

The genus *Synapturanus* currently contains three species.

Disc frogs are fossorial, mostly nocturnal, and are found in the leaf litter and soft soils in tropical rainforest. They usually call during rain (which seems to induce calling). Due to their fossorial habit, little is known about their natural history and they might be much more common than expected.

Sexual dimorphism

Males are smaller than females and breeding males have a glandular swelling on the upper side of the wrist. There is no other evident sexual dimorphism or dichromatism.

Eggs

Eggs are terrestrial, they are deposited in a small burrow below the soil surface.

Tadpoles

Endotroph (nidicolous).

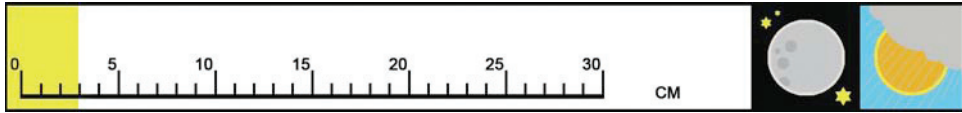
Distribution

Synapturanus species are reported from Colombia and adjacent Ecuador through the Guianas Shield to northern Brazil (Frost, 2008).

Only *Synapturanus salseri* (p. 232) is currently reported from Kaieteur National Park.

Synapturanus salseri Pyburn, 1975

1975: 440, fig. 1.



ENGLISH NAME: Timbo disc frog.

LOCAL NAMES (PATAMONA): Unknown.

TYPE LOCALITY: "Timbó, Vaupés, Colombia".

SELECTED REFERENCE: Pyburn, 1975 (original description, call description, tadpole description, B&W photo, in English).

Field identification - Males reach 27.6 mm SVL, females 29.4* mm.

- Dorsal ground colour medium brown to greyish brown, with irregular small cream to orange spots ; skin on dorsum smooth.
- Ventral surface smooth, pearl white, immaculate.
- Snout very long, acuminate, protruding well beyond lower jaw.
- Light cream line running from snout to upper eyelid, followed by small irregular spots from eye to shoulder.
- Tympanum indistinct.
- When adressed, Finger I shorter than Finger II.
- First toe much reduced.
- Digits unwebbed.

Life history - Mainly nocturnal (although the species may be heard calling during rainy days), terrestrial, fossorial. Found in primary forest, the species seems to prefer clearings. Males call exclusively during rain, from small burrows in the ground, below the leaf litter. Eggs are laid in burrows below the soil surface; tadpoles do not feed and complete their development within the burrow.

Call - First described by Pyburn (1975: 441), who provided a spectrogram. It consists of a short single plaintive whistle repeated at a rate of about 12 notes/min.

Tadpole - First described by Pyburn (1975: 442). Endotroph, nidicolous; cream white with a longitudinal light brown stripe.

Abundance and distribution in KNP - Rare. Observed or heard around main sampling localities # 2, 6, and 11 (see Fig. 3), the species is probably widespread in the Park.

Geographic range - Known only from the type locality and two localities in southern and southwestern Venezuela. Our record from Kaieteur National Park extends the known range about 850 km to the west. The species is also reported from near Manaus (see Zimmerman & Rodrigues, 1990, and Lima *et al.*, 2006), but we have some doubts about the identity of those specimens.

Taxonomic comments - Although our specimens fit very well the original description, we notice slight differences in the call between a recorded male from Kaieteur and the paratype recorded by Pyburn (1975). The specimens from central Amazonia illustrated in Lima *et al.* (2006) look quite different from our specimens and comparison between these populations and specimens from the type locality is required.

