

## Revision of the *Hyphessobrycon heterorhabdus*-group (Teleostei: Characiformes: Characidae), with description of two new species from Venezuela

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### > Abstract

Five valid species of the *Hyphessobrycon heterorhabdus*-group are recognized as occurring in Venezuela: *Hyphessobrycon diancistrus*, *H. sovichthys*, *H. fernandesi*, and two new species from Caribbean coastal drainages, *H. paucilepis* and *H. tuyensis*. A redescription of *H. fernandesi* is included and a neotype is designated. The distribution of these species is analyzed and a key is provided to aid identification.

### > Resumen

Se reconocieron cinco especies válidas pertenecientes al género *Hyphessobrycon* grupo *heterorhabdus* en Venezuela: *Hyphessobrycon diancistrus*, *H. sovichthys*, *H. fernandesi*, y dos nuevas especies de cuencas de la costa caribeña, *H. paucilepis* y *H. tuyensis*. Se incluyen la redescipción de *H. fernandesi*, para lo cual se designa un neotipo. Se analiza la distribución del grupo y se suministra una clave taxonómica de las especies.

### > Kurzfassung

Fünf valide Arten der *Hyphessobrycon-heterorhabdus*-Gruppe sind für Venezuela nachgewiesen. *Hyphessobrycon diancistrus*, *H. sovichthys*, *H. fernandesi* und zwei neue Arten aus Küstenflüssen der caribischen Region: *H. paucilepis* und *H. tuyensis*. Eine Wiederbeschreibung von *H. fernandesi* ist eingeschlossen und ein Neotypus wird für *H. fernandesi* festgelegt. Die Verbreitung dieser Arten wird analysiert und ein Bestimmungsschlüssel gegeben.

### > Key words

Caribbean, Coastal, Lara, Yaracuy, Tuy, tropical fish.

## Introduction

Currently about 110 nominal species are included in the genus *Hyphessobrycon* DURBIN, 1908 (GARCÍA-ALZATE & ROMÁN-VALENCIA, 2008). These usually small to tiny fishes are widely distributed from southern Mexico to the Río de la Plata in Argentina. The genus was proposed by DURBIN (1908) using *Hemigrammus compressus* MEEK, 1904, the northern most representative of the genus, as type and the combination of the following characters as a diagnosis: lateral line incom-

plete, adipose fin present, maxilla with few or no teeth, third infraorbital not in contact with preopercle, two series of premaxillary teeth with five teeth in its inner row and caudal fin naked. At present this diagnosis is obsolete and the genus requires re-description.

No phylogenetic definition of the genus exists, so the inclusion of species using the combination of characteristics is without practical application today. Some authors have proposed the recognition of species groups based on shared color or pigmentation patterns (GÉRY, 1978; WEITZMAN & PALMER, 1997). The *heterorhabdus*-group is defined by the presence of a dark stripe along the mid-axis of the body. WEITZ-

MAN & PALMER (1997) note that such features seldom include information that is useful for phylogenetic analysis.

Seventeen species of *Hyphessobrycon* have been reported from various parts of Venezuela, including the Orinoco, Río Negro, Maracaibo and Caribbean drainages, and three species are included in the *H. heterorhabdus*-group: *H. diancistrus* WEITZMAN, 1977; *H. sovichthys* SCHULTZ, 1944 and *H. fernandezi* FERNÁNDEZ-YÉPEZ, 1972.

Although we recognize that the species groups based on pigmentation patterns are probably artificial, we see no other viable alternatives at this time and continue our studies of *Hyphessobrycon* with this taxonomic revision and re-description of Venezuelan species with a black lateral stripe.

## Methods

Specimens were examined from the following museums: **Venezuela:** Museo de Biología, Instituto de Zoología Tropical, Universidad Central de Venezuela, Caracas (MBUCV); Museo de Historia Natural, La Salle, Caracas (MHNLS), Museo Ciencias Naturales, Universidad Experimental de los Llanos Occidentales "Ezequiel Zamora", Guanare (MCNG) and Colección de Peces de la Universidad Experimental Centrooccidental "Lisandro Alvarado", Barquisimeto (CPUCLA). **Colombia:** Laboratorio de Ictiología de la Universidad del Quindío, Armenia (IUQ), Instituto de Ciencias Naturales–Museo de Historia Natural, Universidad Nacional de Colombia, Bogotá (ICN–MNH). **USA:** Academy of Natural Sciences of Philadelphia (ANSP), California Academy of Science, San Francisco (CAS), National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM). **México:** Colección de peces del Instituto de Biología de la Universidad Nacional Autónoma de México (IB–UAM–P). **UK:** The Natural History Museum, London, formerly British Museum (Natural History) (BMNH). The number of specimens per lot is given in parentheses.

All measurements were taken point to point. Counts were taken using a stereoscope. Counts and measurements were taken on the left side of specimens when possible (Table 1), and followed procedures outlined by WEITZMAN & MALABARBA (1999). Measurements are expressed as percent Standard Length (SL) or Head Length (HL). Some counts and measurements of type material of *Hyphessobrycon compressus* and *H. diancistrus* were taken from digital photographs, using the Scion Image program for Windows version

4.0.3.2. The 21 morphometric characters used in this work (Tables 1–3) were analyzed using the Burnaby method to eliminate the influence of overall size, using the Past program, version 1.82, for Windows. The counts for dorsal–fin rays did not assume the presence of a small vestigial ray, and were either ii, 9–ii, 8, i or iii, 8.

Bones and cartilage were observed in cleared and stained specimens (abbreviated as C&S) using methods modified from those published by TAYLOR & VAN DYKE (1985). Bone nomenclature follows WEITZMAN (1962) and VARI (1995). Vertebral counts were obtained from both cleared and stained material as well as radiographs. The first four vertebrae were considered as components of the Weberian apparatus.

