

dorsal coloration is darker and more uniform. The mouth-disk and its armature are closely similar except that the lowest tooth-row on the lower lip is broader and the teeth larger, and that the fringe of papillae is interrupted on the middle below.

Geographical distribution.—The only point precisely ascertained as to the general range of this species is that it occurs in South Siam, including the provinces of Singgora and Patani in the Malay Peninsula, as well as in Java. It is apparently synonymous with *R. schlueteri*, Werner, from North Borneo, but there is a possibility that the var. *angustopalmata* of van Kampen from Celebes may be distinct, if it is not synonymous with *R. vittigera*, Wiegmann, from the Philippines.

III. POST-SCRIPTUM.

By G. A. BOULENGER.

Dr. Annandale having most courteously communicated to me his reply to the suggestions contained in the first paper, I will add a few words rather than make any alteration to my original draft.

As I say in the last paragraph, my opinion on the rank to be assigned to *R. cancrivora* stands or falls on the question of the tadpole, and as Dr. Annandale appears to have proved his case, I have no further reason to disagree with him, except from the theoretical point of view.

The old conception of the frog in its development climbing up its own genealogical tree must be abandoned. As I pointed out twenty years ago,¹ "larval forms such as the tadpoles are outside the cycle of recapitulation, the ontogeny being broken by the intercalation of the larval phasis. The horny beak, the circular lip with its horny armature, the spiraculum, the enclosure of the fore limbs in diverticula of the branchial chambers, and such special adaptations as the ventral disc or sucker of certain mountain forms, clearly point to tadpoles having had a developmental history of their own. We need, therefore, not be surprised at occasionally finding, within the same genus, very different types of tadpoles, or even a total suppression of the larval stages, as is actually the case in the large and widely distributed genus *Rana*." That adaptational gyrinal polymorphism occurs has been pointed out by Camerano,² and I have myself drawn attention to a very remarkable dimorphism, apparently non-adaptive, in *Pelodytes punctatus*.³

Our progress in the knowledge of the metamorphoses of Batrachians has most decidedly invalidated the prediction of my late chief Dr. Günther who, in his Preface to my Catalogue of 1882, expressed the opinion that probably the next step in perfecting the system of classification would be marked by a consideration of the larval stages.

I conclude, from the close agreement of *R. cancrivora* with the other forms grouped under *R. tigrina*, that the differentiation of the tadpole has arisen independently from that of the adult, the cuspidate beak and other buccal features of the *R. tigrina* tadpole being, of course, as

¹ *Tailless Batrachians of Europe*, p. 110.

² *Atti. Acc. Torin.*, XXVI, 1890, p. 72.

³ *Proc. Zool. Soc.*, 1891, p. 617, pl. xlvii, figs. 1, 2.

Dr. Annandale admits, deviations from the more normal pattern preserved in *R. cancrivora* ; and therefore I do not think that the case in question points to forms originally distinct having converged to resemble each other in the adult condition. My opinion is supported by various examples, drawn from other types of animals, which Giard (1891-1892) has grouped together under the term poecilology, the list of which is constantly being increased.

I am glad my remarks have led Dr. Annandale to procure further material of the Bull-frog which occurs commonly in India and Ceylon ; I only regret he has not had more before expressing a decided opinion on the two forms the distinction of which I have pointed out. These he now regards as valid species, a divergence of view which may appear to some to be merely a matter of opinion. I wish, however, to observe that I feel sure a larger series would have convinced him that intermediate specimens fill up the gap between the extremes shown by his text-figures. To mention only one example, the specimen from Ceylon of which measurements are given in column 10 of my table under *R. tigrina typica* has the metatarsal tubercle in an exactly intermediate condition as regards shape and size.

I have only seen a few living specimens of the Indian frogs, but in dealing with the European *R. esculenta* I have carefully studied enormous numbers, many caught by myself, and I may appeal to experience thus gained, as the distinction between the typical *R. esculenta* and the var. *lessonae* is a perfect parallel to the case of *R. tigrina* and *R. crassa*. The difference between the two extremes, in the proportions of the hind limbs and in the size and *shape* of the metatarsal tubercle is the same, as may be realized from the following measurements (*a*, length from snout to vent ; *b*, length of tibia ; *c*, inner toe, measured from the metatarsal tubercle ; *d*, length of metatarsal tubercle ; *e*, perpendicular diameter of the tubercle) :—

	<i>a.</i>	<i>b.</i>	<i>c.</i>	<i>d.</i>	<i>e.</i>
<i>R. esculenta typica</i> , Nice ...	74	37	10	4	1
<i>R. esculenta var. lessonae</i> , Norfolk	72	29	8	6	2.5

I add the same measurements of a *R. crassa*, from the Madras Presidency, presented under that name to the British Museum by Dr. Jerdon, which show the inner metatarsal tubercle to be even smaller, in proportion, than that in the *R. esculenta var. lessonae*, from Norfolk :—

<i>R. tigrina var. crassa</i>	90	42	9	6	2.5
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Now it is perfectly well known that there is so complete a gradation between the two extremes indicated by the above measurements that not even the extremists in species multiplication, of which we have a few among European herpetologists, have ventured to separate the form *lessonae* as a species. I have not the least doubt that if a large number of specimens could be obtained, from Ceylon for instance, and carefully measured, the distinction between *R. tigrina* and *R. crassa* would present the same difficulties and fully justify the course I have followed, and prove that, as in the European frogs, geographical non-isolation cannot be appealed to as a safe criterion in deciding what warrants specific rank.

I have one more remark to make, and that is on Wiegmann's figure of *R. rugulosa*. I have re-examined this figure, and, with all deference to Dr. Annandale's opinion, I can only repeat my statement that I regard the snout as pointed, as much so as in Dr. Annandale's figures of *R. tigrina*,¹ and the web between the toes incomplete and deeply notched.² It must be borne in mind that the types of *R. rugulosa* and *R. vittigera* have been compared by no less an authority than the late Professor Peters, and pronounced by him to be specifically identical (*Mon. Berl. Ac.* 1863, p. 78).

¹ Dr. Annandale mentioned as one of the characters of his *R. rugulosa* the less pointed snout as compared to *R. tigrina*, and that is why I draw attention to the shape of the snout in Wiegmann's figure. I therefore request a comparison of the latter with the heads figured on Plate V of the *Mem. As. Soc. Beng.*, Vol. VI.

² I have not said that the feet "are meant to be webbed in exactly the same way as in the figure of *R. vittigera* on the same plate," and I know how greatly the extent of the web varies in *R. cancrivora* (see my remarks under that heading). I was alluding to Dr. Annandale's definition on p. 122 of his paper, where *R. rugulosa* is stated to have the feet almost fully webbed and the web very little emarginate.