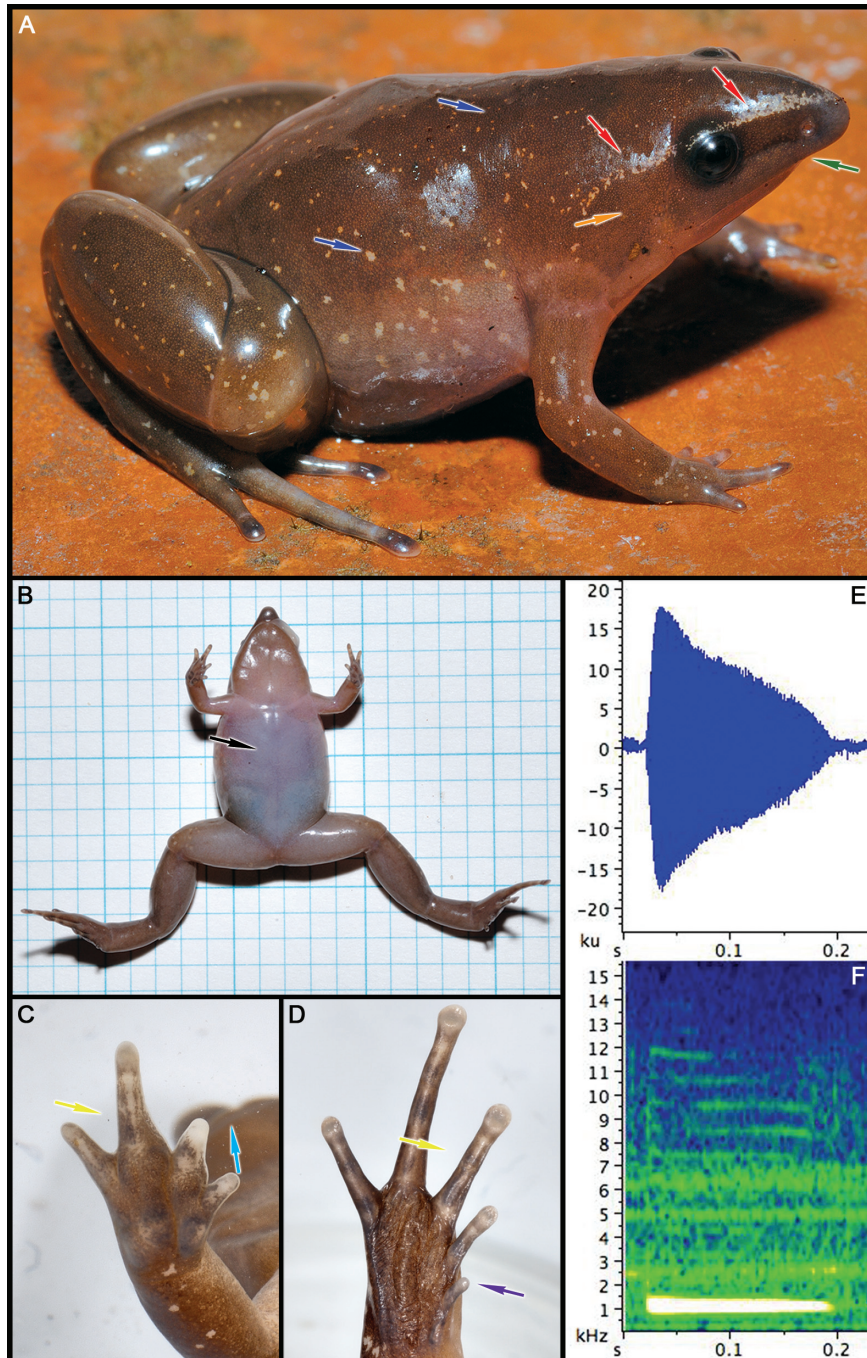


Fig. 143. *Synapturanus salseri* Pyburn, 1975. A. Dorsolateral view of a female. B. Ventral view of a female in life. C. Palm (preserved female specimen). D. Sole (preserved female specimen). E. Call, oscillogram. F. Call, spectrogram. (Photos by P. J. R. Kok).

Pipa Laurenti, 1768

“PIPAS”



Fig. 144. *Pipa pipa*, a species not recorded from Kaieteur National Park; here from Mabura Hill Forest Reserve, central Guyana. (Photo by R. Ernst).

- ⇒ Medium to large size
- ⇒ Body and head dorsoventrally depressed
- ⇒ Snout protruding beyond lower jaw
- ⇒ Maxillary teeth absent or present
- ⇒ Pupil circular (Fig. 42C)
- ⇒ Presence of a lateral line organ
- ⇒ Skin on dorsum spiculate (Fig. 44E)
- ⇒ Feet large, toes extensively webbed
- ⇒ Toes I-III usually capped with keratinous tips (except in *Pipa pipa* and *P. snethlageae*)
- ⇒ Fingertips modified into various arrangements of lobes (e.g. Fig. 51E)
- ⇒ Presence of dermal modifications around the mouth

The genus *Pipa* currently contains seven species.

Pipas are nocturnal and aquatic frogs. They live in permanent or temporary water bodies and in slow-moving streams in tropical rainforest. Individuals have been collected at considerable distance from water and they apparently cross land from a pond to another (when a pond dries out for example). Specimens disturbed in very small pools may quickly escape in the surrounding forest.

Courtship behaviour is complex, involving vertical circular turnovers.

Sexual dimorphism

Males are usually slightly smaller than females; no other evident sexual dimorphism or dichromatism is evident.

Eggs

Eggs are embedded in the dorsal skin of the female.

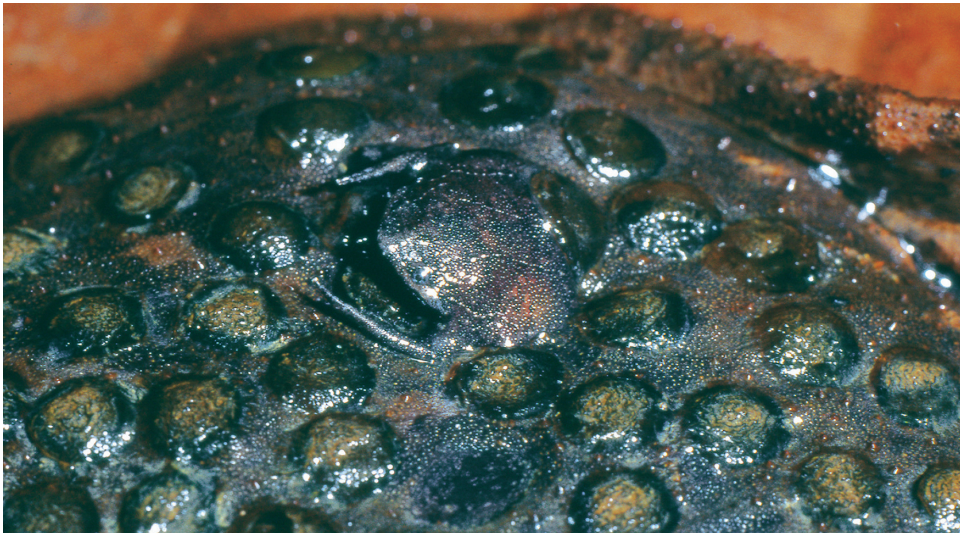


Fig. 145. A juvenile *Pipa pipa* emerging from its mother's back. (Photo by R. Ernst).

