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ON THE PRESENCE OF *BUFO NASICUS* WERNER IN GUIANA, WITH A REDESCRIPTION OF THE SPECIES ON THE BASIS OF RECENTLY COLLECTED MATERIAL

by

M. S. HOOGMOED

Rijksmuseum van Natuurlijke Historie, Leiden

With 1 text-figure and 5 plates

SUMMARY

During research on material recently collected in Guyana and in Venezuelan Guiana, several specimens of the rare toad *Bufo nasicus* Werner, thus far only known from the holotype without known origin, were discovered. On the basis of this material the species is redescribed and some notes on its natural history are given. The species is a member of the *Bufo typhonius*-group.

RESUMEN

Al estudiar anfibios recientemente coleccionados en la Guyana y en el Estado Bolívar, Venezuela, se descubrió algunos ejemplares del sapo poco común *Bufo nasicus* Werner, hasta ahora solamente conocido como ejemplar holotipo, sin proveniencia conocida. A base de estos ejemplares la especie es descrita de nuevo y algunas notas sobre la historia natural de ella serán comunicadas. La especie pertenece al grupo *typhonius*.

INTRODUCTION

In 1968 Mr. A. N. Warren paid a visit to Guyana as a member of a team endeavouring to assemble a collection of the country's wildlife for zoos in Europe and America. Because of several misfortunes that befell the expedition it did not realize its purpose, but Mr Warren succeeded in bringing back with him a small collection of preserved reptiles and amphibians. Among the amphibians he collected I found an adult female toad strikingly different from all toads known from the Guiana area. Being notified, Mr. Warren, when returning to the same area of Guyana in 1969, made it one of his main objectives to obtain more specimens of this species. In this he succeeded by collecting a juvenile specimen. A short note on these specimens (Warren, 1970) appeared in the 'News and Views' section of 'Nature'.

In 1971 Mr. Warren initiated an expedition to Guyana which was going to try and climb Mount Roraima. Because the Venezuelan government did not grant permission to the expedition to enter Venezuelan territory (Warren, 1973) the group decided to approach Roraima from the north and to try and reach the 'North Ridge', in which they were successful. During this expedition again special attention was paid to amphibians and Warren again collected additional specimens of the peculiar toad, both near Roraima and near Echerak Creek, the locality from whence the first two specimens originated. Among the new material was one male.

During a recent trip to Venezuelan museums, I found in the collection of the Sociedad de Ciencias Naturales La Salle (SCNLS) another specimen of this toad, collected in Venezuelan Guiana.

HISTORICAL RÉSUMÉ

In 1903 Werner discovered in the collections of the Brussels Museum (IRSN) a toad that struck him as being new and sufficiently different from all other toads known at that time to warrant its description as a new species, although no data were available about its origin. The species was named *Bufo nasicus* Werner. Since that time *B. nasicus* Werner remained enigmatic, for several reasons, one of them being the lack of new material, another a mistake in labelling. In 1948 the holotype was catalogued anew under no. 9422 (instead of no. 4792 as published in 1903) and stated to have been collected in Texas. In 1950 Smith & Laurent shed some light on the problem of its origin by dissecting the holotype's stomach and having the contents ("chiefly ant and termite remains") examined by a specialist. On the basis of the ant remains it could be concluded that *B. nasicus* Werner was a New World toad, while the termite remains made a further restrictions of its origin possible, as they belonged to a genus known only from South America. As a consequence of these results Smith & Laurent concluded that: "According to these data, the probability is extremely great that *Bufo nasicus* occurs in South America, probably along the Atlantic drainage."

Besides the discussion of the origin of *B. nasicus* Werner, Smith & Laurent (1950) provide a redescription of the holotype and some rather schematic, but very useful, drawings. With the aid of this redescription it proved no problem to identify the peculiar Guianese toads as *B. nasicus* Werner, a conclusion confirmed by a comparison of the recently collected material with the holotype. Thus Smith & Laurent's opinion concerning the origin of *B. nasicus* Werner is evidently right and we may here amplify that this species occurs in Guyana and Venezuelan Guiana at altitudes between 1500 and 4000 feet.

REDESCRIPTION

As a series including adult and halfgrown females, an adult male and juveniles is available, it seems useful to give a redescription of the species that meets modern standards, on the basis of this series and the holotype.

Bufo nasicus Werner (pls. 1-5)

Bufo nasicus Werner, 1903: 252; Nieden, 1923: 145; Smith & Laurent, 1950: 2; Vervoort, 1975: 317, fig. 12.

Bufo typhonius, Myers & Carvalho, 1952: 2 (partly).

"Echerak toads" Warren, 1970: 794.

"Onbekende pad" Roos, 1970: 17.

Bufo sp. Warren, 1973: 79, 86.

Material. — GUYANA: Potaro District: Echerak Creek (5°10'N 59°30'W): 1 ♀, BMNH 1969.1566, 12-viii-1968; 1 juv., BMNH 1970.616, 28-viii-1969; 1 juv., BMNH 1974.633, 8-vii-1971; 1 hgr. ♀, BMNH 1974.634, 9-vii-1971; 1 ♀, BMNH 1974.635, 10-vii-1971; all leg. A. N. Warren. Mazaruni District: Upper Waruma River, Camp II (5°25'N 60°47'W): 1 ♂, BMNH 1974.636, 13-viii-1971; 1 hgr. ♀, BMNH 1974.639, 15-viii-1971; both leg. A. Warren. Roraima, northern slope, trail between camps VIII and V (5°16'N 60°45'W): 2 juvs., BMNH 1974.640-41, 3-ix-1971, leg. A. N. Warren.

VENEZUELA: Estado Bolivar, road between El Dorado and Sta. Elena, km 126: 1 hgr., SCNLS 5949, 25-xii-1972, leg. J. M. Pelaez.

