. Teeth feebly developed; one long uninterrupted series above; two below, the upper narrowly interrupted, the lower short, less than half the length of the one above.

Dimensions. Total length, 33 mm., head and body 11. Depth of tail 6.

Colour (in life). Reddish, brownish or olivaceous, thickly speckled, the markings on the tail sometimes forming vertical bars; a darkish mark down the middle of the back and another along each side of the body. Belly golden, throat blackish, with white spots. The white longitudinal lines of the perfect frog may be present before the creature leaves the water. The tadpole closely resembles that of *R. erythræa*. It may be distinguished by its smaller size and by the disposition of the teeth in the lower lip. In *R. macrodactyla* the upper row is interrupted, and the lower one very short. In *R. erythræa* the upper row is usually continuous and the lower one nearly as long as the upper.

I have obtained the tadpoles of *R. macrodactyla* in June and July shortly after the monsoon has broken, and they would probably be found as long as there is water in the fields. They are very active creatures and usually seek to avoid capture by concealing themselves in the mud.

Rana lateralis Bouleng.

This frog has been found in several localities in both Central and Eastern Siam, and I have obtained the tadpoles at Nong Pling and Ta Rua (C. Siam) in July and August. They were found in deep pools of water.

DESCRIPTION OF THE TADPOLE.

Head and body. Length about 1½ times its breadth, slightly flattened above, full and convex below, snout rounded; nostrils distinctly nearer the tip of the snout than the eyes. Eyes almost entirely upon the sides of the head, looking only very slightly upwards, 2½ times as far apart as the nostrils. Spiraculum sinistral, short, not prominent in life, nearer the eye than the vent. Anus dextral.

Tail. Three and a half times as long as deep, obtusely pointed; crests full but narrowing rapidly before the tip of the tail is reached;

upper one considerably deeper than the lower, not extending on to the back.

Mouth. On the ventral surface. Beak edged with black; a single row of short papillae at the sides, a double row of longer ones below. Upper lip with a long, continuous row of teeth, and a second broadly interrupted by the beak. Below, three rows, first and second of about equal length, the uppermost usually narrowly interrupted, the lowest, three quarters the length of the upper ones.

Colour (in life). Brownish or olivaceous, spotted and marbled with darker. Below white, the throat usually with dark marblings.

Dimensions. Total length, 55 mm.; head and body, 20; depth of tail, 10.

The tadpole is very similar to that of *R. nigrovittata* (Blyth), but is of larger and stouter build, and with the lowest series of teeth in the lower lip shorter.

Many of the young on leaving the water have a strong tinge of pink upon the back and limbs above.

Rana erythræa (Schleg.).

Van Kampen, Webers Zoolog. Ergebn., Bd IV, p. 390 (1907); id. Natuurk. Tijdsch. Ned.-Ind., LXIX, p. 35 (1909).

Except for some differences in colouration, examples from Bangkok agree entirely with Van Kampen's description of those from Batavia.

My specimens were greenish brown or brown above, speckled with darker, and with a dark mark running through the eye and along the flank to the base of the tail. Sides below marbled with olive, muscular portion of tail light brown, crests colourless except for a dappling of reddish. Belly yellowish white, speckled with red, throat brown. A light vertebral line and another along the lateral fold on either side may be present in the fully grown tadpole. The vivid green of the back of adult is not seen until the frog is at least one-third grown.

Rhacophorus leucomystax (Gravenh.).

Flower, P. Z. S., 1896, p. 906, pl. XLIV; id. 1899, p. 899, pl. LIX; van Kampen, Webers Zoolog. Ergebn., Bd. IV, p. 400 (1907); id. Natuurk. Tijdsch. Ned.-Ind., LXIX, p. 42 (1909).

The common tree-frog of Siam and the Malay Peninsula breeds

in Bangkok chiefly in artificial collections of water, such as in the large jars used by the Siamese for growing lotuses, or in the open tanks where rain-water is stored for use. Being thus independent of rainfall, the larvae may be found throughout the year.

Flower has described the Bangkok specimens as having five series of teeth in the upper lip, whilst the Malayan form has only four. Both forms, however, are to be found in this country, and are equally common. Similarly, the upper series of teeth in the lower lip may be continuous or narrowly interrupted. The yellow spot on the tip of the nose is present in all Siamese individuals, and is usually very conspicuous in life. I have seen it in specimens from as far south as Patani.

