

PROCEEDINGS
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BIOLOGICAL SOCIETY OF WASHINGTON

THE GENERIC ALLOCATION OF THE FROG
CERATOPHRYS STOLZMANNI STEINDACHNER,
WITH THE DESCRIPTION OF A NEW
SUBSPECIES FROM ECUADOR

BY JAMES A. PETERS

United States National Museum, Washington, D.C. 20560

The name *Ceratophrys stolzmanni* Steindachner (1882) was based on three frogs from Tumbes, a locality in the coastal desert of northwestern Peru. No additional specimens have been taken. A series of specimens of a *Ceratophrys* that is clearly closely related to *stolzmanni* has been taken over the past twenty years in the coastal plain of Pacific Ecuador. Although there is a considerable distance between the localities in Ecuador and Tumbes, and there are no specimens from intermediate areas that indicate genetic exchange can take place between the isolated populations, I describe the Ecuadorian material as a new subspecies, because I wish to emphasize the similarities, and because I suspect that the relationship is on the subspecific level.

Ceratophrys stolzmanni scaphiopeza new subspecies

Figs. 1-3

Holotype: USNM 160970, male, from Cuatro Hermanitos, an experimental farm approximately 4 km WNW of Guayaquil, Guayas Province, Ecuador, altitude approximately 50 m, collected 17 June 1954 by James A. Peters (field no. JAP 1744).

Paratypes: USNM 118268-77, Salinas, Guayas Province, Ecuador, collected by Lt. J. Hamilton; UCMVZ 77182, Playas, Guayas Province, Ecuador, collected by T. Papenfuss.

Diagnosis: A *Ceratophrys* lacking a bony shield on dorsum; no horn on upper eyelid; skin of dorsum smooth except within areas of dark spots; skin of sides and belly smooth, with faint granulation; tympanum distinct; prominent black edged metatarsal shovel, tarsal fold present. This combination of characters, plus others mentioned below in the description, suffice to distinguish this subspecies from all other members of the genus, including *C. stolzmanni*.

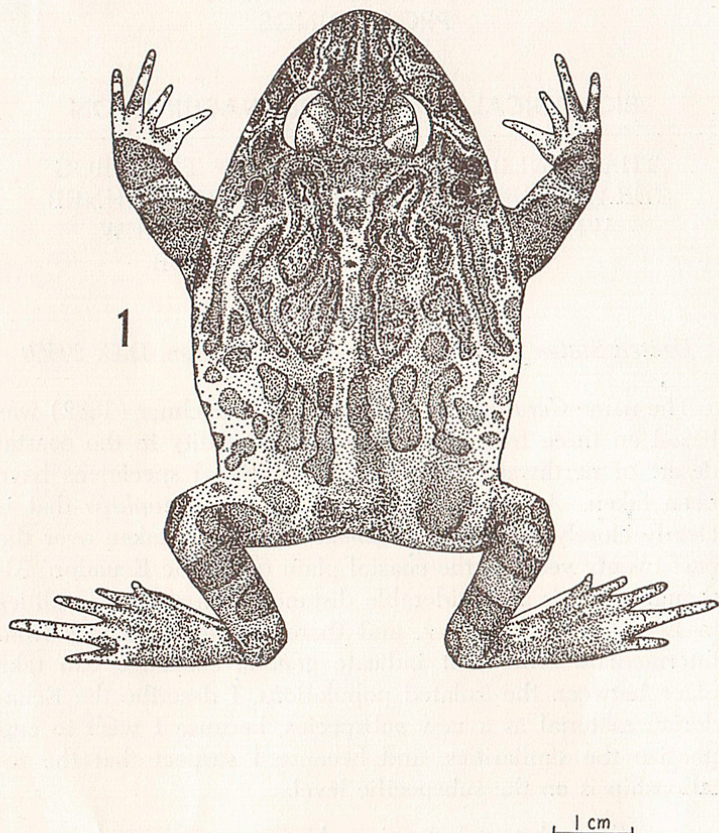
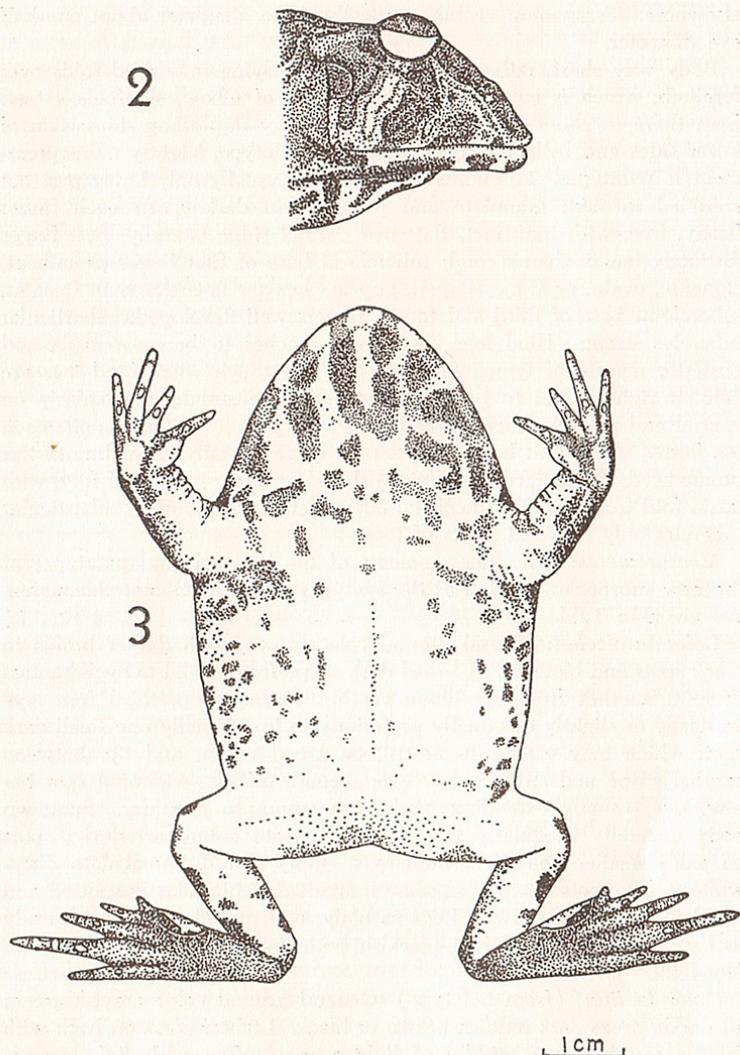