Tadpoles

Endotroph (paraviviparous) or exotroph (suspension-feeder).

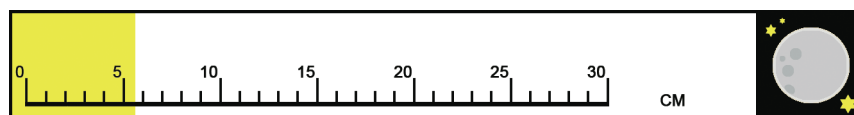
Distribution

Pipa species are found in northern South America, including Trinidad, and in Panama (Murphy 1997; Frost, 2008).

Only *Pipa arrabali* (p. 236) is currently reported from Kaieteur National Park.

Pipa arrabali Izecksohn, 1976

1976: 508, figs 1-3.



ENGLISH NAME: Arrabal's pipa.

LOCAL NAMES (PATAMONA): Unknown.

TYPE LOCALITY: "Vila Amazônia, Município de Parintins, Estado do Amazonas, Brasil".

SELECTED REFERENCES: Izecksohn, 1976 (original description, B&W photos and drawing, in Portuguese); Trueb & Cannatella, 1986 (description, osteology, B&W drawings, distribution, in English); Buchacher, 1993 (natural history, breeding habits, in English).

Field identification - Males reach 40.0 mm SVL, females 57.0 mm.

- Dorsal colour greenish brown to greyish brown, with irregular dark brown spots; skin on dorsum spiculate.
- Ventral surface shagreened, slightly spiculate, whitish, pinkish to orangish brown with irregular dark spots; throat often darker.
- Body and head dorsolaterally depressed.
- Eyes small, pupil circular, iris greenish brown.
- Upper lip forming small pocket at angle of jaw.
- Keratinous tips on Toes I-III.
- Fingertips modified into four small equal-sized lobes.
- Feet large, toes extensively webbed.

Life history - Mainly nocturnal, highly aquatic, but can occasionally be found on land. Observed in primary forest, in slow-moving streams and in small pools and puddles along streams. Males probably call from the water as in other species of the genus. Eggs and larvae are kept in dermal pockets on the back of the female, and toadlets emerged when completely metamorphosed; juveniles and adults feed on insect larvae, earthworms and tadpoles.

Call - Unknown.

Tadpole - No free-swimming larval stage occurs in this species. Endotroph, paraviviparous.

Abundance and distribution in KNP - Rare. Observed only around main sampling localities # 2 and 11 (see Fig. 3), but the species is probably widespread in the Park.

Geographic range - Reported from eastern Venezuela, through Guyana and western Suriname to northern and central Brazil.