SOUTH AMERICA: 1 hgr., IRSN I.G. 9422 Reg. 1015, don J. van der Putte (holotype).

Diagnosis. — A medium-sized, long-legged toad of the *Bufo typhonius*-group. Back greyish-brown to brown, with or without a dark-brown pattern consisting of a triangular spot between the eyes, connected with an irregularly pointed, hour-glass-shaped figure further down the back. Lower jaw with a brilliant white stripe or a series of white spots. Head with low, but prominent bony ridges; parotoid glands moderately large, longitudinally oval, approximately twice as long as wide; upper eyelid produced laterally, projecting over the eye, with a distinct, vertical lateral surface; snout sharply pointed, reaching beyond the mouth. Dorsal surface of head and dorsum with scattered, moderate, rounded warts, most numerous on the occiput and the scapular region. Edges of web between toes smooth; subarticular tubercles elongate, flat, smooth, single; tarsal surface with few, rounded tubercles. A distinct tarsal fold. First finger longer than second. When the hind limbs are folded and flexed at right angles to the longitudinal body-axis, the heels distinctly overlap.

Description. — The snout-vent length of adult females is 66.5 and 64.4 mm, the adult male measures 41.3 mm. The head takes 29-35% of this length in females, 34% in the male, 33% in the halfgrowns and 27-29% in the juveniles. The snout is sharply acuminate when seen from above, in profile it is pointed, distinctly projecting beyond the mouth. A distinct, vertical, fleshy ridge, running from the tip of the snout to the mouth is

present. Snout most prominently pointed in juveniles (pl. 2 figs. c, d); with increasing snout-vent length the sharp edges, present in the juveniles, become rounded. Tip of snout with strongly concave sides. Dorsal surface of the head forming an angle with the commissure of the mouth, convex in longitudinal section. The head is 1.5-1.8 times as long as deep; at tympanum-level it is as long as wide or slightly longer. In adults the angles of the lower jaw project slightly laterally, the distance between them always being slightly more than the head-width at tympanum-level; in juveniles this distance is less than or equal to the head-width at tympanum-level. Loreal region concave, vertical. Canthus rostralis very distinct, concave, forming a knob in front of the eye, where it is joined by a bony preorbital ridge. Nostrils oval, directed laterally and posteriorly, in a swollen area below the canthus rostralis. Distance between nostril and the anterior corner of the eye in females 1.4-1.9 times its distance to the tip of the snout, in the male 1.3-1.6 times, in the halfgrowns 1.3-1.5 times and in the juveniles 1.1-1.4 times. The horizontal eye diameter is distinctly less than the distance between the anterior corner of the eye and the tip of the snout; it is 1.2-1.7 times the vertical diameter of the tympanum in females, 1.9-2.0 times in the male and 1.9-2.1 times in the halfgrowns. Interorbital space flat (in cross-section), but appearing concave because of the circumorbital ridges (see further below), 1.5-1.9 times as wide as an upper eyelid in females, 1.2 times as wide in the male, 1.2-2.0 times in the halfgrowns and 1.0-1.4 times in the juveniles. The upper eyelid is peculiar in having a medial convex part, densely covered with large warts, which passes into a flat part, laterally projecting beyond the eye; the rim is very sharp, and a distinct, vertical lateral surface is present. Tympanum distinct, surrounded by a bony ring, its posterior margin covered by the skin; oval, its vertical diameter 1.3-1.7 times the horizontal diameter in females, 1.7-1.8 times in the male and 1.4-1.7 times in the halfgrowns. The distance between the posterior corner of the eye and the tympanum approximately equals the horizontal diameter of the tympanum. Pupil horizontally oval.

No maxillary or vomerine teeth. Choanae small, transversely oval, nearly round. Tongue oblong, wider posteriorly than anteriorly, posteriorly not notched, attached with its foremost part only. Vocal sacs opening into the mouth via two longitudinal slits.

Parotoid glands protuberant, moderately large, distinct, extending from just behind the tympanum to above the insertion of the forelimbs, asymmetrically shield-shaped (pl. 1, pl. 4, pl. 5); in females 1.8-2.3 times as long as wide, in the male 1.8-2.0 times, in the halfgrown type 1.6-1.7 times and in the juveniles 1.7-2.4 times; their surface pitted and covered with warts; distinctly descending on the lateral surface of the body.

Skin on the dorsal and lateral surfaces of the head smooth, with scattered warts, increasing in number on the occiput and behind the tympanum. Skin on dorsal and lateral parts of the body with irregularly scattered warts of different sizes, largest and most numerous on the occiput and the adjacent area of the back and towards the flanks; smallest and less numerous on the middle of the back in females; in the male the warts are hardly less numerous on the middle of the back, merely smaller; in the juveniles there is no differentiation and the warts seem to be randomly distributed and of the same size. Warts rounded, with a small keratinised tip, skin between the warts with numerous tiny, horny spicules. A continuous series of warts from the parotoids to the groin, obliquely traversing the flanks, forming a ridge in its anterior part, which divides the parotoids into a horizontal dorsal and a vertical lateral part. Ventral skin coarsely granular, except under the chin, where it is finely granular. Limbs with many scattered warts all over; the warts on the limbs tend to be more conical than those on the back.

Head with bony ridges; there is an indistinct preorbital ridge, connected with the canthus rostralis; the circumorbital ridge does not quite reach the canthus rostralis, posteriorly it is continued as a laterally slightly projecting postorbital ridge to the parotoids where it ends in a more or less distinct knob; a short, not very distinct orbitotympanal ridge.