## Material examined

***Hyphessobrycon compressus*:** **México:** BMNH 1905.12.6.4–5 (paratype), (2); Obispo, Vera Cruz. ANSP 124774; (12), río Usumacinta casi unido con Pasión, cerca Sayache. IB–UAM–P 8538, (2); Trinitaria, Flor de Café, Chris. ANSP 124774; (3) (C&S), río Usumacinta casi unido con Pasión, cerca Sayache, 18 Aug. 1961. ***H. diancistrus*:** **Colombia:** BMNH 1977.1.12.1–2 (paratypes), (2); río Vichada. MBUCV–V 902, (3) (C&S); Venezuela, río Cataniapo, aguas abajo del caño Colorado, río abajo de la comunidad de San Pedro, Amazonas. **Venezuela:** MBUCV–V 14065, (2); Caño Las Pavas, afluente del río Cataniapo, Amazonas, 05°34'00"N, 67°30'36"W. MBUCV–V 14109, (26); río Cataniapo, puerto de la Comunidad Las Pavas, Amazonas, 05°36'00"N, 67°30'37"W. MBUCV–V 14235, (60); Puente río Cataniapo, puente carretera Puerto Ayacucho–Samaripapo, Amazonas, 05° 36' 30"N, 67° 35' 33"W. MBUCV–V 14279, (9); río Cataniapo, 200 m río arriba del puerto de la comunidad de Las Pavas, Amazonas, 05° 36' 00"N, 67° 30' 37"W. MBUCV–V 14298, (4); río Cataniapo, 200 m río arriba del puerto de la comunidad de Las Pavas, Amazonas, 05° 36' 00"N, 67° 30' 37"W. MBUCV–V 14484, (373); río Cataniapo, 200 m río arriba del puerto de la comunidad de Las Pavas, Amazonas, 05° 36' 00"N, 67° 30' 37"W. MBUCV–V 14644, (7); río Cataniapo, 200 m río arriba del puerto de la comunidad de Las Pavas, Amazonas, 05° 36' 00" N, 67° 30' 37"W. MBUCV–V 24479, (17); río Cataniapo, raudal Rabipelado, carretera Puerto Ayacucho–Gavilán, Amazonas, 05° 33' 08"N, 67° 20' 52"W. MBUCV–V 25058, (2); Puente río Cataniapo, puente carretera Puerto Ayacucho–Samaripapo, Amazonas, 05° 36' 30"N, 67° 35' 33"W. MBUCV–V 28874, (4); río Cataniapo, comunidad Cucurital, Amazonas. MBUCV–V 30747, (2); río Cataniapo, caño Gavilán, playa arenosa, Amazonas. MBUCV–V 30835, (17); río Cataniapo, aguas abajo del caño Colorado, río abajo de la comunidad de San Pedro, Amazonas. MBUCV–V 30837, (2); río Cataniapo, playa aguas arriba del caño Pendare, Amazonas. MBUCV–V 30852, (2); río Cataniapo, playa fango-arenosa, río arriba de Gavilán, Amazonas. MBUCV–V 30861, (27); Caño Gavilán, en playa al lado

