

Three New Species of Narrow-Mouth Frogs (Genus: *Microhyla*) from Indochina, with Comments on *Microhyla annamensis* and *Microhyla palmipes*

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Three species of *Microhyla* from Indochina are described. One species is from the Northern Truong Son (Annamite Highlands) of Vietnam and Laos, characterized by finger I less than one-half the length of finger II; expanded disks at the tip of the digits with dorsal median longitudinal grooves producing the appearance of two scutes; two metatarsal tubercles; extensive webbing on feet: on toe IV web full to distal subarticular tubercle; and marbled belly. The second species is from the Tay Nguyen Plateau, Gia Lai Province, Vietnam. It is smaller than the above species, has full webbing to medial subarticular tubercle of toe IV, and has a dusted belly. *Microhyla annamensis* is discussed because of its similarity to the two new species above. A third species of *Microhyla* is described from Ngoc Linh Mountain in Quang Nam Province, Vietnam. It is easily separated from congeners of Indochina and China by its small size and the appearance of the first finger as a small, partially free nub. *Microhyla palmipes* is discussed because of its similarity to the third new species.

PARKER'S (1934) monograph on the Microhylidae included 15 Asian species and 11 American species in the genus *Microhyla*. Carvalho (1954) recognized two genera, *Microhyla* (from Asia) and *Gastrophryne* (from the Americas) on the basis of the loss of clavicles and procoracoids in the latter genus. Dubois (1987) recognized a new Asian genus, *Micryletta*, distinguishing it from *Microhyla* on the basis of a suite of characters, including: snout shorter than the eye and eye less prominent (opposite condition in *Microhyla*); distinct tympanum (hidden in *Microhyla*); first finger not highly reduced (opposite condition of *Microhyla*); digit tips not expanded into disks (expanded in most species of *Microhyla*); and webbing totally absent in *Micryletta* (always present in *Microhyla*). Today the genus *Microhyla* is composed of 25 species from east, south, and southeast Asia (Dubois, 1987; D. R. Frost, unpubl., data online at <http://research.amnh.org/herpetology/amphibia/index.html>).

Dubois (1987) divided *Microhyla* into two subgenera, *Microhyla* and *Diplopelma*, distinguishable primarily by the terminal digital disks with median longitudinal grooves and T-shaped distal phalanges (present in *Microhyla*, absent in *Diplopelma*). By this definition, the subgenus *Diplopelma* included the species: *Microhyla okinavensis*, *Microhyla ornata*, *Microhyla picta*, *Microhyla pulchra*, and *Microhyla rubra*. Dubois (1987) also divided the subgenus *Microhyla* into two species groups, the *berdmorei* group and the *achatina* group. In the *berdmorei* group (*Microhyla annamensis*, *Microhyla annectens*, *Microhyla berdmorei*, *Microhyla borneensis*, *Microhyla butleri*, *Microhyla fowleri*, *Microhyla mixtura*, *Microhyla palmipes*, *Microhyla*

perparva, *Microhyla petrigena*, and *Microhyla superciliaris*) the palatines are present, digital disks well developed, and webbing considerable, whereas in the *achatina* group (*Microhyla achatina*, *Microhyla chakrapanii*, *Microhyla fusca*, *Microhyla heymonsi*, and *Microhyla zeylanica*) the palatines are absent, and the cartilage of the posterior portion of the nasal capsule is partially ossified, the digital disks are small, the webbing is reduced, and the tadpoles possess funnel-shaped mouths. This taxonomic arrangement has yet to be tested with a phylogenetic analysis.

There is only one published biogeographic study of *Microhyla* (Lai et al., 1996), a phenetic analysis using allozyme electrophoresis on three species (*M. butleri*, *M. heymonsi*, and *M. ornata*) from Taiwan and the Ryukyu Islands, and *Micryletta inornata* from Taiwan. They found that Ryukyu *M. ornata* grouped together with *M. butleri* and *M. heymonsi* but that Taiwan samples of *M. ornata* were genetically distinct from all other samples in the study. *Micryletta inornata* from Taiwan was also found to be distinct from the other three species studied. This indicates that alpha taxonomic work with this genus, not just phylogenetic work, is wanting.

In reporting amphibians from Vietnam and Laos, Inger et al. (1999:11), Stuart (1999:49), and Ziegler (2002:59–61) tentatively referred to some of their specimens as *M. annamensis*. Inger et al. (1999) and Ziegler (2002) reported that their specimens differed from accounts of *M. annamensis* by having external metatarsal tubercles and smoother skin. Recent field surveys of Vietnam herpetofauna carried out jointly between the Center for Biodiversity and Conser-

vation at the American Museum of Natural History and the Institute of Ecology and Biological Resources, Hanoi (IEBR), resulted in the collection of more specimens with superficial resemblance to *M. annamensis*. Further investigation showed them to be a previously undescribed species, conspecific with those reported by Stuart (1999:49) and Ziegler (2002:59–61). The series reported by Inger et al. (1999:11) was also found to be a previously undescribed species. A third species superficially resembling *M. palmipes* was also found in a recent survey of Vietnam. All three species are described herein.

MATERIALS AND METHODS

Institutional abbreviations are as listed in Leviton et al. (1985). We used opportunistic searching and pitfall traps to sample herpetofauna. Trap lines were each 50 m long, with buckets (300-mm diameter, 450 mm deep) sunk into the ground at 10-m intervals. A drift fence of plastic sheet 0.5 m in height was buried 50 mm in the substrate, positioned to run across the midline of the buckets, and scored such that it hung inside of them. Collected specimens were euthanized within 24 h of collection using a solution of Chlorotone (Simmons, 2002). Previous to fixation, samples of muscle and liver were taken and stored in 95% ethanol. All specimens were fixed in a 10% solution of commercial grade formalin, buffered with calcium carbonate, and subsequently preserved in 75% ethanol. Tissue samples were subsequently stored below 0 C once out of the field and are now housed in liquid nitrogen vapor at -150 C at the AMNH. The information recorded for each specimen included date, locality, approximate time of collection, elevation, and collectors. Each specimen is referable to a field number and an AMNH and/or IEBR catalog number. Those specimens on long-term custodial loan to the AMNH from the IEBR are reported with both an AMNH and an IEBR catalog number (e.g., AMNH A-xx/IEBRxx). Comparative specimens were examined from the collections of the AMNH, BMNH, FMNH, IEBR, and ZFMK (see Material Examined). Collection localities throughout Vietnam and Laos are shown in Figure 1.

We recorded the sex of each frog and made all measurements to the nearest 0.01 mm with dial calipers. Measurements included snout-vent length (SVL); head length (HDL) from tip of snout to the articulation of the jaw; head width (HDW) taken at the widest part of the jaw; snout length (SNT); eye diameter (EYE); interorbital distance (IOD); hand length (HND) from base of the palm to tip of finger

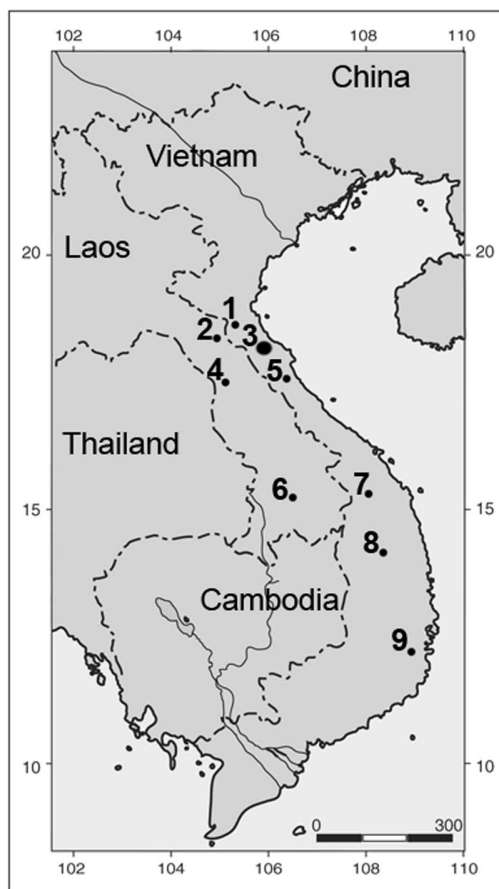


Fig. 1. Localities in Vietnam and Laos: (1) Po-mu Mountain, Huong Son Reserve, Huong Son District, Rao An Region, Ha Tinh Province, Vietnam; (2) Ban Nape, Khamkeut District, Boli Khamxai Province, Laos; (3) Ky Anh-Ke Go, Ha Tinh Province, Vietnam; (4) Phou Vang Mountain, Nakai-Nam Theun Biodiversity Conservation Area, Nakai District, Khammouane Province, Laos; (5) Phong Nha-Ke Bang National Park, Quang Binh Province, Vietnam; (6) Navang, Khammouane Province, Laos; (7) Ngoc Linh Mountain, Tra Don Commune, Tra My District, Quang Nam Province, Vietnam; (8) Buon Luoi Village, An Khe District, Gia Lai Province, Vietnam; (9) Sui Kat, Lam Dong Province, Vietnam.

III; tibial length (TIB); and foot length (FTL) from distal end of tibia to tip of toe IV.

Microhyla marmorata n. sp.

