

L. chaquensis are described. Lungs well developed, about length of floor of mouth; partially inflated. Filamentous gills present.

VENTRAL ASPECT.—Buccal Cavity: Medial pair of infralabial papillae fused on common base; papillae smaller and less elaborate than in *L. chaquensis*; prenarial arena without additional pustulations (Figure 53a). Four lingual papillae in forwardly arching row; all simple and attenuate. BFA V-shaped; 8–10 papillae on each side; all thin and conical, lacking bifurcations. One or two small prepocket papillae. Three or four papillae lateral to BFA just posterior to medial edge of pockets. Buccal pockets perforated. Single papilla on either side of median notch.

Pharyngeal Cavity: Branchial baskets slightly smaller than in *L. chaquensis*. Tops of filter plates slightly more tipped than in *L. chaquensis*; cb 1 with 9–10 filter rows, cb 2 with 11, cb 3 with 9 or 10, cb 4 with 7. Filter mesh with quaternary folds. Filter canals 90% canopied. Glottal lips thicker than in *L. chaquensis*; faint laryngeal disk.

DORSAL ASPECT.—Buccal Cavity: Anterior narial wall pustulate, without distinct papilla. Small, posterolateral, secondary papillae in postnarial arena; larger pair of papillae not as large as in *L. chaquensis* and not abutting on midline. Median ridge broader than in *L. chaquensis*. Lateral-ridge papillae non-branching. Four or five BRA papillae on each side. Free medial margin of dorsal velum more pustulate and less papillate than in *L. chaquensis*.

Leptodactylus knudseni Heyer

FIGURE 21

MATERIAL.—USNM field 44780 (one specimen dissected, stage 39, SVL 18.9 mm). Collected from forest pond at Reserva Biologica Rio Trombetas, Pará, Brazil, 9 February 1979, by Ronald I. Crombie.

REFERENCE.—The larval external morphology is being described by Ronald I. Crombie (pers. comm.). The habitus is very similar to that of *L. labyrinthicus* or *L. pentadactylus*.

GENERAL REMARKS.—Only those features that differ from *L. chaquensis* are described. Lungs average size; left lung larger than right, left lung about same length as buccal floor, right 20% smaller; not inflated.

VENTRAL ASPECT.—Buccal Cavity: Five infralabial papillae as two tiny knobs far forward, third one posteromedial on midline in form of anteriorly cupped palp with deep anteromedial cleft; last pair posterolateral and largest, consisting of multiangular knobby palp-like structures; no infralabial papillae touching, all well separated from each other (Figure 53b). BFA a bit more open posteriorly than in *L. chaquensis*; up to 10 BFA papillae on each side; no BFA papillae with bifurcations, not as tall or attenuate as in *L. chaquensis*. Two or three tiny prepocket papillae. Only 1 or 2 papillae lateral to BFA just posterior to medial edge of pockets. Buccal pockets perforated. Marginal papillae on ventral velum shorter than in



FIGURE 21.—SEM micrographs of floor (above) and roof (below) of oral cavity of *Leptodactylus knudseni*; scale line = 1 mm.

L. chaquensis; secretory pits not as conspicuous as in *L. chaquensis*.

Pharyngeal Cavity: Branchial baskets wider than long by 20%; irregularly oval. Third and fourth filter plates with distinct upward curving peaks; 2nd filter plate with straight dorsal margin; 3rd filter plate overlapping 4th more extensively than in *L. chaquensis*; cb 1 with 11 filter rows, cb 2 with 12, cb 3 with 12, cb 4 with 7.

DORSAL ASPECT.—Buccal Cavity: Prenarial arena with faint posteriorly directed broad V-shaped notch on midline flanked directly laterad by 1 or 2 pustulations. No papillae on prenarial wall; single, large, globose, postnarial papilla directly posterior to median half of nares with completely smooth surface. Median ridge broader than in *L. chaquensis*, with serrate lateral edges; no distinct terminal papilla; anterior surface smooth (Figure 61b). Lateral-ridge papillae small, simple, triangular structures with rugose margins; each about $\frac{1}{4}$ size of median ridge. BRA triangular, poorly defined by 2 or 3 papillae on each side; about 3 dozen pustulations scattered about BRA and postnarial arena. Anterior margin of ventral velum smooth.

Leptodactylus mystacinus (Burmeister)

FIGURE 22

MATERIAL.—USNM 241303 (single specimen dissected, stage 37, SVL 12.2 mm). Collected from a temporary pond in a clearing at Fazenda do Veado, Serra da Bocaina, São Paulo, Brazil, 3 January 1977.

REFERENCE.—Sazima (1975) described and figured the external larval morphology.

GENERAL REMARKS.—Only those features that differ from *L. chaquensis* are described. Lungs well developed, 80%–90% length of buccal floor; not inflated. Filamentous gills present.

VENTRAL ASPECT.—Buccal Cavity: Medial pair of infralabial papillae fused to common base. Four lingual papillae in a transverse row; tall, simple, subequal in size. Seven or eight BFA papillae on each side; no papillae with bifurcate tips; largest 2 BFA papillae rising from common base. No papillae lateral to BFA posterior to medial edge of pockets. Buccal pockets perforated.

Pharyngeal Cavity: Branchial baskets wider than in *L. chaquensis*. Third and 4th filter plates curving upward more extensively and abruptly than in *L. chaquensis*; 3rd filter plate slightly taller and more imbricate than in *L. chaquensis*; cb 1 with 10 filter rows, cb 2 with 10, cb 3 with 10, cb 4 with 8. Filter rows not as abutting as in *L. chaquensis*. Filter canals 80% canopied.

DORSAL ASPECT.—Buccal Cavity: Roof about as long as wide. Prenarial arena with transverse ridge broadly V-shaped; rest of prenarial arena featureless. Anterior narial walls simpler than in *L. chaquensis*, lacking papillae. Small, posterolateral, secondary papillae in postnarial arena; larger pair of papillae not as large as in *L. chaquensis* and not abutting on midline.

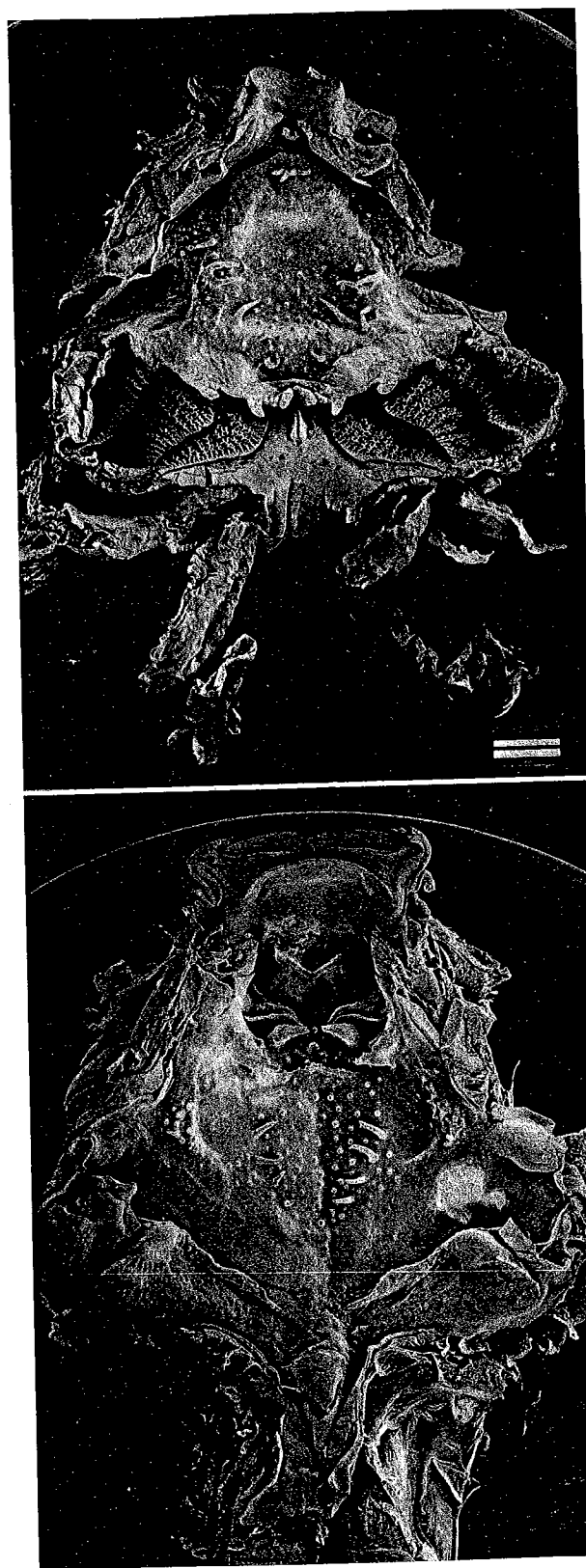


FIGURE 22.—SEM micrographs of floor (above) and roof (below) of oral cavity of *Leptodactylus mystacinus*; scale line = 1 mm.

Anterior surface of median ridge smooth, median ridge broader than in *L. chaquensis*. Lateral-ridge papillae smaller than in *L. chaquensis*, lacking terminal branches, with jagged terminal edges. Four BRA papillae on each side. Free medial margin of dorsal velum slightly pustulate, lacking papillae.

Leptodactylus pentadactylus (Laurenti)

MATERIALS.—USNM uncatalogued (single specimen dissected, stage 34, SVL 18.4 mm). Collected from 6 km west of Turrialba, Cartago, Costa Rica. Specimen subsequently destroyed in SEM preparation.

REFERENCES.—External descriptions are in Heyer (1970, 1979). Discussions of ecology, habitat occurrence, and facultative carnivory are found in Heyer, McDiarmid, and Weigmann (1975) and Muedeking and Heyer (1976).

GENERAL REMARKS.—Only those features that differ from *L. chaquensis* are described.

VENTRAL ASPECT.—*Buccal Cavity:* Floor of mouth relatively wide anteriorly. Four infralabial papillae, 2 fused at midline; the 2 lateral infralabial papillae simple, round palps with single, medially directed, apical projection; all infralabial papillae relatively small but distinct and anteriorly-posteriorly flattened. Three lingual papillae; medial papilla anteriorly-posteriorly flattened, distinctly bifurcate; other 2 lingual papillae simple, attenuate, posterolateral to medial one. Elongate oval BFA, not distinctly defined anteriorly; 6 BFA papillae on one side, 5 on other, simple attenuate cones; no pustules or bifurcations. Randomly scattered pustulations anterior to buccal pockets and on posterior half of BFA. Buccal pockets long, not as wide as in *Leptodactylus chaquensis*; transversely oriented; distinctly perforated. Posterior margin of ventral velum crenulate, peaks over filter cavities relatively small, but distinct; median notch wide and jagged; secretory pits of velar surface very conspicuous, but limited to free margin of velum; secretory pits densest medially, except right in front of median notch.

Pharyngeal Cavity: Area of both branchial baskets about 80% of buccal floor area. Second filter plate largest, 40% larger than 1st or 3rd; 3rd filter plate imbricating 3rd filter cavity covering $\frac{1}{2}$ the filter cavity; cb 1 with 9 filter rows, cb 2 with 11, cb 3 with 10, cb 4 with 9. Filter mesh moderately dense with tertiary and higher order folds present. Filter rows moderately wide, intermittently abutting, but filter canals exposed; filter canals about $\frac{1}{4}$ width of filter rows. Glottis small with tall, moderately thick lips.

DORSAL ASPECT.—*Buccal Cavity:* Roof of mouth wide, trapezoidal, almost as wide as tall; nares located about $\frac{1}{4}$ distance from front of mouth to esophagus. Weak, posteriorly directed, wide, V-shaped elevation in middle of prenarial arena, located about $\frac{2}{3}$ distance from upper beak to nares, otherwise no other structures (pustulations or papillae) in prenarial arena. Nares large; transversely directed; anterior narial wall thick, short, lacking papillae. Postnarial arena with 2 short, stout,

postnarial papillae with rounded apices together with a few small pustulations in the postnarial region. Median ridge small, rounded, but with slightly jagged ventral margin; median ridge lacking any secondary papillae or pustulations. Lateral-ridge papillae small, stout, with jagged apices, located far lateral and slightly anterior to median ridge. BRA poorly defined, with only 1 or 2 small attenuate papillae on each side; BRA papillae not bifurcate. Several dozen randomly distributed pustulations on buccal roof; fewer pustulations laterally. Glandular zone wide and smooth; secretory pits dense, not distinct under light microscope. Dorsal velum short; interrupted medially; with a slightly rough medial margin on each side.

Pharyngeal Cavity: Destroyed in dissection.

Leptodactylus wagneri (Peters)

FIGURE 23

MATERIAL.—USNM 241307 (two specimens dissected, stage 37, SVL 10.8 mm; stage 38, SVL 9.9 mm). Collected from pond at Curuçá, Amazonas, Brazil, 9 November 1975.

REFERENCE.—Kenny (1969) described the external anatomy (as *Leptodactylus podicipinus petersi*).

GENERAL REMARKS.—Only those features that differ from *L. chaquensis* are described. Lungs long, about length of buccal floor, uninflated. Dense gill filaments.

VENTRAL ASPECT.—*Buccal Cavity:* Three infralabial papillae, one on midline bifurcate. No lingual papillae. Zero to three prepocket papillae. Posterior edge of ventral velum symmetrically sculptured, small papillae irregularly spaced on edge; median notch average size.

Pharyngeal Cavity: Cb 1 with 9 filter rows, cb 2 with 10, cb 3 with 11, cb 4 with 6. Filter rows mostly not abutting. Filter canals 80% canopied. Glottis 80% exposed when viewed from above; glottal lips thicker than in *L. chaquensis*.

DORSAL ASPECT.—*Buccal Cavity:* Prenarial arena lacking pustulations and ridge less relief than in *L. chaquensis*. Anterior narial papilla a knob-like structure. Postnarial arena with second small papillae between medial papilla and lateral-ridge papilla. Lateral-ridge papillae simpler structures than in *L. chaquensis*. About 6 BRA papillae on each side. Glandular zone less distinct than in *L. chaquensis*. Papillae on free velar margin smaller than in *L. chaquensis*.

Macrogenioglottis alipioi Carvalho

FIGURE 24

MATERIAL.—USNM 200456 (one specimen dissected, stage 31, SVL 17.7 mm). Collected from a forest pond near Santa Teresa, Espírito Santo, Brazil, 15 April 1971, by James F. Jackson, Jr.

REFERENCE.—Abravaya and Jackson (1978) described and figured the larva and discussed the reproductive behavior of the species.

GENERAL REMARKS.—Beaks weakly cornified. Very slight



FIGURE 23.—SEM micrographs of floor (above) and roof (below) of oral cavity of *Leptodactylus wagneri*; scale line = 1 mm.