izquierdo a lh. de la comunidad de Gavilán, Amazonas. MBUCV-V 30867, (6); Caño Gavilán, laja en Cucurital, aproximadamente 1/2 hr. de Gavilán, Amazonas. MBUCV-V 30914, (18); río Cataniapo, raudal Buisainaca, apróx. 2 km arriba de la boca caño Gavilán, Amazonas. MBUCV-V 31644, (1); Alto río Cataniapo, raudal Sarama Sota, Amazonas. MBUCV-V 31647, (1); río Cataniapo, en el puerto de la Comunidad de Las Pavas, Amazonas. MBUCV-V 31670, (2); Caño Culebra, afluente del río Cataniapo, Amazonas. MBUCV-V 31944, (34); Boca del caño Vaquiro, afluente del río Cataniapo, Amazonas. **H. *sovichthys*: Venezuela:** MBUCV-V 6907, (7); Quebrada entre río Misoa, Pueblo viejo, Zulia. MBUCV-V 906, (2 C&T); Préstamo de la hacienda Berlín, Municipio Bartolomé de las Casas, Zulia. MBUCV-V 907, (4 C&T); Caño La Guardia, balneario abajo del puente, carretera Casigua-Maracaibo, Zulia. MBUCV-V 6926, (11); Área de Manglar, cerca de Altagracia, Zulia. MBUCV-V 7499, (1); Hacienda El Triunfo, cerca de Bachaquero, Zulia. MBUCV-V 8863, (22); Préstamo vía de Plan Bonito a Sabana de Machado, Municipio V. Rodríguez, Zulia. MBUCV-V 8863, (22); Municipio V. Rodríguez. MBUCV-V 9212, (5); Préstamo de la hacienda Berlín, Municipio Bartolomé de las Casas, Zulia. MBUCV-V 13302, (1); Caño El Sargento, caserío El Sargento, carretera vía a Carrasquero, Zulia. MBUCV-V 15072, (38); Cañada Riecito, tributario del río Guaco, Distrito Perijá, Zulia. MBUCV-V 17030, (1); Venezuela, Fundo Los Cojoreños río Guasare, fundo Los Cojoreños, cerca Carrasquero, Zulia. MBUCV-V 18267, (88); río Cachirí, en compuerta de la Hacienda La Abeja, cerca del Embalse Cachirí Tulé, Zulia. MBUCV-V 8287, (205); Río Palmar, en hacienda El Milagro, NW de la Villa del Rosario, pie de Monte Sierra de Perijá, Zulia. MBUCV-V 18318, (10); río Limón, departamento Rosas NW de Carrasquero, Zulia. MBUCV-V 18331, (465); río Santa Ana, hacienda río Grande, Distrito Perijá, Zulia. MBUCV-V 22726, (2); Aguas Clara, Complejo Hidrográfico (01), Lago de Maracaibo, Quebrada Agua Clara, 45 km al N de Cúcuta, Zulia. MBUCV-V 24107, (1); Monte Alto, Cueva de Monte Alto, refugio de fauna Silvestre Cuare, Falcón. MBUCV-V 27347, (60); río Limón, paso de Zanzibar, E de Carrasquero, Zulia. MBUCV-V 29776, (48); Caño La Guardia, balneario abajo del puente, carretera Casigua-Maracaibo, Zulia. MCNG 201, (2); río Socuy, Central hidrológica, Zulia. MCNG 202, (17); Lagunas de Tulé, Maracaibo, Zulia. MCNG 2524, (6); Préstamo al oeste de la hacienda Ciegón, Maracaibo, Zulia. MCNG 2571, (8); Gran Eneal al norte de Sinamaica, Zulia. MCNG 2584, (10); Camino del oleoducto, noreste del puente, Zulia. MCNG 2619, (13); Pozo en la región de Don Bosco, Zulia. MCNG 2719, (1); dentro de los manglares, en la carretera que vía de Sinamaica al Parador de Sinamaica, Zulia. MCNG 2779, (6); Alcantarilla que pasa por debajo de la carretera entre Don Bosco y la costa, Dto. Mara, Maracaibo, Zulia. MCNG 2804, (4); Afluente del río Socuy, cruzando la carretera de San Felipe de Guasare, Maracaibo, Zulia. MCNG 2841, (11); Carretera hacia Perijá en Km 440, en ciénagas, Zulia. MCNG 8665, (9); Pozo en la vía hacia Los Claros, Zulia. MCNG 8682, (1); río Palmar cerca Hacienda El Cigarrón, Zulia. MCNG 8922, (114); Préstamo vía la represa de Tulé, Zulia. MCNG 10658, (2); Préstamos cerca de la represa de Tulé, Zulia. MCNG 10660, (24); Desierto Nor-Oeste de Maracaibo, en un préstamo vía Tulé, Zulia. MCNG 24870, (1); Río Chiquito o Caño Seco, afluente del Río Zulia, Zulia. MCNG 24912, (7); Cañito afluente del Río Causa 2 Km. al Sur de la carretera, Trujillo. MCNG 24938, (1); río Tarra en el puente, Zulia. MCNG 24976, (9); Caño Kanticoory al Norte del puente sobre el río Catatumbo, Zulia. MCNG 25030, (16); río Cocuiza en el Puente, Crta. 3, Zulia, MCNG 25659, (10); Caño Guacara al Norte de Sanare, (aprox. 3 Km.) en el puente, Falcón. MCNG 32153, (1); río Muyapa en Muyapa, en sitio ubicado aproximadamente 8 Km río arriba y otro sitio 5 Km río abajo de Nueva Bolivia, Zulia. MCNG 32179, (80); Río Chama en Puerto Chama, Zulia. MCNG 32212, (1); Caño casi seco al sur de Santa Cruz, Zulia. MCNG 32216, (1); Caño La Yuca en la desembocadura del río Escalante, al sur de Santa Cruz, Zulia. MCNG 32331, (2); Caño Taguara o Tivi, entre Santa Ana y Catatumbo, Santa Ana. MCNG 32907, (286); vía Quisiro, por carretera al oleoducto, Zulia. MCNG 32912, (112); Saliendo de la población de Sartanejo, Zulia, MCNG 32938, (1); después del caserío Negro Bartolo, vía al embalse de Tulé, Zulia. MCNG 32945, (13); Vía al Río Cachirí antes de llegar a Los Caños, Zulia. MCNG 33020, (3); río Santa Rosa en puente de la carretera 6, Zulia. MCNG 33026, (26); Hacienda El Delirio en la vía a Encontrados, Zulia. MCNG 33034, (145); río Mene después del caserío El Guanábano, Zulia. MCNG 33082, (2); vía a la playa de Quisiro, Zulia. MCNG 33078, (5); después del caserío El Corralito, Falcón. MCNG 33281, (12); Préstamo a 6,4 Km antes de llegar a la alcabala de El Vigía a Santa Bárbara, Mérida. MCNG 42742, (30); La Yuca, 50 km al sur sureste de Encontrados, Zulia. **Colombia:** ICNMMNH 2360, (5); Pozo anóxico aislada del río Catatumbo, aguas abajo corregimiento La Gabarra, Río La Gabarra cuenca del río Catatumbo, Norte de Santander. IUQ 2304, (1); Préstamo entre Curarí y Píritu crta. 3 en la entrada de un camino de granzón (al Norte), Falcón. IUQ 2305, (1); Pozo anóxico aislada del río Catatumbo, aguas abajo corregimiento La Gabarra, Río La Gabarra cuenca del río Catatumbo, Norte de Santander. **H. *fernandezii*: Venezuela:** MBUCV-V 904, (4) (C&S); Caño pequeño margen izquierdo de la carretera Puerto Cabello-Morón, detrás de la estación de electricidad, Yaracuy. MBUCV-V 2716, (1); Caño Boca la Vieja, carretera boca de Aroa-Tucacas, Falcón. MBUCV-V 15078, (14); Caño pequeño margen izquierdo de la carretera Puerto Cabello-Morón, detrás de la estación de electricidad, Yaracuy. MBUCV-V 24210, (6); Río Alpagatón, Estación PZ 7/8 bajo la laguna de Yeso, Carabobo. MBUCV-V 24222, (1); Río Yaracuy, bajo el puente Yaracuy. MBUCV-V 24232, (6); Río Yaracuy (boca), Yaracuy. MBUCV-V 24246, (1); Río Sanchón, carretera Puerto Cabello-Morón, Carabobo. MBUCV-V 27676, (2); Río Urama, aprox. 1 km arriba del puente carretera Morón-San Felipe, Carabobo. MBUCV-V 24113, (106); Caño Dieguito, bajo el puente, vía Tocuyo, Refugio de Fauna Silvestre de Cuare, Falcón. MBUCV-V 24117, (5); Caño Dieguito, bajo el puente, vía Tocuyo, Refugio de Fauna Silvestre de Cuare, Falcón. MBUCV-V 24118, (2); Río Tibana, a nivel de la Sabana de Cuare, Refugio de Fauna Silvestre de Cuare, Falcón. MCNG 14058, (44); Quebrada Chupa, finca de Víctor Atria cerca de Aroa, en la vía a Duaca, Yaracuy. MCNG 27614, (1); Río Yurubí cerca entrada Guayabito, Yaracuy. MCNG 32126, (6); Caño Minapo, al norte de Palma Sola aprox. 4 Km, Falcón. MCNG 52207, (3); Canal en la planta procesadora de granos en Payara, Portuguesa.