Hand with a large, round central and a small, oval inner metacarpal tubercle. Subarticular tubercles distinct, round, conical, single. No supernumerary tubercles. Palm with a few rounded tubercles, much smaller than the subarticular tubercles. First finger longer than the second one. Tips of fingers not expanded. A distinct basal web between all fingers. A series of warts from the elbow to the hand, where it is continued as an indistinct glandular ridge along the outside of the fourth finger.

Foot with a large, protuberant, oval inner and a small, conical outer metatarsal tubercle. A distinct tarsal fold; a row of tubercles from the heel to the tip of the fifth toe. Subarticular tubercles distinct, oval, single, slightly protuberant. Toes between the subarticular tubercles slightly swollen. Numerous small tubercles in longitudinal rows on the sole and more or less scattered on the underside of the tarsus. Tubercles not sharply pointed. Web between the toes well developed, with smooth margins; there is no difference in the amount of webbing between the two sexes. Formula of foot (Schjøtz, 1967; Hoogmoed, 1972): $1 (1)$, $2i (2)$, $2e (1\frac{1}{2}-1)$, $3i (3)$, $3e (2)$, $4i (3\frac{2}{3}-3\frac{3}{4})$, $4e (3\frac{2}{3}-3\frac{3}{4})$, $5 (1\frac{3}{4}-2)$. Web continued as narrow ridges to the tip of the toes. Toes slightly depressed, tips not expanded. Tibio-tarsal articulation reaching the eye when the hindlimb is passed forward along the body. Ankles overlapping when the hindlimbs are folded and flexed at right

angles to the body. Tibia comprising 46-49% of the snout-vent length in females, 45-48% in the male, 41-46% in the halfgrowns and 42-46% in the juveniles. The tibia is 1.1-1.2 times as long as the foot (measured from the proximal margin of the inner metatarsal tubercle to the tip of the fourth toe) in adults and halfgrowns, 1.2-1.3 times in juveniles. Tibia without a gland.

Warren (1970) describes the colour in life as: "upper surfaces a rich red brown with a lighter stripe down the back, on one side of which a dark light-edged spot stood out (see [-his-M.S.H.] illustration). Its limbs were faintly barred with dark brown and the lower lip was white. Underneath it was mottled brown and white." This description was based on BMNH 1969.1566. Colour slides of this same specimen when alive allow the following description. Back light reddish brown with darker brown markings and a short ochre vertebral stripe. Sides of the head very dark brown, with a lighter spot under the eye and a chocolate brown marking on the parotoid. Lower jaw bright white, a white line from the elbow to the tip of the fourth finger. Throat brown with white spots, belly white, marbled with brown. Juvenile BMNH 1970.616 on the whole has the same colour pattern as the female, only the dark markings on the back are much more extensive, the lower jaw is not brilliant white and all over the animal there are scattered white spots. Iris golden brown.

In preservative the back is light brown to greyish brown, with or without an extensive darker brown marking. In essence this marking is present in most specimens and absent only in one female and one juvenile. It consists of a triangle between the eyes, with the tip pointing backwards, connected with a roughly rhomboidal mark on the shoulders, which in turn is connected posteriorly with a V-shaped or rhomboidal mark. A fairly wide greyish white vertebral stripe may be present. BMNH 1974.634 is conspicuous because the pattern there is split up into numerous black spots, which together still more or less form the markings as described above. In the male (BMNH 1974.636) the dark pattern is present but not very distinct. Dorsal surface of limbs with oblique darker bars, three on the thighs continuous with three on the shanks when these are flexed against the thighs. Side of head very dark brown, with an ochre bar or a triangular or trapezoid spot from the eye to the mouth. In most females the dark brown of the side of the head continuous as a narrow stripe along the lateral part of the parotoids to their posterior margin. In one female and in the male the very dark brown, nearly black colour of the side of the head continues on the flanks below the oblique series of tubercles, fading posteriorly. Margin of lower lip white or with a series of white spots. Throat in the male immaculate,

blackish; in females dark brown with white spots. Male with a white spot in each axilla. Chest and anterior part of belly cream-coloured with brown spots and vermiculations, of which the number diminishes posteriorly. Ventral surface of limbs like the belly. Two white, oval areas on the thighs just below the cloaca. Ventral surface of tarsus and sole very dark brown. Tips of toes and fingers whitish. Subarticular tubercles under the fingers sometimes whitish.

Range and distribution. — The species hitherto is only known from the material listed above, viz. from three localities in Guyana, with altitudes between 1500 and 4000 feet, and from one in Venezuelan Guiana at 1350 m. So far, no indication of its occurrence in other areas of the Guiana shield