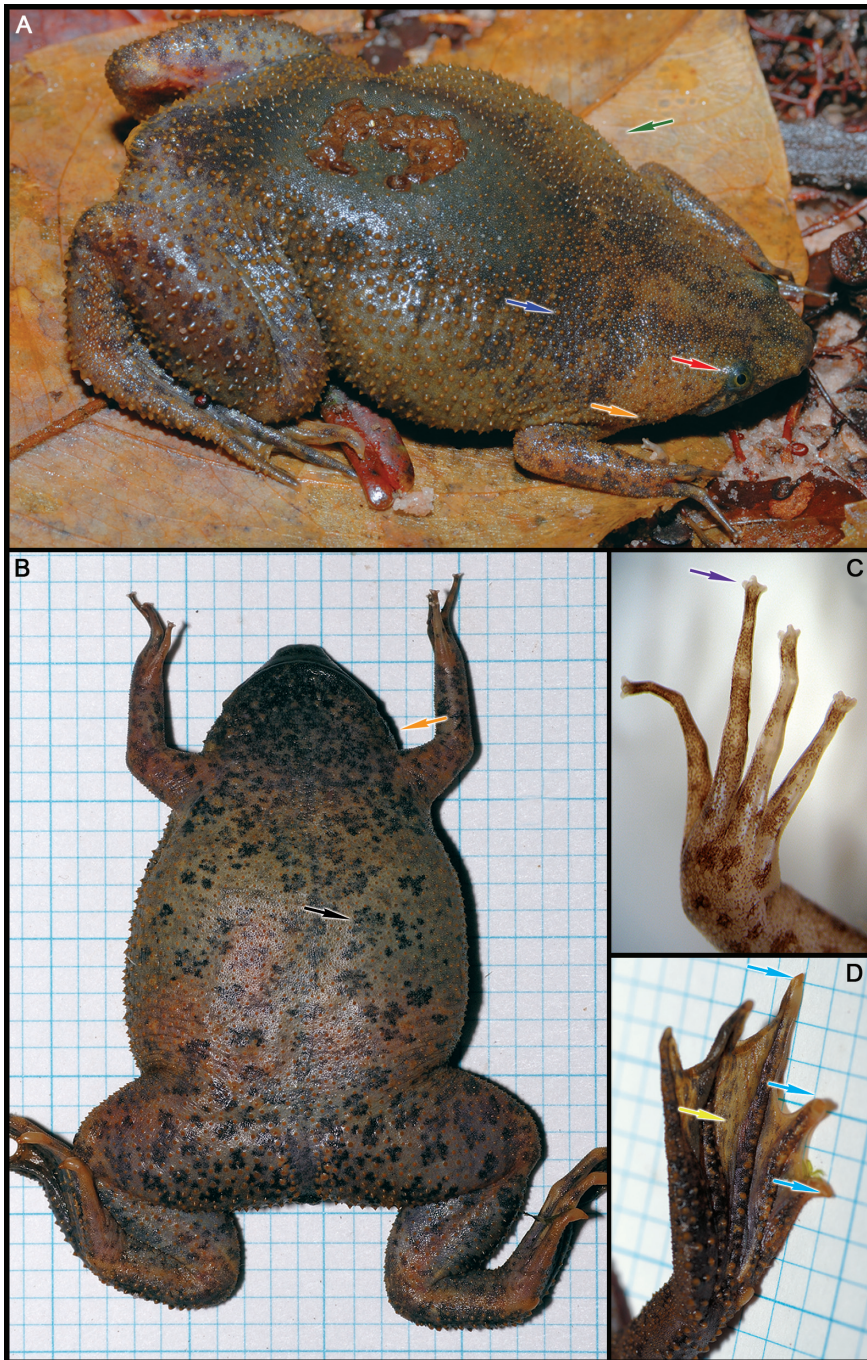


Fig. 146. *Pipa arrabali* Izecksohn, 1976. A. Dorsolateral view of a female. B. Ventral surface of a female in life. C. Palm (preserved female specimen). D. Sole (female specimen in life). (Photos by P. J. R. Kok).

***Pristimantis* Jiménez de la Espada, 1871**

“SOUTH AMERICAN RAIN FROGS”



Fig. 147. *Pristimantis jester*, a beautiful species that does not occur in Kaieteur National Park; here from Mt Maringma (Photo by P. J. R. Kok)

- ⇒ Very small to large size
- ⇒ Maxillary teeth present
- ⇒ Pupil horizontally elliptical (Fig. 42A)
- ⇒ Head about as wide as body
- ⇒ Parotoid glands absent
- ⇒ Skin on dorsum smooth, shagreened, granular, tuberculate, spiculate or warty (Fig. 44A-F)
- ⇒ Vocal sac single, subgular (Fig. 56A)
- ⇒ Finger I \leq II when fingers adpressed
- ⇒ Fingers unwebbed
- ⇒ Finger discs expanded (Fig. 51B-C)
- ⇒ Tympanum present, distinct or indistinct, or absent (Fig. 43A-C)

Pristimantis is a very large genus currently containing ca. 430 species; additional species are described each year.

Heinicke *et al.* (2007) removed *Pristimantis* from the synonymy of *Eleutherodactylus* on the basis of molecular data. The genus is now subdivided in three subgenera and several species series and species groups (Hedges *et al.*, 2008).

South American rain frogs are nocturnal and mostly arboreal. They inhabit tropical rainforest and are not dependent on water bodies for reproduction (see below).

The genus is highly polymorphic (especially in skin texture), and most species of *Pristimantis* are exceedingly polychromatic, often rendering their identification problematic. A revision of the genus in the Guiana Shield is necessary to delimit exact species distribution and identify possible cryptic species.

Sexual dimorphism

Variable among species. Males are usually smaller than females and may have spinous nuptial pads or not.

Eggs

No eggs are laid (froglet births from oviduct) in at least one species (*Pristimantis jasperi*); eggs are terrestrial with no tadpole stage in other species.

Tadpoles

Endotroph (ovoviviparous or direct developer).

Distribution

Species belonging to the genus *Pristimantis* are found from Honduras to Bolivia, in the Guianas and in Trinidad and Tobago (Frost, 2008).

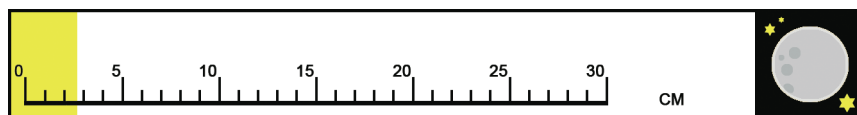
Only two species are currently recorded from Kaieteur National Park, but we suspect many additional species to be discovered.

Field key to the *Pristimantis* species of Kaieteur National Park

- 1. Yellowish spot on groin *P. cf. inguinalis* (p. 240)
- 1'. No yellowish spot on groin *P. cf. marmoratus* (p. 242)

Pristimantis cf. *inguinalis* (Parker, 1940)

1940: 263.



ENGLISH NAME: New River South American rain frog.

LOCAL NAMES (PATAMONA): Unknown.

TYPE LOCALITY: "New River, British Guiana".

SELECTED REFERENCES: Parker, 1940 (original description, in English); Lescure, 1981b (description, B&W photo, in French); Lescure & Marty, 2001 (brief description, colour photo, in French).

Field identification - Males reach 20.0 mm SVL, females 27.0 mm.

- Dorsal colour highly variable, greenish brown, brown or dark brown, with darker markings, with or without a broad dorsolateral stripe extending from upper eyelid to midbody; skin on dorsum tuberculate.
- Ventral surface smooth to weakly granular; throat and chest whitish with dark brown flecks, venter dark grey with whitish flecks.
- Iris grey to gold in its upper part, reddish grey in its lower part.
- W-shaped darker marking on neck.
- Yellowish spot on groin.
- Digital discs expanded, very large.
- When adpressed, Finger I shorter than II; fingers unwebbed.
- Webbing on feet absent or very basal.