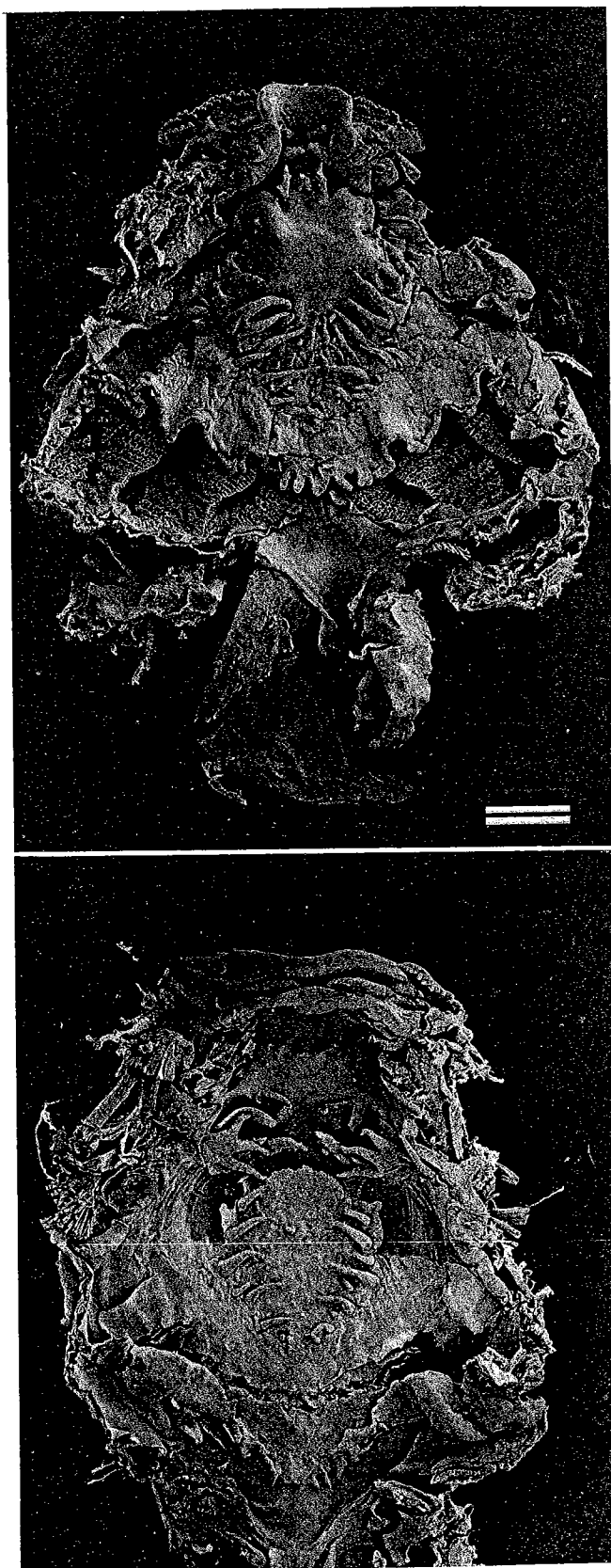


FIGURE 24.—SEM micrographs of floor (above) and roof (below) of oral cavity of *Macrogenioglottus alipioi*; scale line = 1 mm.

interhyoideus and orbitohyoideus musculature. Lungs average length, longest about equal length of buccal floor, sacculate, other lung shorter but more sacculate.

VENTRAL ASPECT.—Buccal Cavity: Floor of mouth ovoid-triangular, about as long as wide. Four infralabial papillae, 1 pair anteromedial, 1 pair posterolateral, not touching on midline, all small, conical, with serrate and rugose anterior surfaces (Figure 52c). Four lingual papillae in slightly bowed forward transverse line; lingual papillae of average size, lateral larger, with surface rugosities. BFA egg-shaped; 15–25 papillae on each side; very small, conical, anterior BFA papillae extending to base of tongue anlage; 2 larger papillae on each side medial to buccal pockets arising from common base; all BFA papillae simple, thin, lacking bifurcations or extensive surface sculpturing; 4 medium-sized papillae in one transverse row, 6 papillae in a second row running across the BFA about $\frac{2}{3}$ distance posteriorly; assorted pustulations and small papillae scattered about the posterior half of BFA. Three or four very small, prepocket papillae on each side. Another half dozen papillae just posteromedial to buccal pockets near BFA and as a cluster continuous with posterior BFA papillae. Buccal pockets long, 50% wider than long; primarily transversely oriented; perforated (?). Free velar surface of average length; conspicuous spicular support; very wavy free margin, broad peaks over free edge of each filter plate plus additional, small, irregular peak medially, medial to peak over 4th filter plate; distinct but irregular peaks bounding median notch; median notch broad, of average depth; secretory pits small, dense, conspicuous, associated with all marginal projections and in narrow zone along posterior margin of free velar edge.

Pharyngeal Cavity: Branchial baskets slightly wider than long, triangular; each branchial basket about 70% or more of remaining buccal floor area; deep, twice as wide as deep; 2nd filter cavity largest, 50% larger than 1st, 3–4 times 3rd; 1st filter cavity more longitudinally oriented than 2nd or 3rd. Second filter plate with straight dorsal edge; 3rd filter plate with slightly upward-bowing dorsal edge; 2nd filter plate 50% longer than tall, 3rd as long as tall; 2nd filter plate tipped medially at 45°, ventral portion of 3rd filter plate horizontal, dorsal portion of free edge curving upward overlapping lateral half of 3rd filter cavity by about 45°; cb 1 with 11 filter rows; cb 2 with 13; cb 3 with 10, cb 4 with 8. Filter mesh dense; filter rows wide with quaternary and higher order folding common. Filter rows of relatively even size, fully abutting. Filter canals 50% or less width of rows; 100% canopied except where exposed in dissection. Branchial food traps with secretory ridges. Glottis 50% covered by ventral velum; relatively small; lips average thickness; laryngeal disk not evident. Esophageal funnel narrow; esophagus of small diameter.

DORSAL ASPECT.—Buccal Cavity: Roof of mouth triangular, about as wide as long; nares 25% distance from front of mouth to esophagus; median ridge 40% distance from front of mouth to esophagus. Prenarial arena with largely transverse

but irregular row of 8 large pustulations. Nares large; internarial distance about 30% length of naris; nares largely transversely oriented; anterior narial wall thin, not tall, with tall, posteriorly directed, conical, prenarial papilla with some surface rugosities arising from midportion; posterior narial wall large with gently curved margin pointing downward, but no distinct narial-valve projection. Postnarial arena defined by 6 papillae on each side with largely transverse orientation although smaller more medial papillae turning anteriorly; largest papillae in middle of row; larger papillae with rugose anterior surfaces; transverse row of 4 unequal-sized conical papillae in posterior portion of postnarial arena. Median ridge large; semicircular free edge with many tiny serrations; anterior surface largely smooth with only 1 or 2 pustulations. Lateral-ridge papillae laterally compressed, flap-like structures, each with 3 conical projections, each projection with surface rugosities/pustulations; each lateral-ridge papilla about $\frac{1}{2}$ size of median ridge. BRA egg-shaped; 10 papillae on each side; smallest papillae most caudal; pustulations scattered within BRA, a few extending anteriorly onto posterior surface of median ridge; all BRA papillae thin, pointed, not bifurcate. Few small papillae on far lateral midportion of buccal roof. Glandular zone very distinct; medium small secretory pits, barely continuous on midline; maximum length $\frac{1}{8}$ length of buccal floor. Dorsal velum interrupted on midline; of average size; medial third on each side with papillate fringe, turning medially into esophagus.

Pharyngeal Cavity: Two distinct pressure cushions, lateral one (partially destroyed in dissection) apparently smaller, more medial cushion an elongate oval running anteromedial to posterolateral. Ciliary groove destroyed in dissection.

Megaelosia goeldii (Baumann)

FIGURE 25

MATERIAL.—USNM 241293, 241297 (two specimens dissected, stage 25, SVL 21.8 mm; stage 37, SVL 54.7 mm). Collected from a stream near Teresópolis, Rio de Janeiro, Brazil, 25 December 1977. Stage 25 specimen illustrated.

REFERENCE.—Lutz (1931) described and illustrated the external morphology.

GENERAL REMARKS.—Description based on stage 37 specimen, stage 25 specimen differences indicated in parentheses. Luxuriant gill filaments. Lungs slightly smaller than average, about equal to length of buccal floor (75%); not inflated.

VENTRAL ASPECT.—Buccal Cavity: Floor of mouth oval, but very broad, slightly wider than long, buccal floor overall strongly concave. Three pairs infralabial papillae in approximately transverse row; most medial pair small with unbifurcated rugose apices; 2nd pair lateral and slightly anterior, also of simple shape; largest pair posterolateral with hand-like palps bearing 6 long, rough fingers. (Two pairs of infralabial papillae; one huge anterior and lateral pair of hand-like structures with about 7 long, attenuate, interdigitating fingers; second pair simpler, smaller, each with a bifurcation, apices

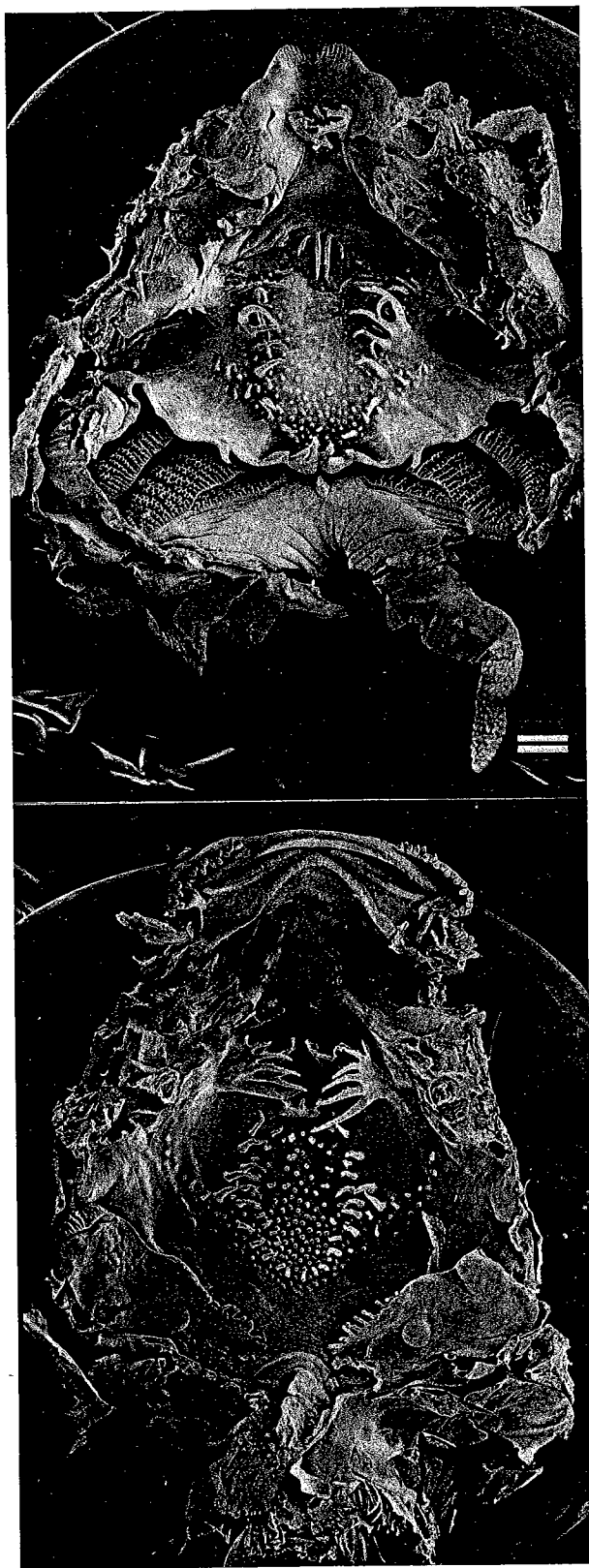


FIGURE 25.—SEM micrographs of floor (above) and roof (below) of oral cavity of *Megaelasia goeldii*; scale line = 1 mm.

of posterior and more medial "fingers" touching on midline; all papillae with knobby anterior surfaces; see Figure 52*d*.) Long bare area between infralabial papillae and tongue anlage; 2 pair simple, pointed lingual papillae in transverse row, medial pair larger, but unequal in size. BFA an elongate oval, defined by 20–25 papillae on each side; largest papillae medial to buccal pockets; only largest BFA papillae bifurcate, all others thin cones with pointed apices but rugose anterior margins. Four to six (6–10) small assorted pustulations in prepocket region. About 4 small papillae within posterior portion of BFA, 10–12 irregularly scattered additional small papillae and pustulations immediately lateral to posterior $\frac{1}{3}$ of BFA. Buccal pockets long, almost as long as wide; transversely oriented; perforated (not perforated). Free velar surface long with long, distinct, spicular support; area on one side $\frac{1}{6}$ – $\frac{1}{8}$ that of remainder of buccal floor; middle $\frac{1}{2}$ of posterior margin of ventral velum directed dorsally rather than posteriorly; most medial portion of velum recurved such that free margin pointing toward front of mouth; posterior velar margin with distinct peak over 2nd filter plate and 3rd filter cavity; 6 long marginal papillae of subequal size in midportion, 1 marginally serrated; median notch present, but 1 of 5 (7) subequal notches in this region; secretory pits distinct, large, limited to marginal peaks and ventral surface of velum.

Pharyngeal Cavity: Branchial baskets transversely oval, slightly wider than long, of average size, each one equal in area to $\frac{1}{4}$ ($\frac{1}{2}$) area of buccal floor; shallow, 6 times wider than deep. Filter cavities transversely oriented anteriorly, obliquely oriented posteriorly; filter cavities small due to dorsoventral depression; dorsal margins of 2nd and 3rd filter plates slightly concave, 2nd filter plate twice as long as tall, 3rd filter plate as long as tall; medially and posteriorly filter plates oriented almost horizontally such that top of 3rd filter plate touching bottom of 4th filter plate posteriorly, however, 3rd filter plate overlapping 4th filter plate anteriorly; cb 1 with 12 (10) filter rows, cb 2 with 15 (11), cb 3 with 11 (12), cb 4 with 11 (6). Filter mesh moderately dense with quaternary filter folds on some ridges. Filter rows wide, not abutting neighboring rows. Filter canals about equal to width of filter rows; 75%–90% canopied. Branchial food traps average size, relatively shallow; distinctly visible, evenly spaced, large, conspicuous secretory ridges. Glottis fully exposed (50% exposed), small, open (closed but probe patent); lips very distinct but narrow; glottis oriented forward on a large laryngeal disc projecting upward and over midportion of ventral velum (not over ventral velum). Esophageal funnel with wide profile.

DORSAL ASPECT.—Buccal Cavity: Roof of mouth approximately triangular, length and width subequal; nares about 20% distance from front of mouth to esophagus; median ridge about 40% distance from front of mouth to esophagus. Prenarial arena smooth (arch of pustulations), surface bowed downward; one very small prenarial papilla far posterior adjacent to anteromedial corner of anterior narial wall. Nares small (large);

internarial distance very short; nares obliquely oriented; anterior narial wall tall, thickened particularly posterolaterally (height equal to internarial distance); anterior wall partially supported by cartilage posterolaterally; anterior wall with 2 or 3 attenuate, bifurcate papillae projecting posteromedially over posterior narial valve; posterior narial wall a simple thin flap with weak narial-valve projection. Postnarial arena an elongate isosceles triangle with median ridge as its base and apex between nares; postnarial papillae in multiple, evenly spaced rows in a triangular patch with about 20 (12–20) papillae on each side; largest postnarial papillae most medial, curved, pointing medially or posteromedially with rough, anterior, serrated edges; postnarial papillae decrease in size anterolaterally; single papilla on midline within postnarial arena. Median ridge square with projections from its two free corners and medial projection on ventral edge; all projections with rough anterior surfaces. Lateral-ridge papillae in form of very large longitudinally oriented ridge with 6 or 7 palmate (moose antler-like) projections, several of which with secondary bifurcations and rugosities (Figure 61c). BRA elongate "U" defined by about 15–20 papillae on each side; all BRA papillae thin, larger ones with terminal bifurcations and rugosities. Assorted small papillae in anterior portion of buccal roof grading posteriorly into smaller, more densely packed papules, other pustulations and papules extend laterally slightly anteriorly from posterior $\frac{1}{3}$ of BRA; 6–10 papillae on each side within this area. Glandular zone narrow with irregular (wavy) anterior margin but distinctly visible with small (large), relatively dense (average density), secretory pits; glandular zone barely continuous across midline. Dorsal velum very distinct flap with secretory pits on full ventral surface; lateral $\frac{2}{3}$ of free margin smooth, medial $\frac{1}{3}$ papillate; turning strongly posteriad; dorsal velum discontinuous on midline.

Pharyngeal Cavity: Two very faint pressure cushions; lateral one more obliquely oriented, second rounded. Ciliary groove shallow, narrow (wider).