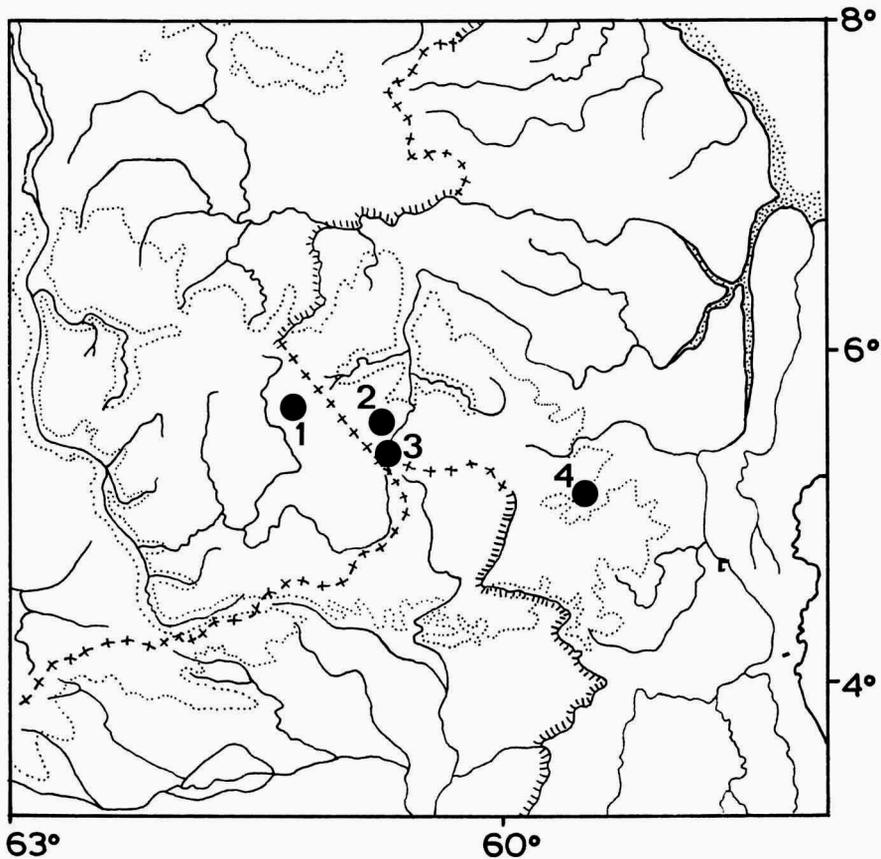


Fig. 1. Collecting localities of *Bufo nasicus* Werner. The dotted line represents the 200 m contour line, the lines of crosses and the shaded areas along rivers the international borders. 1. Road from El Dorado to Sta. Elena, km 126; 2. Upper Waruma River, Camp II; 3. Northern slopes of Mount Roraima, between camps V and VIII; 4. Echerak Creek.

has been found, but then it may be restricted to the poorly explored mountain ranges in the interior. Anyway, it might be expected to occur also in the Brazilian territory bordering Mount Roraima. All four known localities are within the limits of the Roraima sandstone formation. Apparently this is a species of altitudes above 500 m, which has not been found in the lowlands bordering its known area of distribution. As these lowlands have been explored rather thoroughly, I think it warranted to assume we are here dealing with a truly endemic species of the Guiana shield.

Habitat. — From the scanty habitat-notes that accompany the Guyanese specimens it is clear that *Bufo nasicus* Werner is an inhabitant of forest, which ranges from “dense primary forest” via “tropical riverine forest” to “montane forest”. All specimens were captured on the forest-floor among leaf litter. The area from where this species is known is characterised climatologically by two wet and two dry periods per year, as are the adjacent lowlands of Guyana and Venezuela. Chapman (in Warren, 1973) reports two rainfall maxima: May-July and December-February. Dry periods occur in February/March and in October. The total amount of rainfall per year in Pipilipai, 28 miles east of Mount Roraima, is about 112 inches. The period in which the British Roraima Expedition 1971 took place presumably was “transitional between heavy rains of May, June, July period and the relatively dry month of October”. However, in August 1971 it was raining heavily. Warren (1973) gives more details on the localities where the toads were collected. Camp II: “The Waruma river and its tributaries are here typical of upper reaches, with stony beds, occasional rapids, and great variation in the daily volume of water carried. The forest is riverain and is fairly flat, any slopes being gradual. There are low-lying areas which tend to flood in the wet season. Altitude 2000-2500 feet”. Camps V-VIII: “The forest here is typically montane. Everything is wet; thick moss covers the branches and trunks of trees, ferns and moss cover the ground, which is rocky and uneven with a thin layer of leaf litter. Streams and rivers are torrential; rain is frequent, even in the dry season. Altitude 2500-5000 feet”. The habitat in Echerak was described on a label as: “dark dense primary forest”. Philcox (in Warren, 1973) reports on the Roraima region: “Between Camps 1 and 4 the riverain forest varied very little. The tree cover was estimated to be between 80% and 90%, giving very little concentrated sunlight through to the forest floor, hence the ground flora was comparatively sparse in herbaceous plants. It was, however, variously covered with small undershrubs of *Rubiaceae*, *Leguminosae* (*Caesalpinoidae* and mainly *Bauhinia* spp.) and the spiny-leaved *Astrocaryum* (Palmae). With these occurred two large-leaved (c. 1.5 m long) *Rapataceae* and a huge spiny-leaved

bromeliad (?*Bromelia* sp.). It must be stated here that the trail cut was rising only very slowly in altitude, rising only about 70 metres between Camps 1 and 4. The tall tree species here were many, but appeared to be dominated by *Lecythidaceae*, *Ebenaceae*, *Rosaceae* and *Leguminosae*". And "Above Camp 5 the vegetation clearly changed to montane type, and the tall trees of the previous type [= riverain forest, M.S.H.] were replaced by smaller species...".

Natural history. — Most specimens were collected in daytime, from 7.00 a.m. to 4.00 p.m. One specimen (BMNH 1974.635) was collected in the evening (8.30 p.m.) while it was sitting on "bare ground near a still pool". As this female is full of mature eggs, it seems reasonable to assume that she was on that site in order to try and find a mate and to deposit the eggs in the water of the pool. The other adult female available (BMNH 1969.1566) also contained numerous ripe eggs. Therefore, we may state that the breeding season at least covers the months of July and early August, which means the end of the long wet season (Beebe, 1925; Chapman (in Warren, 1973)). However, this statement is only based on observations of two specimens and thus it will not be surprising if the breeding period proves to extend over a much longer period when more material becomes available. About the available juveniles I can only say that they are not recently metamorphosed, but I am unable to make a guess as to their actual age.

The stomachs of two of the Guyanese specimens were examined, one (BMNH 1974.634) was crammed with ants and two curculionid beetles (respectively 3 and 6 mm); the other (BMNH 1974.639) contained one ant and one terrestrial gastropod shell. The curculionid beetles form another piece of evidence that this toad is diurnal, as they belong to a group that is only active in daytime. The stomach-contents of the type-specimen were examined by Smith & Laurent (1950), it contained ants of the genera *Holcaponera*, *Euponera* and *Odontomachus* and termites of the genus *Syntermes*.

