Catalogue of American Amphibians and Reptiles.

Nowacki, A.M. and T.M. Doan. 2012. *Phyllobates terribilis*.

Phyllobates terribilis Myers, Daly, and Malkin 1978
Golden Poison Dart Frog, Terrible Poison Dart Frog

Phyllobates terribilis Myers, Daly, and Malkin 1978: 313. Type-locality, "lowland rain forest at Quebrada Guanguí, about 0.5 km above its junction with Río Patia, 100–200m elevation, in upper Río Saija drainage, Department of Cauca, Colombia." Holotype, American Museum of Natural History (AMNH) 88876 (field no. CWM 11920), an adult male, collected 18–19 February 1973 by C.W. Myers and J.W. Daly (not examined by authors).

Dendrobates terribilis: Laschat, Narjes, and Overman 1994:348. Invalid emendation.

• **CONTENT**. No subspecies are recognized.

• **DEFINITION**. *Phyllobates terribilis* is a relatively large dendrobatid with males reaching up to 45 mm SVL. Females are slightly larger and can attain a maximum SVL of 47 mm. Males mature at roughly 37 mm and females at 40–41 mm SVL. The males have a shallow subgular vocal sac which is typically indicated by small, grey expansion wrinkles at the base of the throat. Males also have well-developed vocal slits on the floor of the mouth. Measured from the base, the third finger is longest and the first finger is next, followed by the roughly equal length second and fourth. The skin is smooth to finely rugose or finely granular, turning conspicuously rugose to very coarsely granular on the upper surfaces of the hind limbs. Body coloration is nearly uniform and constant despite light or temperature changes. The range of colors observed at the type-locality include pale metallic green, pale greenish yellow, pale yellow, golden yellow, golden orange, and orange (Myers et al. 1978). Another site also has a turquoise cream morph (Lötters et al. 1997). Dorsally the color is uniform along the body and limbs with few exceptions, including black digit tips, usually black edging on the lower rim of the tympanum and often black edging along the mouth and creases of limb segments. Ventrally the color is the same or slightly lighter than the dorsal color aside from the black palms, soles, and seat patch. The call of *Phyllobates terribilis* is described as a long melodious trill. Laboratory recordings show the call is comprised of a uniform train of notes produced at a rate of 13 per second. The dominant frequency is about 1800 Hz (Myers et al. 1978).

Freshly hatched larvae have an average total length of 11.1 mm and have uniformly grey bodies and throats, turning pale grey on the tail. At around stage 37, when the hind limbs have become fairly well developed, the tadpole is an average total length of 35.4 mm. At this stage the tadpole becomes much darker

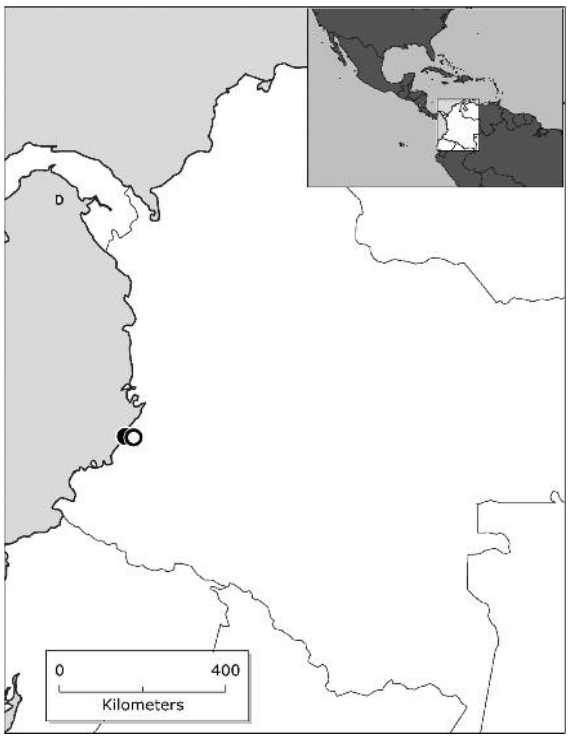
FIGURE 1. Two adult *Phyllobates terribilis* in captivity (photograph by Marc van Doorn).

blackish-gray with bronze dorsal flecking. The flecking is particularly concentrated into two dorsolateral stripes that diverge from the snout, pass over the eyes, and extend to the tail base. Metamorphosis occurs at roughly 13 mm SVL and juveniles retain the dorsolateral stripes until they reach an SVL of 20 mm (Myers et al. 1978).