MCNG 52216, (1); Un caño después del canal en la vía a Payara, Portuguesa. MCNG 41736, (1); Río Portuguesa, La Aduana vía a Nueva Florida, Portuguesa. MCNG 33071, (13); Vía a Casigua por el oleoducto, Falcón. MCNG 33086, (23); Vía a Bariro, antes de llegar a Agropecuaria El Bao, Falcón. MCNG 33091, (7); Vía a Borojó, Falcón. MCNG 19696, (21); Préstamo entre Curarí y Piritu crta. 3 en la entrada de un camino de granzón (al Norte), Falcón. CPUCLA 0093, (9); Punta Agüide, Desvío vía Mirimire Capadare, Falcón, 11° 21' 12.6''N, 68° 41' 36''W. CPUCLA 0532, (33), vía Carora-El Venado, aproximadamente a 1 km de Puricaure, vía Quebrada Arriba, Lara, 10° 06' 26.6''N, 070° 28' 9.3''W. CPUCLA 0562, (13); Puente cerca poblado Santa Bárbara, vía interna Yumare-Tucacas, Falcón, 10° 44' 20.5''N, 68° 29' 3.1''W. CPUCLA 0688, (2); Hacienda Los Rastrojos, Falcón, 10° 42' 21.2''N, 068° 27' 37.9''W. CPUCLA 0777, (1); Río Galápagos, sector Los Lirios, Yaracuy, 10° 34' 24.5''N, 68° 49' 59.4''W. CPUCLA 0931, (39); Tacarigua, Vía a la vía de Coro, Falcón, 11° 01' 12.0''N, 68° 24' 20.9''W. CPUCLA 0963, (1); Río Crucito, Vía Marín Yumare. Sector Crucito. 1 km del asfalto, vía Palma Sola. Gran Puente Rojo, Yaracuy, 10° 33' 27.6''N, 068° 37' 43.9''W. Colombia: IUQ 1965, (2 C&T); Embalse Tacarigua, cuenca del río Tocuyo, Falcón, 11° 01' 12.0''N, 68° 24' 20.9''W. IUQ 2302, (1 C&T) Río Yaracuy (boca), Yaracuy. IUQ 2303, (2 C&T); Quebrada Chupa, finca de Víctor Atria cerca de Aroa, en la vía a Duaca, Yaracuy.

## *Hyphessobrycon* DURBIN, 1908

**Type species.** *Hyphessobrycon compressus* (MEEK, 1904: 87).

**Distribution.** As currently understood this genus ranges from southern México to Río de la Plata in Argentina.

## *Hyphessobrycon diancistrus* WEITZMAN, 1977

(Tab. 1, Fig. 1, 4–6)

*Hyphessobrycon diancistrus* WEITZMAN, 1977, description, Type locality: Vichada River, Orinoco drainage, approximately 4°14'N, 70°20'W, 50 km. west of San José de Ocué.

**Description.** Morphometric and meristic data presented in Table 1. Body long, not deep, fusiform. Dorsal profile of head curved from snout to supraoccipital, partially concave from this point to dorsal-fin origin, curved from base of last dorsal ray to base of adipose thence straight to base of caudal. Ventral profile of head and body convex from snout to anal-fin base. Head short but snout elongate, fitting twice in HL;

jaws equal; mouth terminal: lips soft and flexible, covering externally outer row of premaxilla teeth; ventral portion of upper jaw straight; posterior limit of maxilla not reaching anterior margin of orbit.

**Osteological characters.** Premaxilla with two rows of teeth and short, rounded lateral process that inserts between nasal and mesethmoid. Three teeth of outer row tricuspid, and arranged in a line (fig. 4). Internal row with six heptacuspids that diminish gradually in size (fig. 5). Maxilla long, anterior ventral margin convex, toothless (fig. 4), posterior ventral margin straight, not in contact with infraorbitals. Metapterygoids with upper border wide and with a laminar prolongation at the upper dorsal edge, and with two foramina in the posterior region. Ectopterygoids reduced, not in contact with the quadrate, and with the upper margin concave (fig. 6).

Six infraorbitals present, the first fusiform and laterally concave, the third, the longest of the series, with its ventral margin concave, the shape of the fifth infraorbital, the widest of the series, suggests fusion with the sixth. Antorbital anteriorly semi convex and with a wide ventral section. Supraorbital absent. Mesethmoid longer than wide, its anterior margin inserted over the posterior surface of the premaxilla.

Rhinospheoid bony, united to orbitospheoides by a band of cartilage, united ventrally with dorsal margin of paraspheoids. Orbitospheoid bony, elongated anteriorly, with a small rounded apophysis on the antero-ventral section, a small rounded foramen is present near the junction with the pterospheoids. Paraspheoid united to ventral surface of vomer by cartilage; extreme posterior tip of paraspheoid in contact with the basioccipital and united to prootic by a band of cartilage. Nasal bones present.

22 total gill-rakers; 15 in the upper limb and seven in the lower limb. Dorsal-fin margin straight. Proximal pterygiophores of dorsal-fin rays inserted between neural spines 7 to 17; anal fin with 16 proximal pterygiophores the first two inserted between hemal spines 13 and 14, and the fifth to seventh inserted between hemal spines 15 and 16. Five thin elongate supraneurals and 14–15 epipleurals.

Cleithrum elongate, its posterior border rounded, located under ventral edge of opercle. Posttemporal with upper tip sharp, extrascapular fusiform. Three proximal radials. Pelvic fin short, its tip not reaching anal-fin origin. Elongate pelvic bone situated parallel to central axis of body. Caudal fin bifurcate with long pointed lobes, Principal caudal rays 1/17/1 with 8/8 procurrents. Scales cycloid. Caudal and anal fins without scales. 35–36 vertebrae.