Figure 2

Holotype.—A mature male (AMNH 161364/IEBR 71) from Po-mu Mountain, Huong Son Reserve (now known as Huong Son Forest and Service Company), Huong Son District, Rao An Region, Ha Tinh Province, Vietnam

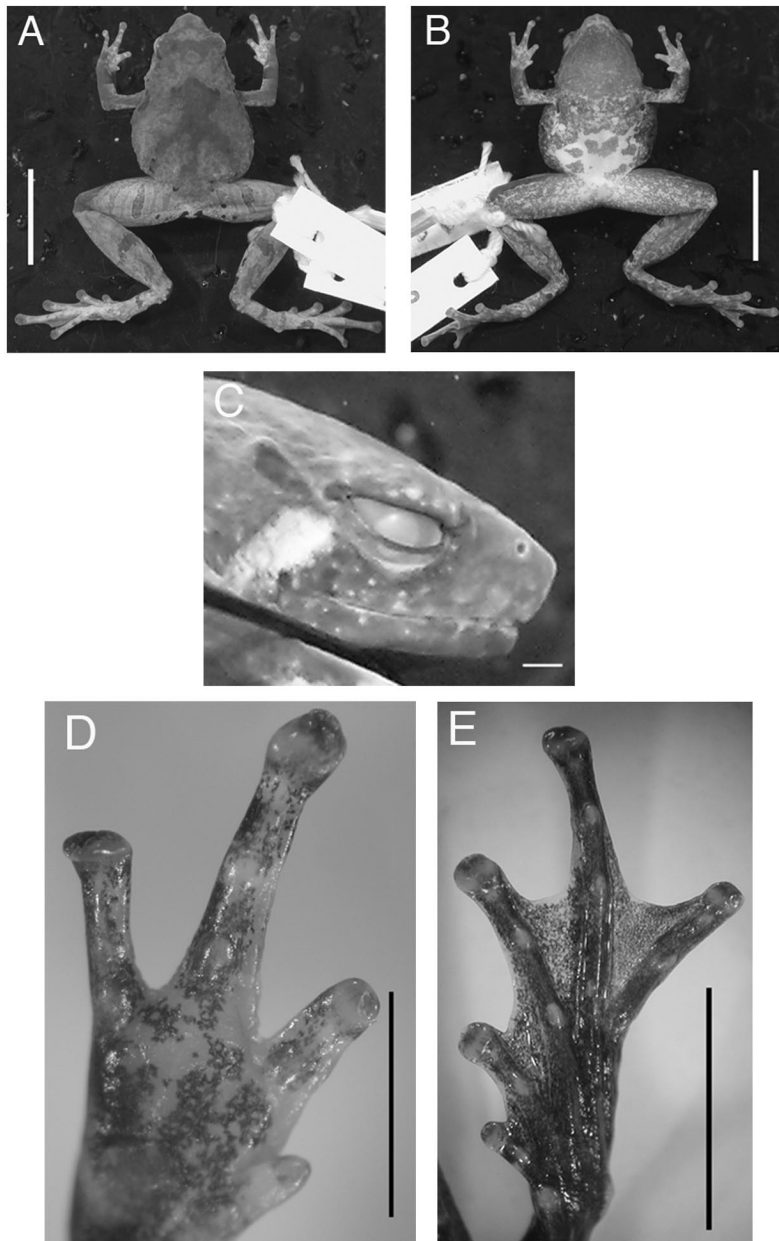


Fig. 2. Holotype of *Microhyla marmorata* (AMNH 161364/IEBR 71): (A) dorsal and (B) ventral view of body (scale equals 10 mm); (C) head in lateral view (scale equals 1 mm); (D) palmar view of right hand (scale equals 2.5 mm); (E) plantar view of left foot of paratype of *M. marmorata* (AMNH 161360; scale equals 5 mm).

(18°20'53"N, 105°14'38"E, elevation 1010–1080 m) on 11 May 1998 by Nguyen Quang Truong.

Paratypes.—Thirteen mature males, 11 mature females, and three subadults: four mature males (AMNH 161360, 161361, 161362, 161363) from the type locality, found on 8 May 1998 by Nguyen Quang Truong; one mature male (AMNH 161365) from Po-mu Mountain, Huong Son Re-

serve (now known as Huong Son Forestry and Service Company), Huong Son District, Rao An Region, Ha Tinh Province, Vietnam (18°20'26"N, 105°14'13"E, elevation 870 m) on 13 May 1998 by Pham Duc Tien; one gravid female (AMNH 161366) from Po-mu Mountain, Huong Son Reserve (now known as Huong Son Forestry and Service Company), Huong Son District, Rao An Region, Ha Tinh Province, Vietnam

(18°21'53"N, 105°13'13"E, elevation 200 m) found on 18 May 1998 by David A. Kizirian; one mature female (ZFMK 76242) from Ky Anh-Ke Go, Ha Tinh Province, Vietnam (18°46'–17°53'N, 105°10'–106°29'E, elevation 280 m) on 29 August 1997 by Thomas Ziegler; one subadult (ZFMK 76241) from Ky Anh-Ke Go, Ha Tinh Province, Vietnam (18°46'–17°53'N, 105°10'–106°29'E, elevation 170 m) on 7 July 1997 by Thomas Ziegler; one mature female (ZFMK 76192) from Phong Nha-Ke Bang National Park, Quang Binh Province, Vietnam (17°20'–17°37'N and 106°09'–106°23'E, elevation approximately 800 m) collected in 2001 by T. Pagel; one mature male (AMNH 163685) from Mount Ngoc Linh, Tra Don Commune, Tra My District, Quang Nam Province, Vietnam (15°11'41"N, 108°2'25"E, elevation 860 m) on 15 March 1999 by Nguyen Quang Truong; five adult males (FMNH 257956, 257959, 257961, 257963, 257964), three gravid females (FMNH 257958, 257962, 257965), three nongravid adult females (FMNH 257955, 257957, 257966), and two subadult females (FMNH 257960, 257967) from Navang, Khammouane Province, Laos by David Davenport between 25 February and 2 March, 1997; two adult males (FMNH 257970, 257971) from Phou Vang Mountain, Nakai-Nam Theun Biodiversity Conservation Area, Nakai District, Khammouane Province, Laos (elevation 1300 m), on 2 January 1999 by William G. Robichaud; and two gravid females (FMNH 257968, 257969) from Nape border area, Laos on 16 and 19 March 1997, respectively, by David Davenport (Bryan Stuart notes in FMNH collections database that Ban Nape village [coordinates 18°18'N, 105°04'E] is in Khamkeut District, Boli Khamxai Province, Laos).

Diagnosis.—*Microhyla marmorata* is characterized by a combination of the following characters: (1) Mean of SVL males 19.80 mm (18.81–21.47), females 22.30 mm (21.10–23.17); (2) body moderately stocky; (3) smooth dorsum, sometimes feebly pustular; (4) finger I less than one-half the length of finger II; (5) expanded disks ($< 2\times$ width of phalanges) on fingers II to IV and all toes; (6) disks with dorsal median longitudinal grooves producing the appearance of two scutes; (7) two metatarsal tubercles, inner short and oval, outer varies from short, conical to long and projecting; (8) webbing extensive: full to disks of toe I, V, and postaxial side of II and III, webbing reaches all other disks as a fringe: on toe IV from distal subarticular tubercle; (9) chin dark gray-brown, belly with distinctive large white-brown marbling.

Description.—Body moderately stocky, mean male SVL 19.80 mm (18.81–21.47), female 22.30 (21.10–23.17); HDL shorter than HDW, median HDL:HDW 0.95; median male HDL:SVL 0.37, female 0.32; snout short, triangularly rounded in dorsal view, bluntly rounded in profile, protruding beyond margin of lower jaw; median male EYE:SNT 0.77, female 0.83; eyelid broader than interorbital distance. Top of head flat; canthus rostralis rounded, not distinct; loreal region nearly vertical; nostril about three-quarters distance from eye to tip of snout; tympanum hidden; supratympanic fold usually present, runs straight from posterior corner of eye to tympanum, curving sharply at posterior edge of tympanum to run straight to arm insertion. Choanae round, widely spaced; no maxillary teeth, no vomerine dentigerous processes. Tongue roundly spatulate, without any posterior notch, free for approximately two-thirds its length.

Forearms, fingers slender, median HND:SVL 0.25; finger I greatly reduced ($<$ one-half the length of II), relative finger lengths $I < II < IV < III$, lateral fringes on inside of finger II and III; fingertips of II, III, IV expand to disks ($< 2\times$ width of phalanges), relative pad size $II = IV < III$, median longitudinal groove on the dorsal surface producing the appearance of two scutes present on fingers II, III, IV; subarticular tubercles rounded, two palmar tubercles. Hind limbs slender; median TIB:SVL 0.65; median FTL:SVL 0.81; relative toe lengths $I < II < V \equiv III < IV$; inner tarsal fold absent; webbing full to disks on toes I, V, postaxial side of II, and III, webbing reaches all other disks as a fringe: on preaxial side of toe II from subarticular tubercle, on preaxial side of toe III from between subarticular tubercles, on toe IV from distal subarticular tubercle, fringe on preaxial side of toe I to inner metatarsal tubercle and on postaxial side of V to proximal subarticular tubercle; toes long, with rounded disks (larger than those of fingers), relative toe disk size $I = V < IV = III = II$, each disk with same grooves as fingers; subarticular tubercles round; inner metatarsal tubercle short (equal to disk of toe I), oval; outer metatarsal tubercle present in various conditions: small and conical when tarsus smooth, long and sometimes as an indistinct ridge, when tubercles present along tarsus to tibiotarsal articulation; tibiotarsal articulation reaching well beyond snout.