• **DIAGNOSIS**. *Phyllobates terribilis* can be distinguished from its sister species *Phyllobates bicolor* primarily by size and color pattern. *Phyllobates bicolor* is significantly smaller; the mean SVL for *P. terribilis* is 41.05 mm for males, 43.23 mm for females, whereas the respective values for *P. bicolor* are 36.17 mm for males and 38.9 mm for females. In *P. bicolor* the venter and extremities are darker (usually black) than the dorsum while *P. terribilis* is unicolor. *Phyllobates terribilis* also possesses higher amounts of the skin toxin batrachotoxin (Lötters et al. 1997). Other characters that can be used to distinguish the 2 species include tibia length (shorter in *P. terribilis*), head width (narrower in *P. terribilis*), and finger discs (slightly smaller in *P. terribilis*). These characters have some overlap, however, and are less reliable (Myers et al. 1978).

• **DESCRIPTIONS**. A brief description of the coloration of the frog and its use by the Chocó Indians can be found in Myers and Daly (1983). Lötters et al. (1997) included a more detailed description of the coloration and size of *Phyllobates terribilis*. Daly et al. (1980) described the levels of batrachotoxin in the skin secretions after various lengths of time. Myers et al. (1978) included thorough descriptions of external morphology, coloration, osteology, tadpoles, juveniles, and vocalizations.

• **ILLUSTRATIONS**. Photographs of three color morphs appeared in Lötters et al. (1997); other photographs are in Myers et al. (1978) and Zimmermann and Zimmermann (1985). Myers and Daly (1983) included a drawing and Zimmermann and Zimmer-



Map. Distribution of *Phyllobates terribilis* in Colombia. The circle indicates the type-locality and the dot indicates the only other known locality.

mann (1985) included illustrations of courtship and oviposition. Zimmermann and Zimmermann (1985) also included photographs of an adult carrying a tadpole and a clutch of eggs/tadpoles. Myers et al. (1978) included photographs of a stage 40 tadpole, juveniles showing various stages of color change, and the poisoning of a dart on a frog's back. Zimmermann and Zimmermann (1985, 1992) provided sonograms of advertisement and courtship calls.

Color photographs of adults are in Andriantsiferana et al. (2005), Barceloux (2008), Bartlett (2003), Clark (2009), Killeen (2007), Moffett (1995), Obst et al. (1988), and Steven and Overman (2007), and black-and-white photographs are in Barceloux (2008), Daly (1998), Duellman and Trueb (1986), and Myers et al. (1978).

• **DISTRIBUTION**. The known range of *Phyllobates terribilis* is very limited. It can be found in a small area in Pacific coastal Colombia, at the western foot of a northerly inclined spur of the Cordillera Occidental at an elevation of 50–200 m. The type-locality is a small tributary to the Río Saija, and other sites are in the Río Saija drainage basin or the proximity of its mouth.

• **FOSSIL RECORD**. No fossils are known.

• **PERTINENT LITERATURE**. Myers et al. (1978) provided a very comprehensive account including morphology, osteology, habitat, distribution, natural history, skin secretions, skin texture, and a description of the tadpole. Other references listed by topic include: **behavior** (Hödl and Amezquita 2001), **captive husbandry** (Martel et al. 2011; Nogge 2004; Zimmermann and Zimmermann 1992), **conservation** (Bolívar and Lötters 2004; Caporale 1995; Furrer and Corredor 2008; Killeen 2007; Nijman and Shepherd 2010; Rueda-Almonacid 1999; Zimmermann and Zimmermann 1992, 1994), **disease** (Forzán et al. 2008; Miller et al. 2008), **distribution** (Acosta-Galvis 2000; Duellman 1999; Lötters et al. 1997; McCain and Sanders. 2010; Ruiz-Carranza et al. 1996), **morphology** (Glaw and Vences 1997; Lötters et al. 1997; Myers 1982; Myers and Daly 1983; Neuwirth et al. 1979), **reproduction** (Brown et al. 2010; Zimmermann and Zimmermann 1985), **systematics and phylogeny** (Darst et al. 2005; Glaw and Vences 1997; Grant et al. 2006; Hagman and Forsman 2003; Han 2008; Lahanas 1992; Lötters et al. 1997; Maxson and Myers 1985; Santos 2009; Santos et al. 2003; Toledo et al. 2007; Widmer et al. 2000), **toxins** (Barceloux 2008; Clarke 1997; Daly 1995, 1998a,b; Daly et al. 1980, 1987, 2003; Dumbacher et al. 2004; Gusovsky and Daly 1988; Gusovsky et al. 1986, 1987, 1988, 1992; Hollingsworth et al. 1986; Jones et al. 1999; Laschat et al. 1994; Lovenberg and Daly 1986; Müller 1996; Myers and Daly 1983; Riston