Life history - Nocturnal, arboreal. Exclusively observed in primary forest, the species seems to be more common in clearings. Males call at dusk and during the first part of the night, at heights between 0.5-2.5 m, from small trees that usually have trunks of small diameter.

Call - Apparently not formally described. Lescure & Marty (2001: 347, 368) provided some data and an oscillogram and spectrogram. The call consists of a single metallic note ("tik"), repeated at a rate of about 10-20 notes/min.

Tadpole - No larval stage occurs in the genus. Endotroph, direct developer.

Abundance and distribution in KNP - Rare. Observed only around main sampling locality # 11 (see Fig. 3), but the species might be more widespread in the Park.

Geographic range - Restricted to the Guianas (Guyana, Suriname, French Guiana).

Taxonomic comments - Due to the high polymorphism and polychromatism of the genus, additional morphological, and ideally molecular comparisons are needed to clarify the identity of the Kaieteur specimens, which might prove to belong to a different species.

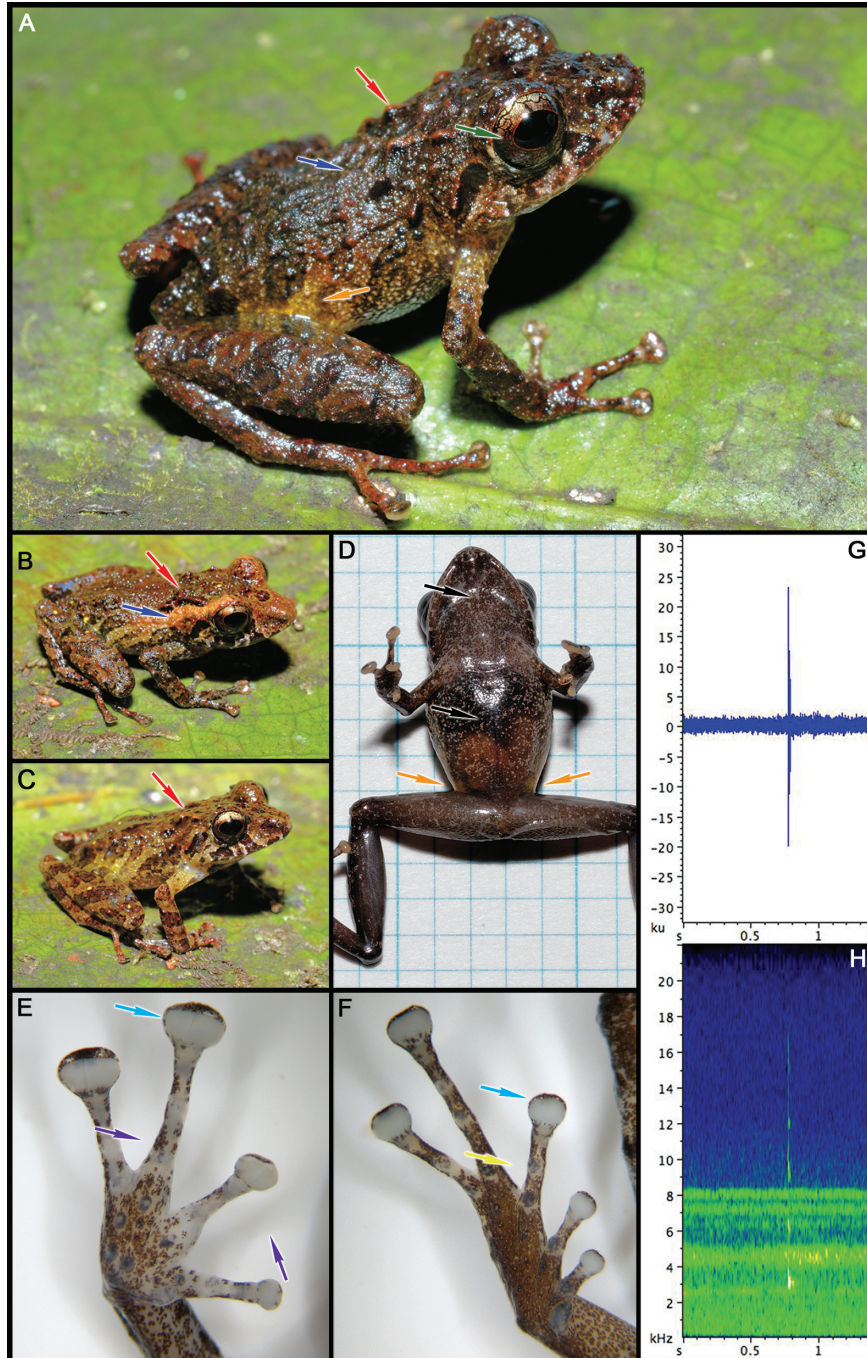
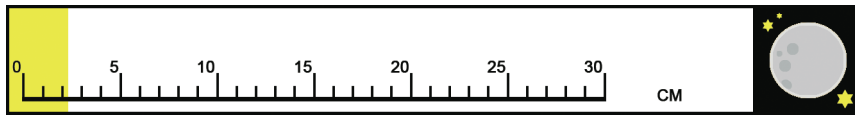


Fig. 148. *Pristimantis* cf. *inguinalis* (Parker, 1940). A. Dorsolateral view of a male. B. Dorsolateral view of a female. C. Dorsolateral view of a male. D. Ventral surface of a male in life. E. Palm of hand (preserved male specimen). F. Sole of foot (preserved male specimen). G. Call, oscillogram. H. Call, spectrogram. (Photos by P. J. R. Kok).