A batch that I obtained last August from Prabat, differed in colour from all the specimens that I have seen before, in that the upper part of the head and body was of a dark uniform grey, and there was a broad vertical band of the same colour near the end of the tail. Some others obtained at Ta Rua, a few miles distant, at the same time, were of normal colouration.

Microhyla ornata Bouleng.

Flower, P.Z.S., 1899, p. 902, pl. LX.

By far and away the commonest of the *Microhyla* tadpoles in Bangkok. They may be found in almost every suitable deposit of water, and at any time of the year, except perhaps in April and May at the end of the dry season.

Flower's specimens measured 20 mm. in total length, and that is usual for full grown ones. I obtained some from Koh Lak (Pen. Siam) last year, however, which measured 29 mm. in length, head and body 10. The tail, as a rule, is deeper than he has figured it.

Microhyla butleri Bouleng.

"Transparent tadpoles", Flower, P.Z.S., 1899, p. 903, pl. LX, fig. 2.

Annandale has recently suggested* that Flower's "transparent tadpoles" from Penang, are probably those of *M. berdmorii*. He may be right, as the larva of this frog is still unknown, but tadpoles that I have bred out on several occasions and which agree entirely with Flower's description, belong to *M. butleri*. Most of the Siamese speci-

* Mem. Asiat. Soc. Bengal, VI, p. 151 (1917).

mens that I have seen, have scarlet or reddish brown upon the tail, as Annandale found with some of those that he obtained.

M. butleri is common in many parts of Siam, both at sea level and upon the hills. I have not yet obtained it at any great elevation.

My tadpoles are from Ta Rua and Nong Pling (C. Siam), where they are plentiful during July and August. They inhabit the deep pools that have been made by the excavation of earth to form the railway embankment.

None of those that I have kept have ever attained the size of those developing under natural conditions, and in all of them also, a distinct diminution in the brilliance of their colouration has taken place while in captivity.

Upon the gregarious habits of this tadpole, Annandale has already remarked, and it seems to be a family trait, for I have observed it in other species belonging to this genus.

Glyphoglossus molossus Gunth.

I have obtained the tadpole of this species also at Nong Pling and Ta Rua in the months of July and August, and at Koh Lak in the Peninsula, in February. They were found in ponds where the water was of considerable depth.

DESCRIPTION OF THE TADPOLE.

Head and body. Length one and one-third times its breadth, snout broadly rounded. Nostrils midway between the eyes and the tip of the snout. Eyes perfectly lateral, four to five times as far apart as the nostrils. Spiraculum median, the opening below the centre of the coil of gut. Anal tube long and curved, opening in the mid-line.

Tail. Four to five times as long as deep, ending in a fine point. Membranes shallow, almost straight, upper one, half the depth of the lower, barely reaching to the back.

Mouth. Simple, consisting of a nearly straight upper lip and a contractile lower one, which forms a vertical slit when closed.

Colour (in life). Pale greenish, greyish or brownish, more or less translucent, sometimes almost colourless. Some dark patches of pigment, in the mid-line, around the nostrils, between the eyes, and at the base of the tail. Posterior part of tail often dark grey or blackish.

Dimensions. Very variable ; well grown individuals are :—total length, 40 ; head and body, 12 ; depth of tail, 6 mm.

The young on leaving the water are very variable in colour ; greenish, greyish or brownish, sometimes with regular markings upon the back. The large metatarsal tubercle is fully developed, and the lower jaw is thickened, but the peculiar truncate formation of the snout takes some weeks to develop.

In general characters, and in its peculiar translucency of colouration, this tadpole closely resembles certain of the *Microhyla* larvae, and except for its narrower and longer tail, is practically indistinguishable from them. In life, however, it may be easily recognised by the peculiar position which it assumes in the water. It has the same habit of "floating" quietly about just below the surface, but whereas all the *Microhyla* tadpoles that I know of lie in a horizontal position, *Glyphoglossus molossus* assumes an oblique one. The obliquity may not be great, but in fully grown individuals it is often very marked, and I have seen them almost perpendicular. Usually they lie at about an angle of 45° with the surface of the water.

Like the *Microhyla* larvae also, they are sociable, and are generally to be seen in shoals. Some of these assemblies are very large, and must be composed of many thousands of individuals, all closely packed together with their heads turned in the same direction.