Odontophrynus americanus (Duméril and Bibron)

FIGURE 26

MATERIAL.—USNM 253687 (one specimen dissected, stage 37, SVL 22.9 mm). Collected from a reservoir at Hotel El Tirol, 19.5 km by road NNE Encarnación, Itapúa, Paraguay, 14 November 1976, by Mercedes S. Foster.

REFERENCE.—Ceï (1980) provides a description and figure of the tadpole.

GENERAL REMARKS.—The full morphological description for this genus is based on *O. occidentalis* (following account). Differences only between *O. americanus* and *O. occidentalis* are noted. Lungs about equal buccal floor length; inflated. In general, papillae smaller and less numerous than in *O. occidentalis*.

VENTRAL ASPECT.—**Buccal Cavity:** Medial pair of infralabial papillae shorter than lateral pair. Buccal pockets perforate

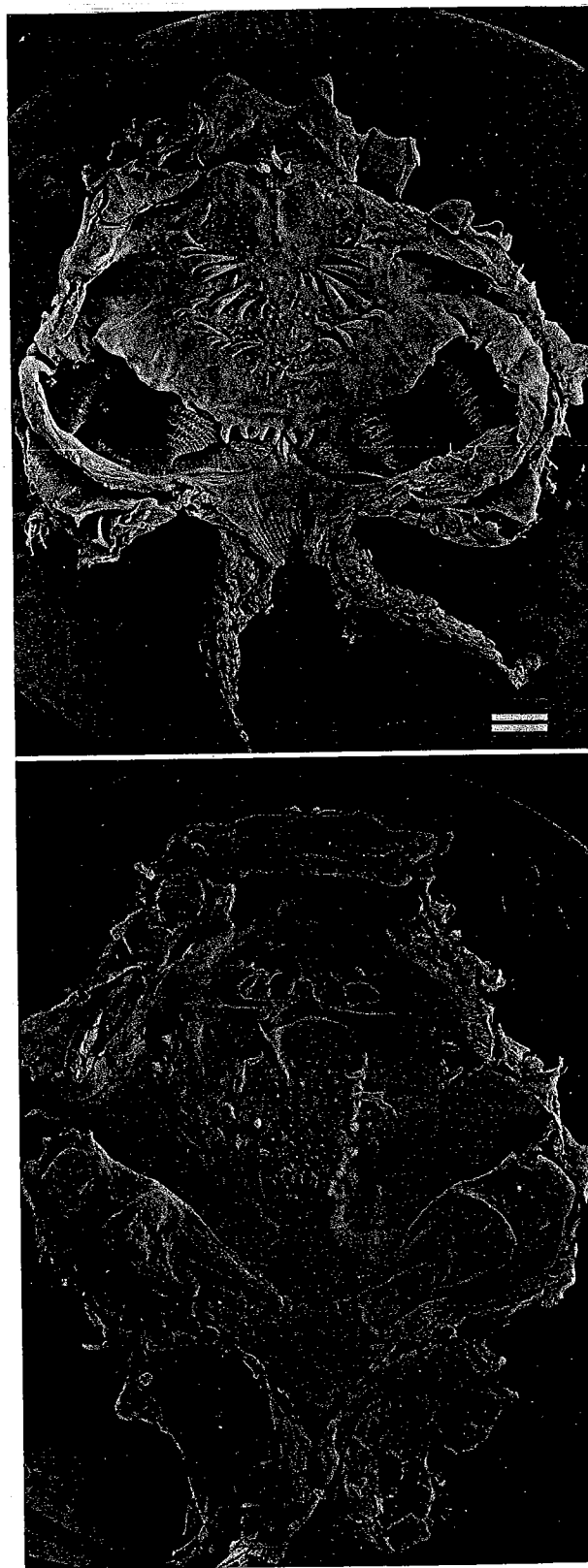


FIGURE 26.—SEM micrographs of floor (above) and roof (below) of oral cavity of *Odontophrynus americanus*; scale line = 1 mm.

rated. Lateral peaks of free velar margin less distinct than in *O. occidentalis* with 6 papillae across midsection. Ceratobranchial 1 with 10 filter rows, cb 2 with 10, cb 3 with 10, cb 4 with 11.

Pharyngeal Cavity: Branchial food traps large, secretory rows even. Glottis 100% visible.

DORSAL ASPECT.—Buccal Cavity: Prenarial arena with poorly defined transverse ridge with pustulate apex. Anterior narial wall not as thickened as in *O. occidentalis*; posteriorly directed, conical, prenarial papillae arising from midportion of anterior wall. Median ridge broad, semicircular flap (Figure 61d).

Pharyngeal Cavity: Medial pressure cushion slightly larger than lateral. Ciliary groove broad and shallow.

Odontophrynus occidentalis (Berg)

FIGURE 27

MATERIAL.—No number (one specimen dissected, stage 36, SVL 18.5 mm). Collected from Sosneado, Río Salado Valley, SW Mendoza Province, Argentina, 6 March 1977.

REFERENCE.—Cei (1980:308–310, fig. 125) described and illustrated the external morphology and indicated that the larvae occur in clear streams or springs in semi-arid sandy areas.

GENERAL REMARKS.—Lungs well developed, running length of body, subequal to floor of mouth; inflated. Gill filaments typical.

VENTRAL ASPECT.—Buccal Cavity: Buccal floor triangular, approximately as wide as long. Four infralabial papillae in transverse line; medial 2 tall and attenuate; lateral ones cup-shaped with anterior surface pustulate. Four tall, attenuate, lingual papillae in transverse row. U-shaped BFA with 20–30 BFA papillae per side; BFA papillae pointed, sickle-shaped, unbifurcated, pointing medially or anteriorly. Five to ten pre-pocket papillae. Fifteen to twenty thin, medium to large, anteriorly directed papillae in posterior $\frac{1}{2}$ of BFA; four times as many pustulations scattered among the papillae. Buccal pockets shallow, elongate, 50% wider than long; transversely oriented; perforated (?). Long, free, velar margin with conspicuous spicular support; semicircular, free, velar edge with distinct papillae above each filter cavity and a transverse row of 5 irregular blunt papillae in the midsection above the glottis; small, shallow, median notch; secretory pits visible in dorsal view, but largely limited to papillae on free velar margin.

Pharyngeal Cavity: Branchial baskets 75% wider than long; each branchial basket about 60%–70% remaining buccal floor area; relatively deep; 1st and 2nd filter cavities subequal, 3rd filter cavity 30% of other two. Straight dorsal margin on 2nd filter plate and upward curving margin on the 3rd filter plate; dorsal edge of 3rd filter plate folded over lateral edge of 3rd filter cavity; cb 1 with 9 filter rows, cb 2 with 12, cb 3 with 11, cb 4 with 9. Filter mesh dense; many tertiary filter

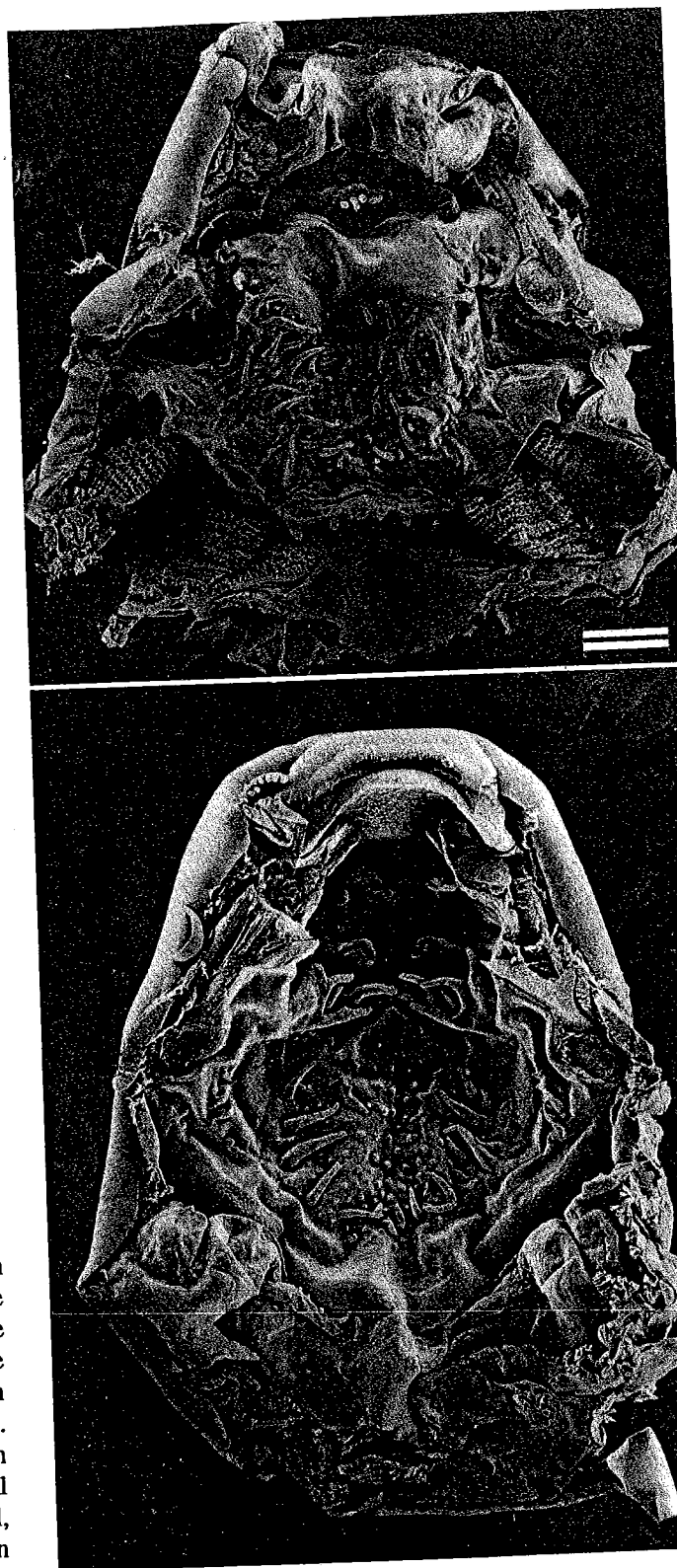


FIGURE 27.—SEM micrographs of floor (above) and roof (below) of oral cavity of *Odontophrynus occidentalis*; scale line = 1 mm.

folds; filter rows relatively uniform; of average width; rows not abutting, slightly separated. Filter canals narrower than rows; filter canals 80% canopied. Conspicuous secretory ridges on branchial food traps. Glottis 50% visible; narrow lips. Esophageal funnel narrow; esophagus of average diameter.

DORSAL ASPECT.—Buccal Cavity: Roof of mouth diamond-shaped, length equal to width; nares about 25% distance from front of mouth to esophagus; median ridge about 50% distance from front of mouth to esophagus. Prenarial arena with ridged plate projecting forward and downward from center of the prenarial arena; free edge broad and doubly convex. Nares average size; internarial distance about 50% width of nares; anterior narial wall thick and pustulate with lateral, V-shaped projection; posterior narial wall tall and medially elongate, yielding an anteriorly directed flap. Three postnarial papillae in oblique line parallel to nares and $1/2$ way from nares to median ridge on each side; 2nd postnarial papilla largest, all with jagged anterior margins. Median ridge large, simple, triangular flap. Lateral-ridge papillae a rectangular flap with 2 large, medially directed, finger-like projections and secondary papillae on anterior free edge, in line with the postnarial papillae. Two small papillae immediately anterior to median ridge. BRA oval with 8–15 papillae on each side, 4 small papillae lateral to BRA in tight cluster; heavy pustulation in middle of BRA. Distinct glandular zone with relatively smooth anterior margin. Dorsal velum not long; interrupted on the midline; few small but distinct papillae on medial termination.

Pharyngeal Cavity: Two distinct pressure cushions on each side; medial 50% larger than lateral. Ciliary groove destroyed in dissection.

Paratelmatobius lutzii Lutz and Carvalho

FIGURE 28

MATERIAL.—USNM 209371 (one specimen dissected, stage 27, SVL 9.8 mm). Collected from a roadside rivulet at Brejo da Lapa, Rio de Janeiro, Brazil, 18 January 1976.

REFERENCE.—Heyer (1976) described and figured a tadpole that is presumed to be the larva of *P. lutzii*.

GENERAL REMARKS.—Buccal roof cracked in SEM preparation. Lungs very narrow, about 80% length of buccal floor; not inflated. Moderate amount of filamentous gills.

VENTRAL ASPECT.—Buccal Cavity: Floor of mouth almost inverted T-shaped, about as long as wide. Single infralabial papilla on each side consisting of short, laterally compressed palp with knobby margins; hemispheric swelling in far lateral and posterior edge of infralabial region with keratinized apical peak. Eleven lingual papillae arranged in large anteriorly directed arch; of unequal size, largest most anterior and medial, pointing anteriorly; papillar arch very wide, as wide as lower beak (Figure 53c). BFA shape a truncated oval, open anteriorly, pointed posteriorly; bounded by about 50 papillae on each side,



FIGURE 28.—SEM micrographs of floor (above) and roof (below) of oral cavity of *Paratelmatobius lutzii*; scale line = 400 μ m.

unusual in their uniformity in size and origin from such a narrow band; all BFA papillae medially directed, thin, pointed, some with tops a bit turned or twisted, otherwise straight; most anterior and posterior BFA papillae noticeably smaller than others; no pustulations or papillae within BFA. Anteriorly directed papillate fringe of 6–10 prepocket papillae on each side, running in a cluster almost perpendicular to anterior BFA papillae. A row of tiny anterolateral to posteromedially arranged papillae on each side running parallel to row of papillae defining posterior $\frac{1}{3}$ of BFA, each row consisting of about 6–10 stubby papillae. Buccal pockets small; 4 times as wide as long; oriented at about 25° from transverse plane; perforated. Free velar surface relatively short, particularly medially; no obvious spicular support; posterior margin transverse rather than curved; large but blunt cusp over edge of 2nd filter plate, weaker cusp over edge of 3rd filter plate; median notch shallow and tiny, not bounded by distinctive papillae; uniform zone of secretory tissue in band along entire posterior edge of ventral velum with small secretory pits of uniformly high density on and between peaks.

Pharyngeal Cavity: Branchial baskets 10% wider than long; right-triangular in shape with anterolateral to posteromedial hypotenuse; each branchial basket about 50% remaining area of buccal floor; branchial baskets shallow, 4 times as long as deep. Second filter plate free edge arched downward slightly, 3rd filter plate lying on side such that the normally free dorsal margin of the 3rd plate abutting instead with the ventral margin of a very abbreviated 4th filter plate, resulting in a single, common, medial, filter cavity rather than separate 2nd and 3rd cavities; 2nd filter plate 3 times as long as tall, 3rd twice as long as tall; 2nd filter plate tipped at about 45° , 3rd tipped up at about 45° , meeting base of very short 4th filter plate; cb 1 with 10 or 11 filter rows, cb 2 with 12, cb 3 with 9, cb 4 with 5. Filter mesh low density; secondary but few tertiary folds. Filter rows thin, not abutting. Filter canals equal to twice width of filter rows; 20%–80% canopied. Branchial food traps shallow; secretory ridges shallow and evenly spaced. Glottis open; 80% covered by ventral velum; bounded by narrow lips; round but not distinct laryngeal disk. Esophageal funnel narrow.

DORSAL ASPECT.—Buccal Cavity: Roof of mouth unusually broad anteriorly, just longer than wide; nares about 30% distance from front of mouth to esophagus; median ridge about 50% distance from front of mouth to esophagus. Prenarial arena very long and large with large, single, blunt, knobby, median papilla and few pustulations on each side extending in arc posterolaterally from median papilla. Nares large; internarial distance about 50% length of naris; 45° orientation from transverse plane; anterior narial wall with distinct anteromedial swelling and distinct, conical, posteromedially directed, prenarial papilla arising from lateral $\frac{1}{3}$ of wall bounded by pustulations on both sides; posterior narial wall lacking projections. Postnarial arena broad and defined by 3 papillae on each side; papillae arranged in oblique row from

anteromedial to posterolateral; anterior and posterior postnarial papillae very small, simple, conical; middle postnarial papilla 5–10 times size of other 2 with irregular, jagged, anterior surfaces and apex; small pustulations but no papillae within postnarial arena.