Skin on dorsum smooth, sometimes with low pustules that continue on the sides, commonly includes four distinct brown melanistic posterior tubercles, rarely rough (males only); low, rounded tubercles on upper eyelid; small tubercles laterally; thick pustules below eye, anterior to supratympanic fold. Venter smooth, some specimens with low tubercles near the anus;

anus unmodified, directed posteriorly, at upper level of thighs.

Color in preservative.—Dorsum varies from gray, dark brown, light brown, red-brown; black or charcoal mark medially with posterior projections; separate butterfly pattern on top of head between eyes; a dark oblique streak runs from above the shoulder to middle of the flank; off-white sash runs from lower posterior corner of eye to jaw articulation; limbs banded, legs with one band distinctly prominent; forward part of thigh with dark band to the knee; dark triangular area around the anus, but with white bar across cloaca; sometimes dark dorsal and flank marking outlined in white; hands stippled brown; chin deep gray-brown, sometimes with white spots; throat, chest deeply mottled brown, some specimens with dark spots just medial to arm insertions; distinctive large white-brown marbling on belly; dark brown stippling on thighs; outside of foot to tibiotarsal articulation dark brown; femur with dark brown spots inside.

Secondary sexual characters.—Chin of adult males wrinkled and loose over top of the single median vocal sac; often a distinct line running across the bottom of it, sometimes darker gray than rest of venter.

Measurements of holotype.—In millimeters (AMNH 161364): SVL 19.59; SNT 3.25; HDL 6.72; HDW 7.19; EYE 2.29; IOD 3.06; HND 5.44; TIB 12.87; FTL 16.02.

Measurements of adult male paratypes.—In millimeters; mean, \pm SD; range in parentheses ($n = 13$): SVL 19.82 ± 0.78 (18.81–21.47); SNT 2.91 ± 0.23 (2.59–3.33); HDL 7.38 ± 0.30 (6.99–7.90); HDW 7.82 ± 0.50 (6.88–8.67); EYE 2.31 ± 0.29 (1.87–2.93); IOD 2.67 ± 0.23 (2.25–3.01); HND 5.36 ± 0.47 (4.57–6.39); TIB 12.98 ± 0.66 (12.08–14.58); FTL 16.27 ± 0.93 (14.56–17.86). Median IOD:SNT 0.89. For geographic variation of paratypes, see Table 1.

Measurements of adult female paratypes.—In millimeters; mean, \pm SD; range in parentheses ($n = 11$): SVL 22.30 ± 0.72 (21.10–23.17); SNT 3.02 ± 0.19 (2.63–3.28); HDL 7.24 ± 0.68 (6.49–9.02); HDW 7.49 ± 0.59 (6.66–8.32); EYE 2.48 ± 0.14 (2.18–2.64); IOD 2.75 ± 0.43 (1.66–3.22); HND 5.47 ± 0.47 (4.90–6.32); TIB 14.50 ± 0.68 (13.07–15.25); FTL 17.73 ± 0.95 (16.73–19.35). Median IOD:SNT 0.92. For geographic variation of paratypes, see Table 1.

TABLE 1. GEOGRAPHIC VARIATION OF BODY PROPORTIONS IN *Microhylla marmorata*. SVL shown as mean (in mm) with \pm 1 SD, range below. All ratios shown as mean, with median in parentheses and range below. See Materials and Methods for abbreviations.

Locality	<i>n</i>	SVL	HDL:HDW	TIB:SVL	SNT:HDL	EYE:SNT	HND:SVL	FTL:SVL
MALES								
Ngoc Linh Mt.	1	19.33	0.94	0.69	0.37	0.92	0.29	0.87
Ha Tinh Prov.	6	19.62 \pm 0.64	0.95 (0.95)	0.64 (0.65)	0.42 (0.40)	0.75 (0.75)	0.28 (0.28)	0.84 (0.83)
		18.82–20.36	0.90–1.00	0.62–0.66	0.37–0.48	0.67–0.82	0.27–0.31	0.79–0.88
Laos	7	20.02 \pm 0.86	0.94 (0.93)	0.66 (0.65)	0.39 (0.39)	0.81 (0.76)	0.26 (0.25)	0.80 (0.81)
		18.81–21.47	0.84–1.01	0.63–0.70	0.38–0.42	0.74–0.98	0.23–0.28	0.70–0.90
FEMALES								
Ha Tinh Prov.	3	22.23 \pm 0.12	0.93 (0.94)	0.64 (0.64)	0.40 (0.41)	0.85 (0.81)	0.26 (0.25)	0.82 (0.80)
		22.12–22.36	0.89–0.95	0.62–0.66	0.36–0.43	0.78–0.95	0.23–0.29	0.79–0.87
Laos	8	22.33 \pm 0.86	0.98 (0.98)	0.65 (0.65)	0.43 (0.43)	0.82 (0.83)	0.24 (0.24)	0.79 (0.80)
		21.1–23.17	0.91–1.09	0.61–0.70	0.32–0.48	0.73–0.89	0.22–0.29	0.70–0.83

Comparisons.—A suite of characters differentiates *Microhyla marmorata* from all of its Chinese and Indochinese congeners *M. annamensis*, *M. berdmorei*, *M. butleri*, *Microhyla erythropoda*, *M. fowleri*, *Microhyla fusca*, *M. heymonsi*, *M. mixtura*, *M. ornata*, *M. picta*, *M. pulchra*, and from *Micryletta inornata* (Appendix 1; for exclusion of *M. palmipes* from the fauna of Indochina, see discussion below). The presence of a greatly shortened finger I in *Microhyla marmorata* separates it from *M. butleri*, *M. erythropoda*, *M. fowleri*, and *Micryletta inornata*, each of which have finger I greater than one half the length of finger II. The presence of finger and toe disks with dorsal median longitudinal grooves separates it from *M. ornata*, *M. picta*, *M. pulchra*, and *Micryletta inornata* (disks and grooves entirely absent); *M. fowleri* (finger disks absent or weakly present; grooves absent); and *M. mixtura* (disks and grooves only on toes). *Microhyla marmorata* possesses two metatarsal tubercles, differentiating it from *M. annamensis* and *Micryletta inornata* (each with one metatarsal tubercle). The extensive webbing of *M. marmorata* differentiates it from the basal webbing of *M. erythropoda*, *M. heymonsi*, *M. ornata*, *M. picta*, and *M. fusca* (the latter with webbing to disks as fringes for all toes) and the absence of webbing in *M. mixtura* and *Micryletta inornata*. The tibiotarsal articulation of *M. marmorata* extends beyond the snout when pulled alongside the body, separating it from *M. butleri*, *M. erythropoda*, *M. fusca*, *M. heymonsi*, *M. mixtura*, *M. ornata*, *M. picta*, and *Micryletta inornata* (tibiotarsal articulation does not reach snout). *Microhyla marmorata* is smaller than *M. berdmorei* (male SVL 24–28 mm), *M. fowleri* (mean 31 mm), *M. picta* (maximum 29 mm), *M. pulchra* (24–30 mm), and *Micryletta inornata* (21–25.5 mm). *Microhyla marmorata* is further separated from *M. butleri* by the absence of a diagonal ridge from the inner to outer tarsus (present on *M. butleri*). *Microhyla marmorata* lacks the rugose skin and three palmar tubercles (*M. marmorata* with two) of *M. fowleri*. *Microhyla marmorata* lacks the minutely shagreened dorsum, mediodorsal ridge, and deeply furrowed outer metacarpal tubercle of *M. fusca*. *Microhyla marmorata* also lacks the stocky body and white mediodorsal line with dark bracketing (-) shaped spots of *M. heymonsi*.

Microhyla marmorata is further separated from *M. annamensis* by a suite of characters: habit (*M. annamensis* more slender, digital disks smaller, fingers more gracile), skin (*M. annamensis* rough, with greater-sized tubercles; *M. marmorata* smooth, sometimes with dorsal tubercles, males rarely with rough skin), and color (mediodorsal dark mark with posterior projections

in *M. marmorata*, only as a chevron in *M. annamensis*; belly with white-brown marbling in *M. marmorata*, dusted in *M. annamensis*; anal area with dark triangular mark and white bar across the cloaca found only in *M. marmorata*).

Microhyla marmorata can also be differentiated from other Southeast Asian congeners. Two species from the Sundas differ from *M. marmorata* in having the first digit present as a pronounced bulge: *M. petrigena* (male SVL 14–16 mm) and *M. perparva* (10–12 mm). *Microhyla palmipes* (mean of male SVL 16 mm) has finger I present only as a small free nub, and lacks dorsal median longitudinal grooves of digital disks. *Microhyla achatina* (Java) is smaller than *M. marmorata* (mean of male SVL 16 mm) and has basal webbing. *Microhyla annectens* (Malaya-Sundas) lacks an outer metatarsal tubercle and is smaller than *M. marmorata* (SVL 14.5–16 mm). *Microhyla borneensis* (Borneo) differs from *M. marmorata* in possessing three dark brown spots on the upper lip (absent or sometimes present as white spots in *M. marmorata*) and having less extensive webbing (does not reach the disks of toe III or V). *Microhyla maculifera* (Borneo) is diminutive (SVL of male types 12, 13.3 mm), with finger I greater than one-half of finger II, has basal webbing, lacks finger disks, and lacks median longitudinal grooves on all digits. *Microhyla supercilialis* (Malaya, Sumatra) is diminutive (mean female SVL 12 mm), lacks a median groove on the finger disks, and has a prominent spine on its upper eyelid.