The spawn is laid is masses, and floats on the surface of the water. Breeding commences at Ta Rua and Nong Pling at the end of May or in June, as soon in fact as there is sufficient water to permit of it. As the ponds in these localities are entirely dry from about November to May, they obviously cannot spawn there during those months, and I was somewhat surprised, therefore, to have larvae sent me from Koh Lak in February, where the rainfall is practically the same.

Calluella guttulata (Blyth).

Except that it grows to a larger size, and appears to have the tip of its tail always black, the tadpole of this species is indistinguishable from that of *Glyphoglossus molossus ;* and I have always found them together, in the same ponds and at the same time of the year. They assume the same oblique position in the water.

Dimensions. Total length 50-57 mm.; head and body, 16.

Megalophrys montana Kuhl.

Max Weber, Ann. Jardin Bot. Buitenzorg, Supp. II, p. 5 (1898); Laidlaw, P. Z. S., 1900, p. 889; Gadow, Amphibia and Reptiles (Cambridge Nat. Hist.) pp. 59, (1901); Bouleng., Fascic. Malay., Zool., I, p. 132 (1903); Annandale, Fascic. Malay., Zool., Pt. II, p. 275 (1903); id. Rec. Ind. Mus., VIII, p. 30 (1912); id. Mem. As. Soc. Bengal, VI, p. 154, pl. VI (1917); Van Kampen, Webers Zoolog. Ergebn., Bd. IV p. 409 (1907); id. Natuur. Tijdsch. Ned.-Ind, LXIX, p. 27 (1909).

This species is widely distributed throughout Siam, and I have obtained the tadpoles on many of the hills. At the end of February this year I found them in plenty on Doi Nga Chang (N. Siam), at about 1000 metres, and not only had I abundant opportunities of observing them there under natural conditions, but also succeeded in bringing some living specimens down to Bangkok and keeping them until their metamorphosis was completed.

The amount of discussion which has centred round the function of the curious mouth of this tadpole, can be judged from the literature quoted above, and as my observations extended over a considerable period, I have added them to those already recorded by other naturalists. They were made almost daily for nearly four months.

The conclusion that I came to with regard to the "funnel" was, that its chief, and possibly its sole, function, was to enable the creature to obtain its food, much in the same way as the membranous lip of the tadpole of *Microhyla achatina*, which I described in a previous number of this Journal (*antea* p. 37).

Watching them feed in their native pools, one could see the "funnel" pulsating with the sucking action set up by the creature, and one could see too how all small particles of matter floating down the stream, that happened to come within range of the current thus set up, were drawn towards the mouth and swallowed. And no doubt many other minute particles, not visible to the naked eye, were devoured in this way. The same performance could be demonstrated in captivity, by shaking the dust of decaying vegetable matter upon the water where they were feeding. The so-called "teeth" appeared to act as a filter, by holding up particles that were too large for assimilation. Every now and again the creature would reverse its sucking action, and spit away these undesirable fragments.

Both in their natural habitat, and in captivity, they showed a marked predilection for shallow water. The streams where I found them were small and fairly swift, but it was in the quiet puddles here and there that they usually congregated and could be observed feeding. Those that I kept spent most of their time on the top of bricks placed in their tank, where the water was never more than one centimetre deep. Hidden there beneath the leaf of some aquatic plant, they would poke their "funnel" round the edge and so feed. I saw the same thing happen under natural conditions. Sometimes they lay quite still, with the "funnel" expanded on the surface of the water, but not feeding.