FIG. 1. *Ceratophrys stolzmanni scaphiopeza*, holotype, dorsal view.

Description: Vomerine teeth in two small, widely separated, ovate series between choanae; tongue ovate, not or very slightly notched posteriorly; snout short, sharply declivous, rounded from above, with upper jaw slightly protrusive above lower. Nostrils directed posteriorly, with distinct flap of skin at anterior margin; situated at point of snout where angle of declivity increases sharply; distance between nostrils less than distance from nostril to corner of eye which in turn is less than distance from nostril to snout tip. Distinct ridge from nostril to snout tip; second, less distinct ridge across loreal region from nostril, and third ridge forming curve around anterior eye margin across cheek to slightly above lip line, where third ridge and nostril ridge merge with ridge that arises in temporal region and passes below eye. Horizontal ridge around upper margin of upper lid. Canthus rostralis forms distinct ridge; less pro-



FIGS. 2 and 3. *Ceratophrys stolzmanni scaphiopeza*, holotype. 2, lateral view of head. 3, ventral view.

nounced postorbital ridge curving over and ending in weak boss or knob slightly behind tympanum; a weak subtympenic ridge. All ridges speckled with minute tubercles in holotype; tubercles do not appear distinctly in juvenile paratypes. Eyelid, without dermal horn, extends over eye, forming wide flap more heavy and glandular along outer margin than

elsewhere. Tympanum visible, vertically ovate, diameter about one-half eye diameter.

Body very short, rather stubby; body skin lying in several folds over forelimb, which is covered by skin to level of elbow, skinfolds extend from there to about mid-thigh, forming baggy flap along sides; skin of lower sides and belly faintly granulate in holotype, slightly more prominent in paratypes. Forelimbs short, stubby, usually only lower part not enfolded in skin; granulate and pustulate in dark spots; each finger fleshy, free, with indistinct, flattened dermal ridge laterally; first finger distinctly longer than second; tubercle at base of first finger prominent, elongate, ovate, or kidneyshaped, appears heavier in males than females, tubercle at base of third and fourth fingers well developed; subarticular tubercles strong. Hind legs short; heel reaches to between axilla and posterior margin of tympanum, heels do not touch when hind legs are held at right angles to body; thighs heavily pustulate, particularly on ventral and posterior faces, tibia-fibula with pustules in dark spots; each toe fleshy, webbed at base, with dermal ridge laterally, extending to tip; pronounced, blackedged, keratinized shovel on inner margin of foot, with tarsal fold from shovel to heel; no outer metatarsal tubercle; subarticular tubercles only on basal joints of toes.