Etymology.—The specific name is derived from the Latin *marmor*, meaning marble, in reference to the marbling pattern on the belly.

Distribution and ecology.—Currently, *M. marmorata* is known from Mount Ngoc Linh, Quang Nam Province, Vietnam, and the Northern Truong Son Range of Vietnam (Ha Tinh and Quang Binh Provinces) and adjacent Laos (Khammouane and Boli Khamxai Provinces).

The type locality of *M. marmorata* is within the An River watershed, Huong Son Forest, Ha Tinh Province, Vietnam (18°15'–18°37'N, 105°07'–105°17'E). The forests in Huong Son are lowland through to premontane broad-leaved evergreens with some conifers, bamboo, and cycads. Both primary and secondary forests are present and disturbance level varies with accessibility and topography along the river valleys (*M. M. Hurley*, unpubl., data available at: <http://research.amnh.org/biodiversity/vietnamresearch/viet.main.html>). Ha Tinh borders the eastern foothills of the Northern Truong Son, with drainages going east to the sea. The total annual rainfall is 2888

mm, 70% of which fall from September to early November (wet season late August to mid November) (Ziegler, 2002:17–18). Mean annual temperatures in the region are 12–15 C, although the dry season (December to July) can peak with temperatures of 41 C (Ziegler, 2002:17–18). Most specimens from Laos were also found streamside or closely associated with streams at night.

Paratypes from Ky Anh–Ke Go, Ha Tinh Province, Vietnam were discussed by Ziegler (2002: 59–61), as *Microhyla* cf. *annamensis*. Ziegler included a live color photo of the subadult female (ZFMK 76241 as TZ 95; fig. 69) and some ecological notes: specimens were found close to small forest streams; the subadult was found in the daytime on the forest floor during the dry season and had small, lightly colored eggs (0.2 mm diameter), whereas the adult (ZFMK 76242, as TZ 770) was found at dusk and had 200 light and darkly colored eggs (1.1 mm diameter) at the end of the dry season (August); both of the specimens had nematodes and endoparasites in their intestines; prey sizes ranged from 8–35 mm length, although the subadult contained only one beetle as prey. No calls or larvae have been recorded for this species.

Microhyla pulverata n. sp.

Figure 3

Holotype.—An adult male (FMNH 254122) from Buon Luoi village, 20 km northwest of Kannack (Kannack coordinates: 14°20'N, 108°36'E), An Khe District, Gia Lai Province, Vietnam, (700–750 m elevation) on 26 April 1995 by Ilya S. Darevsky and Nikolai N. Orlov.

Paratypes.—Sixteen adult males (FMNH 252975–252981, 252984, 252985, 254123–254126, 254130–254132), four gravid females (FMNH 252982, 252983, 254127, 254128), one subadult female (FMNH 254133), and one subadult male (FMNH 254129) from the type locality, between 28 March and 26 April, 1995 by Ilya S. Darevsky and Nikolai N. Orlov.

Diagnosis.—*Microhyla pulverata*, is characterized by a combination of the following characters: (1) Mean of SVL males 18.45 mm (17.26–19.54), females 19.57 mm (18.76–20.23); (2) body moderately stocky; (3) smooth dorsum, sometimes feebly pustular; (4) finger I less than one-half the length of finger II; (5) expanded disks ($< 2\times$ width of phalanges) on fingers II to IV and all toes; (6) disks with dorsal median longitudinal grooves producing the appearance of two scutes; (7) two metatarsal tubercles, inner short and oval, outer small, conical; (8) webbing extensive:

full to disks of toes I, V, and postaxial side of II, webbing reaches all other disks as a fringe: on toe IV from medial subarticular tubercle; (9) venter dusted brown to thighs.

Description.—Moderately stocky, mean male SVL 18.45 mm (17.26–19.54), female 19.57 mm (18.76–20.23); median HDL:HDW 0.98; median male HDL:SVL 0.38, female 0.34; snout short, triangularly rounded in dorsal view, bluntly rounded in profile, protruding beyond margin of lower jaw; median male EYE:SNT 0.87, female 0.96; eyelid broader than interorbital distance. Top of head flat; canthus rostralis rounded, indistinct; loreal region nearly vertical; nostril about three-quarters distance from eye to tip of snout; tympanum hidden; supratympanic fold rarely present, runs straight from posterior corner of eye to tympanum, curving sharply at posterior edge of tympanum to run straight to arm insertion. Choanae round, widely spaced; no maxillary teeth, no vomerine dentigerous processes. Tongue roundly spatulate, without any posterior notch, free for approximately two-thirds its length. Forearms, fingers slender, HND:SVL 0.26; finger I greatly reduced ($<$ one-half the length of II), relative finger lengths $I < II < IV < III$, lateral fringes on inside of finger II and III; fingertips of II, III, IV expand to disks ($< 2\times$ width of phalanges), relative pad size $II = IV < III$, median longitudinal groove on the dorsal surface producing the appearance of two scutes present on fingers II, III, IV; subarticular tubercles rounded, two palmar tubercles. Hind limbs slender; median TIB:SVL 0.64; median FTL:SVL 0.80; relative toe lengths $I < II < V \leq III < IV$; tarsus smooth, inner tarsal fold absent; webbing full to disks on toes I, V, postaxial side of II, webbing reaches all other disks as a fringe: on preaxial side of toe II from below subarticular tubercle, on preaxial side of toe III from between subarticular tubercles, on postaxial side of toe III from distal subarticular tubercle, on toe IV from medial subarticular tubercle, fringe on preaxial side of toe I and postaxial side of V to metatarsal tubercles; toes long, with rounded disks (larger than those of fingers), relative toe disk $I = V < IV = III = II$, each disk with same grooves as fingers; subarticular tubercles round; inner metatarsal tubercle short (equal to disk of toe I), oval; outer metatarsal tubercle small and conical; tibiotarsal articulation reaching well beyond snout.

Skin on dorsum smooth, sometimes with low pustules that continue on the sides, commonly includes four distinct brown melanistic posterior tubercles, rarely rough (males only); low, rounded tubercles on upper eyelid; small tuber-

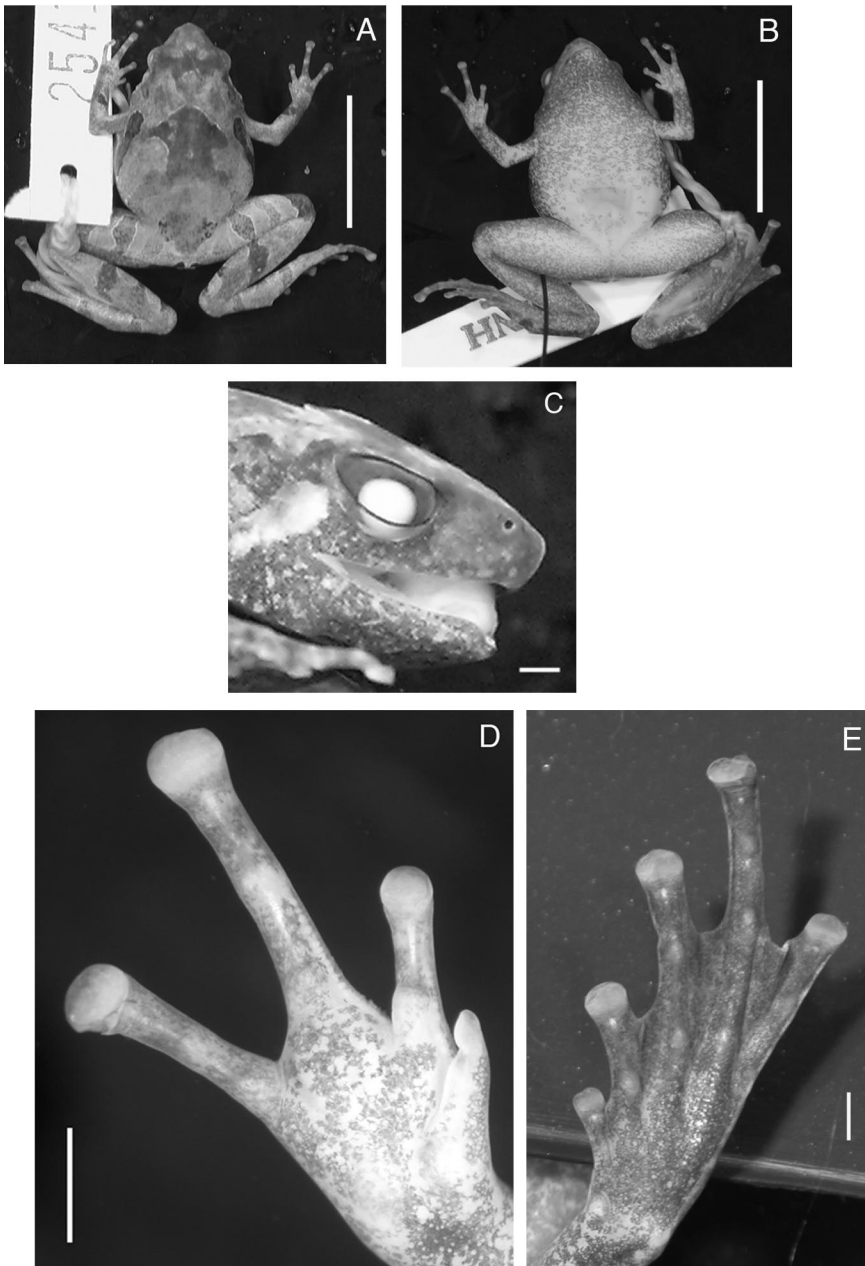


Fig. 3. Holotype of *Microhyla pulverata* (FMNH 254122); (A) dorsal and (B) lateral view of body (scale equals 10 mm), (C) head in lateral view (scale equals 1 mm), (D) palmar view of right hand and (E) plantar view of left foot (scale equals 1 mm).

cles laterally; thick pustules below eye, anterior to supratympanic fold. Venter smooth, some specimens with low tubercles near the anus; anus unmodified, directed posteriorly, at upper level of thighs.

