

mo, additisque multis in hunc Amphibiorum ordinem observationibus. Sumptibus C. G. Lüderitz, Berolini.

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APPENDIX

List of synonyms for both *Neusticurus bicarinatus* and *Crocodylus amazonicus*. It includes the Latin binomen and references mentioned in the text plus all references we found where the Latin binomen *Crocodylus lacertinus* was used. It is not exhaustive for *N. bicarinatus*.

Neusticurus bicarinatus (Linnaeus, 1758)

Lacerta bicarinata Linnaeus, 1758:201 (holotype UUZM 70; Type locality "Indiis" in error); Gmelin, 1789: 1060.

Lacerta Bicarinata; Daubenton, 1782:680, 706; La Cèpède, 1788: *Synopsis methodica Quadrupedum Oviparum*, 266; Bonnaterre, 1789:39.

Tupinambis lacertinus Daudin, 1802:85.

Thorictis bicarinatus; Wagler, 1830:153.

Teius A. [da] Bicarinata; Gray, 1831:29.

Neusticurus bicarinatus; Duméril and Bibron, 1839:64; Boulenger, 1885:381; Goeldi, 1902:537–548; Cunha, 1961:118; Uzzell, 1966:281; J. A. Peters and Donoso-Barros, 1970:206; Hoogmoed, 1973:28, 330; Hoogmoed and Lescure, 1975:160; Hoogmoed, 1979:278; Gasc, 1990:54; Avila-Pires, 1995:421; Jorge da Silva and Sites, 1995:900; Ulber, 1996:iv; Gorzula and Señaris, 1999:157.

Neusticurus rudis; Gasc, 1990:55 (part.).

Crocodylus amazonicus Spix, 1825

"Le lézardet" (non Daudin, 1802); Cuvier, 1816:26, 1824:263, 1829:27.

Crocodylus amazonicus Spix, 1825:19, pl. XXI (holotype ZSMH 638/0; type-locality: São Paulo de Olivenças, Rio Solimões, Brazil); Boie, 1826:119; Fitzinger, 1827:746; Wiegmann, 1834:8; Gray, 1838:278.

Crocodylus ocellatus Spix, 1825:20, pl. XXII, fig. 1 (syn-types RMNH 3394 and ZSMH 639/0; type-locality: São Paulo de Olivenças, Rio Solimões, Brazil).

Crocodylus lacertinus (non Daudin, 1802); Wagler, 1830:153; Peters, 1877:411, 414; Guichenot, 1855:29; Boulenger, 1885:380; Goeldi, 1902:546; Burt and Burt, 1931:326, 1933:60; Hellmich, 1960:81; Cunha, 1961:116; Vanzolini and Valencia, 1965:20; Donoso-Barros, 1968:118; Rand and Humphrey, 1968:3; J. A. Peters and Donoso-Barros, 1970:102; Vanzolini, 1972: 105; Hoogmoed, 1973:28; Hoogmoed and Lescure, 1975:157; Müller, 1976:540; Hoogmoed, 1979:278; Vanzolini, 1981:XXI; Hoogmoed and Gruber, 1983: 392; Lescure, 1977:55; 1986:114; Ayala, 1986:571; Gasc, 1990:54, 75; Avila-Pires, 1995:535; Jorge da Silva and Sites, 1995:900; Ulber, 1996:iv; Gorzula and Señaris, 1999:150.

"Le Crocodilure lézardet" (non Daudin, 1802); Cocteau, 1835:586.

"C[rocodylure] des Amazones"; Cocteau, 1835:586.

Crocodylus Lacertinus (non Daudin, 1802); Duméril and Bibron, 1839:46; Gray, 1845:25.

Crocodylus lacertina (non Daudin, 1802); Crump, 1971:20.

Crocodylus lacertinus (non Daudin, 1802); Jégu and Keith, 1998:33.