Median ridge narrow, tall, triangular; of average size; papillate apex, pustulate lateral margins. Lateral-ridge papillae far lateral; laterally compressed flaps supporting up to 10 relatively small, thin, finger-like papillae, most with pointed tips, few with terminal bifurcations. BRA U-shaped; about 50 papillae on each side; BRA papillae rather uniform size, larger anteriorly, less dense posteriorly; papillae simple, thin, pointed, lacking rugosities or bifurcations; BRA papillate rows relatively straight anteriorly running to base of lateral-ridge papillae. One or two papillae scattered within central portion of BRA along with several dozen pustulations; fine pustulate fringe in longitudinal row in most lateral portion of buccal roof. Glandular zone a narrow band, just discontinuous on midline, with very small secretory pits. Dorsal velum with fairly smooth anterior margin; broadly interrupted medially; most medial portion slightly papillate.

Pharyngeal Cavity: Two pressure cushions, lateral one smaller, longitudinally oriented, medial one 3 times as large, transversely oriented. Ciliary groove relatively narrow and deep.

Physalaemus petersi (Espada)

FIGURE 29

MATERIAL.—USNM 247549 (one specimen dissected, stage 37, SVL 14.1 mm). Collected from a stream and swamp at Zona Reservada de Tambopata, Madre de Dios, Peru, 19 August 1983 by S.L. Jewett, H. Ortega, and R.P. Vari. Roof of mouth destroyed during SEM preparation.

REFERENCE.—Duellman (1978) described the larva.

GENERAL REMARKS.—The full morphological description for this genus is based on *P. pustulosus* (following account). Only those features that differ from *P. pustulosus* are described. Lungs large; larger twice size of smaller; larger 20% longer than buccal floor; inflated.

VENTRAL ASPECT.—Buccal Cavity: Four asymmetrical lingual papillae, 3 clustered on midline, 1 separated; not as tall as in *P. pustulosus*. One or two very small prepocket papillae. Buccal pockets perforated. Secretory tissue band broader than in *P. pustulosus*.

Pharyngeal Cavity: Branchial baskets shallower than in *P. pustulosus*. Free edge of 3rd filter plate taller and oriented more vertically, as in most other tadpoles, such that 2nd and 3rd filter cavities distinct; cb 1 with 11 filter rows, cb 2 with 10, cb 3 with 10, cb 4 with 7. Filter mesh denser than in *P. pustulosus*, quaternary folds common. Filter rows wide, largely abutting; filter canals 80%–100% canopied. Glottis 50% exposed.

DORSAL ASPECT.—Buccal Cavity: Prenarial arena ridge

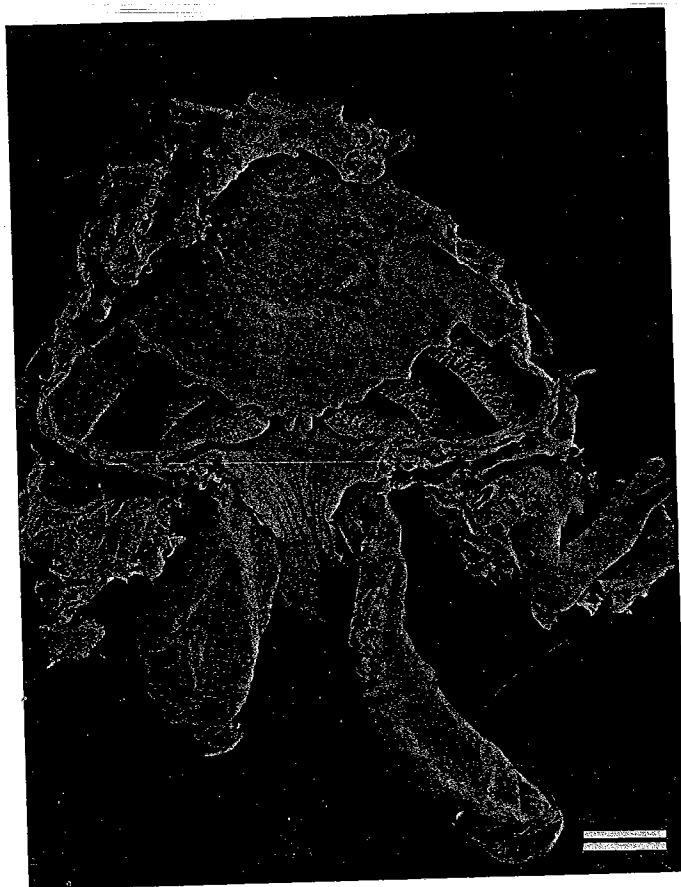


FIGURE 29.—SEM micrograph of floor of oral cavity of *Physalaemus petersi*; scale line = 1 mm.

lacking median notch, structurally simpler than in *P. pustulosus*. Nares smaller and slightly farther apart than in *P. pustulosus*. Thickened bicuspid ridge extending from anterolateral portion of anterior narial wall with serrated margin. Prenarial arena wider with papillae not as large as in *P. pustulosus*; anterior prenarial papillae about twice size of posterior prenarial papillae. Lateral-ridge papilla slightly larger than median ridge. BRA more oval than in *P. pustulosus*.

Physalaemus pustulosus (Cope)

FIGURE 30

MATERIAL.—No number (one specimen dissected, stage 37, SVL 9.5 mm). Collected from Playa Blanca, Costa Rica, 5 March 1970, by R.J. Wassersug.

REFERENCE.—Breder (1946) described and figured the external morphology.

GENERAL REMARKS.—The tadpole lives in small ephemeral pools of water. Lungs of a second specimen, stage 29, curled, long, and septate, just less than length of buccal floor; uninflated. Typical filamentous gills.

VENTRAL ASPECT.—*Buccal Cavity:* Buccal floor approximately 20% wider than long. Four infralabial papillae, 1 pair

small and anteromedial; other pair large and posterolateral; larger pair extending dorsally and abutting anterior to the tongue; both pairs with pustulate, jagged margins. Four equal-sized, very tall and thin, lingual papillae, with pustulate tips; arranged in a square pattern. BFA wide, defined by nearly parallel lateral rows of papillae; approximately 6 BFA papillae on each side; papillae with short, truncated tips, a few bifurcated. No prepocket papillae. Four papillae scattered about the posterior portion of BFA; approximately 20 pustulations on the central buccal floor. Buccal pockets shallow; obliquely

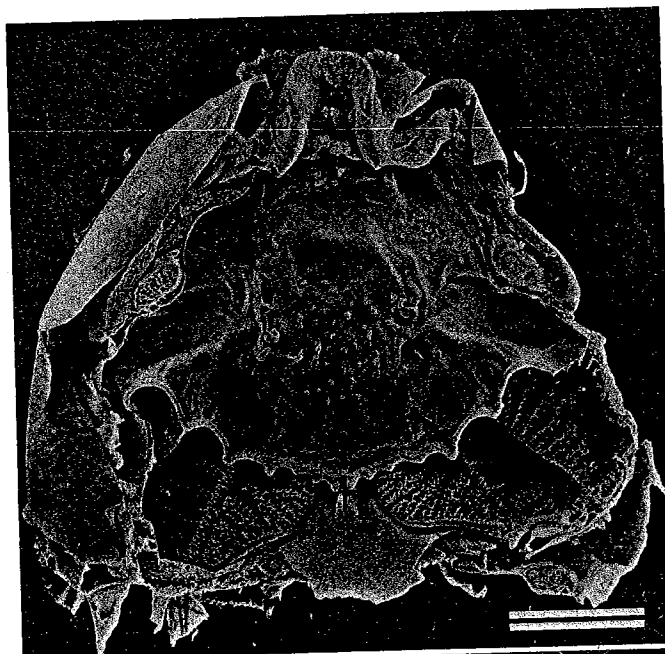


FIGURE 30.—SEM micrographs of floor (above) and roof (below) of oral cavity of *Physalaemus pustulosus*; scale line = 1 mm.

oriented at about 30° from transverse plane; unperforated. Free velar surface gently scalloped; long with distinct spicular support; small, distinct, median notch with a short blunt papilla on each side; distinct band of secretory tissue along whole free velar margin.

Pharyngeal Cavity: Branchial baskets wide, 30% wider than long; each branchial basket 60%–70% of remaining buccal floor area; 50% longer than deep. Most medial filter plate more horizontal than vertical and abutting with top of 3rd filter plate such that only a single, large, common, 2nd and 3rd filter cavity defined. Free margins of 2nd and 3rd filter plates relatively straight; cb 1 with 8 filter rows, cb 2 with 12, cb 3 with 11, cb 4 with 7. Filter mesh fairly dense with conspicuous tertiary folds; filter cavities at least 80% canopied. Branchial food traps of moderate size with conspicuous, long, uniform, secretory ridges. Glottis open; fully exposed below and between medial papillae of ventral velum; glottal lips tall; large, elevated laryngeal disc. Esophageal funnel narrow.

DORSAL ASPECT.—Buccal Cavity: Roof of mouth triangular; slightly wider than long. Nares about 25% distance from front of mouth to esophagus; median ridge about 40% distance from front of mouth to esophagus. Anteriorly directed, crescentic ridge with median notch in middle of prenarial arena; anterior margin pustulate, posterior base with a single median papilla. Nares average size; internarial distance short, less than 50% long axis of naris; anterior narial wall thick and pustulate; thickened bicuspid ridge extending from anterolateral portion of anterior narial wall; tall posterior narial wall, elongated medially. Postnarial arena a narrow triangle with 2 very tall papillae, each with smooth posterior margin and pustulate anterior margin, arranged in oblique line on each side with lateral-ridge papillae. Triangular, asymmetrical, median ridge, $\frac{1}{2}$ height of prenarial papillae. Lateral-ridge papillae short, anteriorly concave palps with rugose margins, slightly smaller than median ridge. BRA shaped like elongated rectangle with 6 papillae on each side; papillae small with jagged tips. Approximately 16–20 pustulations randomly distributed within BRA. Conspicuous glandular zone with uniformly dense secretory pits; anterior margin of zone V-shaped but wavy anterolaterally and irregular medially. Dorsal velum long laterally, broadly interrupted on the midline.

Pharyngeal Cavity: Two pressure cushions per side; both oval; largest medial. Ciliary groove very distinct; very broad and shallow.

Pleurodema borellii (Peracca)

FIGURE 31

MATERIAL.—KU 160729 (two specimens dissected, both stage 37, SVLs 12.6, 14.2 mm). Collected from 18 km SSE Tafi del Valle, 1800 m, Tucumán, Argentina.

REFERENCE.—Ceï (1980) described the larva.

GENERAL REMARKS.—Description based on first specimen. Lungs well developed, about equal length of buccal floor.

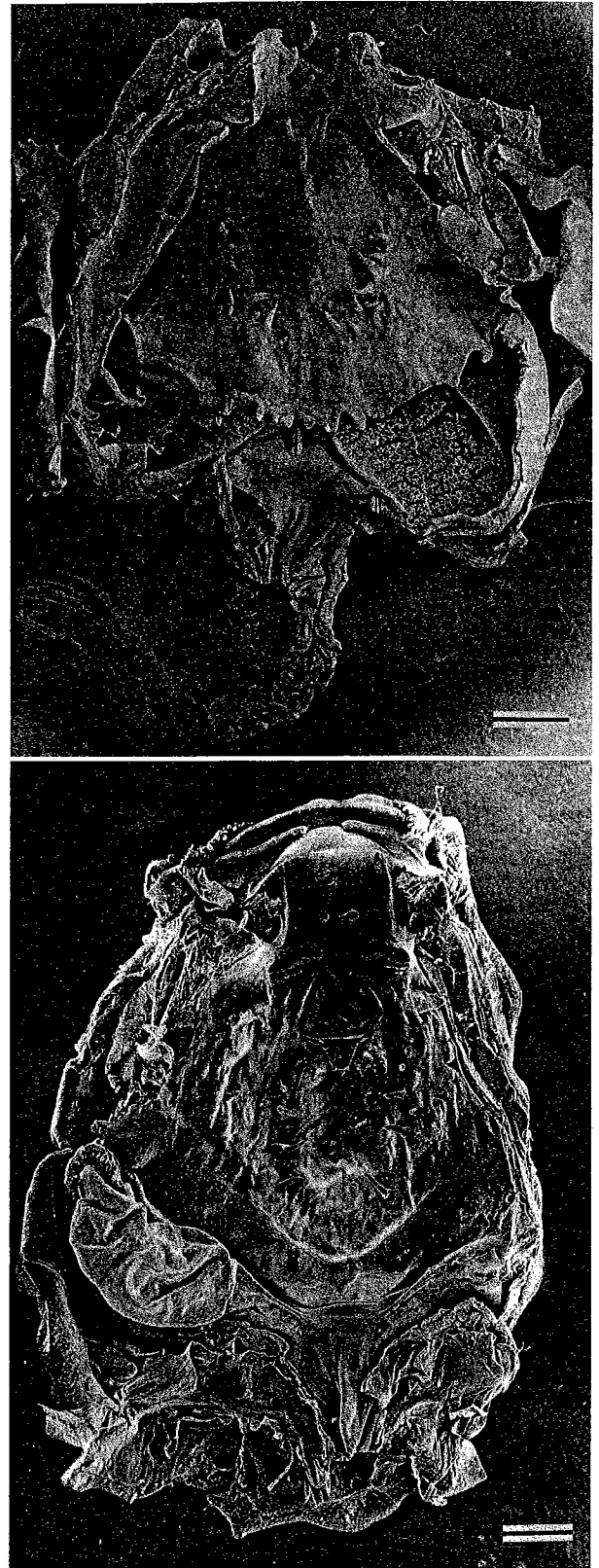


FIGURE 31.—SEM micrographs of floor (above) and roof (below) of oral cavity of *Pleurodema borellii*; scale lines equal 1 mm.

Filamentous gills short, not extensive.

VENTRAL ASPECT.—Buccal Cavity: Floor of mouth triangular, length about equal width. Four infralabial papillae in a transverse row, directed anteriorly; subequal, slightly curved, conical, medium small, with rugose surfaces (second specimen Figure 54, top). Four lingual papillae in a transverse row; attenuate; medial pair 50% larger than lateral pair. BFA U-shaped; 10–15 BFA papillae on each side, small, simple, attenuate cones, most curving anteromedially. No pre-pocket papillae. About 12 pustulations on posterior $\frac{1}{2}$ of buccal floor; about 6 anterior to buccal pockets. Buccal pockets small; twice as wide as long; transversely oriented; perforated. Free velar surface relatively long with delicate spicular support; posterior margin irregularly sculptured with simple gradual peaks over free edge of 2nd filter plate and cluster of irregular peaks running across middle $\frac{1}{3}$ of free velar edge; median notch small, bounded by distinct round papilla on each side; secretory pits present but largely limited to peaks on free velar margin.

Pharyngeal Cavity: Branchial baskets as long as wide, roundish; branchial baskets large, each about 70% remaining buccal floor area, almost as deep as wide. Bottom of 4th filter plate abutting directly with top of 3rd filter plate, resulting in common 3rd filter cavity; first filter plate very shallow such that 1st filter cavity barely separated from 2nd and 3rd filter cavity. First filter plate almost vertical, 2nd filter plate tipped 45°; 3rd filter plate with single anterolateral face, sloping about 45°; 4th filter plate almost vertical. First filter plate almost as tall as long, 2nd and 3rd filter plates 4 times as long as tall, 4th filter plate as long as tall; cb 1 with 10 filter rows, cb 2 with 10, cb 3 with 10, cb 4 with 7. Filter mesh dense with tertiary and higher folds; filter rows of relatively uniform width; filter rows slightly separated; filter canals as wide as filter rows, 80% canopied. Two branchial food traps on each side with well-developed, secretory ridges descending to anterior medial portion of 2nd filter plate. Glottis open; small; 75% exposed; thin but distinct lips; indistinct laryngeal disk. Esophageal funnel very narrow.