Color in preservative.—Dorsum varies from gray, dark brown, light brown, red-brown; black or

charcoal mark medially with posterior projections; separate butterfly pattern on top of head between eyes; a dark oblique streak runs from above the shoulder to middle of the flank; off-white sash runs from lower posterior corner of eye to jaw articulation; limbs banded, legs with one band distinctly prominent; forward part of thigh with dark band to the knee; dark trian-

gular area around the anus, but with white bar across cloaca; one specimen with dorsal mark outlined in white; hands stippled brown; chin dusted brown, varying light to dark, usually darker than rest of the venter, without white spots; some specimens with dark spots just medial to arm insertions; chest, belly dusted brown; light brown stippling on thighs; outside of foot to tibiotarsal articulation dark brown; femur with dark brown spots inside.

Secondary sexual characters.—Chin of adult males wrinkled and loose over top of the single median vocal sac, sometimes darker brown than rest of venter.

Measurements of holotype.—In millimeters (FMNH 254122): SVL 18.03; SNT 3.10; HDL 6.84; HDW 8.16; EYE 2.74; IOD 2.53; HND 4.62; TIB 11.52; FTL 14.74.

Measurements of adult male paratypes.—In millimeters; mean, \pm SD, range in parentheses ($n = 16$): SVL 18.47 \pm 0.68 (17.26–19.54); SNT 2.70 \pm 0.33 (2.03–3.11); HDL 7.17 \pm 0.55 (6.32–8.21); HDW 7.17 \pm 0.76 (6.08–9.17); EYE 2.26 \pm 0.21 (1.93–2.73); IOD 2.62 \pm 0.16 (2.23–2.92); HND 4.90 \pm 0.27 (4.26–5.22); TIB 12.00 \pm 0.53 (11.13–13.39); FTL 14.97 \pm 0.64 (13.71–17.86). Median SNT:HDL 0.37, IOD:SNT 0.95.

Measurements of adult female paratypes.—In millimeters; mean, \pm SD, range in parentheses ($n = 4$): SVL 19.57 \pm 0.67 (18.76–20.23); SNT 2.39 \pm 0.19 (2.21–2.57); HDL 6.88 \pm 0.44 (6.48–7.42); HDW 7.47 \pm 0.83 (6.60–8.53); EYE 2.24 \pm 0.22 (2.01–2.45); IOD 2.40 \pm 0.41 (1.91–2.90); HND 5.13 \pm 0.34 (4.82–5.55); TIB 12.57 \pm 0.33 (12.18–12.87); FTL 15.12 \pm 0.61 (14.32–15.79). Median SNT:HDL 0.35, IOD:SNT 1.00.

Comparisons.—A suite of characters differentiates *M. pulverata* from all of its Chinese and Indochinese congeners *M. annamensis*, *M. berdmorei*, *M. butleri*, *M. erythropoda*, *M. fowleri*, *M. fusca*, *M. heymonsi*, *M. marmorata*, *M. mixtura*, *M. ornata*, *M. picta*, *M. pulchra*, and from *Micryletta inornata* (Appendix 1; for exclusion of *M. palimpsestus* from the fauna of Indochina, see discussion below). The presence of a greatly shortened finger I in *M. pulverata* separates it from *M. butleri*, *M. erythropoda*, *M. fowleri*, and *Micryletta inornata*, each of which have finger I greater than one-half the length of finger II. The presence of finger and toe disks with dorsal median longitudinal grooves separates *M. pulverata* from *M. ornata*, *M. picta*, *M. pulchra*, and *Micryletta inornata* (disks and grooves entirely absent);

M. fowleri (finger disks absent or weakly present; grooves absent); and *M. mixtura* (disks and grooves only on toes). The extensive webbing in *M. pulverata* differentiates it from the basal webbing of *M. erythropoda*, *M. heymonsi*, *M. ornata*, *M. picta*, and *M. fusca* (the latter with webbing to disks as fringes for all toes) and the absence of webbing in *M. mixtura* and *Micryletta inornata*. The tibiotarsal articulation of *M. pulverata* extends beyond the snout when pulled alongside the body, separating it from *M. butleri*, *M. erythropoda*, *M. fusca*, *M. heymonsi*, *M. mixtura*, *M. ornata*, *M. picta*, and *Micryletta inornata* (tibiotarsal articulation does not reach snout). *Micryletta pulverata* is smaller than *M. berdmorei* (male SVL 24–28 mm), *M. fowleri* (mean 31 mm), *M. picta* (maximum 29 mm), *M. pulchra* (24–30 mm), and *Micryletta inornata* (21–25 mm). *Micryletta pulverata* is further separated from *M. butleri* by the absence of a diagonal ridge from the inner to outer tarsus (present on *M. butleri*). *Micryletta pulverata* lacks the rugose skin and three palmar tubercles (*M. pulverata* with two) of *M. fowleri*. *Micryletta pulverata* lacks the minutely shagreened dorsum, mediodorsal ridge, and deeply furrowed outer metacarpal tubercle of *M. fusca*. *Micryletta pulverata* also lacks the stocky body and white mediodorsal line with dark bracketing (-) shaped spots of *M. heymonsi*.

Micryletta pulverata is most similar to *M. annamensis* and *M. marmorata*. It can be separated from *M. annamensis* by a suite of characters: habit (*M. annamensis* more slender), metatarsal tubercles (*M. pulverata* with two, *M. annamensis* with one), webbing (for *M. pulverata* webbing on toe IV full to medial subarticular tubercle, on toe III full to distal subarticular tubercle on postaxial side; for *M. annamensis* full to distal subarticular tubercle of toe IV and to disk for postaxial side of toe III), skin (*M. annamensis* rough, with larger tubercles; *M. pulverata* smooth sometimes with dorsal tubercles, males rarely with rough skin), and color (dorso-medial dark mark with posterior projections in *M. pulverata*, only as a chevron in *M. annamensis*; anal areas with dark triangular mark and a white bar across the cloaca found only in *M. pulverata*). *Micryletta pulverata* differs from *M. marmorata* in webbing (*M. marmorata* web as in *M. annamensis*); and ventral coloration (*M. pulverata* dusted brown from throat to belly, *M. marmorata* with dark chin, sometimes with white spots, belly heavily marbled, thigh marbled or deeply mottled). *Micryletta pulverata* is slightly smaller than *M. marmorata* (mean of SVL males 18.45 mm for *M. pulverata*, 19.84 mm for *M. marmorata*), with a more prominent eye (*M. pulverata* median male EYE:SNT 0.87, female 0.96; *M.*

marmorata 0.77, 0.83), smaller digital disks, and more gracile hands. Tarsus of *M. pulverata* is always smooth, whereas *M. marmorata* sometimes has tubercles on the outside edge of tarsus to tibiotarsal articulation.

Microhyla pulverata can also be differentiated from all other Southeast Asian congeners. Two species from the Sundas differ from *M. pulverata* in having the first digit present as a pronounced bulge: *M. petrigena* (male SVL 14–16 mm) and *M. perparva* (10–12 mm). *Microhyla palmipes* (mean of male SVL 16 mm) has finger I present only as a small free nub, and lacks the dorsal median longitudinal grooves of the digital disks found in *M. pulverata*. *Microhyla achatina* (Java) is smaller than *M. pulverata* (mean of male SVL 16 mm) and has basal webbing. *Microhyla annectens* (Malaya-Sundas) lacks an outer metatarsal tubercle and is smaller than *M. pulverata* (male SVL 14–16 mm). *Microhyla borneensis* (Borneo) differs from *M. pulverata* in webbing (does not reach the disks of toe III or V in *M. borneensis*) and coloration (*M. borneensis* with brown spots on upper lip, absent in *M. pulverata*). *Microhyla maculifera* (Borneo) is diminutive (SVL of male types 12, 13 mm), has basal webbing, finger I greater than one-half the length of finger II, disks on fingers absent, and all digits lack median longitudinal grooves. *Microhyla superciliaris* (Malaya, Sumatra) is diminutive (mean of female SVL 12 mm), lacks a median groove on the finger disks, and has a prominent spine on its upper eyelid.

Etymology.—The specific name is derived from the Latin *pulvis* for dust, referring to the dusty speckling on the venter.

Distribution and ecology.—Currently, *M. pulverata* is known from the Tay Nguyen Plateau of Gia Lai Province, Vietnam. This locality was discussed by Inger et al. (1999:1–3), but intensive deforestation and conversion to coffee plantations have severely altered the area since that time (pers. obs.). Most of these specimens were found at night along silty banks from forest ponds and slow moving streams or in leaf litter 1–2 m from the banks (Inger et al., 1999:11). No calls or larvae have been recorded for this species.