Discussion. — At first sight it is evident that this is a species of the *Bufo typhonioides*-group, occurring in northern South America (Cei, 1968, 1972). Common characters of this group are the presence on the flank of an oblique row of tubercles from the parotoid to the groin, the presence of bony (rarely fleshy) ridges on the head, a more or less prominent snout and projecting angles of the jaw. Most, but not all species are covered with numerous warts, and most have a pattern on the back more or less resembling a leaf. *Bufo nasicus* Werner shows all these characters. A peculiar feature of the species is the projecting upper eyelid. *B. ceratophrys* Boulenger from Ecuador, Colombia and Venezuela also shows this character, but

here it is much better developed, spinelike, strongly projecting beyond the eye. It could be argued that this state of the eyelid indicates relationship between *B. nasicus* and *B. ceratophrys*, *B. nasicus* being the more primitive of the two, whereas *B. ceratophrys* would represent the derived situation. There are, of course, several differences, the most important being that in snout-vent length, specimens of *B. ceratophrys* not reaching more than 35 mm. Furthermore, *B. nasicus* lacks the pointed flap of skin at the corner of the mouth, present in *B. ceratophrys*; the parotoids in *B. nasicus* are less elongate and pointed, whereas the paired swellings of the skin present above the five anterior vertebrae in *B. ceratophrys* are absent in *B. nasicus*. The pattern of both species shows great similarities. On the basis of this evidence I am inclined to consider *B. ceratophrys* to be most closely related to *B. nasicus*, as I think the similarities between the two are much more important than the differences. After its description *B. nasicus* was only discussed by Smith & Laurent (1950) and by Myers & Carvalho (1952). The first two authors did not give an opinion on its relationships. Myers & Carvalho thought that "*B. nasicus* was based on one of the several races of *B. typhonius*, probably from southeastern Brazil". As pointed out above this opinion was wrong. Later authors dealing with species of the *Bufo typhonius*-group (Cei, 1968, 1972) did not mention *B. nasicus*.

As stated before, I think that this species can be considered as endemic to the Guiana shield, where at least three other species of this group are present. Actually, *B. nasicus* at one locality (Camp II, Upper Waruma River) was taken sympatrically with *B. typhonius* (L.). In Surinam one other species of this group occurs sympatrically with *B. typhonius* and in French Guiana even a third species enters the picture. The pattern in the Amazon drainage is still confused, but there also three and possibly four species are present, all hiding under the common denominator '*B. typhonius*'. It is possible that to some of these species old Spix-names can be attributed, although there is a fair chance that one or more of these species are still unnamed. The situation is complex and studies on this problem are in progress. Until the situation in the *B. typhonius*-group is cleared, it seems inadvisable to use this group for zoogeographical purposes. In a forthcoming paper on the *typhonius*-group a key to the Guianese species will be given.

ACKNOWLEDGEMENTS

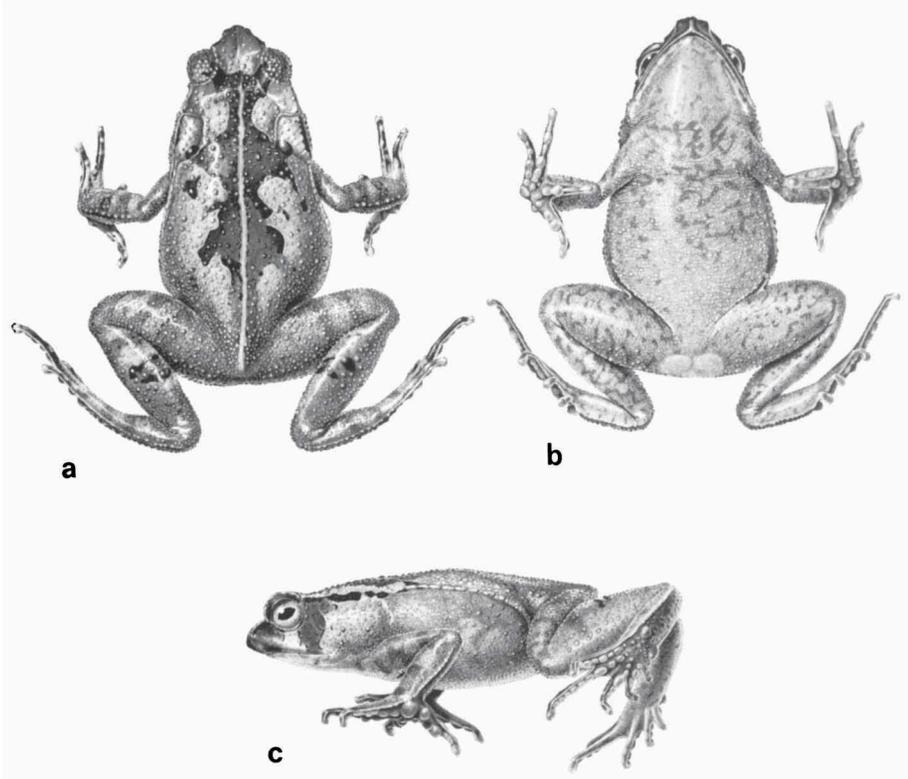
Thanks are due to Miss A. G. C. Grandison, British Museum (Natural History), London (BMNH), Carlos A. de Lima, Sociedad de Ciencias Naturales La Salle, Caracas (SCNLS) and Dr. G. F. de Witte, Institut Royal de Sciences Naturelles, Brussels (IRSN), who kindly loaned me material in