**Sexual dimorphism.** Males with pair of bony hooks on first segment of third unbranched ray and first



Fig. 1. *Hyphessobrycon diancistrus*, paratype: BMNH 1977.1.12.1, 23.13 mm SL male, Río Vichada, Colombia. Scale = 0.5 cm.

Tab. 1. Morphological and meristic data for *H. diancistrus*. Standard and total length in mm. Mean in parentheses.

	Paratypes	Non types
	BMNH 1977.1.12.1–2	
	n = 2	n = 70
Standard length	23.13–23.53 (23.33)	21.65–35.70 (30.10)
Total Length	27.92–29.09 (28.50)	27.35–42.96 (37.60)
<b>Percent Standard Length:</b>		
1. Body depth	17.93–19.80 (18.87)	18.64–27.18 (23.70)
2. Snout–dorsal fin origin	49.85–50.06 (49.96)	48.23–58.25 (52.29)
3. Snout–pectoral fin origin	25.68–26.82 (26.25)	22.6–30.79 (25.95)
4. Snout–pelvic fin origin	46.7–47.64 (47.18)	42.83–52.77 (48.91)
5. Snout–anal fin origin	64.51–66.71 (65.61)	48.53–71.19 (65.56)
6. Dorsal fin–hypurals	48.78–52.10 (50.44)	44.19–55.33 (49.86)
7. Dorsal fin–anal fin	23.75–25.51 (24.63)	18.15–29.45 (24.66)
8. Dorsal fin–pectoral fin	30.04–32.68 (31.37)	29.65–40.99 (36.14)
9. Dorsal fin length	19.33–24.99 (22.16)	18.21–27.34 (22.53)
10. Pectoral fin length	14.23–19.33 (16.78)	13.57–23.54 (18.11)
11. Pelvic fin length	14.78–16.90 (15.85)	12.49–19.57 (16.06)
12. Anal fin length	13.13–17.12 (15.13)	12.95–18.74 (16.55)
13. Caudal peduncle depth	8.32–8.34 (8.33)	7.94–12.24 (9.79)
14. Caudal peduncle length	16.73–17.93 (17.33)	12.84–18.56 (15.59)
15. Head length	21.50–24.64 (23.07)	12.06–28.98 (25.17)
<b>Percent Head Length:</b>		
16. Snout length	21.40–24.31 (22.86)	23.49–66.67 (29.13)
17. Eye diameter	38.94–42.69 (40.82)	33.29–84.38 (42.02)
18. Post orbital head length	33.85–33.99 (33.93)	31.36–83.48 (40.48)
19. Maxilla length	27.89–32.61 (30.65)	26.22–81.98 (37.54)
20. Interorbital width	31.57–35.38 (33.48)	32.64–80.48 (42.74)
21. Upper jaw length	16.84–18.77 (17.81)	17.20–49.55 (22.27)
<b>Meristic data:</b>		
Lateral scales	33	32–34
Pored lateral line scales	9	9
Scales between lateral line and dorsal fin	6	6
Scales between lateral line and anal fin	5	5
Scales between lateral line and pelvic fins	4	4
Predorsal scales	12	12
Dorsal fin rays	–	ii, 9
Anal fin rays	–	iii, 14–20
Pelvic fin rays	–	ii, 7–8
Pectoral fin rays	–	ii, 10

branched ray of anal fin; 11 or 12 spines present on second to fifth branched rays, and 6–8 pairs of spines on pelvic-fin rays.

**Color in alcohol.** see WEITZMAN (1977).

**Geographic distribution.** Vichada and Cataniapo River drainages, upper river Orinoco basin (fig. 13).

**Comments:** We noted small differences in the pigmentation pattern of the caudal fin among paratypes. The species was described as having dark spots at the base of both caudal lobes, but the paratypes we examined have a dark spot only on the upper caudal lobe. The principal component analysis (fig. 9) shows that this species is distinguished from other Venezuelan members of the *H. heterorhabdus* species group in axis 1 by body depth vs. length, and in axis 2 by the length of the dorsal and anal fins, the upper jaw and the snout. The first axis explains 89.93 % of total variation, while the first and second combined explain 96.47 %.

## *Hyphessobrycon sovichthys* SCHULTZ, 1944

(Tab. 2, Fig. 2, 4–6)

*Hyphessobrycon sovichthys* SCHULTZ, 1944, description, Type locality: Ciénaga de Guanábana, 10 km. N of Sinamaica, approximately 10° 05'N and 72° 28'W, Maracaibo drainage, (Zulia state); GÉRY (1978): 474, reference in key.

**Description:** Morphometric and meristic data given in Table 2. Body short and deep, robust. Dorsal profile of head and body straight from snout to supraoccipital, from this point to origin of dorsal fin slightly curved, straight from base of last dorsal-fin ray to base of caudal fin. Ventral profile of head and body convex from snout to base of anal fin. Body short, snout short and rounded. Jaws equal; mouth terminal; lips soft and flexible, not covering externally external row of premaxilla teeth; ventral margin of upper jaw straight; posterior limit of maxilla not reaching anterior edge of third infraorbital.

**Osteological characters.** Premaxilla with long and pointed lateral process, inserted between nasal and lateral margin of mesethmoid. Teeth in two rows, outer with four tricuspid teeth, arranged in a irregular line. Inner row with five pentacuspoid teeth that diminish gradually in size (fig. 5). Maxilla short, undulated anteriorly, curved posterior and with one heptacuspoid tooth. Posterior tip of maxilla in contact with anterior

margin of second infraorbital (fig. 4). Dentary with posterior dorsal and ventral borders rounded, the postero-dorsal margin convex; with 8–9 teeth on its antero-dorsal margin; four large pentacuspoid teeth anteriorly, followed by 4–5 tricuspid teeth that diminish in laterally. Metapterygoid with upper border wide and with two laminar prolongations on dorsal margin, a foramen in the posterior region, and a band of cartilage on the anterior side anterior that unites it with the quadrate and ventro-posteriorly with the hyomandibular. Hyomandibular with anterior margin concave. Ectopterygoids short and wide, in contact with quadrate, with band of cartilage along entire posterior margin. Mesopterygoid reduced with convex upper edge (fig. 6).