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Barycholos savagei: A Junior Synonym of *Paludicola ternetzi*, with Notes on Development

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Alípio de Miranda-Ribeiro (1874–1939) was one of the foremost Brazilian naturalists of his era and published extensively on all vertebrate groups. Regarding anurans, several of his papers appeared in a Brazilian farm journal, *O Campo*, which had a very limited circulation. Although most of these papers were reprinted in 1955 (Arq. Mus. Nac. Rio de Janeiro, 42), many published species names have been overlooked, misinterpreted, or not associated with any biological entity, as seen below.

Paludicola ternetzi was described by Miranda-Ribeiro (1937) based on a female specimen at the Museu Nacional, Rio de Janeiro (MNJR 488; Fig. 1), collected at "Vão do Maranhão," State of Goiás, Brazil, on March 1923, by Carlos Ternetz. The relatively detailed description, among other characters, refers to an sternal apparatus with double xiphisternum, each half ending in a curved, cartilaginous plate.

Bokermann (1966) transferred the species to the genus *Physalaemus* without comment and probably only because the genus *Paludicola* was synonymized with *Physalaemus* by Parker (1927). The combination *Physalaemus ternetzi* was used again by Lynch (1970, 1971), who associated the species with the *Physalaemus cuvieri* group.

The genus *Barycholos* was proposed by Heyer (1969) to accommodate one species, *B. pulcher* (Boulenger, 1898), known from the Pacific lowlands of Ecuador (Frost, 1985). This genus was considered most closely related to *Eleutherodactylus* but characterized by the absence of a groove on the outer circumference of the toe discs (present in *Eleutherodactylus*) and by having a posteriorly bifid mesosternum with a calcified style, each half bearing a cartilaginous xiphisternum (the mesosternum is a cartilaginous plate in *Eleutherodactylus*).

A second species in the genus, *Barycholos savagei*, was described by Lynch (1980) based on specimens housed at the Muséum national d'Histoire naturelle, Paris (MNHN) and at the National Museum of Natural History, Smithsonian Institution, Washington, DC (USNM). The specimens were collected between the Rio Tapirapé and Conceição (MNHN 1946–328, holotype; USNM 130184, paratype), and at Bananal and Rio Vermelho (MNHN 1946–327 plus 327 a–k, USNM 130182–130183, paratypes), all localities in the State of Goiás, Brazil. *Barycholos savagei* and *B. pulcher* were diagnosed from *Adenomera*, the *fuscus* group of *Leptodactylus*, *Lithodytes*, and *Vanzolinius* by having calcified, stylelike sterna which bifurcate posteriorly and support separate xiphisternal elements. *Barycholos savagei* differs from *B. pulcher* by having a tarsal fold instead of a tarsal tubercle, a sharp canthus rostralis



FIG. 1. Holotype of *Barycholos ternetzi*, MNRJ 0488 (SVL 34.4 mm).

(indistinct, rounded in *B. pulcher*), and lacking vocal slits and vocal sac (sometimes absent in *B. pulcher*). Furthermore, there is a large geographic hiatus (3250–3350 km) between the species.

The early species of Miranda-Ribeiro (1937), *Paludicola ternetzi*, was overlooked in the checklist of Gorham (1974), Frost (1985), and Duellman (1993), although it is listed in the catalog of Harding (1983). Meanwhile, no additional specimens of *P. ternetzi* have been referred to in the literature, nor have any specimens entered collections since the original description.

Comparison of specimens currently identified as *Barycholos savagei* (Fig. 2), from several localities in the states of Tocantins, Goiás, Mato Grosso, and Minas Gerais (see Appendix), with the holotype of *Paludicola ternetzi*, indicate that they are conspecific. All diagnostic characters, including the unique architecture of the pectoral girdle (a character mentioned in all previous descriptions), the morphology of the vomerine teeth paths, and the T-shaped terminal phalanges are shared by both taxa. Other morphological characters such as snout shape, shape of canthus rostralis, supratympanic fold, shape of tympanum, dermal dorsolateral fold, shape and relative lengths of fingers and toes, shape and size of finger and toe discs, texture of skin, tubercles of the hand and foot, and shape of choanae, also are shared by the holotype of *P. ternetzi* and the purported specimens of *B. savagei*. Consequently, we consider *Barycholos savagei* Lynch, 1980, a junior synonym of *Paludicola ternetzi* Miranda-Ribeiro, 1937, and species to the genus *Barycholos*, under the combination *B. ternetzi* (Miranda-Ribeiro, 1937).