DORSAL ASPECT.—Buccal Cavity: Roof of mouth triangular; nares about 25% distance from front of mouth to esophagus; median ridge about 40% distance from front of mouth to esophagus. Prenarial arena smooth except for 2 small blunt papillae in transverse row in middle of arena. Nares of average size; internarial distance about 60% length of naris; orientation 15° from transverse plane; anterior narial wall simple, lacking projections; posterior wall with weak, triangular, narial-valve projection. Postnarial arena bounded on each side by 3 papillae in an anteromedial to posterolateral row; 1st and 3rd papillae very small, blunt; middle larger and more attenuate with slightly roughened anterior surfaces. Median ridge an elongate trapezoid of average size with a few pustulations on lateral margins. Lateral-ridge papillae laterally compressed small triangular flaps, about equal in area to median ridge. BRA poorly defined by 7 papillae on each side; BRA papillae all simple, attenuate, conical. Two pustulations

in transverse row at anterior end of postnarial arena; random pustulations within posterior end of postnarial arena; 2 or 3 lateral-roof papillae isolated on buccal roof. Glandular zone very long with V-shaped, smooth, anterior margin, narrowing anteriorly; $\frac{1}{6}$ length of buccal floor; smooth, distinct, anterior margin; secretory pits particularly conspicuous anteriorly and laterally. Dorsal velum of average length, barely continuous across midline with smooth free edge.

Pharyngeal Cavity: Single, large, round pressure cushion on each side. Ciliary groove broad and shallow.

Pleurodema brachyops (Cope)

FIGURE 32

MATERIAL.—KU 129101 (one specimen dissected, stage 37, SVL 13.8 mm). Collected from Cumaná, Sucre, Venezuela.

REFERENCE.—Duellman and Veloso (1977) provide external characteristics of the larva.

GENERAL REMARKS.—Lungs present, of average size. Gill filaments present, of average development.

VENTRAL ASPECT.—Buccal Cavity: Floor of mouth 20% wider than long. All infralabial papillae with rugose surfaces; lateral pair pointing more dorsally than in *P. borellii*. In addition to pustulations, 4 or 5 papillae within BRA. Area above median notch irregular; median notch asymmetrical and small.

Pharyngeal Cavity: Branchial baskets 25% wider than long; each branchial basket 80% area of remaining buccal floor area, 50% wider than deep. Second and 4th filter plates larger and taller than in *P. borellii*; 4th filter plate almost horizontal (Figure 56c). Second filter plate twice as long as tall, 3rd 3 times as long as tall; cb 1 with 11 filter rows, cb 2 with 10, cb 3 with 11, cb 4 with 7. Glottis 50% exposed. Esophageal funnel broader than in *P. borellii*.

DORSAL ASPECT.—Buccal Cavity: Prenarial arena with 2 lunate shelves in middle of arena. Anterior narial wall with some rugosity. A small median papilla just in front of median ridge in postnarial arena. Median ridge wider, triangular. Lateral-ridge papillae more irregular in shape. Less than 6 BRA papillae on each side. Secretory pits smaller and secretory zone of more uniform length than in *P. borellii*. Dorsal velum discontinuous across midline.

Pleurodema bufonina Bell

FIGURE 33

MATERIAL.—KU 160772 (two specimens dissected, stages 37, 38, SVLs 16.6, 19.0 mm; first specimen illustrated). Collected from Confluencia Trafal, 750 m, Neuquén, Argentina.

REFERENCE.—Ceï (1980) described and figured the larva.

GENERAL REMARKS.—Lungs larger than in *P. borellii*.

VENTRAL ASPECT.—Buccal Cavity: BFA wider than in *P. borellii*; 20 BFA papillae on each side, in a row turning laterally

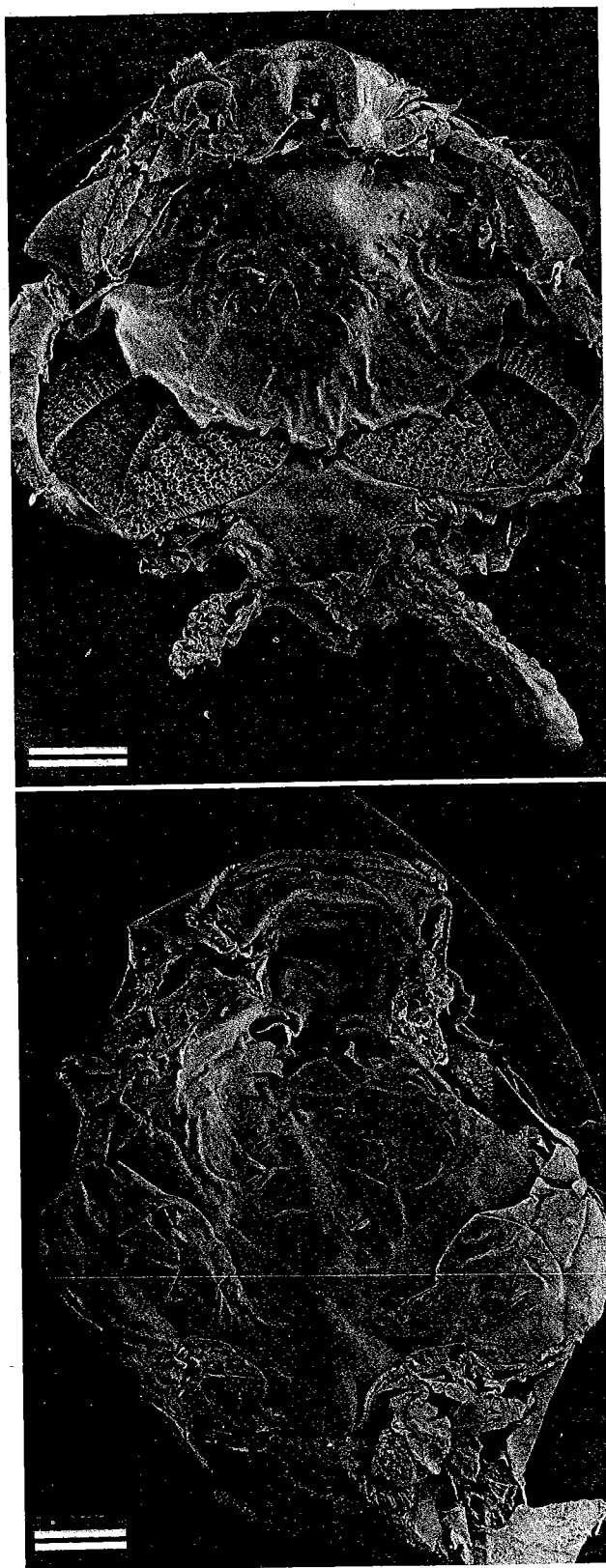


FIGURE 32.—SEM micrographs of floor (above) and roof (below) of oral cavity of *Pleurodema brachyops*; scale lines = 1 mm.



FIGURE 33.—SEM micrographs of floor (above) and roof (below) of oral cavity of *Pleurodema bufonina*; scale line = 1 mm.

in pre-pocket area (approximately 6 prepocket papillae on each side). About 30 pustulations on posterior $\frac{1}{2}$ of BFA; 6–10 pustulations anterior to buccal pockets. Velar marginal cusps more distinct than in *P. borellii*, 3 distinct cusps on each side, one over each of 2nd, 3rd, and 4th filter plates, additional cusp near median notch in addition to peaks surrounding median notch. Secretory pits on very margin of velum between and on cusps.

Pharyngeal Cavity: Second filter plate a bit taller than in *P. borellii*; cb 1 with 10 filter plates, cb 2 with 12, cb 3 with 10, cb 4 with 8. Glottis 50%–100% exposed.

DORSAL ASPECT.—Buccal Cavity: Lunate ridges in pre-narial arena with pustulate margins, not as distinct as in *P. brachyops*; single median papilla just behind ridges. Anterior narial wall similar to but more rugose than in *P. brachyops*. First papilla in postnarial arena larger than in *P. borellii*, 2nd papilla curving backwards; additional median cylindrical papilla in posterior portion of postnarial arena. Median ridge with broad base tapering to truncated peak. BRA defined by less than 6 papillae on each side. Thirty to forty pustulations scattered throughout postnarial arena. Glandular zone of uniform length with extremely conspicuous margin with very large secretory pits. Dorsal velum discontinuous across midline.

Pleurodema cinerea Cope

FIGURE 34

MATERIAL.—KU 164009 (3 specimens dissected, stages 31, 32, 33, SVLs 21.0, 20.6, 23.9 mm respectively; stage 32 specimen illustrated). Collected from 4 km W Santa Rosa, 4010 m, Puno, Peru.

REFERENCE.—Ceï (1980) described and illustrated the larva.

GENERAL REMARKS.—Because of the distinctiveness of this species from the previous species of *Pleurodema* dissected, a complete description is given. Lungs large, 25% longer than buccal floor; sacculate. Luxuriant external gill filaments. Rostrum curves ventrally more than is evident in illustration of the roof of the mouth.

VENTRAL ASPECT.—Buccal Cavity: Floor of mouth triangular; about as long as wide. Four infralabial papillae in a transverse row; medial pair simple, attenuate; lateral pair about 4–5 times larger than medial pair, anteroposteriorly flattened, projecting dorsally, with very serrate margins and rugose anterior surfaces. Two lingual papillae, attenuate, with or without slightly roughened surfaces. BFA ovoid; 30–40 BFA papillae per side; BFA papillae attenuate, sickle-shaped; largest bifurcate or trifurcate, rest simple. Six to ten prepocket papillae per side; all relatively simple, conical. About 10 papillae in middle and posterior region of BFA; additional oblique row of papillae on each side beginning anterolaterally to buccal pockets running posteromedially and merging with papillae forming back of BFA; scattered pustulations amongst all

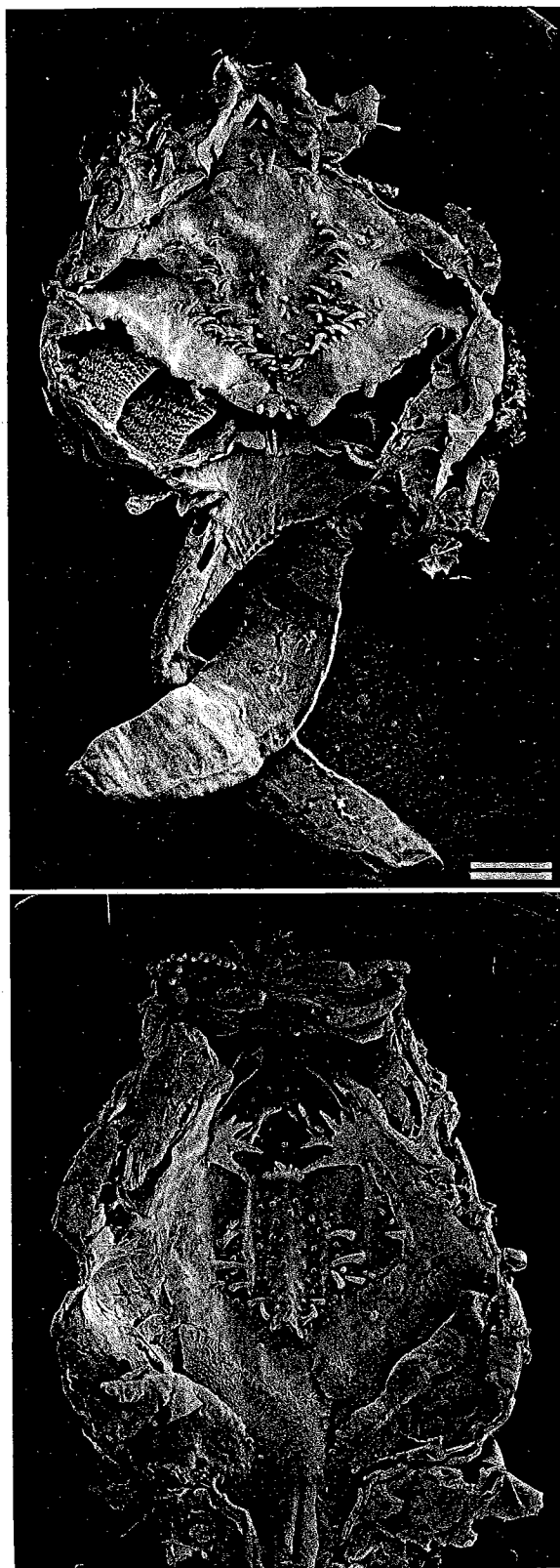


FIGURE 34.—SEM micrographs of floor (above) and roof (below) of oral cavity of *Pleurodema cinerea*; scale line = 1 mm.

papillae, densest in posterior $\frac{1}{2}$ of BFA. Buccal pockets of average size, but larger than in other *Pleurodema*; 25% wider than long; as deep as long; oriented about 15° from transverse plane; perforated. Free velar surface of average length, entire extent about 60% rest of buccal floor; distinct spicular support; posterior margin sculptured, with more distinctive peaks than in other *Pleurodema* dissected; 3 distinct peaks over filter cavities, largest over medial margin of 4th filter plate; peaks over 3rd and 4th filter plates directed medially; narrow, small, median notch surrounded by fairly large globose papillae; secretory pits large and conspicuous, particularly on margin of free velar surface.

Pharyngeal Cavity: Branchial baskets about as wide as long, rounded; each branchial basket about 60% remaining buccal floor area; $\frac{2}{3}$ as deep as long; 1st and 2nd filter cavities subequal, 3rd 50% smaller (Figure 56d). Dorsal edge of 2nd filter plate relatively straight; edge of 3rd filter plate curving upward greatly, covering $\frac{3}{4}$ of 3rd filter cavity; 1st filter plate 20% longer than tall, 2nd, 3rd, and 4th filter plates as long as tall; 1st and 4th filter plates vertical, 2nd tipped at 45° , 3rd tipped at 30° from horizontal with top running horizontally over 3rd filter cavity; cb 1 with 10 filter rows, cb 2 with 11, cb 3 with 8, cb 4 with 7. Filter mesh of average density; tertiary folds abundant; filter rows of variable width; filter rows largely not abutting; filter canals of equal width to rows or 20% wider, 0%–80% exposed. Three branchial food traps; secretory ridges present. Glottis 50% or more exposed; large, open, with thin, relatively small lips on an indistinct laryngeal disk. Esophageal funnel relatively broad; esophagus of average diameter.

DORSAL ASPECT.—Buccal Cavity: Roof of mouth pentagonal, 20% longer than wide; nares 25%–30% distance from front of mouth to esophagus; median ridge 45% distance from front of mouth to esophagus. Prenarial arena long, but surface smooth. Nares large; internarial distance 50% length of naris; nares obliquely oriented at 45° ; anterior narial wall with rugosities on most anterior portion; a small papilla arising from midportion of anterior wall; posterior narial wall a thin flap lacking a narial-valve projection. Postnarial arena defined by 5 papillae on each side running in an oblique row parallel to nares; next to last papilla in series largest, with knobby apex; smallest papilla most anterior, other papillae ascendingly larger except last, last 50% length of penultimate; postnarial papillae simple; single, small, median papilla in posterior postnarial arena.

Median ridge small, jagged, lunate flap with terminal papilla. Lateral-ridge papillae laterally compressed, hand-like structures with 4–6 attenuate pointed fingers with jagged margins, 3–4 times size of median ridge. BRA diamond-shaped, almost as wide as long; 8–12 BRA papillae per side, all simple, attenuate. Four small, lateral-roof papillae in row running from anteromedial to posterolateral on each side; pustulations scattered between postnarial arena and nares; other pustulations between posterior limit of papillae on lateral-roof region and

BRA and within BRA proper. Glandular zone distinct; defined by large, conspicuous, secretory pits, anterior secretory pits primarily oriented in longitudinal row. Dorsal velum widely interrupted on midline; tiny papillae/pustulations at medial end providing delicate sculpture to medial edge on each side.