***Pristimantis* cf. *marmoratus* (Boulenger, 1900)**

1900: 56, pl. 5, fig. 6.



ENGLISH NAME: Marbled South American rain frog.

LOCAL NAMES (PATAMONA): Unknown.

TYPE LOCALITY: "foot of Mt. Roraima" [Guyana].

SELECTED REFERENCES: Boulenger, 1900 (original description, B&W drawing, in English); Lescure, 1981b (description, in French); Lescure & Marty, 2001 (brief description, colour photo, in French).

Field identification - Males reach 19.0 mm SVL, females 22.5 mm.

- Dorsal colour highly variable, brown, greenish brown, greyish brown, reddish brown or dark brown, with darker markings; skin on dorsum tuberculate.
- Ventral surface weakly granular, greyish white.
- Iris greyish in its upper part, copper in its lower part.
- W-shaped darker marking on neck.
- No yellowish spot on groin.
- Digital discs expanded, large.
- When adpressed, Finger I shorter than II; fingers unwebbed.
- Webbing on feet basal.

Life history - Nocturnal, arboreal. Exclusively observed in primary forest. Males call at dusk and during the night, at heights between 0.5-1.5 m, from small bushes and trees.

Call - Apparently not formally described. Lescure & Marty (2001: 347, 368) provided some data and an oscillogram and spectrogram. The call consists of a series of 4-10 metallic notes, repeated at a rate of about 18 calls/min according to Lescure & Marty (2001).

Tadpole - No larval stage occurs in the genus. Endotroph, direct developer.

Abundance and distribution in KNP - Very rare. Only observed around main sampling locality # 10 (see Fig. 3), but the species might be more widespread in the Park.

Geographic range - Found in southern and eastern Venezuela, Guyana, Suriname, French Guiana, and Amapá State in Brazil.

Taxonomic comments - Due to the high polymorphism and polychromatism of the genus, additional morphological, and ideally molecular comparisons are needed to confirm the presence of this species in Kaieteur.

Remark - Photos in figure 151 are of a specimen from French Guiana.

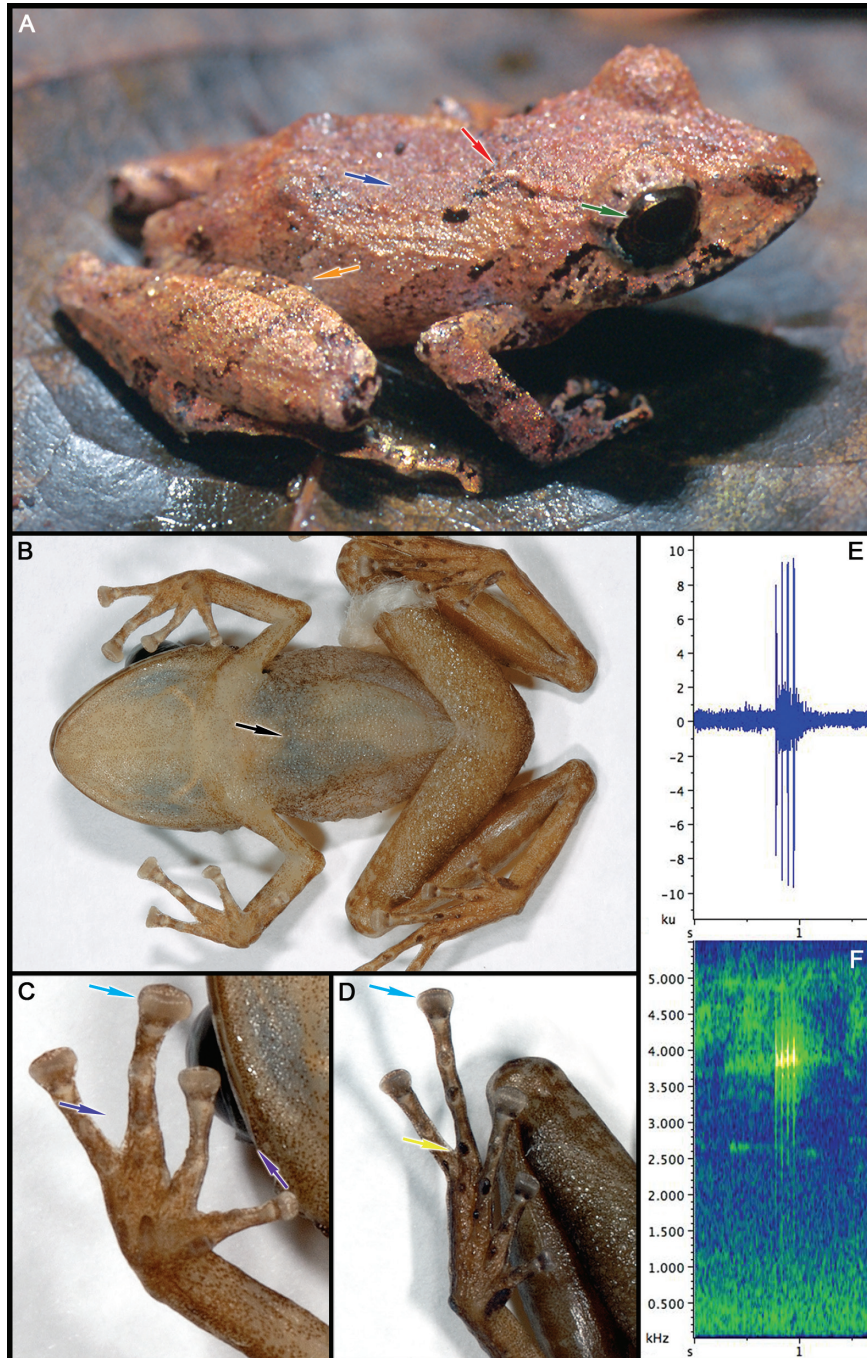


Fig. 149. *Pristimantis* cf. *marmoratus* (Boulenger, 1900). A. Dorsolateral view of a male. B. Ventral surface of preserved male. C. Palm (preserved male specimen). D. Sole (preserved male specimen). E. Call, oscillogram. F. Call, spectrogram. (Photos by P. J. R. Kok).