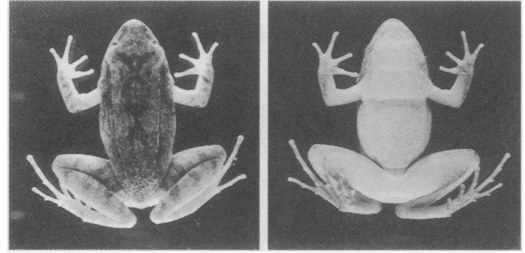


FIG. 2. Adult male of *Barycholos ternetzi* (MNRJ 19831) from municipality of Porangatú, State of Goiás. Dorsal and ventral views.

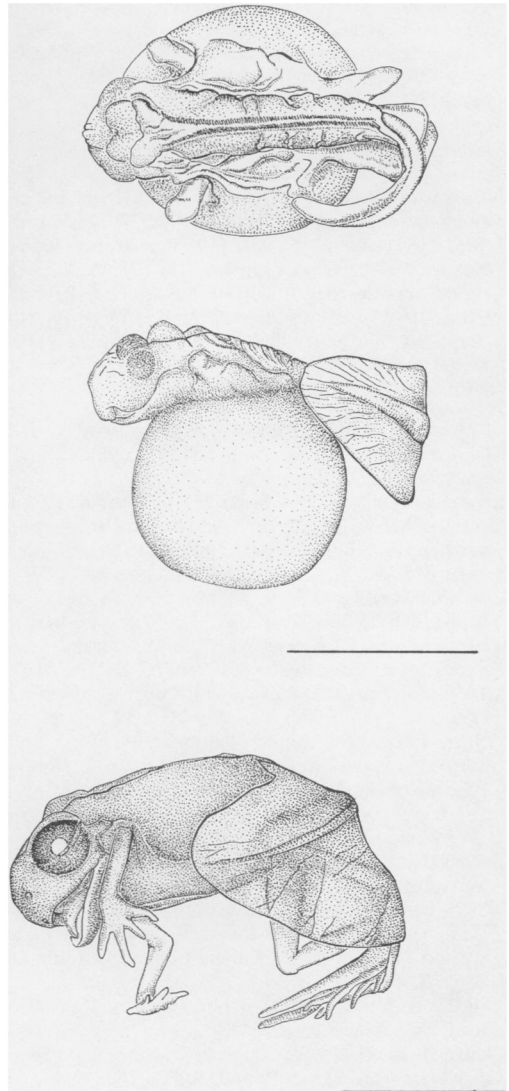


FIG. 3. Embryos of *Barycholos ternetzi* from municipality of Porangatú, State of Goiás. Dorsal (upper), lateral (middle) views of early, and late (bottom) development stage. Scale 2.0 mm.

Lynch (1980) used a purported absence of vocal sac and vocal slits as diagnostic characters for *B. savagei*. However, he examined only subadult males (20.3–22.2 mm SVL). Adult males (\bar{x} = 26.04 mm SVL, SD = 0.98; range 24.5–28.3 mm; N = 14) have a well-developed subgular vocal sac (Fig. 2B) and perfectly defined vocal slits. The description of *B. savagei* by Lynch (1980) perfectly agrees with *B. ternetzi* in all other characters.

Barycholos ternetzi undergoes direct development. Two egg clutches (see below) were collected at BR 153 highway, between 360 and 365 km, municipality of Porangatú, State of Goiás, on 4 January 1979, by J. Jim and U. Carmaschi. Two adult males (MNRJ 19826 and 19828; 25.7 and 25.5 mm SVL) were found just beside the eggs, which may suggest paternal care. The egg surfaces were covered with soil particles. Soil particles may improve the concealment of the eggs, although clutches were found in a situation where camouflaging would seem unimportant; also, soil particles may prevent desiccation of the eggs (Pombal et al., 1994; Pombal, 1999). Sometimes the eggs adhered to each other in groups of three to four. A few eggs did not develop or had mold. Mold is common in terrestrial egg clutches (see Lynn and Lutz, 1946a,b).