Measurements: The measurements of the holotype and paratypes of the new subspecies, as well as the syntypes of *C. stolzmanni stolzmanni*, are given in Table 1.

Color in alcohol: Dorsal ground color brown, with darker brown to black spots and blotches. A broad dark stripe from eyelid to eyelid across occiput, another from eye along canthus to snout tip, third from eye vertically or slightly diagonally posteriorly to lip. Usually one small dark spot, which may extend to nostril, on loreal region and lip, between canthal stripe and stripe below eye; second, diffuse, widening spot behind eye, usually extending across tympanum to shoulder. Spots on body generally irregularly paired and elongate anteroposteriorly; spots on sides smaller and more numerous. Belly almost immaculate dirty-white, a few spots laterally in some individuals; chin heavily spotted and streaked with dark brown. Legs as body, with prominent spots dorsally to base of digits. Hind foot blackish both dorsally and ventrally; fore-foot light.

Color in life: (from holotype) General ground color grayish-green; all darker areas dark reddish-brown or black. Lighter areas on back with faint greenish tinge; middle of lighter areas often with light orange streak. These orange streaks more prominent on head, where one runs from corner of eye to snout tip, and another from posterior corner of eye to lip, at slight angle. Eye with fairly obvious golden ring. Legs greenish-gray above, with definite orange tint below. Stripes on chin light chocolate brown; rest of venter white.

Comparisons: I have compared the type series with two of the three syntypes (Vienna Mus. 4631) of *Ceratophrys stolzmanni* Steindachner. The primary difference between the nominate form and *scaphiopeza* lies

in the degree of wartiness and pustulation on the body. In *s. stolzmanni* the areas of ground color on the dorsum are studded with pustules; in *s. scaphiopeza* there are practically no pustules in the ground color areas. The sides and belly of *s. stolzmanni* are thickly granular and in part pustulate; in *s. scaphiopeza* these areas are either quite smooth or lightly granular. The skin in *s. stolzmanni* is thicker and heavier than in *scaphiopeza*, and is perhaps less permeable to water. The skin in *scaphiopeza* is quite thin and delicate for an animal inhabiting a desert area. Although it is difficult to know what effect different preservation techniques may have had on skin folds, it appears that the body skin is more sacklike in *scaphiopeza*, extending to the elbows on the forearms and to the knees on the hind limbs; in *s. stolzmanni* it extends only slightly below the axilla and the groin.

Both the holotype and the specimen from Playas are dark, with a dark brown ground color and much darker blotches. The paratypes from Salinas are much lighter brown, with almost tan ground color, and slightly darker blotches, and resemble very closely the pattern of the syntypes of *s. stolzmanni*. It would seem either that there is strong dichromatism or even polychromatism in *scaphiopeza* or that both the series of Salinas paratypes of *scaphiopeza* and the syntypes of *s. stolzmanni* have been badly faded in preservative.

Generic allocation: The published distinctions between the genera *Ceratophrys* Boie and *Odontophrynus* Reinhardt and Lütken have been so slight in the past that some authors have synonymized them, following Boulenger (1882, p. 221). The principal character used to separate them has been the horn on the upper eyelid in *Ceratophrys*, which is lacking in *Odontophrynus*. On this basis, *C. stolzmanni* should be assigned to *Odontophrynus*. Recently, however, Reig and Limeses (1963) have reviewed the frog genera related to *Ceratophrys*, and have found several additional differences. They point out that each tooth in *Odontophrynus* is small and blunt, and is made up of a short pedicel and equally short crown, with the tooth length less than its anteroposterior diameter. On the other hand, a tooth in *Ceratophrys* is long, sharp and needlelike, considerably longer than wide, with a distinct posteriorly directed curve, and, according to Reig and Limeses, no distinction between the crown and the pedicel. *Ceratophrys*, however, does have a crown and pedicel. The crown is formed first, with the pedicel appearing at about the time the crown has moved into its permanent position from its "seed-tooth" location. The two fuse completely, and the mature tooth is firmly ankylosed to the jaw, with the boundary between the crown and pedicel visible only under high magnification. The teeth in *Odontophrynus* are much more similar to the typical salientian tooth, as described and figured by Parsons and Williams (1962), with an open root on the parapat of the jaw, and rapid loss and replacement of the crown. The teeth in *Ceratophrys stolzmanni scaphiopeza* are long, recurved, and sharp, appearing to be very similar to other members of the same genus, but, unfortunately, the only adult specimen available is the holotype, and it is not possible

TABLE 1. Measurement of all measurable specimens of *Ceratophrys stolzmanni*. All measurements are to the nearest tenth of a millimeter. Two paratypes of *scaphiopeza* are too contorted to measure accurately.