Pharyngeal Cavity: At least 2 pressure cushions, otherwise region destroyed in all specimens. Ciliary groove broad and shallow.

Pleurodema nebulosa (Burmeister)

FIGURE 35

MATERIAL.—No number (2 specimens dissected, stage 35 and 37, SVL 11.2 and 14.5 mm respectively, former specimen illustrated). Collected from 20 km W Encan, San Juan, Argentina, 10 February 1977, by J.M. Cei.

REFERENCE.—Cei (1980:380, fig. 164) described and illustrated the external morphology and reported that the larva occurs in clayish water of lagoons and temporary summer pools in xerophilous scrub arid zones.

GENERAL REMARKS.—Because of distinctiveness of this species from the other species of *Pleurodema* dissected, a complete description is given. Lungs well developed, medium-sized, less than 20% length of head. Gill filaments average size.

VENTRAL ASPECT.—Buccal Cavity: Floor of mouth triangular, relatively wide posteriorly; length to width ratio 1:1. Two pair simple, unbifurcated infralabial papillae in transverse row; 1 pair adjacent to midline, other near angle of jaw; lateral pair larger. Four tall, thin, lingual papillae in slightly forward-arching, transverse row; subequal. BFA almost square; approximately 25–40 BFA papillae in a patch of even density across the midline, all strongly curved medially or posteriorly and unbifurcated. Six to eight large prepocket papillae, posteriorly directed. Buccal pockets conspicuous, deep; nearly transversely oriented; perforated; 50% wider than long. Lateral, free, posterior edge of ventral velum recurved such that the more lateral portions convex anteriorly and medial $\frac{1}{2}$ of ventral velum concave anteriorly; slight spicular support; free velar surface relatively short; margin unsculptured except for small flap over glottis, narrow median notch in flap in specimen not photographed; no conspicuous secretory pits.

Pharyngeal Cavity: Branchial baskets $1\frac{1}{2}$ times as wide as long; each branchial basket equal to rest of buccal floor area; baskets moderately deep. Second and 3rd filter plates oriented about 30° from transverse plane, tipped about 45° ; third filter plate short without filter ruffles on posteromedial surface; dorsal edge of 3rd filter plate concave superiorly, vertical, its dorsal edge meeting base of 4th filter plate such that the 3rd filter cavity poorly defined and more or less continuous with the 2nd filter cavity; cb 1 with 8–13 filter rows, cb 2 with 11, cb 3 with 9 or 10, cb 4 with 8–10. Filter mesh of average to low density; many tertiary filter folds; filter rows narrow; filter rows abutting completely or almost abutting; filter canals

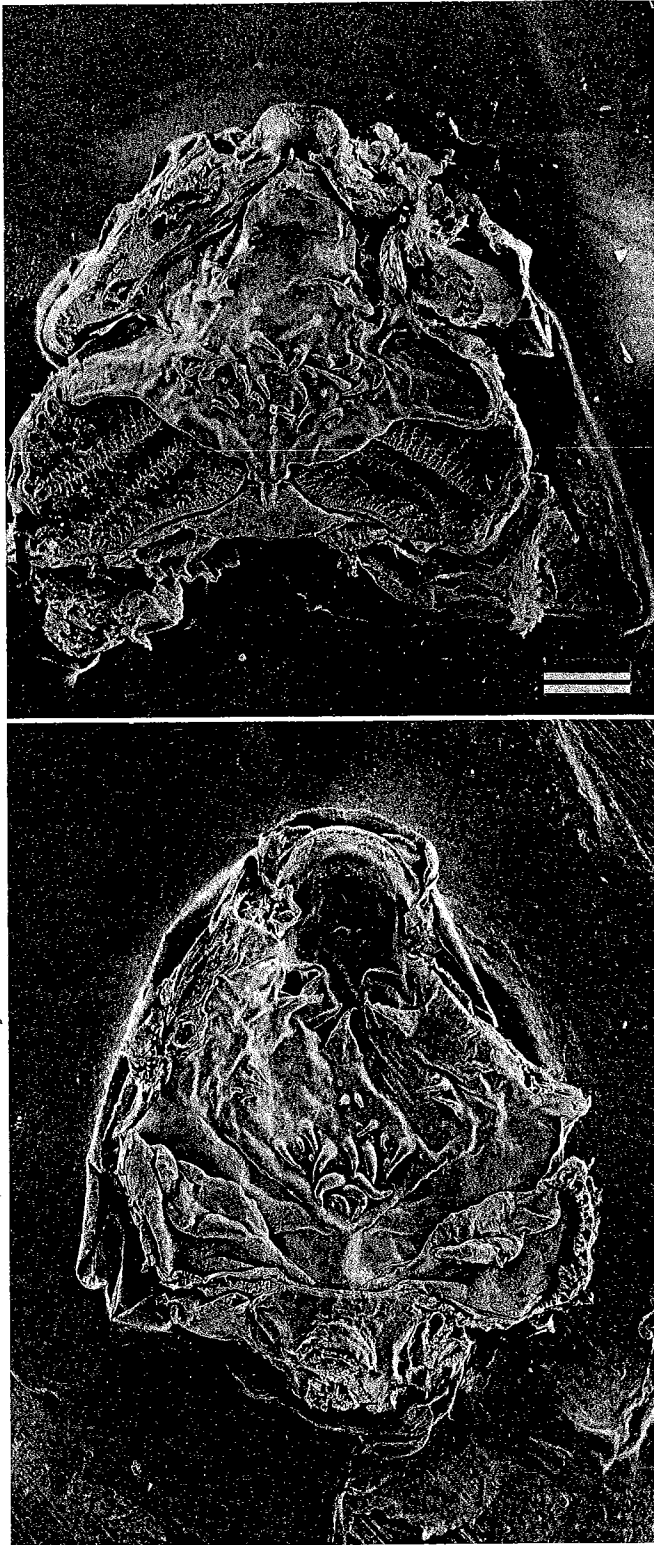


FIGURE 35.—SEM micrographs of floor (above) and roof (below) of oral cavity of *Pleurodema nebulosa*; scale line = 1 mm.

narrow, 80%–100% canopied. Lacking well-defined branchial food traps; no secretory ridges (Figure 60a,b). Glottis $\frac{1}{2}$ exposed; glottal lips tall; laryngeal disc indistinct. Wide esophageal funnel.

DORSAL ASPECT.—Buccal Cavity: Shape of roof of mouth triangular; nares 30% distance from front of mouth to esophagus, median ridge 45% distance from front of mouth to esophagus. Prenarial arena shallow, with one large central pustulation. Nares large; anterior narial wall thin, shallow, without pustulations; posterior narial wall simple flap. Postnarial arena with two simple blunt papillae near midline; two larger tall papillae posterolateral to these. Median ridge simple, tall, triangular flap. Lateral-ridge papillae far lateral, as tall as median ridge, with faint pustulations on anterior margin. BRA diamond-shaped cluster of 18–20 papillae, largest in medial posterior portion of BRA; all BRA papillae curved posteriorly; no secondary ornamentation. Four to six tall, thin, medially directed, lateral-roof papillae on each side. Very distinct, large uniform glandular zone; anterior margin distinct; bounded by a weak V-shaped ridge; approximately $\frac{1}{4}$ length of roof of mouth. Dorsal velum not long; faint on midline; no marginal papillae.

Pharyngeal Cavity: Two transversely oriented pressure cushions per side; tall, elongate, oval; posteromedial cushions smaller than anterolateral ones. Ciliary groove wide laterally and narrowing toward the midline.

Proceratophrys appendiculata (Günther)

FIGURE 36

MATERIAL.—USNM 241334 (one specimen dissected, stage 38, SVL 14.1 mm). Collected from a small stream near Teresópolis, Rio de Janeiro, Brazil, 29 November 1978.

REFERENCE.—Peixoto and Cruz (1980) described and figured the external morphology and provided habitat data for this species.

GENERAL REMARKS.—Beak slightly compressed laterally. Lung buds extremely small, length $<\frac{1}{4}$ maximum width of mouth; uninflated. Long gill filaments.

VENTRAL ASPECT.—Buccal Cavity: Floor of mouth triangular, broad anteriorly, slightly wider than long. Two pair of infralabial papillae; anteromedial pair stout with jagged anterior margin, extending forward to posterior edge of keratinized beak; 2nd pair posterolateral with complexly branching apices, touching each other on midline (Figure 53d). Four very tall lingual papillae, each divided near base into 2 or 3 terminal branches, terminal branches further divided, creating a dense collection of attenuate, jagged papillae above the tongue anlage. W-shaped BFA; 45–60 BFA papillae on each side; BFA papillae medium tall, very attenuate, sharply pointed; largest BFA papillae directly medial to buccal pockets originating from common transversely oriented ridge; very few papillae with terminal bifurcations or marginal serrations. Eight



FIGURE 36.—SEM micrographs of floor (above) and roof (below) of oral cavity of *Proceratophrys appendiculata*; scale line = 1 mm.

to twelve tall, attenuate, prepocket papillae on each side, largest arising from common base running into base of BFA papillae. Buccal pockets very wide, shallow; horizontally oriented; perforated. Free velar surface of average length, total area on each side $<1/10$ area of buccal floor; spicular support conspicuous; posterior margin gently curved with only slight irregularities except medially; medial $1/10$ of velar margin with long, irregularly shaped, posteriorly directed apron completely covering glottis; median notch absent; secretory pits small, largely confined to very narrow band along posterior margin of ventral velum.

Pharyngeal Cavity: Branchial baskets small, triangular, 50% wider than long; total area $1/3-1/4$ area of rest of buccal floor; baskets shallow, 4–5 times wider than deep. First filter cavity small, shallow, obliquely oriented; 3rd filter plate virtually horizontal with its dorsal margin meeting rather than overlapping ventral margin of 4th filter plate (such that a single filter cavity formed rather than a separate 2nd and 3rd filter cavity, as seen in most other tadpoles); 1st filter plate very strongly curved medially, overlapping 80% of 2nd filter plate; dorsal edge of 2nd filter plate with slightly concave dorsal margin; 2nd filter plate 6 times as long as tall; 3rd filter plate horizontal (lacking height); 2nd, 3rd, and 4th filter plates abutting rather than overlapping; cb 1 with 8 filter rows on one side, 6 on other, cb 2 with 8, 7, cb 3 with 5, 8, cb 4 with 4. Filter mesh of moderately low density; tertiary folds common. Filter rows of average width, but widely spaced, such that filter canals as broad as rows and the canals only 50%–75% canopied. Branchial food traps shallow; average to medium small in size; secretory ridges present, average-sized, uniform. Glottis extremely small, fully occluded; lips most conspicuous anteriorly; laryngeal disc broad but poorly defined anteriorly. Esophageal funnel extremely broad; esophagus of average diameter.

DORSAL ASPECT.—Buccal Cavity: Roof of mouth diamond-shaped, slightly longer than wide; nares about 30% distance from front of mouth to esophagus; median ridge about 45% distance from front of mouth to esophagus. Prenarial arena very long, strongly curved, smooth except for a medial, small, transversely oriented flap with a jagged ventral margin and 2 tiny papillae lateral to it, approximately halfway between edge of prenarial arena and midline. Nares very large, obliquely oriented; internarial distance about 60% length of naris; anterior narial wall thin, shallow, but supporting a comb-like array of long anteriorly directed papillae; 3 tall and several minor prenarial papillae on each side; posterior narial wall tall very thin flap; narial-valve projection very small. Five postnarial arena papillae on one side, 6 on other, arranged in oblique rows parallel to nares; all tall with pustulate anterior margins. Median ridge very small trapezoidal flap with pointed pustulations on anterior surface and free ventral edge. Lateral-ridge papillae elaborate flaps oriented lengthwise with free margin covered with attenuate finger-like papillae oriented medially; marginal papillae on the lateral-ridge “papillae”

serrated on anterior surface; 2 asymmetrical papillae in postnarial arena. BRA an inverted heart-shape; BRA bounded by approximately 30–35 papillae on each side; all attenuate, pointed papillae, only 1 bifurcate; largest papillae most lateral. Even field of pustulations within BRA; oblique row of papillae/pustulations running from posterolateral corner of BRA anterolaterally. Lateral-roof papillae absent. Glandular zone poorly defined, with a few isolated secretory pits behind most caudal portion of BRA, no secretory pits on midline, largest pits lateral to midline, zone discontinuous. Dorsal velum very long; absent on midline; medial portion of margin extensively papillate, with papillae of the attenuate, pointed, occasionally bifurcate form seen elsewhere on buccal roof and floor; medial portion of dorsal velum curving gradually backward towards esophagus.

Pharyngeal Cavity: Very weakly defined pressure cushion, single on each side. Ciliary groove shallow and very wide.

Proceratophrys boiei (Wied)

FIGURE 37

MATERIAL.—USNM 241336 (one specimen dissected, stage 35, SVL 14.0 mm). Collected from a small stream near Teresópolis, Rio de Janeiro, Brazil, 18 January 1978.

REFERENCE.—Izecksohn, Cruz, and Peixoto (1979) described and illustrated the external morphology and provided habitat data for this species.

GENERAL REMARKS.—Beak more U-shaped than in *P. appendiculata*, not as laterally compressed. Lung buds larger, lung length from glottis to posterior tip equal to approximately $\frac{2}{3}$ maximum width of mouth; uninflated. Gill filaments present.

VENTRAL ASPECT.—*Buccal Cavity:* Posterolateral pair of infralabial papillae smaller, not touching on midline. Four lingual papillae, all bifurcate or trifurcate near base, but not complexly branching. BFA oval with transverse band of papillae in posterior region of BFA; 25 papillae on each side; ridge supporting largest BFA papillae obliquely oriented. Fewer prepocket papillae than in *P. appendiculata*. Posterior margin of ventral velum with small cusps over 2nd, 3rd, and 4th filter plates and a slightly jagged margin across midregion, lacking posteriorly directed apron over glottis.

Pharyngeal Cavity: Branchial baskets triangular; as long as wide; total area 50% of rest of buccal floor. Three distinct filter cavities; 3rd filter plate overlapping part of 4th filter plate rather than abutting with ventral margin of 4th plate; dorsal margin of 3rd filter plate convex upward; 2nd filter plate 3 times as long as tall; 3rd filter plate imbricated, not horizontal; approximately as tall as long; cb 1 with 7 filter rows, cb 2 with 12 relatively narrow rows, cb 3 with 10 relatively wide rows, cb 4 with 6. Filter mesh denser than in *P. appendiculata*. Filter rows wide; filter canals 25% narrower than filter rows; canals 80% canopied. Branchial food traps of average depth; secretory ridges present. Glottis average size, fully occluded; 50%–75%

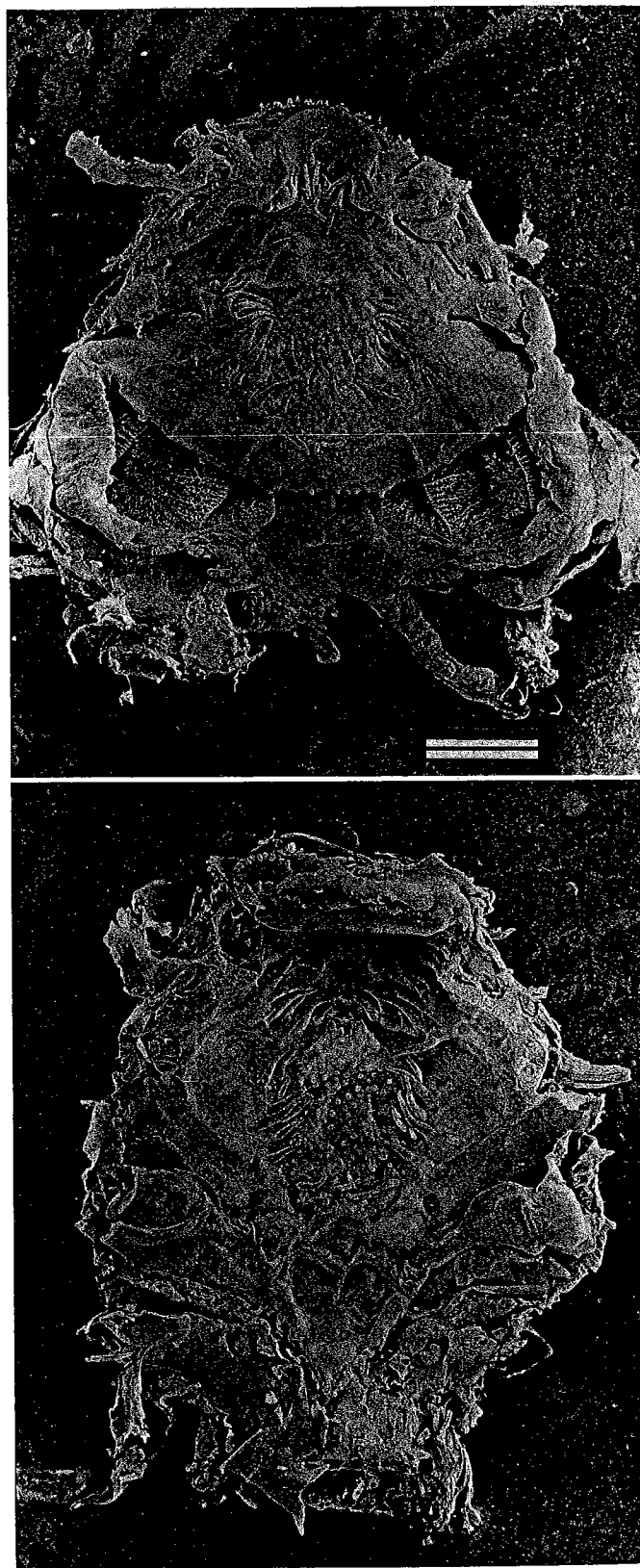


FIGURE 37.—SEM micrographs of floor (above) and roof (below) of oral cavity of *Proceratophrys boiei*; scale line = 1 mm.

covered by ventral velum. Esophageal funnel not as broad.