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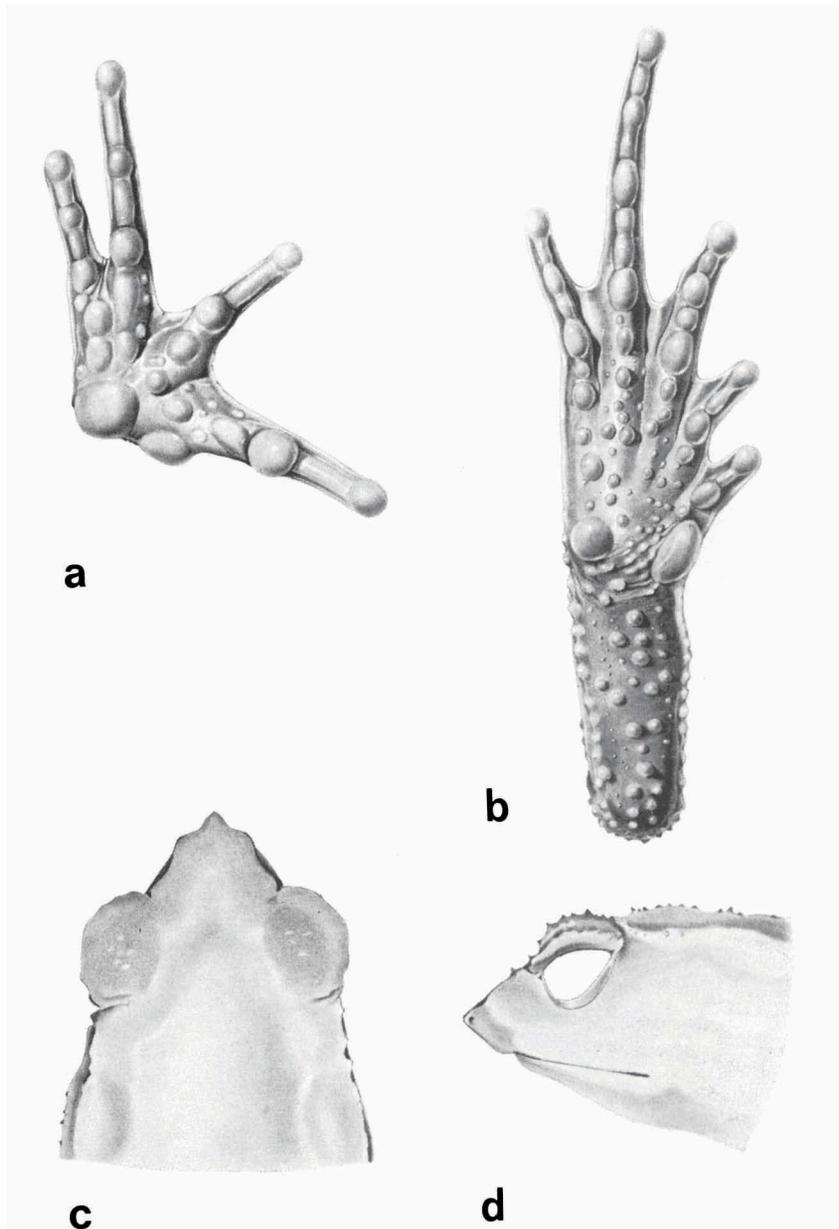
The photographs of living specimens were made after colour slides provided by Mr. Warren, the photographs of preserved material were made by Mr. C. Hoorn of the Rijksmuseum van Natuurlijke Historie. The drawings of plates 1 and 2 were made in pencil by Mr. W. C. G. Gertenaar, also of the Rijksmuseum van Natuurlijke Historie, Leiden.