Egg jelly consisted of two membranes. Eggs were found in two different development stages, suggesting that two different clutches were laid side by side. The earliest developmental stage is comparable to stage 7 of *Eleutherodactylus coqui* (Fig. 3 upper and middle; Townsend and Stewart, 1985). Features are eyes not completely pigmented; yolk surfaces not pigmented; mouth present; limbs developed, but fingers and toes not developed yet; long tail with large fin; 2.9 mm head–body length, yolk diameter 2.3 mm. The late developmental stage found is similar to *E. coqui* stage 14 or 15 (Fig. 3 lower; Townsend and Stewart, 1985) with eyes and eyelids developed; limbs, fingers, and toes developed; metacarpal and metatarsal tubercles visible; subarticular tubercles not present; long tail with a large nonpigmented fin; tongue and nostrils developed; a single egg tooth; 4.5 mm head–body length, 2.8 mm tail. An egg tooth has been reported for *Eleutherodactylus* (Leptodactylidae), *Discodeles* (Ranidae), *Stefania* (Hylidae; see Thibaudeau and Altig, 1999), and *Brachycephalus* (Pombal et al., 1994; Pombal, 1999).

Barycholos pulcher was thought to have direct development by Heyer (1969) because a female contained 43 large ova, about 2.8 mm diameter. Herein, we reported the direct development in *B. ternetzi*. We suggest that direct development is a very important character shared by *Barycholos* and *Eleutherodactylus*.

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APPENDIX

List of specimens examined (CFBH, C. F. B. Haddad Collection, Universidade Estadual Paulista, Rio Claro, SP, Brasil; MNRJ, Museu Nacional, Rio de Janeiro, RJ, Brasil; MZUSP, Museu de Zoologia, Universidade de São Paulo, SP, Brasil).

Barycholos ternetzi.—BRAZIL: Goiás: "Vão do Maranhão" (MNRJ 488, holotype); Paraíso do Norte (MNRJ 19831–19837); Porangatu (MNRJ 19826–19828; MNRJ 19829, 19830, eggs); São Miguel (MNRJ 700); Niquelândia, Serra da Mesa (CFBH 2559–2560, 2562, MNRJ 19820–19825, MZUSP 69752, 69754, 69756–69757, 69758–69759, 69762–69767, 69771); Niquelândia, Serra Negra (MZUSP 69760); Serra da Mesa, Ponto 1 (MZUSP 71416–71530); Serra da Mesa, Ponto 2 (MZUSP 71781–71790); Serra da Mesa, Ponto 3 (MZUSP 72108–72152); Serra da Mesa, Ponto 4 (MZUSP 72575–72576); Goiás Velho (MZUSP 23539–23541); Santa Rita do Araguaia, Fazenda Babilônia (MZUSP 66684, 66685); Santa Rita do Araguaia, Fazenda Mutum (MZUSP 66740); km 16 da Estrada Goiás Velho–Aruanã (MZUSP 12627); Porto Real, Cór-

rego Salobro (MZUSP 66484–66485); Jataí, Fazenda Aceiro (MZUSP 25302); Gurupi (MZUSP 58316–58317); Caldas Novas, UHE Corumbá (MZUSP 75039–75106); Chapada dos Veadeiros, Fazenda do Claro (MZUSP 80934–80935); Silvânia, Eflex (CFBH 2664).

Distrito Federal.—Brasília, Fercal (MNRJ 24017, 24018).

Mato Grosso.—Cachoeira Couto de Magalhães (MZUSP 66840, 66841–66842).

Tocantins.—Porto Nacional (MZUSP 69926).

Minas Gerais.—Nova Ponte, Reserva do Jacob (MNRJ 19787–19788, 19789–19792, 19793, 19794–19809, 19810–19813, 19814–19815); Presidente Olegário, Fazenda Vereda Grande (CFBH 2521–2523, MNRJ 19816–19817, 19818–19819); Uberlândia, Córrego do Costinha (MNRJ 19786); Uberaba (MNRJ 24019).