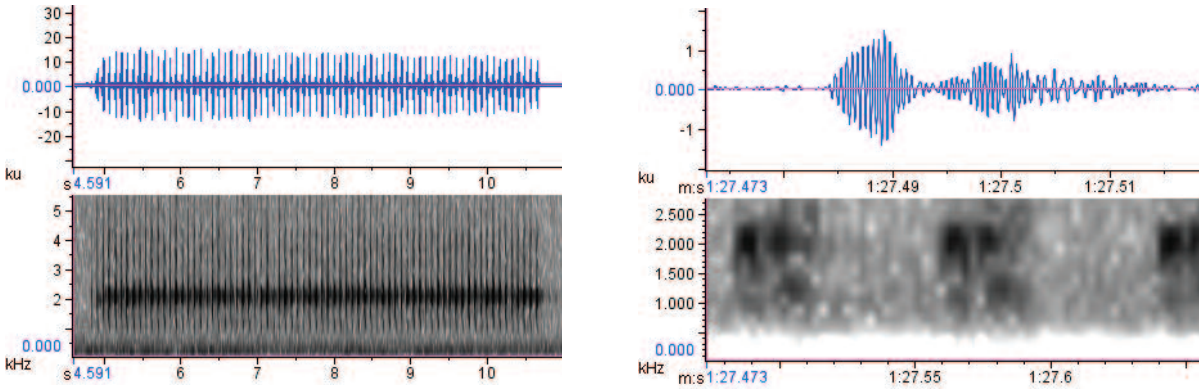


Figure 2. Wave form and audiospectrogram of *Phyllobates terribilis*. The call rate is 3.5 calls/minute; call duration is about 5.7 s; each call is comprised of notes and/or publses ranging from 0.002–0.011 s in duration. Dominant frequency is 1361–2320 Hz. Provided by W. Ronald Heyer, Smithsonian Institution, and based on recordings by Charles W. Myers and John W. Daly provided by the American Museum of Natural History.

2006; Steven and Overman 2007; Tokuyama and Daly 1983), and **vocalizations** (Erdtmann and Amézquita 2009; Zimmermann and Zimmermann 1985, 1992).

• **REMARKS**. These frogs produce a massive quantity of the potent neurotoxin batrachotoxin; a single frog may yield up to 1900 μg (Daly et al. 1980). They are therefore at least 20 times more toxic than other *Phyllobates*, and presumably as a result bolder and less secretive (Myers and Daly 1983). The putative source for this toxin are melyrid beetles of the genus *Choresine* (Dumbacher et al. 2004). Native tribes recognized the potency of the poison and poison their darts by rubbing them along the back of a living frog, coating the dart tip (Myers and Daly 1983; Myers et al. 1978). The toxin also means that wild specimens should be handled with great care. The frogs themselves are not sensitive to the effects of batrachotoxin (Daly et al. 1980) but they are able to contract infections of *Batrachochytrium dendrobatidis,* ranavirus, and *Aeromonas* bacteria (Miller et al. 2008).

• **ETYMOLOGY**. The specific name *terribilis* is a Latin adjective meaning “terrible” or “frightful”, in reference to the potency and amount of the batrachotoxin secreted by this species. The name also alludes to the fear once evoked by the poisoned blowgun darts of a warlike people (Myers et al. 1978).

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