Remarks.—Because of the similarity between *M. pulverata* and *M. annamensis*, we make some additional notes on the holotype of *M. annamensis* in the context of *M. pulverata* (Fig. 4).

In the original description, Smith (1923) designated an adult female with “the author’s number 2412” as the holotype of *M. annamensis*. He examined 35 specimens from the Lang-

bian Plateau (specifically Sui Kat, the type locality, and Dran, “a few miles distant”). Parker (1934) later studied the type series, indicating the holotype to be 1923.5.14.10, an adult female from Sui Kat. The catalog number for this specimen has been changed to BMNH 1947.2.11.50.

The holotype of *M. annamensis* has a bluntly rounded snout in profile (Fig. 4C); very long, and spatulate tongue (degree of freedom too difficult to observe because of the fragility of the specimen); relative finger lengths are $I < II \leq IV < III$ for the right hand and $I < II < IV < III$ for the left hand; lateral fringes on inside of finger II and III as in *M. pulverata*; dorsal median grooves of the fingers and toes and palmar tubercles as in *M. pulverata*; relative toe length $I < II < V < III < IV$; webbing is as *M. marmorata* but external fringe on toe V is only to the distal tubercle (not proximal; Fig. 4E).

Markings on the holotype are as described by Smith (1923:47–48, Plate V, fig. 2) and elaborated by Parker (1934:130): “Gray-brown above, with a short, black streak above each shoulder; a chevron-shaped dark spot on the scapular region and, sometimes, a few indistinct dark spots posteriorly; usually there is a triangular dark spot between the eyes, and a light line from beneath the eye to the fore-limb. Limbs with more or less distinct black cross-bars. Yellow beneath, more or less thickly brown dusted” (Fig. 4B).

Microhyla annamensis is a rough-skinned frog; Smith (1923) noted that in the 35 specimens studied, the “warty condition of the skin is variable but is always present in some degree.” The opposite condition is seen in *M. pulverata*, as the skin is smooth; the holotype of *M. pulverata* and 76% (16 of 21) of the type series are completely smooth, another 19% (4 of 21) are smooth with some pustules, and one specimen (male) has rough skin. Dorsal skin of the holotype of *M. annamensis* (a female) is rough with tubercles on the back, head, upper eyelid, supratympanic fold, and limbs. The eggs of the holotype of *M. annamensis* are varied in color; some have pigment and others do not. The measurements of the holotype of *M. annamensis* (BMNH, 1947.2.11.50; formerly 1923.5.14.10; in mm): SVL 20.07; SNT 2.40; HDL 6.11; HDW 6.62; EYE 2.27; IOD 1.89; HND 4.30; TIB 12.43; FTL 15.17. HDL:HDW 0.92; TIB:SVL 0.62; SNT:HDL 0.39; IOD:SNT 0.79.

Microhyla annamensis is currently known from the Langbian Plateau, Lam Dong Province, Vietnam (Smith, 1923), the Northern Truong Son (Annamites), Ha Tinh Province, Vietnam (Semenov, 2001), Khao Sebab, Thailand (Taylor, 1962:542–543), and the Cardamom Mountains

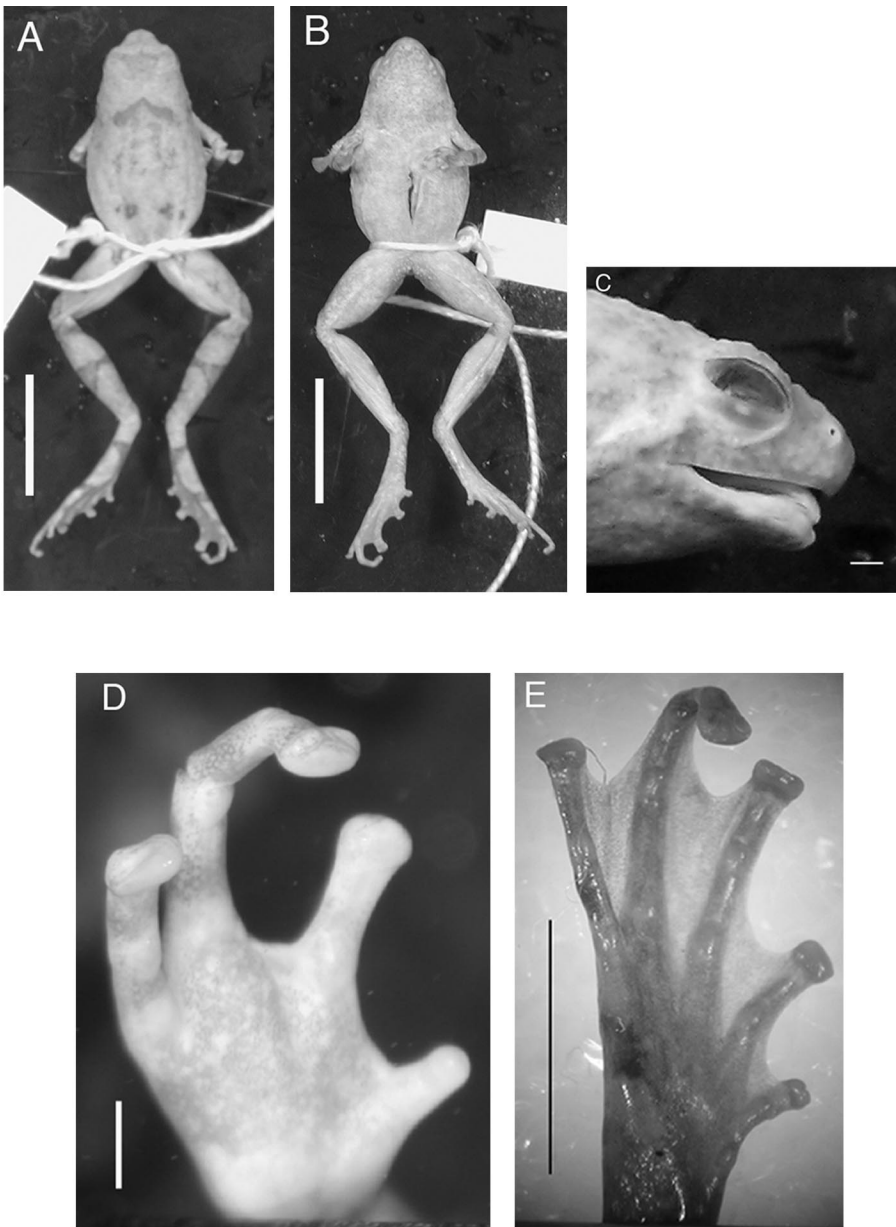


Fig. 4. Holotype of *Microhyla annamensis* (BMNH 1947.2.11.50); (A) dorsal and (B) lateral view of body (scale equals 10 mm), (C) head in lateral view (scale equals 1 mm), (D) palmar view of right hand (scale equals 1 mm), and (E) plantar view of right foot (scale equals 5 mm).

of Cambodia (Ohler et al., 2002). Comparisons of the Ha Tinh, Thai, and Cambodian specimens should be made to *M. annamensis*, *M. pulverata*, and *M. marmorata* for confirmation.

Microhyla nanapollexa n. sp.

Figure 5

Holotype.—A gravid female (AMNH 163686/IEBR 72) from Mount Ngoc Linh, Tra My Dis-

trict, Tra Don Commune, Quang Nam Province (15°10'42"N, 108°2'32"E, elevation 1480 m) on 19 March 1999 by Nguyen Quang Truong.

Diagnosis.—*Microhyla nanapollexa* is characterized by a combination of the following characters: (1) Snout-vent length 16.63 mm (female); (2) body slender; (3) smooth dorsum; (4) finger I reduced to a small, partially free nub just

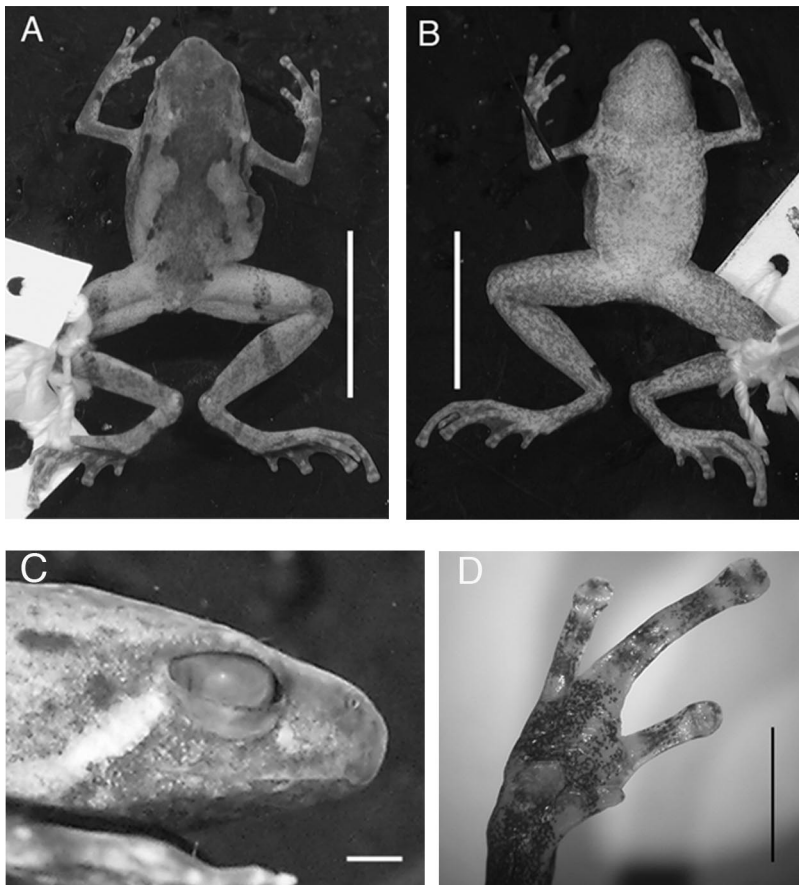


Fig. 5. Holotype of *Microhyla nanapollexa* (AMNH 163686/IEBR 72); (A) dorsal and (B) ventral view of body (scale equals 10 mm), (C) head in lateral view (scale equals 1 mm), and (D) plantar view of right hand (scale equals 1 mm).

proximal to finger II; (5) expanded disks ($< 2\times$ width of phalanges) on fingers II to IV and all toes; (6) disks with dorsal median longitudinal grooves producing the appearance of two scutes; (7) one metatarsal tubercle; (8) webbing extensive: full to disks of toe I, V, and postaxial side of II, webbing reaches all other disks as a fringe: on toe IV from between distal two subarticular tubercles; (9) venter lightly mottled brown, belly distinctly lighter.