DORSAL ASPECT.—*Buccal Cavity*: Prenarial arena long, not as strongly curved ventrally; smooth except with simple medial papilla and single pustulation posterolateral on each side. Anterior narial wall rugose, but lacking large papillae. Median ridge much larger. Several pustulations and a small, medially notched flap present within postnarial arena. BRA simple, U-shaped; BRA bounded by approximately 15 papillae on each side; papillae not bifurcate. Additional papillae/pustulations absent on buccal roof. Glandular zone well defined by large secretory pits of moderately low density; secretory zone broadly interrupted on midline. Dorsal velum not quite as long; absent on midline; marginal papillation not quite as extensive.

Pharyngeal Cavity: Weakly defined pressure cushions; asymmetrical, 2 on one side, 1 on other.

Pseudopaludicola species

FIGURE 38

MATERIAL.—USNM 218232 (two specimens dissected, stages 36, 37; SVL 7.8, 10.3 mm, respectively; first specimen figured). Collected in extremely shallow, slowly running water in a boggy, grassy area near Chapéu de Sol, Minas Gerais, Brazil, 31 January 1980.

REFERENCE.—The *Pseudopaludicola* from this region cannot be identified to species with certainty. The larvae generally share features of other *Pseudopaludicola* (such as described and illustrated in Cei, 1980:412, fig. 175), namely: spiracle sinistral; anus median; mouthparts directed more ventrally than anteriorly; oral disc laterally indented, single row of marginal papillae interrupted anteriorly; denticle formula 2(2)/2(1); overall habitus somewhat fusiform in having low dorsal and ventral tail fins.

GENERAL REMARKS.—Description applicable to both specimens dissected unless noted otherwise. Lung buds small, thin, and just slightly longer than $\frac{1}{4}$ maximum width of mouth; not inflated. Filamentous gills present.

VENTRAL ASPECT.—*Buccal Cavity*: Floor of mouth shape approximately equilateral triangle. Single blunt infralabial papilla on each side and small cluster of papules anterior to it (Figure 54). Three lingual papillae, 1 on midline with long groove from base to apex suggesting fusion of 2 papillae; other 2 papillae lateral and slightly posterior; posterolateral pair laterally compressed, taller, curved medially, surfaces knobby. BFA shape an inverted "U" in one specimen, more oval in 2nd; BFA defined by 10–12 papillae on each side in 1 specimen, 8–10 papillae in 2nd (smaller) specimen; all BFA papillae thin, long, simple, pointed. Single, very small, pre-pocket papilla on each side anteromedial to buccal pockets; additional small papilla on each side farther anterior to medial edge of buccal pocket, neighboring BFA papillae; field of small pustulations scattered about posterior floor of BFA. Buccal pockets of average width; shallow; transversely



FIGURE 38.—SEM micrographs of floor (above) and roof (below) of oral cavity of *Pseudopaludicola* species; scale line = 400 μ m.

oriented; perforated (?). Free velar surface of average length with distinct spicular support; posterior margin of ventral velum irregular in shape particularly near midline with very distinct secretory pits that form a thickened rim on dorsal side of ventral velum particularly on medial $\frac{2}{3}$; velum irregular on midline such that a distinct median notch not defined.

Pharyngeal Cavity: Branchial baskets smaller than average; triangular in dorsal view, 20% wider than long; each branchial basket about $\frac{1}{3}$ area of remaining buccal floor area; each basket about 5–6 times wider than deep. Single filter cavity on each side; obliquely oriented; filter plates extremely shallow, abutting each other; cb 1 with 7 filter rows, cb 2 with 7, cb 3 with 8, cb 4 with 6. Filter mesh moderately to slightly less than average density; however, rows abutting, fully canopying filter canals; tertiary folds present, higher order folds rare; filter rows about as wide as filter canals. Branchial food traps shallow but long, of average overall area; secretory ridges straight, visible under light microscope. Glottis fully covered by posterior edge of ventral velum in larger specimen, 50% covered in smaller specimen; glottis average to small size; occluded; lips faint; laryngeal disk small. Esophageal funnel very broad, esophagus of average to large diameter.

DORSAL ASPECT.—Buccal Cavity: Roof of mouth truncated, diamond-shape; nares 15%–20% distance from front of mouth to esophagus; median ridge about 40% distance from front of mouth to esophagus. Prenarial arena smooth except for 2 faint knobs about $\frac{2}{3}$ way back and directly anterior to medial end of nares. Nares of average size; internarial distance about $\frac{2}{3}$ length of naris; nares more transversely than obliquely oriented, curving medially; narial walls very shallow, medial portion rugose; nares 3 times wider than height of anterior wall; prenarial papillae absent; posterior narial wall smooth, lacking narial-valve projection, except for an asymmetrical papilla or knob in middle of narial valve on one side. Postnarial arena transversely oval, bounded laterally by 1 or 2 postnarial papillae on each side; postnarial papillae between nares and median ridge in larger specimen, more posterior in smaller specimen; postnarial arena papillae average size, slightly rugose. Median ridge trapezoidal, slightly concave free edge in larger specimen, straighter in smaller specimen; free edge of median ridge with marginal sculpturing. Lateral-ridge papillae large longitudinal flaps extending as far forward as lateral edge of nares, each with 3 jagged, finger-like projections, extending medially over postnarial papillae, 1 papilla with secondary bifurcation. BRA defined by 4–6 papillae on each side in rows converging slightly posteriorly; BRA papillae attenuate, simple, with slightly irregular apices. Assorted pustulations in postnarial arena and BRA, otherwise buccal roof lacking pustulations/papillae. Irregular and continuous glandular zone defined by large, distinct, secretory pits of moderate density. Dorsal velum average length, medial $\frac{2}{3}$ papillate, slightly interrupted on midline.

Pharyngeal Cavity: Single, very poorly defined pressure cushion. Ciliary groove very shallow, narrow.

Rhinoderma darwini Duméril and Bibron

FIGURE 39

MATERIAL.—KU 161531 (one specimen dissected, stage 38 [based on hind limbs], SVL 6.6 mm). Collected from Parque Nacional Nahuelbuta (Cabreras), 1030 m, Malleco, Chile.

REFERENCE.—Ceï (1962) described and figured the larva.

GENERAL REMARKS.—Lungs about length of buccal floor; flat, sacculate, not inflated. Gill filaments present, short.

VENTRAL ASPECT.—Buccal Cavity: Floor of mouth oval; $\frac{1}{3}$ wider than long. Infralabial papillae effectively absent; arch of mouth filled with large precociously developed tongue. Three or four irregular bumps on tongue perhaps homologous to larval lingual papillae. BFA a wide U-shape; 20–30 subequal, simple, cylindrical BFA papillae on each side in a very narrow band. No prepocket papillae. No other papillae on buccal floor; 20–30 small pustulations in posterior $\frac{1}{2}$ of BFA. Buccal pockets wide, 3 times as wide as long; 30° orientation from transverse plane; perforated. Free velar surface relatively short; posterior margin semicircular, an overall gentle curve, with very irregular cluster of 12 marginal papillae spread along middle $\frac{1}{2}$ of ventral velum not in line with underlying filter plates or cavities; no visible spicular support; no visible secretory pits.

Pharyngeal Cavity: Branchial baskets 50%–60% wider than long, triangular with a long transversely oriented base; each branchial basket less than 50% remaining buccal area, branchial baskets extremely shallow; 1st and 2nd filter cavities subequal, 3rd 50% smaller. Dorsal edge of 2nd filter plate straight, dorsal edge of 3rd filter plate very slightly curved dorsally; 1st filter plate 3 times as long as tall, 2nd 4 times as long as tall, 3rd twice as long as tall; 2nd, 3rd, and 4th filter plates tipped about 45°; cb 1 with 5 filter rows, cb 2 with 7, cb 3 with 8, cb 4 with 4 or 5. Low-density filter mesh; filter rows sparse or degenerate; weakly developed secondary filter folds; filter rows wispy; filter canals about twice filter row width, fully exposed. Branchial food traps with secretory tissue present, but not organized into ridges (determined from two serially sectioned specimens: FMNH 3684, stages 36 and 37, SVLs 5.1 and 6.1 mm). Glottis relatively large; 100% exposed; open; with thick lips; on an indistinct laryngeal disk. Esophageal funnel very broad; esophagus of large diameter.

DORSAL ASPECT.—Buccal Cavity: Shape of roof of mouth an elongate diamond, broad in front; length about same as width; nares about 10% distance from front of mouth to esophagus; median ridge about 20% distance from front of mouth to esophagus. Prenarial arena bare. Nares small; widely separated, internarial distance about length of naris; nares obliquely oriented at 45°; anterior narial wall thickened medially and ill-defined laterally; posterior narial wall a simple flap lacking narial-valve projection. One pustulation on one



FIGURE 39.—SEM micrographs of floor (above) and roof (below) of oral cavity of *Rhinoderma darwinii*; scale line = 400 μ m.

side and two on other asymmetrically positioned behind nares, otherwise no postnarial arena papillae or pustulations. Median ridge a simple half moon with slightly jagged margins. Lateral-ridge papillae absent. BRA U-shaped with array of papillae similar to those on floor of mouth but more widely spaced, papillae beginning almost as far forward as median ridge, 15–20 per side; relatively uniform, simple. No other pustulations/papillae on buccal roof. Dorsal portion of buccal roof lacking well-defined field of secretory pits, i.e., no glandular zone (based on sectioned specimens). Dorsal velum relatively short; widely separated on midline.

Pharyngeal Cavity: Pressure cushion region destroyed in dissection. Very broad and shallow ciliary groove.

Telmatobius jelskii (Peters)

FIGURE 40

MATERIAL.—KU 181850 (one specimen dissected, stage 37, SVL 38.7 mm). Collected from Tarma, 3100 m, Junín, Peru.

REFERENCE.—Vellard (1951) described and figured the tadpole.

GENERAL REMARKS.—Filamentous algae in gill filters. Lungs large, 50% longer than buccal floor length; uninflated. Luxuriant gill filaments.

VENTRAL ASPECT.—*Buccal Cavity:* Floor of mouth triangular, slightly wider than long. Bicuspid keratinized spur at corner of jaw, medially directed. Two pairs of infralabial papillae in transverse rows; lateral pair much larger and with roughened texture, not bifurcate; more medial pair very small, round. Lingual papillae asymmetrical; 2 main papillae small and simple, third irregular, attached to base of one main papilla. V-shaped BFA; 18–24 BFA papillae on each side, larger papillae with slightly serrate anterior edges; largest papillae medial to buccal pockets and medially directed, largest papillae sickle-shaped and rising from anterolateral to posteromedial ridge-like base, papillae simple, without bifurcations. Large cluster of small, simple, conical, prepocket papillae, 8 on one side, 9 on other. About a dozen papillae and 2 dozen pustulations randomly distributed on posterior half of BFA. Buccal pockets average size; 3 times as wide as long; transversely oriented; perforated. Free velar surface relatively long; conspicuous spicular support; several distinct marginal peaks; lateral-most peak above free edge of 2nd filter plate and pointing posteriorly on each side; next peak over edge of 3rd filter plate and recurved, pointing medially; third peak just over anterolateral edge of esophagus, pointing medially; most posterior portion of free velar surface with small, distinct, medial notch bounded by rounded papillae and irregular sculpturing immediately lateral to medial notch and lateral to 3rd peak; large secretory pits on margin, conspicuous under light microscope.

Pharyngeal Cavity: Branchial baskets irregularly ovoid, 50% wider than long, each about $\frac{1}{3}$ remaining buccal area;

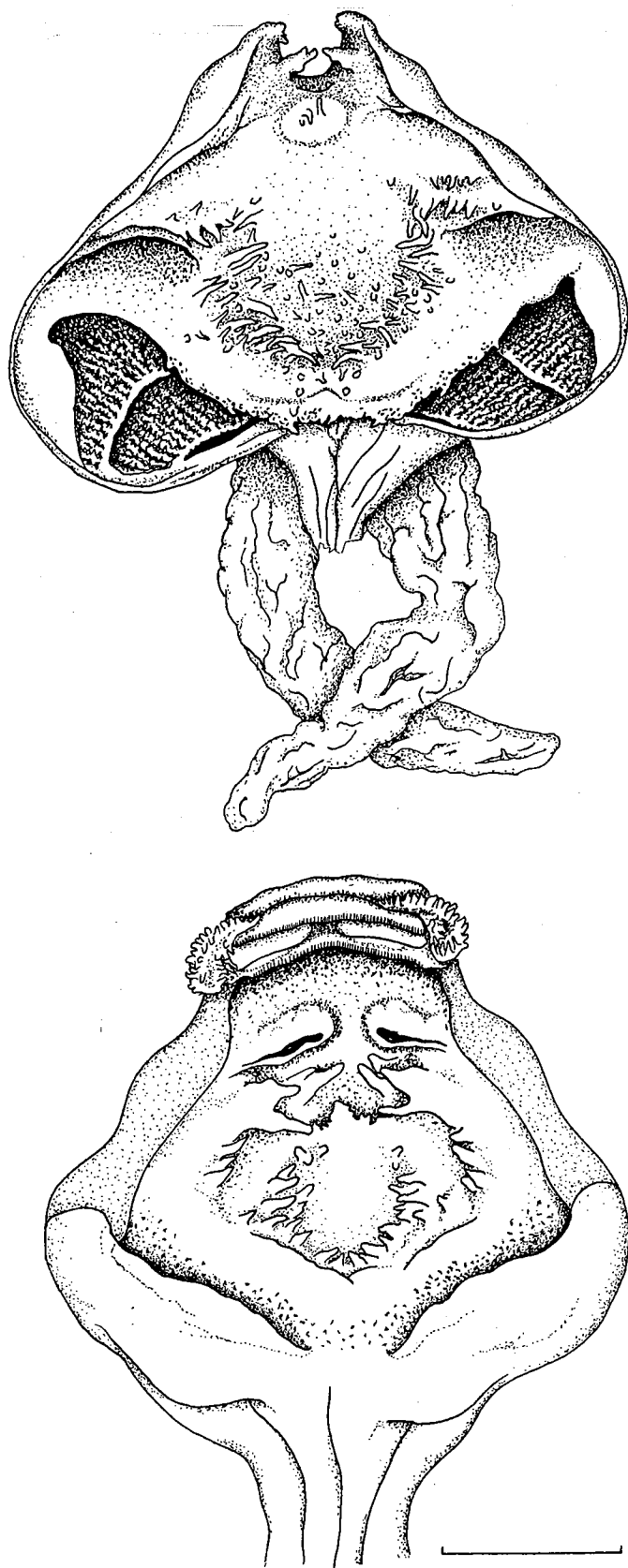


FIGURE 40.—Camera lucida drawings of floor (above) and roof (below) of oral cavity of *Telmatobius jelskii*; scale bar = 5 mm.

baskets relatively shallow. Lateral filter cavity largest, 2nd and 3rd filter plates strongly tipped medially such that 3rd filter cavity largely obscured from view; 2nd filter plate with relatively straight edge, 3rd filter plate with strongly bowed dorsal edge; 2nd filter plate about 2 times as long as high, 3rd filter plate about as tall as long; cb 1 with 12 filter rows, cb 2 with 12, cb 3 with 9, cb 4 with 6. Filter mesh of average density; tertiary or higher order folding. Filter rows wide, rows abutting dorsally but separate ventrally; filter canals of average width, 70%–80% canopied. Branchial food traps large; secretory tissue organized into greatly interrupted ridges with a predominantly transverse orientation rather than uninterrupted ridges seen in most leptodactylid larvae. Glottis occluded, oriented vertically and mostly covered by medial portion of ventral velum; lips shallow; laryngeal disk an irregularly shaped, longitudinally oriented oval. Esophageal funnel relatively broad.