Six infraorbitals present, the first fusiform, anterior and posteriorly concave, the second with four small foramina arranged in a line in the antero-medial region, the third is the longest but it is in contact with the sensory canal of the preopercle. Antorbital convex anteriorly, the ventral part wide. Supraorbital absent. The mesethmoid has undulated lateral edges and is inserted between the anterior surfaces of the premaxilla in dorsal view. Supraoccipital process short. Elongate nasal bone present.

Rhinospheonoid cartilaginous. Orbitospheonoids bony, elongated anteriorly and with a small rounded apophysis on ventro-anterior part, and a rounded foramen on the ventral edge. Parasphenoids long and not divided, united to ventral surface of vomer by means of cartilage; posterior tip of parasphenoid in contact with basioccipital and with prootic by band of cartilage.

Basihyal bony. Pharyngeal plate short. 16 total gill-rakers, 11 in the upper limb and five in the lower limb. Margin of dorsal fin oblique, small vestigial, sharp projecting ray present just anterior to dorsal fin. Proximal pterygiophores of dorsal fin rays inserted between neural spines 9 to 16; proximal pterygiophores of the anal fin 18, the first two inserted between hemal spines 12 and 13. Five thin, elongate supraneurals, with cartilage on upper tips.

Pectoral girdle with a sharp dorsal process above the cleithrum, which is elongate. Posttemporal with upper tip pointed and with a bony pointed apophysis on its antero-ventral margin. Four proximal radials. Pelvic fin short, its tip not reaching anal-fin origin. Caudal peduncle robust, caudal fin bifurcate with short pointed lobes. Principal caudal rays 1/18/1 with 8/8 procurrents. Scales cycloid. Caudal fin scaleless. Anal fin with sheath of two rows of accessory scales on base from last two simple rays continuing on first 11 branched rays. 32–33 vertebrae.

**Sexual dimorphism:** Males with six or seven spines on third unbranched anal-fin ray, four to nine hooks on first nine branched anal-fin rays and seven or eight pairs of spines on pelvic-fin rays.



**Fig. 2.** *Hyphessobrycon sovichthys*, topotype, Male, MBUCV-V 29776, 28.85 mm SL, Maracaibo, Zulia, Venezuela. Scale = 0.5 cm.

**Color in alcohol:** Body light yellow, dorsally brown. Dorsal area of head dark. Lateral part of body with strong dark band, continuing from posterior margin of opercle onto central caudal-fin rays. Posterior portion of scales dark. Dorsal and anal fins with small dark dots between rays, pectoral, pelvic and adipose fins hyaline.

**Geographic distribution.** Lake Maracaibo Basin and Caribbean Drainages (fig. 13).

**Comments.** In his description, SCHULTZ (1944) gave no diagnosis, and reported 13 branched pectoral-fin rays and a range of 15–21 branched anal-fin rays; in the specimens examined we count only 11–12 branched pectoral-fin rays, and iii 19–21 anal-fin rays (table 2). No significant differences were detected with the principal component analysis. This species is very similar to *H. fernandesi*, differing in the number of teeth in the inner premaxilla row (five vs. six), in the number of cusps on the maxillary teeth (seven vs. three), by the number of teeth on the dentary (8–9 vs. 10–11), by the number of vertebra (32 or 33 vs. 30), in the number of pored scales in the lateral line (9 or 10 vs. 11 or 12), in the number of dorsal-fin rays (ii, 9 vs. iii, 8), in the number of unbranched anal-fin rays (iii vs. iv–v) and by the distance from the snout to the pectoral fin insertion (16.16–27.67 % SL vs. 27.14–36.30 % SL in *H. fernandesi* and 28.02–32.16 % SL in *H. compressus*).

### *Hyphessobrycon fernandesi* FERNÁNDEZ-YÉPEZ, 1972

(Tab. 2, Fig. 3–6)

*Hyphessobrycon fernandesi* FERNÁNDEZ-YÉPEZ, 1972, description, Type locality: río Yaracuy. RODRÍGUEZ-OLARTE *et al.* (2005): 108, distribution, abundance, use; RODRÍGUEZ-OLARTE *et al.* (2006a): 80, reference, distribution, diet; RODRÍGUEZ-OLARTE *et al.* (2006b): 10, reference, diet, abundance.

**Neotype.** MBUCV-V 34105; (1) Venezuela, Quebrada Cupa, finca de Víctor Atria, Cerca a Aroa en la vía a Duaca, 10° 29' 50"N, 68° 52' 20"W, Yaracuy, 7 Jul. 1985.

**Diagnosis.** This species is distinguished from its congeners in Venezuela by having the combination of four or five unbranched anal-fin rays (vs. iii–iv), three unbranched and 8 branched dorsal-fin rays (vs. two unbranched and nine branched rays, except in *H. notidanos* with iii, 8), six teeth in the inner premaxillary tooth row (vs. 5), 13 branched rays in pectoral fins (vs. 10–11), the absence of the rhinosphenoid (vs. presence) and by having the dark lateral band that fades out at a point beneath the adipose fin and then starts up again as a vertical caudal peduncle blotch that covers the bases of the middle caudal-fin rays (vs. dark lateral band continuous to middle caudal-fin rays).

Tab. 2. Morphometric and meristic data for *H. sovichthys* and *H. fernandezi*. Standard and total length in mm. Mean in parentheses.