Description.—Body slender, female SVL 16.63 mm; HDL:HDW 1.21; HDL:SVL 0.44; snout short, rounded in dorsal view, rounded in profile, protruding beyond margin of lower jaw; EYE:SNT 0.82; eyelid broader than interorbital distance. Top of head flat; canthus rostralis rounded, indistinct; loreal region nearly vertical; nostril about three-quarters distance from eye to tip of snout; tympanum hidden; supratympanic fold absent. Choanae round, widely

spaced; no maxillary teeth, no vomerine denticulous processes. Tongue long, spatulate, without any posterior notch, free for approximately two-thirds its length.

Forearms, fingers slender, HND:SVL 0.29; finger I reduced to a small, partially free nub just proximal to finger II, relative finger lengths $I < II = IV < III$, lateral fringes on finger II and inside of III; fingertips of II, III, IV expand to disks ($< 2\times$ base of phalanges), relative pad size $II = IV < III$, median longitudinal groove on the dorsal surface producing the appearance of two scutes present on fingers II, III, IV; subarticular tubercles flat; two rounded, flat palmar tubercles. Hind limbs slender; TIB:SVL 0.66; FTL:SVL 0.81; relative toe lengths $I < II < V < III < IV$; tarsus smooth, inner tarsal fold absent; feet webbed to disks of toes I, V, postaxial side of II, webbing reaches all other disks as a fringe: on preaxial side of II from below subarticular tubercle, on III from between subarticular tu-

bercles, and on IV from between the distal two subarticular tubercles; no fringe on preaxial side of toe I or postaxial side of V; toes long, with disks more squared and larger than those of fingers, relative toe disk $I = V < IV = III = II$, each disk with faint circummarginal grooves and longitudinal median grooves as on the fingers; subarticular tubercles round; inner metatarsal tubercle short (equal to disk of toe I), ovoid; no outer metatarsal tubercle; tibiotarsal articulation reaching well beyond snout.

Skin on dorsum smooth; one or two low, rounded tubercles on upper eyelid; thick pustules below and posterior to eye. Venter smooth; anus unmodified, directed posteriorly, at upper level of thighs.

Color in preservative.—Dorsum tan with charcoal gray head; charcoal gray mark medially with blunt posterior projections; off-white sash runs from lower posterior corner of eye to jaw articulation; legs with one band; forward part of knee with dark band; dark triangular band around the anus; arms stippled and banded brown to finger tips; entire venter lightly mottled brown, with belly noticeably lighter; tibia with dark brown splotch just proximal to tibiotarsal articulation.

Secondary sexual characters.—The holotype has mature oviducts packed with ova, some of which lack melanin and some of which are completely melanic.

Measurements of holotype.—In millimeters (AMNH 163686): SVL 16.63; SNT 2.32; HDL 7.35; HDW 6.05; EYE 1.91; IOD 1.88; HND 4.87; TIB 11.06; FTL 13.55.

Comparisons.—*Microhyla nanapollexa* can be easily differentiated from *Micryletta inornata* and all other Indochinese and south Chinese *Microhyla* species (*M. annamensis*, *M. berdmorei*, *M. butleri*, *M. erythropoda*, *M. fowleri*, *M. fusca*, *M. heymonsi*, *M. marmorata*, *M. mixtura*, *M. ornata*, *M. picta*, *M. pulchra*, and *M. pulverata*) by the presence of finger I as a small, partially free nub (Appendix 1; see discussion below regarding exclusion of *M. palmipes* from the fauna of Indochina). The presence of one metatarsal tubercle further differentiates *M. nanapollexa* from *M. berdmorei*, *M. butleri*, *M. erythropoda*, *M. fowleri*, *M. fusca*, *M. heymonsi*, *M. marmorata*, *M. mixtura*, *M. ornata*, *M. picta*, *M. pulchra*, and *M. pulverata* (two metatarsal tubercles). The presence of disks with dorsal median longitudinal grooves further differentiates *M. nanapollexa* from *M. ornata*, *M. picta*, *M. pulchra*, and *Micryletta inornata* (disks and grooves

entirely absent); *M. fowleri* (finger disks absent or weakly present; grooves absent); and *M. mixtura* (disks and grooves only on toes). The extensive webbing of *M. nanapollexa* easily differentiates it from *M. erythropoda*, *M. heymonsi*, *M. ornata*, *M. picta* (basal webbing), *M. fusca* (basal webbing that continues to disks as fringes for all toes), and *M. mixtura* and *Micryletta inornata* (no webbing). *Microhyla nanapollexa* lacks the diagonal ridge from the inner to outer tarsus of *M. butleri*, the deeply furrowed outer metacarpal tubercle of *M. fusca*, the stocky habit and white mediodorsal line bracketed with dark (-)shaped spots of *M. heymonsi*, and the large size (mean male SVL 31 mm), rugose skin, and three palmar tubercles (two in *M. nanapollexa*) of *M. fowleri*. *Microhyla nanapollexa* has a different ventral coloration than *M. marmorata* (lightly mottled in *M. nanapollexa*, marbled in *M. marmorata*).

Microhyla nanapollexa can also be differentiated from all other southeast Asian congeners. Most other *Microhyla* from southeast Asia have larger first fingers than *M. nanapollexa*: finger I less than one-half the length of finger II for *M. achatina*, *M. annectens*, *M. borneensis*, and *M. superciliaris*; finger I greater than one-half the length of finger II in *M. maculifera*. *Microhyla palmipes* has finger I less than one-half the length of finger II, but it is completely free and longer than that of *M. nanapollexa*. Two species from the Sundaland have the first digit greatly reduced, although in a different state than *M. nanapollexa*: in *M. petrigena* and *M. perparva* finger I appears as a median bulge on the palm (only rarely seen as a free digit, and even then, the free portion is shorter than its width). The presence of one metatarsal tubercle in *M. nanapollexa* separates it from *M. achatina*, *M. borneensis*, *M. palmipes* and *M. superciliaris* (all with two metatarsal tubercles). The presence of median longitudinal grooves on the digit disks of *M. nanapollexa* separates it from *M. palmipes* (no grooves), *M. maculifera* (disks on toes only; no grooves), and *M. perparva* and *M. superciliaris* (grooves on toes only). *Microhyla borneensis* possesses three dark brown spots on the upper lip (absent in *M. nanapollexa*) and has webbing that does not reach the disks of toe III or V. *Microhyla maculifera* can further be differentiated by its two rows of tubercles on the flanks (absent in *M. nanapollexa*) and basal webbing. *Microhyla superciliaris* possesses a prominent spine on the upper eyelid, which is absent in *M. nanapollexa*. *Microhyla perparva* further differs from *M. nanapollexa* by being smaller (SVL female *M. perparva* 10–12 mm) and less slender.

Etymology.—The specific name is a noun in opposition derived from the Latin prefix *nanus* (meaning dwarf) and *pollex*, in reference to the thumb which is reduced to a small, partially free nub in this species.

Distribution and ecology.—Currently only known from Mount Ngoc Linh, Quang Nam Province. Surveys on the northeastern flank of the Ngoc Linh Mountain Range were conducted in Tra My District, Quang Nam Province (15°11'N, 108°02'E), where dominant forest habitats are lowland through montane broad-leaved evergreen, with deciduous components below 1000 m and small mixed coniferous areas above 1000 m (M. M. Hurley, unpubl., data available at <http://research.amnh.org/biodiversity/vietnamresearch/vietmain.html>). The dry season is short (February and March) and total annual rainfall exceeds 3500 mm per year, with higher elevations experiencing heavier precipitation. Up to approximately 900 m (low montane forest) the habitat was heavily disturbed, with forests persisting only in ravines and steeper slopes. At higher elevations (medium and high montane forests) disturbance levels were lower and the canopy became increasingly closed. Stream bottom composition included rock, gravel, sand and mud. Disturbance of the waterways and surrounding vegetation was variable.