***Microcaecilia* Taylor, 1968**

“TINY CAECILIANS”

- ⇒ Tail absent (no discernible folds posterior to vent)
- ⇒ Primary annuli congruent with segmentation of trunk musculature, some may be divided posteriorly by secondary annular grooves
- ⇒ Scales present
- ⇒ Eyes covered by skull bone, not visible
- ⇒ Tentacle closer to eye position than to naris

The genus currently contains five species (a sixth species, from Suriname, is in press by M. Wilkinson and colleagues).

Distribution

Occurs from Ecuador through southern Venezuela to the Guiana Shield, also reported from São Paulo in Brazil (Frost, 2008).

***Microcaecilia* sp**

ENGLISH NAME: None.

LOCAL NAME (PATAMONA): Unknown.

TYPE LOCALITY: -

SELECTED REFERENCE: -

Field identification - Reaches 145.0 mm in total length.

- ➔ Body pinkish to bluish grey, darker in its two posterior thirds.
- ➔ Eyes not visible, covered by skull bone.
- ➔ Tentacle located below level of eye, very close to mouth.
- ➔ Only 9-18 secondary annuli, maximum 130 folds in total.

Life history - Virtually unknown. The only specimen collected was crawling on the ground in primary forest by day, after a heavy rain.

Abundance and distribution in KNP - Very rare. A single specimen collected around main sampling locality # 11 (see Fig. 3), but the species is probably more widespread in the Park.

Geographic range - Unknown, only three specimens currently known (one specimen from Kaieteur National Park, two additional specimens collected by R. Ernst at Mabura Hill Forest Reserve, central Guyana).

Taxonomic comments - *Microcaecilia* is a taxonomically challenging group. This species seems close to *Microcaecilia rabei* but differs in some discrete characters.

Remark - Photos in figure 152 are of a specimen from Mabura Hill Forest Reserve, central Guyana.



Fig. 150. *Microcaecilia* sp. A. Dorsolateral view of a living specimen. B. Close-up of neck and head of a living specimen. (Photos by R. Ernst).

Rhinatrema Duméril & Bibron, 1841

“TWO-LINED CAECILIANS”

- ⇒ Tail present (discernible folds posterior to vent)
- ⇒ Annuli not congruent with segmentation of trunk musculature, no distinction between primary and secondary annular grooves
- ⇒ Scales numerous
- ⇒ Eyes visible externally
- ⇒ Tentacle immediately anterior to or on the anterior edge of eye

The genus is currently monotypic, but see below.

Distribution

Occurs in the Guianas (Guyana, Suriname, French Guiana) and adjacent Amapá State in Brazil (Frost, 2008), but see below.

***Rhinatrema cf. bivittatum* (Guérin-Méneville, 1838)**

1838: 16, pl. 25, fig. 2.

ENGLISH NAME: Two-lined caecilian.

LOCAL NAME (PATAMONA): Unknown.

TYPE LOCALITY: “L’Amérique méridionale” [South America].

SELECTED REFERENCES: Taylor, 1968 (description, B&W drawings and photos, in English), Nussbaum & Hoogmoed, 1979 (description, distribution, in English), Lescure & Marty, 2001 (brief description, colour photo, in French).

Field identification - Reaches 235.0 mm in total length.

- ➔ Body medium to dark brown, with yellow lateral band and usually many irregular yellow flecks.
- ➔ Eyes well visible externally.
- ➔ Tentacle located just anterior to eye.
- ➔ Total number of body annuli 315-384.

Life history - Fossorial, subterranean; diurnal and nocturnal. Found in primary forest only. Breeding habits unknown, but probably breeds in streams with aquatic larva like other members of the family.

Abundance and distribution in KNP - Very rare, collected only around main sampling locality # 11 (see Fig. 3), but probably widespread in the Park.

Geographic range - Same as for the genus.

Taxonomic comments - The Kaieteur specimens substantially differ from specimens from the type locality (Cayenne, French Guiana) and most likely belong to an undescribed species (M. Wilkinson, D. Gower, P. Kok, pers. obs.).



Fig. 151. *Rhinatrema* cf. *bivittatum* (Guérin-Méneville, 1838). A. A living male. B. Close-up of neck and head of a living male. (Photos by P. J. R. Kok).

6. Conservation issues

It is hoped that the data presented here, most likely not complete, will serve as a basis for future research in the area. Rare or highly secretive species that could occur in the Park, including possible new taxa, might have been missed because not all the park area has been sampled with the same intensity. Higher elevation areas between 600-900 m above sea level in the western and southeastern parts of Kaieteur National Park were notably undersampled; special attention should be paid to arboreal habitats such as bromeliads and high canopy, which also remain understudied.