REFERENCES

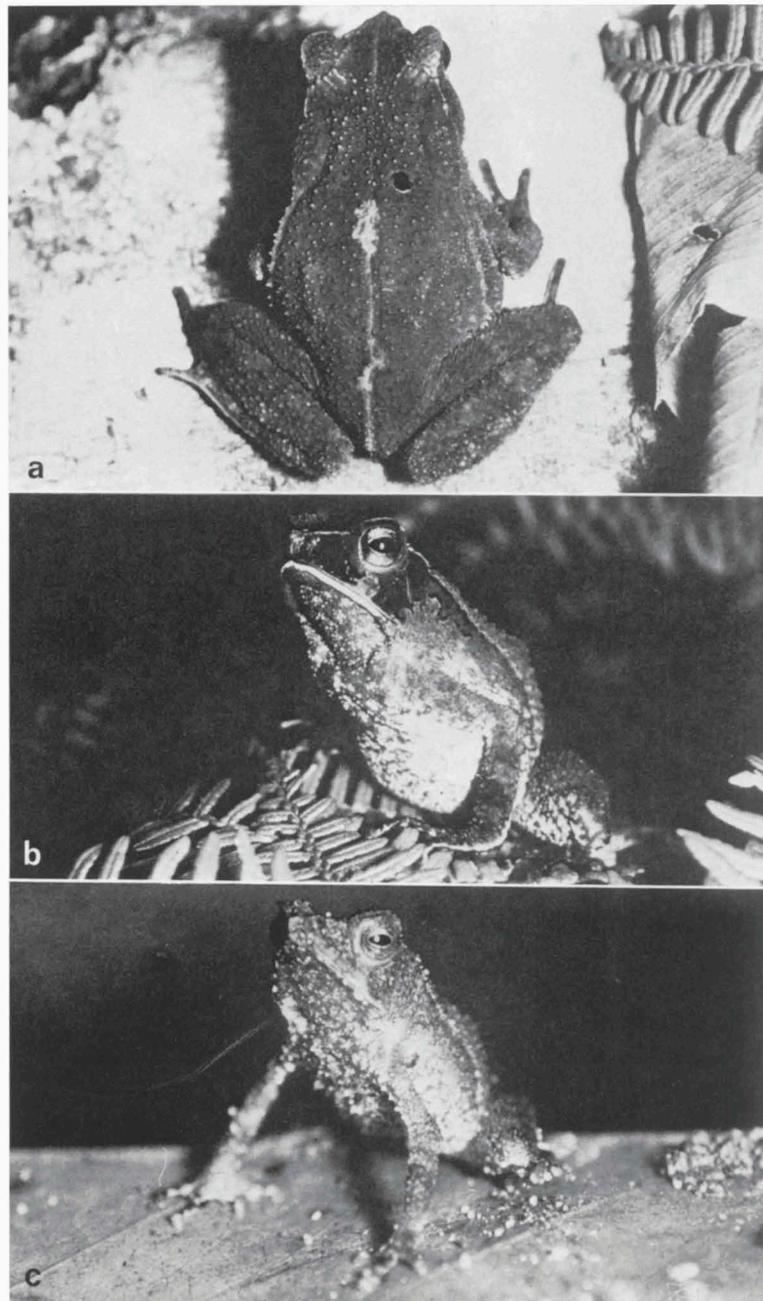
- BEEBE, W., 1925. Studies of a tropical jungle. One quarter of a square mile of jungle at Kartabo, British Guiana. — *Zoologica*, N.Y., 6 (1): 1-193, figs. 1-17, pls. A-B, tables.
- BLAIR, W. F., 1972. Evolution in the Genus *Bufo*: I-VIII, 1-459, figs., pls. 1-6.
- CEI, J. M., 1968. Remarks on the Geographical Distribution and Phyletic Trends of South American Toads. — *The Pearce Sellards Series*, 13: 1-21, figs. 1-6.
- , 1972. *Bufo* of South America. — In: BLAIR, 1972: 82-91, figs. 6-1/6-2.
- CHAPMAN, J. R., 1973. Climatological Report of the British Roraima Expedition. — In: WARREN, 1973: 89-98, figs. 2-4, app. 1-2.
- HOOGMOED, M. S., 1972. On a new species of toad from southern Morocco. — *Zool. Meded. Leiden*, 47 (5): 49-64, figs. 1-3, pls. 1-4, tables 1-3.
- MYERS, G. S. & A. L. DE CARVALHO, 1952. A new dwarf toad from South-eastern Brazil. — *Zoologica*, N.Y., 37: 1-3.
- NIEDEN, F., 1923. Anura I. Subordo Aglossa und Phaneroglossa, Sectio I Arcifera. — *Das Tierreich*, 46: I-XXXII, 1-584, figs. 1-380.
- PHILCOX, D., 1973. Botanical Report of the British Roraima Expedition. — In: WARREN, 1973: 69-72.
- ROOS, K., 1970. Drs. M. S. Hoogmoed onderzoekt: Het raadsel van de onbekende pad. — *De Telegraaf*, 28-III-1970: 17, 2 figs.
- SCHIØTZ, A., 1967. The treefrogs (Rhacophoridae) of West Africa. — *Spolia zool. Mus. haun.*, 25: 1-346, figs. 1-227.
- SMITH, H. M. & R. LAURENT, 1950. Further notes upon the enigmatical *Bufo nasicus* Werner. — *Bull. Inst. Royal Sci. Nat. Belgique*, 26 (21): 1-3, figs. A-D.
- VERVOORT, W., 1975. Rijksmuseum van Natuurlijke Historie te Leiden. Verslag van de Directeur over het jaar 1973. — *Nederlandse Rijksmusea*, 95: 276-371, figs. 1-26.
- WARREN, A. N., 1970. Amphibia. Possible New Toad. — *Nature*, London, 225: 794, 1 photo.
- , 1973. Roraima. Report of the 1971 British Expedition to Mount Roraima in Guyana, South America. Oxford, I-V, 2 pp., 1-152, figs., maps, tables.
- WERNER, F., 1903. Neue Reptilien und Batrachier aus dem naturhistorischen Museum in Brüssel. Nebst Bemerkungen über einige andere Arten. — *Zool. Anz.*, 26: 246-253.