Remarks.—Boulenger (1897) described *M. palmipes*, a species superficially similar to *M. nanapollexa*; diminutive, with finger I present as a small bulge on the palm. Tarkhishvili reported on a specimen similar to *M. palmipes* (as *Microhyla* af. *palmipes*) from Ma Da, Dong Ny Province, in southern Vietnam (Tarkhishvili, 1994: 22; Tarkhishvili, 1995). This specimen warrants further study, since it may represent another record of *M. nanapollexa*, or perhaps a previously undescribed species. Smirnov and Ho (1982) included *M. palmipes* in their tadpole guide to Vietnam, though they do not state the locality from which it was reported, a specimen number, or any relevant literature. Nguyen and Ho (1996:231) included *M. palmipes* in their list of herpetofauna of Vietnam from Huu Lung, Lang Son Province, in northeastern Vietnam, citing a 1963 report by Q. Vo (unpubl.). We consider this record, which is the only one for *M. palmipes* in Vietnam, to be unjustified. The type locality for *M. palmipes* is Java, and the record closest to Vietnam is the Malay Peninsula. At minimum, such a large range extension would require an associated voucher, or some descriptive text or illustration in the reference. None of these is present, and, therefore, *M. palmipes*

cannot be confirmed to be in Vietnam. It should be removed from the herpetofaunal list of Vietnam.

MATERIAL EXAMINED

Type specimens of species described above noted in text of *Microhyla annamensis*: Vietnam (as South Annam): Langbian Plateau, Sui Kat, BMNH 1947.2.11.50 (formerly 1923.5.14.10) (holotype).

Microhyla berdmorei: Thailand (as Siam): AMNH 5165–5167, 10764–10770.

Microhyla butleri: Vietnam: Ha Tinh Province: Huong Son District, Huong Son Reserve, Rao An Region, tributary of Rao An River, 18°21'53"N, 105°13'13"E (coordinates approximate), 200 m, AMNH 161388. Thailand: Nakhon Province: Khao Yao National Park, AMNH 97835; Chonburi Province: Bang Phra, AMNH 81598, 81599; km 82, Highway 304, south of Korat (Paktongchai), 500 m a.s.l., AMNH 83929, 83930. China: Fujien Province: Yenping AMNH 28559–28562.

Microhyla heymonsii: Vietnam: Ha Tinh Province: Ke Go Natural Reserve, Rao Cai Region, AMNH 161367; Huong Son District, Huong Son Reserve, Rao An Region, Top of Po-mu Mountain, 18°20'53"N, 105°14'38"E, 1010–1080 m, AMNH 161368, 161369; Top of Po-mu Mountain, 18°20'53"N, 105°14'38"E, 900–1200 m, AMNH 161370.

Microhyla ornata: Vietnam: Nghe An Province: Con Cuong District, Chi Khe Commune, Chai Stream 19°3'55"N, 104°49'50"E, 200m, AMNH 161371–161384; Anh Son District, near Con Cuong AMNH 161385. China: Fujien Province: Kuatun Village, Ch'ungan Hsien, 4500–5000 ft. a.s.l., AMNH 28844–28850, 29506–29509; Yenping, AMNH 28406–28416, 28501–28505; Fuching Hsien 29312–29323.

Microhyla palmipes: Indonesia: Java, FMNH 130983.

Microhyla perparva: Malaysia: Sarawak: 4th Division, Bintulu District AMNH 90486 (topotype).

Microhyla picta: Vietnam (as Cochinchina): Cape St. Jacques, AMNH 35901.

Microhyla pulchra: Vietnam: Nghe An Province: Con Cuong District, Chi Khe Commune, Chai Stream 19°3'55"N, 104°49'50"E, 200 m, AMNH 161386; Ha Tinh Province: Huong Son District, Huong Son Reserve, Rao An Region, tributary of Rao An River, near 18°21'53"N, 105°13'13"E, 200 m, AMNH 161387; Ha Giang Province: Yen Minh District, Du Gia Commune, stream 22°54'27"N, 105°13'59"E, 800 m, AMNH 163853–163855; Vi Xuyen District, Cao Bo Commune, rice paddies below Mount Tay Con Linh

II, 22°45'39"N, 104°52'23"E, 600 m, AMNH 163856, 163857.

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APPENDIX 1. ADULT FROGS OF THE GENUS *Microhylax* AND *Microlytta* FROM CHINA, MAINLAND SOUTHEAST ASIA AND THE GREATER SUNDAS. Codes and abbreviations for characters: SVL, snout-vent length; reported from the literature as a mean or range, except *Microlytta fusca* and *Microlytta namapollexa*, which are each known from one specimen; F1, relative length of finger I; (-) I < one-half length of II, (+) I > one-half length of II, (++) present as a nub or pronounced bulge; F disk, disks on distal end of fingers; F median groove, dorsal median longitudinal grooves on finger disks producing the appearance of two scutes; T disk, disks on distal end of toes; T median groove, dorsal median longitudinal grooves on toe disks producing the appearance of two scutes; Web: extent of webbing on feet; MTT, number of metatarsal tubercles; Tibtars, where on body tibiotarsal projection stretches, (-) shorter than snout, (+) to snout or just beyond, (++) well beyond snout.

	Male SVL (mm)	Female SVL (mm)	Habit	Snout profile	Dorsum skin	F1	F disk	F median groove	T disk	T median groove	Web	MTT	Tibtars
<i>M. achatina</i>	16	23	Slender	Obtusely pointed	Smooth or feebly tubercular	-	+	+	+	+	Basal	2	+
<i>M. annamensis</i>	20	20	Moderately slender	Bluntly rounded	Warty, tubercular	-	+	+	+	+	To disk; T4, preaxial T2 and T3 to disk as fringe	1	+
<i>M. annectens</i>	14.5-16	18	Slender	Rounded	Smooth	-	+	+	+	+	Beyond distal tubercle of T3	1	++
<i>M. berdmorei</i>	24-28	27-45	Slender	Obtusely pointed	Smooth, small tubercles	-	Weak	+	+	+	To disks	2	++
<i>M. borneensis</i>	17-21	19-23	Slender	Obtusely pointed	Smooth	-	+	+	+	+	To disks except III, V	2	+
<i>M. butleri</i>	21-26	22-26	Slender	Rounded	Smooth or tubercular	+	+	+	+	+	Between distal 2 tubercles on T3	2	-
<i>M. erythropoda</i>		26.1, 27.2	Broad	Obtuse	Smooth, slightly granular laterally	+	+	?	?	?	Basal	2	-
<i>M. foulieri</i>	31	36, 37	Stocky	?	Rugose, pustular	+	- or weak	-	+	?	To disks, except T4	2	++
<i>M. fusca</i>	23?*	23?*	Slender	Acuminate	Shagreened; faint medi-odorsal ridge	-	On F3	?	F2-F5 weak	+	Basal; continue as folds up toes	2	-

APPENDIX 1. CONTINUED

	Male SVL (mm)	Female SVL (mm)	Habit	Snout profile	Dorsum skin	F1	Fdisk	F median groove	Tdisk	T median groove	Web	MIT	Tibians
<i>M. heymonsi</i>	16–22	18–26	Stocky	Obtusely-pointed	Smooth	–	+	Usually +	+	Usually +	Basal	2	–
<i>M. maculifera</i>	12, 13	?	Moderately stout	Rounded	2 rows of tubercles, scattered laterally	+	–	–	+	–	Basal	1	?
<i>M. marmorata</i>	19–21.5	21–23	moderately stocky	Bluntly rounded	Smooth, sometimes feebly pustular	–	+	+	+	+	To disks, T4, preaxial T2 and T3 to disk as fringe	2	++
<i>M. mixtura</i>	22	25	Stout	?	Smooth with tubercles	–	±	–	+	+	None	2	–
<i>M. nanapollexa</i>	?	16.63	Slender	Rounded	Smooth	++	+	+	+	+	To disks, T4, T3, and preaxial T2 to disk as fringe	1	++
<i>M. ornata</i>	18–27	20–28	Moderately slender	Obtusely pointed	Smooth or slightly tubercular	–	–	–	–	–	Basal	2	–
<i>M. palmipes</i>	16	22	Slender	Rounded	Smooth or slightly tubercular	++	+	–	+	–	Just beyond distal tubercle T3	2	+
<i>M. perparva</i>	10–12	13–15	Moderate	?	Smooth	++	+	–	+	+	To disks except T4	1	++
<i>M. petrigena</i>	14–16	15–18	Moderately stout	?	Smooth, flank and posterior tubercles	++	+	±	+	+	To disks except T4	1	++
<i>M. picta</i>	to 29	To 31	Stout	Rounded	Smooth or slightly warty	–	–	–	–	–	Basal	2	–

APPENDIX I. CONTINUED

	Male SVL (mm)	Female SVL (mm)	Habit	Snout profile	Dorsum skin	Fl	Fdisk	F median groove	Tdisk	T median groove	Web	MTT	Tibians
<i>M. pulchra</i>	24-30	29-35	Stout	Obtusely pointed	Smooth, feebly granular	-	-	-	-	-	Not beyond distal tubercle of T3	2	+
<i>M. pulchra</i>	17.5-19.5	19-20	Moderately stocky	Bluntly rounded	Smooth, sometimes feebly pustular	-	+	+	+	+	To disks; T4, T3, and preaxial T2 to disk as a fringe	2	++
<i>M. superciliana</i>	?	12	Slender	Rounded	Smooth	-	+	-	+	+	To disks except T4	2	+
<i>Micryletta inornata</i>	21-25.5	25-30	Moderately stout	Blunt	Smooth or slightly shagreened	+	-	-	-	-	None	1	-

* It is unknown whether the singleton specimen of *M. fissa* is male or female.