	<i>H. sovichthys</i>		<i>H. fernandezi</i>	
	Topotypes	Non types	Neotype	Topotypes
	n = 29	n = 90	MBUCV-V 34105	n = 25
Standard length	21.12–39.01 (26.60)	21.12–39.01 (26.36)	26.61	18.79–28.85 (23.49)
Total length	27.35–39.01 (33.77)	27.35–48.57 (33.49)	32.55	25.13–33.65 (29.61)
<b>Percent Standard Length:</b>				
1. Body depth	31.58–38.46 (34.60)	31.60–41.24 (35.33)	35.36	26.72–38.53 (35.03)
2. Snout–dorsal fin origin	49.26–62.83 (53.45)	49.37–62.83 (53.83)	53.25	46.10–71.41 (56.14)
3. Snout–pectoral fin origin	16.16–27.67 (24.02)	19.96–27.87 (24.82)	27.40	22.14–36.30 (31.97)
4. Snout–pelvic fin origin	47.22–58.05 (51.24)	47.20–58.05 (51.39)	46.45	41.62–52.73 (49.83)
5. Snout–anal fin origin	63.28–77.27 (67.30)	63.28–77.65 (67.66)	63.17	52.27–70.03 (65.45)
6. Dorsal fin–hypurals	48.16–53.38 (51.05)	44.62–57.37 (50.80)	48.63	34.97–59.63 (49.91)
7. Dorsal fin–anal fin	32.79–39.11 (35.37)	32.70–43.16 (36.43)	34.16	27.69–38.48 (33.57)
8. Dorsal fin–pectoral fin	35.72–44.92 (41.38)	35.72–47.09 (41.22)	41.75	34.10–45.61 (40.10)
9. Dorsal fin length	20.45–29.40 (25.83)	20.45–31.14 (26.57)	25.59	21.80–32.56 (26.51)
10. Pectoral fin length	16.11–23.63 (19.48)	16.11–23.63 (20.00)	21.27	15.59–25.78 (19.92)
11. Pelvic fin length	13.91–18.08 (16.08)	13.93–19.46 (16.49)	17.74	11.33–22.36 (17.11)
12. Anal fin length	16.75–27.46 (20.75)	17.23–27.46 (19.31)	20.07	16.87–24.70 (20.43)
13. Caudal peduncle depth	11.11–14.02 (12.32)	11.21–14.14 (12.53)	11.84	5.07–13.26 (10.48)
14. Caudal peduncle length	10.20–17.80 (13.91)	10.20–17.80 (13.63)	10.52	9.49–19.06 (13.02)
15. Head length	28.08–35.95 (31.23)	25.56–35.95 (30.65)	29.88	24.22–33.12 (29.54)
<b>Percent Head Length:</b>				
16. Snout length	21.65–29.60 (25.46)	21.65–32.05 (25.97)	29.14	28.71–42.42 (36.21)
17. Eye diameter	26.76–40.22 (35.83)	26.76–43.62 (37.10)	37.11	32.87–47.43 (37.84)
18. Post orbital head length	19.94–54.02 (42.40)	19.94–51.55 (42.63)	43.27	37.97–66.46 (48.44)
19. Maxilla length	23.07–33.80 (28.49)	23.07–42.55 (30.89)	33.96	21.22–39.39 (28.71)
20. Interorbital width	36.67–50.71 (44.89)	37.14–50.71 (45.86)	41.89	19.03–49.69 (42.46)
21. Upper jaw length	12.36–29.48 (22.35)	14.74–29.48 (22.11)	18.74	15.52–28.47 (22.31)
Lateral scales	30–32	30–32	31	30–31
Pored lateral line scales	9–10	9–10	11	11–12
Scales between lateral line and dorsal fin	5–6	5–6	5	5–6
Scales between lateral line and anal fin	4–5	4–5	4	4–5
Scales between lateral line and pelvic fins	5	5	5	5
Predorsal scales	11	11	10	10–11
Dorsal fin rays	ii, 9	ii, 9	iii, 8	iii, 8
Anal fin rays	iii, 19–21	iii, 19–21	iv, 21	iv, 19–21
Pelvic fin rays	ii, 6–7	ii, 6–7	ii, 7	ii, 6–7
Pectoral fin rays	ii, 10–12	ii, 10–12	ii, 13	ii, 13





**Fig. 3.** *Hyphessobrycon fernandesi*, neotype. MBUCV-V 34105, 26.61 mm SL., river Yaracuy, Venezuela. Scale = 0.5 cm.

**Description.** Morphometric and meristic data presented in Table 2. Body short and deep, robust. Dorsal profile of head and body straight from snout to supraoccipital, oblique from this point to dorsal-fin origin, slightly concave from last dorsal-fin ray to base of caudal fin. Ventral profile of head and body convex from snout to base of anal fin. Caudal peduncle not deep. Head short, snout long. Jaws equal; mouth terminal; lips soft and flexible covering externally the outer row of premaxillary teeth. Ventral margin of upper jaw straight; posterior limit of maxilla not reaching anterior margin of second infraorbital.

**Osteological characters.** Premaxilla with short and rounded lateral process; inserted over lateral margin of mesethmoid. Two rows of premaxillary teeth, the outer row with four tricuspid teeth arranged in a irregular line. Internal row with six teeth; first five pentacuspoid and the last conical (fig. 4). Teeth diminishing gradually in size medially (fig. 5). Maxilla short, convex anteriorly with one tricuspid tooth, posterior margin straight, posterior tip not in contact with infraorbitals. Dentary with dorsal margin convex and ventral margin oblique, the posterodorsal margin rounded, with 10–11 teeth located on its anterodorsal edge. Four large pentacuspoid teeth anteriorly with the second projecting outward. Large teeth followed laterally by one tricuspid tooth, and then 5–6 conic teeth that diminish in size laterally. Meckel's cartilage extends along entire medial surface. A small rounded foramen present in antero-medial region. Metapterygoids with wide upper border and with laminar prolongation on anterodorsal margin and a pointed, bony apophysis on the postero-dorsal edge that unites with the ventral margin of hyomandibular. A small foramen is present in posterior region. Articulations among quadrate, mesopterygoid and hyomandibular without cartilage, there is no fusion. Ectopterygoid in contact with quadrate. Mesopterygoid large with undulated upper margin,