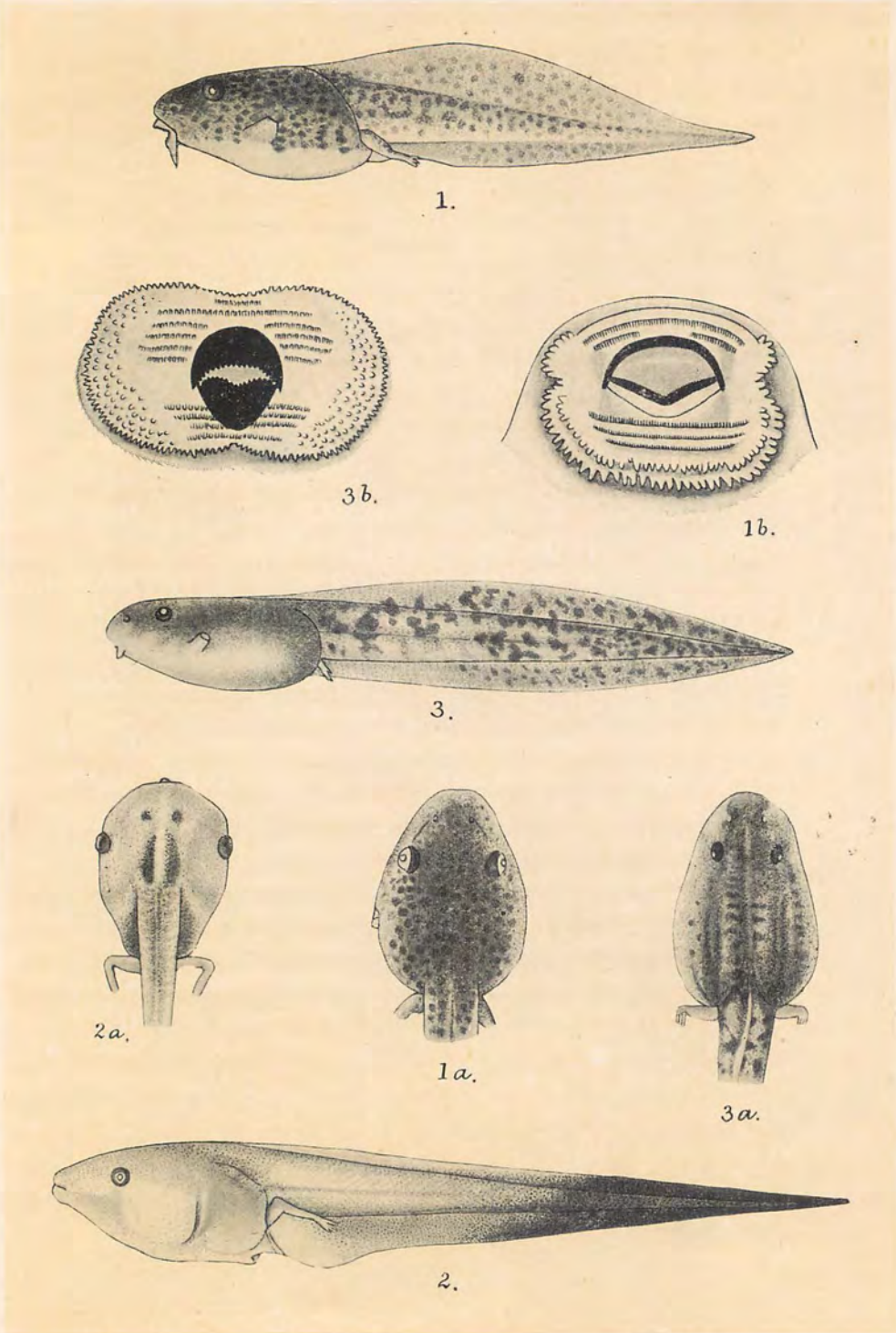
Although when first caught and kept in a jar, they often asumed the vertical attitude as figured by Gadow, I seldom saw them in that position when placed in their permanent abode. Nor did I often see them so in nature. Even when feeding in deeper water, their bodies were usually kept in a more or less horizontal plane.

That the funnel acts as a float, and is of assistance in that way to the creature whilst feeding, is evident, but that its function ever can be to enable its owner to float away upon flood water into safety, as has been suggested, I doubt very strongly. Certainly, at the first signs of disturbance in the water, mine in captivity invariably curled up their floats and sank to the bottom. I never saw mine use the "funnel" as a rasp, as Van Kampen has remarked, and they fed so persistently at the surface, that I imagine this to be the usual method of obtaining food. I quite agree with Annandale with regard to the muscular action of the structure.

Of the six individuals which I succeeded in bringing home, only two completed their development; one at the end of May, and the other a month later. The absorption of the "funnel" took place concurrently with the absorption of the tail, and occupied about ten days. When it was practically completed, the creature left the water.

Megalophrys pelodytoides Bouleng.

I obtained the tadpole of this species early in March on Doi Nga Chang at about 1,000 metres elevation, together with a few adult specimens. At this height the larvae were quite common, but as one descended the hill, they became less numerous, and below 400 metres were not seen at all. Some ten individuals that I brought down with



1. Rana lateralis. 2. Calluella guttulata. 3. Megalophrys pelodytoides.

me to Bangkok finally completed their metamorphosis, and I was thus able to confirm the identification.

DESCRIPTION OF THE TADPOLE.