	Holotype		Paratypes										Syntype		Syntype
	USNM 160970	USNM 118268	USNM 118269	USNM 118270	USNM 118271	USNM 118272	USNM 118273	USNM 118275	USNM 118276	USNM UCMVZ 77182	USNM 4631.1	USNM 4631.2	VM	VM	
Snout to vent length	65.5	47.7	52.2	52.4	54.0	54.1	49.8	—	46.4	32.6	60.1	51.6			
Snout to end of coccyx length	60.6	45.8	47.7	48.8	50.0	49.8	47.7	—	42.1	29.7	58.3	49.3			
Snout to corner of jaw	31.9	22.7	24.9	24.6	26.1	24.1	21.3	21.5	21.8	15.0	27.5	24.9			
Greatest head width	34.1	25.5	26.3	27.2	27.7	26.8	24.7	22.1	23.6	16.9	31.9	27.8			
Knee to knee when perpendicular to body	47.1	34.0	33.5	—	35.1	36.8	31.2	28.7	30.5	21.5	42.9	34.2			
Tibia-fibula,—knee to joint	22.7	16.5	16.9	17.1	16.4	17.1	15.2	14.3	15.3	9.7	20.3	16.7			
Eye diameter	8.3	5.7	6.2	6.0	5.5	6.2	5.8	5.1	5.5	3.7	7.2	6.5			
Snout to eye	16.2	13.1	12.5	12.4	13.7	12.2	11.3	11.6	12.1	7.8	14.2	14.4			
Interorbital distance	5.6	4.5	4.8	3.8	4.9	4.9	3.8	4.1	3.8	3.0	4.8	4.2			
Width of eyelid	6.1	4.5	6.0	5.7	4.6	4.8	5.1	4.3	3.8	3.3	5.1	4.2			

to determine the tooth condition satisfactorily without mutilating the specimen. In the juvenile paratypes, the teeth are still in such an early stage of development that the ankylosis is not clear.

In her paper on the thigh musculature of ceratophrynid frogs, Limeses (1964) discussed a series of characters that more or less distinguish between *Ceratophrys* and *Odontophrynus*. It is difficult, if not impossible, to evaluate these characters adequately without comparative material in each genus. Comparison of the subspecies of *C. stolzmanni* with the material used and described by Limeses will provide further clues on the relationships.

Habitat: The type-locality is clearly in a marginal habitat for the subspecies. The holotype was collected on the experimental farm "Cuatro Hermanitos," near Guayaquil, where I also collected the lizard *Ophryoesoides iridescens* Günther, the toad *Bufo marinus* Linnaeus, and the frog *Rana palmipes* Spix. The *R. palmipes* and the new *Ceratophrys* were found together in a barrel sunk into the ground and covered with boards, less than half full of water.

Guayaquil is on the eastern margin of the coastal desert, but both of the other localities for the new subspecies lie well within it. The vegetation around Guayaquil and the experimental farm can be described as tropical scrub, which is usually fairly open with few trees, but remains green during about half of the year. The desert around Playas and Salinas, on the other hand, is open and sandy, with scattered, low, desert vegetation, and trees are absent except near temporary stream beds. Rainfall is very scanty, as it is in most of that part of the western coast of South America lying under the influence of the Humboldt Current. Occasionally rain falls heavily in the area.

The genus *Ceratophrys* includes several species that are good burrowers, even in more equable environments, but in this case I believe the digging ability has permitted the species access to the coastal deserts. Although data are not available to verify it, my conjecture is that this species occupies the same niche here as do the toads of the genus *Scaphiopus* in southwestern United States, living deep in the ground during long dry periods, perhaps for several years at a time. This conjecture is strengthened by the occurrence of a heavy, cornified, shovel-like structure on the hind foot, very similar to that of *Scaphiopus*. In *Scaphiopus* the adults come to the surface in response to a soaking rainfall, breed, and disappear. The eggs and larvae have an accelerated developmental period. I predict that *C. stolzmanni* will be found to have a similar life cycle.

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