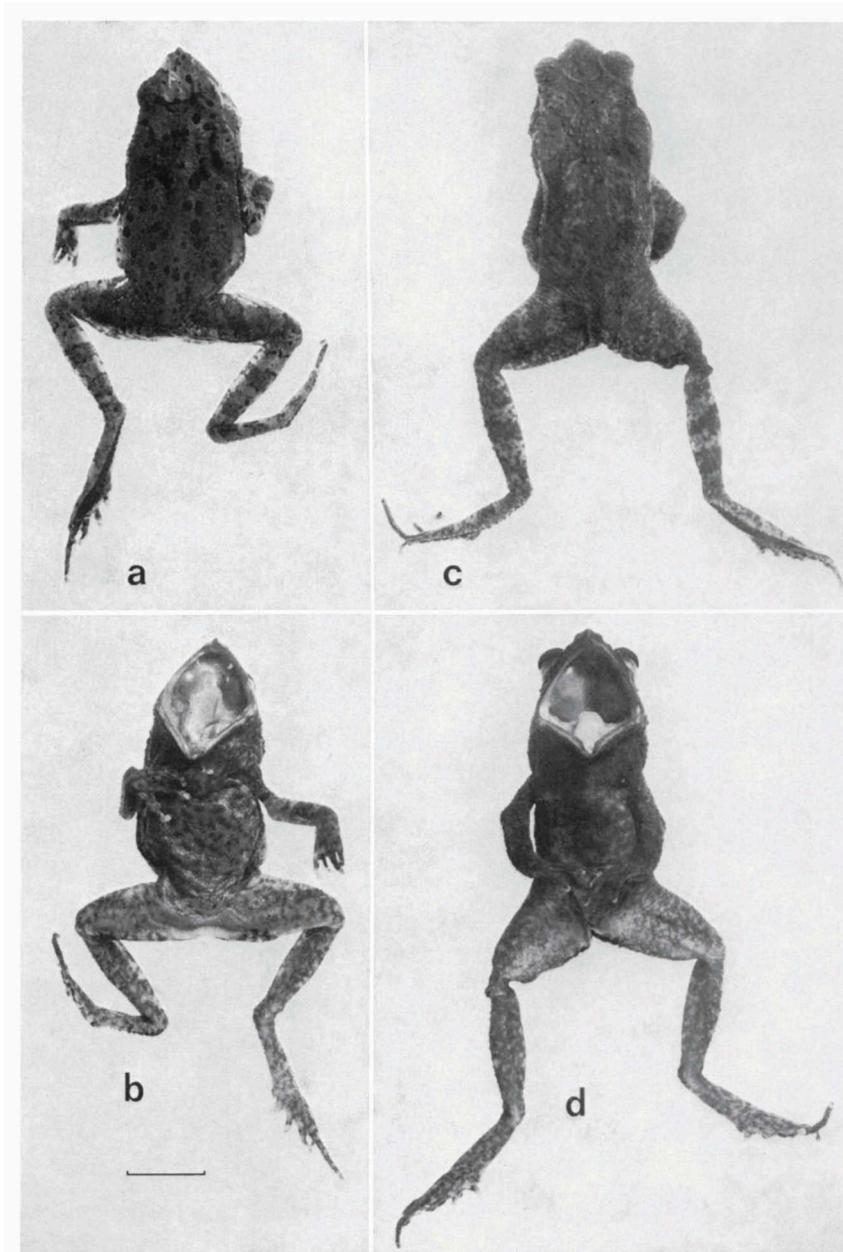
Bufo nasicus Werner, a. dorsal, b. ventral, c. lateral view of ♀ BMNH 1974.633, snout-vent length 66.5 mm.



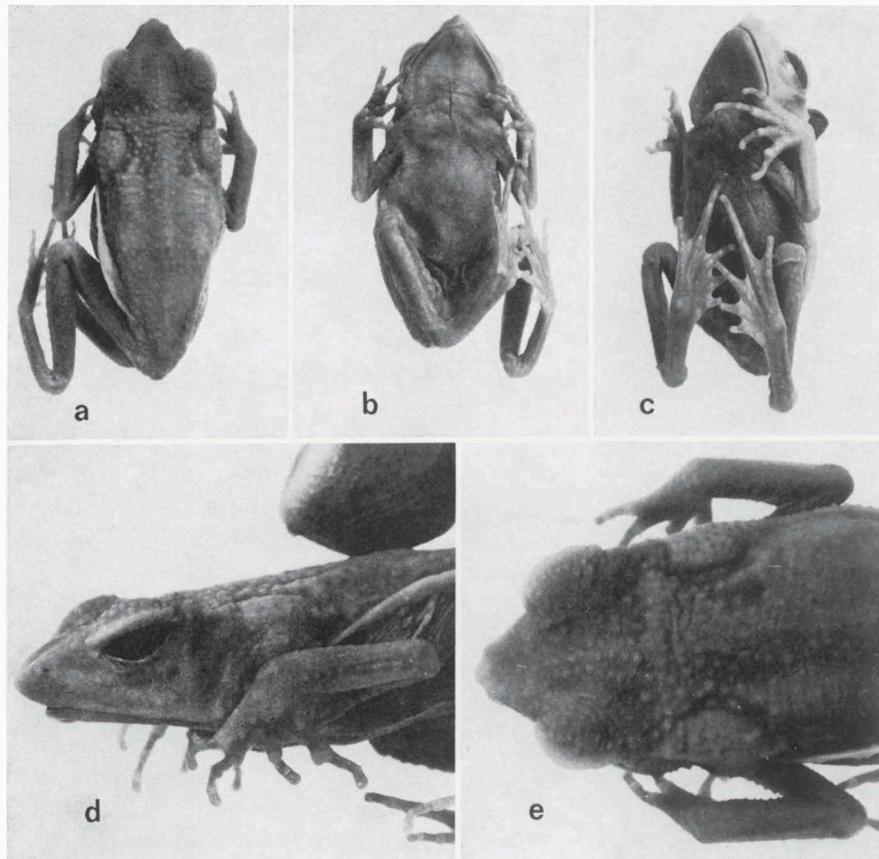
Bufo nasicus Werner, a. ventral view of right hand of ♀ BMNH 1974.633, b. ventral view of right foot of ♀ BMNH 1974.633, c. dorsal profile of head of juvenile BMNH 1974.641, d. lateral profile of head of juvenile BMNH 1974.641. a and b on the same scale, c and d on the same scale. Length of foot 27.7 mm, length of head of juvenile 6.5 mm.



Bufo nasicus Werner, living specimens. a, b. ♀ BMNH 1969.1566, c. juvenile BMNH 1970.616.



Bufo nasicus Werner, a. dorsal view of ♀ BMNH 1974.634, b. ventral view of ♀ BMNH 1974.634, c. dorsal view of ♂ BMNH 1974.636, d. ventral view of ♂ BMNH 1974.636. The horizontal bar represents 1 cm.



Bufo nasicus Werner, holotype IRSN I.G. 9422, Reg. 1015. a. dorsal view, b. ventral view, c. ventro-lateral view, d. detail side of head, e. detailed dorsal view of head. Snout-vent length 32.6 mm, length of head 10.8 mm. a, b and c are on the same scale, d and e also are on the same scale.