The exceptional beauty and superlative natural phenomenon of Kaieteur Falls coupled with our data on biodiversity (including published and unpublished information on the reptiles of Kaieteur) indicate that Kaieteur National Park meets several of the criteria used by UNESCO (2008) to establish a site's eligibility for World Heritage Status (e.g. criteria vii-x). In fact, the high biodiversity and high level of endemism observed in the Pakaraima Mountains of Guyana advocates for the designation of the entire region as a protected area. Protection of the region would also be protection of an important watershed.

Although a national park and a protected area, Kaieteur is inhabited by diamond miners. Some of these miners are working within the boundaries of the Park, but fortunately it appears that many of them are now working outside the protected area. Mechanized mining activities such as dredging and their associated habitat destruction and pollution are a threat to the fauna in certain parts of Kaieteur National Park, which have been extensively deforested (either for mining activities, for camp constructions, or for farming). It should be noted that early and less invasive techniques used to find gold and diamonds such as panning may have some benefits for the herpetofauna: small diamond/gold pits provide pools used as breeding sites by several species (e.g. *Osteocephalus taurinus*, *Phyllomedusa bicolor*, *Phyllomedusa vaillantii*, *Pipa arrabali*).

There are considerable anthropogenic alterations and pollution around Menzies Landing, notably due to diamond miners who use Menzies trail to bring food and gasoline from the Kaieteur airstrip to Menzies Landing. Gasoline is transported in large barrels that are rolled along the trail from the airstrip to Menzies Landing. It is common to see a layer of gasoline in the small streams running on and parallel to the trail.

Policy makers should be aware of the presence of unique endemic species that could be easily made extinct by development projects. Therefore we strongly suggest policy makers to be advised by scientists before making decisions that could be environmentally irreversible.

Tourists should be better informed and educated to preserve ecological quality of the site by minimizing their ecological impact (e.g. by proper disposal of waste, not disturbing the flora and the fauna).

7. Glossary

We are aware that some terms might be newly introduced or uncommon to the beginner. Explanations of many technical terms are already within the text, main others are defined in this section.

Acoustic foramen: the natural opening of the acoustic meatus.

Acuminate: narrowing to a slender point.

Acute: ending in a sharp point, pointed.

Alkalinisation: the process by which a substance becomes an alkali, which is a compound having very basic properties (the opposite of an acid).

Amplexus: the copulatory embrace of frogs and toads.

Annulus (pl. annuli): a ring-shaped structure or marking.

Anthrophilic: human-seeking or human-preferring; a species attracted by human beings.

Aposematic: relating to, characteristic of, or exhibiting aposematism (see aposematism).

Aposematism: an antipredator defence involving warning signals (e.g. warning colouration).

Aquatic: adapted to live in water; consisting of, relating to, or being in water.

Arboreal: adapted to live in the trees. Also an ecomorphological guild that includes lentic tadpoles adapted to live in water-filled phytotelmata or similar arboreal sites.

Arciferal pectoral girdle: an anuran pectoral girdle in which the epicoracoid cartilages are free and overlapping.

Atlantal: relating to the atlas.

Atlas: the first vertebra of the neck, articulating immediately with the skull.

Benthic: an ecomorphological guild that includes lentic or lotic tadpoles that rasp food from submerged surfaces mostly at or near the bottom.

Bicondylar: having two condyles.

Bicuspid: having two points (cusps) or prominences.

Bulbous: resembling a bulb in shape.

Carnivorous: an ecomorphological guild that includes lentic tadpoles that feed on macroinvertebrates and conspecific and heterospecific tadpoles.

Ceratobranchial: pertaining to the bone, or cartilage, below the epibranchial in a branchial arch.

Chorus (pl. choruses): several frogs calling together.

Clade: a group of biological taxa that share features inherited from a common ancestor.

Class: a taxonomic category of related organisms ranking below a superclass or phylum and above an order.

Cleithrum: a bone external and adjacent to the clavicle.

Cloaca: the common cavity into which the intestinal, genital, and urinary tracts open.

Columella: the ear bone of amphibians and reptiles.

Condyle: a rounded articulating prominence at the end of a bone.

Conspecific: a member of the same species.

Convergence: the adaptive evolution of superficially similar structures in distantly related organisms subjected to similar environment.

Cosmopolitan: occurring in many parts of the world.

Cotyle: a cuplike cavity or organ.

Crest: a narrow prominent ridge.

Cryptic: (1) difficult to detect, especially visually, because of the resemblance of an animal with its environment; (2) cryptic species are distinct taxa that are not or hardly distinguishable on the basis of morphology.

Dentary teeth: the teeth on the dentary bone in the lower jaw.

Dextral: of, or pertaining to the right side.

Diapophysis: the part of the transverse process of a thoracic vertebra that articulates with its corresponding rib.

Direct developer: an ecomorphological guild that includes species that have direct development (no tadpole stage).

Distal: remote from the point of attachment or origin.

Dorsal ground colour: the basic colour of the dorsal skin.

Ectotherm (or poikilotherm): an organism that depends on heat external sources to regulate its body temperature.

Endemic: restricted to a certain region or part of a region.

Endotroph (or endotrophic): an embryo or larva that entirely depends on vitellogenic yolk or other parentally produced material for its development; sometimes non-feeding.

Epiphytic: a plant that grows on another plant upon which it depends for mechanical support only (not for nutrients).

Euthanize: killing without pain.

Excrescence: a protruding outgrowth from a part of the body.