Head and body. Length $1\frac{3}{4}$ to 2 times its breadth, much flattened above; snout broadly rounded. Nostrils a little nearer the tip of the snout than the eyes; nearly as far apart as the eyes. Eyes looking upwards and outwards, the portion of head visible on their outer sides when viewed from above equal to one quarter the interocular space. Spiracle on the left side, much nearer the eye than the vent, not prominent in life. Anus dextral.

Mouth. On the ventral surface, entirely surrounded with a lip fringed with papillae. Beak entirely black, with coarsely serrated edges. Upper lip with five or six series of teeth, the first very short, the second long and narrowly interrupted, the remaining three or four broadly interrupted, the last poorly developed and often absent; lower lip with four series also, the lowermost one not interrupted.

Tail. Twice as long as the head and body, four to five times as long as deep, tip bluntly pointed; crests low, subequal, the upper not extending on to the back.

Colour (in life). Light or dark brown, speckled and spotted with black, below greyish, uniform.

Size. Very variable. A well grown specimen measured :—total length, 63 ; head and body, 21; depth of tail, 10 mm.

The lip surrounding the mouth serves also as an adhesive disc.

It has been long known to herpetologists, that the tadpoles of the genus *Megalophrys* form two very distinct groups, one with the "funnel" formation of mouth, the other of Ranid type with horny beak and teeth. In this first group five species are now known,* whilst in the latter only one has so far been discovered, namely *M. hasseltii*. It is of particular interest, therefore, to be able to record a second.†

In general characters these two tadpoles are alike, and on my visit to the hill I found them both inhabiting the same stream. But

* Annandale, Mem. Asiat. Soc. Bengal, VI, p. 155 (1917).

† Another point of difference which so far appears to be constant between the two groups, is in the position of the anus. In the funnel-mouthed form this is median, in the other, dextral.

while *M. pelodytoides* was at a higher level, where the water was shallow and the current swift, *M. hasseltii* lived lower down, in deep pools of nearly still water. The fat, rounded, body of this latter tadpole was in marked contrast to the flattened shape of the former that lived continually in running water.

Those which I brought to Bangkok seemed in no way inconvenienced by the higher temperature. They fed freely upon both animal and vegetable matter, but their development was slow, as has already been remarked with the tadpoles of this genus. Judging from their rate of growth I should imagine it was not complete under about five or six months. Even after the fore-limbs had appeared, no apparent reduction in the size of the tail took place for many days, and it was at least two weeks later before the creature left the water. Like *M. hasseltii* too, which I have reared, the young ones evinced little or no desire to feed, and did not survive many weeks.

Megalophrys hasseltii (Tschudi).

Leptobrachium hasseltii, Blgr., P.Z.S. 1890, p. 37 ; Butler, Journ. N. H. S. Bombay, XV, p. 397 (1904) ; van Kampen, (?) in Webers Zoolog. Ergebn., Bd. IV, p. 408 (1907).

Megalophrys hasseltii, van Kampen, Natuurk. Tidsch. Ned.-Ind., LXIX, p. 27, pl. II (1909) ; Annandale, Mem. As. Soc. Bengal, VI, p. 153, pl. VI (1917).

This species appears to be found upon most of the hills in northern Siam and along the western boundary, and I have obtained the tadpoles in January, April and July. They have always been found in deep pools where the water is comparatively sluggish.

Annandale has recently described the three different colour varieties of this tadpole, and all my specimens (which are from the North) agree with his var. B., from the Dawna hills in Tenasserim.

Bufo melanosticus Schneid.

Flower, P. Z. S., 1896, p. 911, pl. XLIV, fig. 3 ; Van Kampen, Natuurk. Tijdsch. Ned.-Ind., LXIX, p. 29.

Van Kampen states that the common Asiatic toad breeds throughout the year in Java, and the same may be said of those in Bangkok. A special increase of sexual activity, however, appears to take place in November with the advent of the dry, cool weather ; and at that time numbers of them may be found congregated together, in the

same way as with *B. vulgaris* in Europe. The disproportion between the sexes does not seen to be so great, as I have never seen more than two or three males to one female.

The males may be heard calling on almost any night in the year, but whether for the mere pleasure of hearing their own voices, or for sexual purposes, I cannot say. The clear, moonlight nights of the dry months appear to stimulate them to special effort. They continue to call throughout the entire night, and if the sky is overcast, sometimes until quite a late hour in the morning.

I have nothing to add to Flower's description of the tadpole.