DORSAL ASPECT.—*Buccal Cavity:* Roof of mouth triangular, about as long as wide; nares about $\frac{1}{4}$ distance from front of mouth to esophagus; median ridge about 40% distance from front of mouth to esophagus. Prenarial arena smooth, lacking distinct topographic features. Nares large, obliquely oriented; internarial distance small, about $\frac{1}{3}$ distance of long axis of naris; medial portion of anterior narial wall expanded to an irregular knobby structure; no prenarial papillae; no narial-valve projection. Postnarial arena triangular, defined by 6 or 7 papillae in oblique rows on each side; papillae simple, conical; postnarial papillae reduced to pustulations anteriorly, enlarged posteriorly, with penultimate papilla largest; rows of pustulations running parallel between the postnarial papillae and posterior wall of nares. Median ridge tricuspid with large central cusp; no serrations or secondary papillae on ventral margin or on anterior surface. Lateral-ridge papillae large, compressed structures with 3 cusps of which the anterior smallest, most posterior largest and most attenuate with jagged anterior margin; lateral-ridge papillae collectively $1\frac{1}{2}$ times size of median ridge. BRA U-shaped; defined by 10 papillae on 1 side, 8 on other and 10 pustulations on each side; all simple, some with 1 or 2 pustulations on anterior edge. About 6 papillae randomly distributed within postnarial arena, several dozen pustulations in BRA; 3 simple, slightly curved papillae on one side, 4 on other, posterolateral to lateral-ridge papillae. Distinct glandular zone with diffuse anterior margin; large secretory pits. Large dorsal velum broadly interrupted medially.

Pharyngeal Cavity: Two very poorly defined pressure cushions on each side. Ciliary groove shallow.

Telmatobius marmoratus (Duméril and Bibron)

FIGURE 41

MATERIAL.—KU 164021 (one specimen dissected, stage 37, SVL 35.5 mm). Collected from 34 km E Tincopalca (Laguna), 4130 m, Puno, Peru.

REFERENCE.—Ceï (1980) described and figured the tadpole.

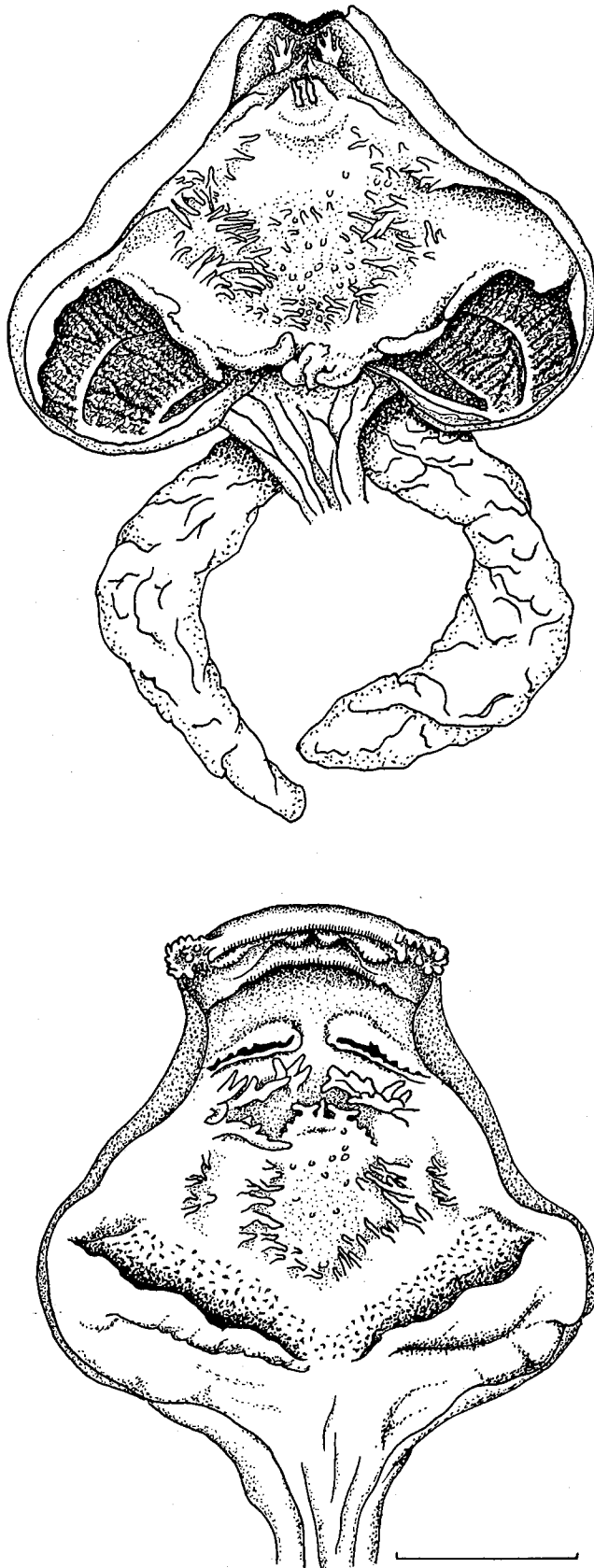


FIGURE 41.—Camera lucida drawings of floor (above) and roof (below) of oral cavity of *Telmatobius marmoratus*; scale bars = 5 mm.

GENERAL REMARKS.—Only those features which differ from *T. jelskii* are described. Lungs 40% longer than buccal floor length.

VENTRAL ASPECT.—*Buccal Cavity*: Lateral pair of infralabial papillae more hand-like than in *T. jelskii*, with multipapillate margins; medial pair of infralabial papillae taller and more attenuate. Two lingual papillae with slightly pustulate anterior margins. Diamond-shaped BFA; about 30 BFA papillae per side, posterior margins of arena with broad zone of more than 100 papillae in or around BFA; largest BFA papillae directly lateral to buccal pockets, multibranching; most others attenuate and sickle-shaped with jagged concave edges. Prepocket papillae taller, thinner, with more rugose margins than in *T. jelskii*. Papillae and pustulations within BFA extending anteriorly halfway to level between buccal pockets and lingual papillae. Margin of ventral velum thicker and marginal projections more rounded than in *T. jelskii*. Medial notch of free velar surface larger than in *T. jelskii*.

Pharyngeal Cavity: Branchial baskets slightly deeper than in *T. jelskii*. Third filter cavity 50% obscured from view; 2nd filter plate dorsal margin arched downward slightly more than in *T. jelskii*, 3rd not arched upward as much as in *T. jelskii*; cb 1 with 12 filter rows, cb 2 with 11, cb 3 with 11, cb 4 with 9. Filter rows more separate, tending not to abut. Secretory ridges more continuous than in *T. jelskii*. Glottis closed.

DORSAL ASPECT.—*Buccal Cavity*: Medial portion of anterior narial wall not as expanded as in *T. jelskii*. Postnarial arena papillae larger, more curved than in *T. jelskii*, with rougher anterior edges; rows of pustulations and papillae running parallel between the postnarial papillae and posterior wall of nares. Median ridge with very irregular, papillate-free margin with pustulations on anterior surface. Lateral-ridge papillae large, elkhorn-like (lost in dissection on one side), with at least 6 arms, some with further bifurcations. BRA defined by about 20 papillae on each side and an equal number of pustulations; largest lateral BRA papillae bifurcated. Six papillae in lateral groove group on each side, simple. Distinct glandular zone, anterior margin better defined than in *T. jelskii*. Dorsal velum smaller than in *T. jelskii*, medial portion of free edge sculptured.

Pharyngeal Cavity: Pressure cushions small, subequal, more distinct than in *T. jelskii*.

AUSTRALIAN LEPTODACTYLOIDS

Crinia tasmaniensis (Günther)

FIGURE 42

MATERIAL.— UMMZ 154858 (one specimen dissected, stage 31, SVL 8.5 mm). No locality data.

REFERENCE.—Watson and Martin (1973) described the external morphology.

GENERAL REMARKS.—Lungs very small, diameter about 0.03 mm; asymmetrical; length of longest lung about 0.16 mm. Well-developed gill filaments.

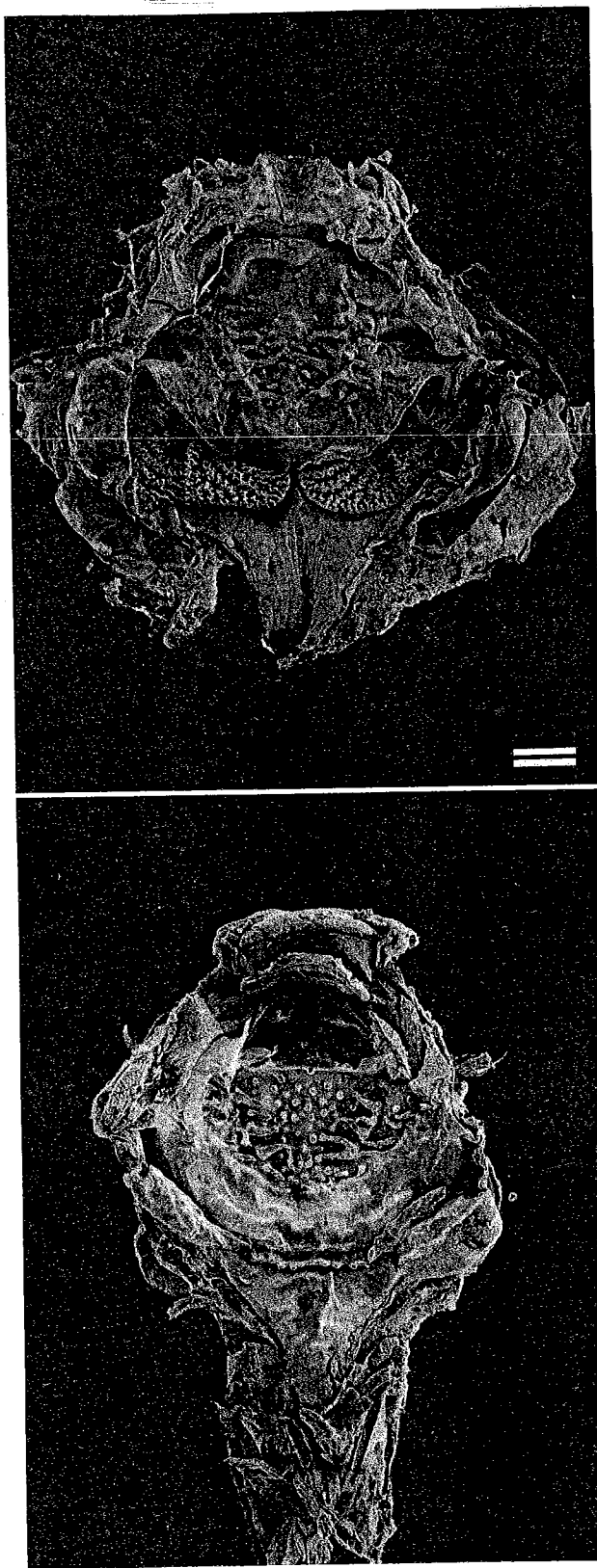


FIGURE 42.—SEM micrographs of floor (above) and roof (below) of oral cavity of *Crinia tasmaniensis*; scale line = 400 μ m.

VENTRAL ASPECT.—*Buccal Cavity*: Floor of mouth 20% wider than long. Infralabial papillae a single, small, anteroposteriorly compressed, square flap on each side with irregular edges. Two symmetrical lingual papillae. BFA V-shaped; 12 BFA papillae on each side; BFA papillae simple, relatively thin, some slightly knobby, none bifurcate. Two or three small prepocket papillae per side. Large field of pustulations covering posterior $\frac{2}{3}$ of buccal floor. Buccal pockets average-sized; 3 times as wide as long; transversely oriented; not perforated. Free velar surface of average length; area on each side about 20%–25% area of rest of buccal floor; spicular support faint, not extensive; posterior margin somewhat truncate in overall shape, with thickened rim of secretory tissue; tissue of uniform thickness along free edge with scattered secretory cells, but no distinct pits; free edge lacking marginal papillae except for small median notch surrounded by single, short, blunt papilla on either side (Figure 55).

Pharyngeal Cavity: Branchial baskets 50% wider than long, obliquely oval; baskets relatively large, each about $\frac{1}{2}$ remaining area of buccal floor; baskets about 75% as deep as wide. First filter plate vertical, 2nd tipped at 45°, 3rd with short vertical ridge with lateral edge oriented horizontally; filter rows on medial edge of 3rd filter plate extremely short, abutting filter rows of 4th filter plate; 4th filter plate horizontally oriented (Figure 55), single common 2nd and 3rd filter cavity resulting from primarily horizontal orientation of 3rd and 4th filter plates; cb 1 with 8 filter rows, cb 2 with 9, cb 3 with 6 or 7, cb 4 with 6. Filter mesh of slightly lower density than average; many 2° and some tertiary folds; no higher order folding. Filter rows relatively narrow, non-abutting; many filter canals as wide as, or wider than, filter rows, up to 50% exposed. Branchial food traps relatively deep; large; second and 3rd food traps merged; distinct secretory ridges near lateral limits of food traps in lattice-like pattern, otherwise in parallel ridges (Figure 57b). Glottis not visible from above, occluded (Figure 55); laryngeal disk absent. Esophageal funnel very broad, relatively large esophageal bore.

DORSAL ASPECT.—*Buccal Cavity*: Roof of mouth oval, almost round, length about equal width; nares about 20% distance from front of mouth to esophagus; median ridge about 40% distance from front of mouth to esophagus. Weak, anteriorly directed ridge in prenarial arena. Nares large; internarial distance about $\frac{1}{2}$ length of naris; nares transverse medially, but laterally curving backward at a 45° angle; anterior narial wall tall, of average thickness with single, large, blunt papilla near medial margin; posterior narial wall with a thin but tall valve, with a relatively large, triangular, narial-valve projection. Single, medial, postnarial papilla in middle of postnarial arena, rest of arena featureless. Median ridge very wide with crescentic, irregular, serrate-free, anteroventral edge, approximately 50% wider than tall; single medial papilla arising from middle of posterior surface. Lateral-ridge papilla arising directly lateral to median ridge from edge of faint ridge-like line continuous with median ridge proper; lateral-ridge papillae tall palps, each with single anteriorly curved