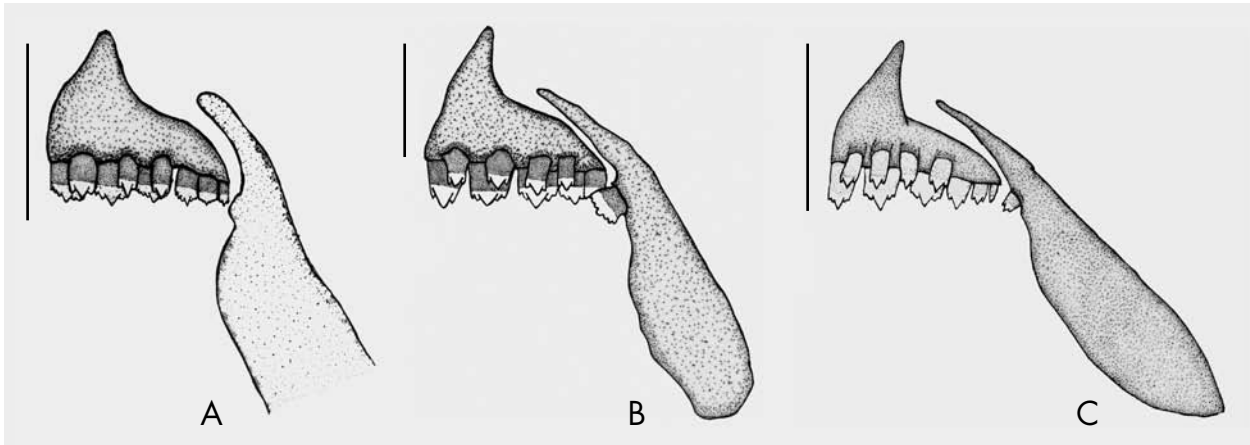
equal length to ectopterygoid. Metapterogoid has a syndesmotic articulation with mesopterygoid (fig. 6).

Six infraorbitals present, the first anteriorly convex and posteriorly straight, the third is the longest and its ventral margin not in contact with preopercle. Antorbital anteriorly convex, upper part pointed. Supraorbital absent. Mesethmoid wider in middle region than at tips, inserted between the anterior surfaces of the premaxillaries in dorsal view. Supraoccipital process long. Nasal bone reduced.

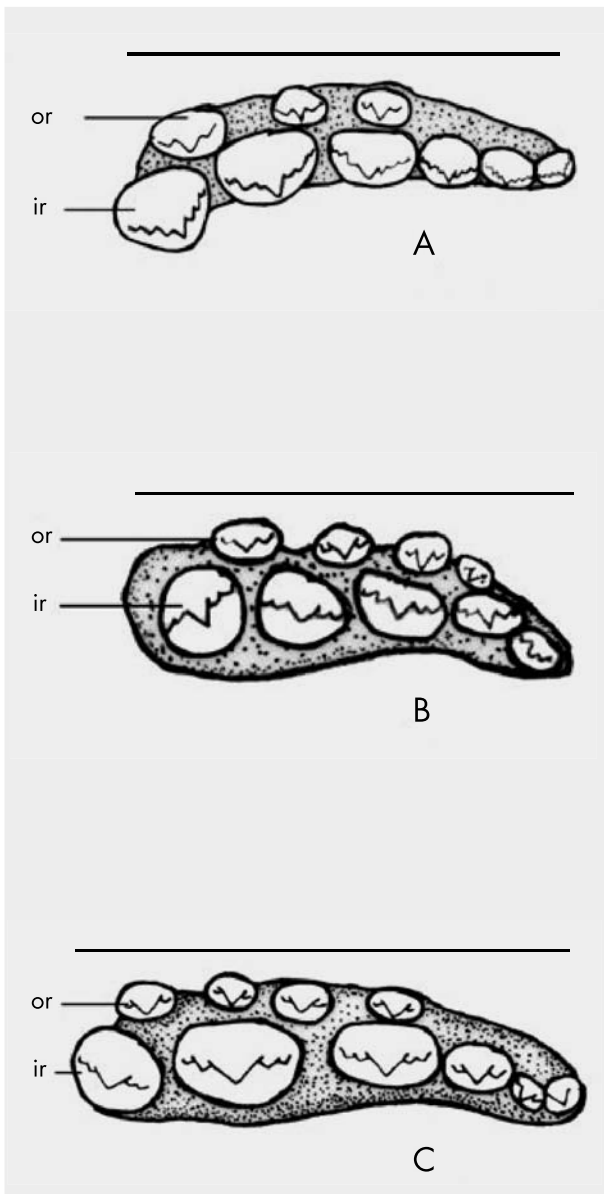
Rhinosphenoid cartilaginous. Orbitosphenoid bony, elongated anteriorly, with a thick rounded apophysis on ventro-anterior portion. Parasphenoid long, united to ventral surface of vomer by means of cartilage. Basihyal cartilaginous. Pharyngeal plate short and curved. 19 total gill-rakers, 13 in the upper limb and six in the lower limb. Margin of dorsal fin oblique, dorsal fin with small bony prolongation similar to anterior vestigial ray. Proximal dorsal-fin pterygiophores inserted between neural spines 6 to 16; proximal anal-fin pterygiophores numbering 20, the first four inserted between hemal spines 12 and 13. Five long supraneurals, thick in upper region and with cartilage at tip.

Pectoral girdle with a sharp dorsal process over cleithrum. Posttemporal with sharp upper tip, and with a bony apophysis at antero-ventral margin. Extrascapular fusiform. Three proximal radials. Pelvic fin short, its tip not reaching origin of anal fin. Caudal fin bifurcate with short lobes. Principal caudal rays 1/18/1 with 8/8 procurent. Scales cycloid. Caudal fin not scaled. Anal fin with sheath of 5–6 accessory scales between last three simple rays and along bases of first six branched rays. 30 vertebrae.

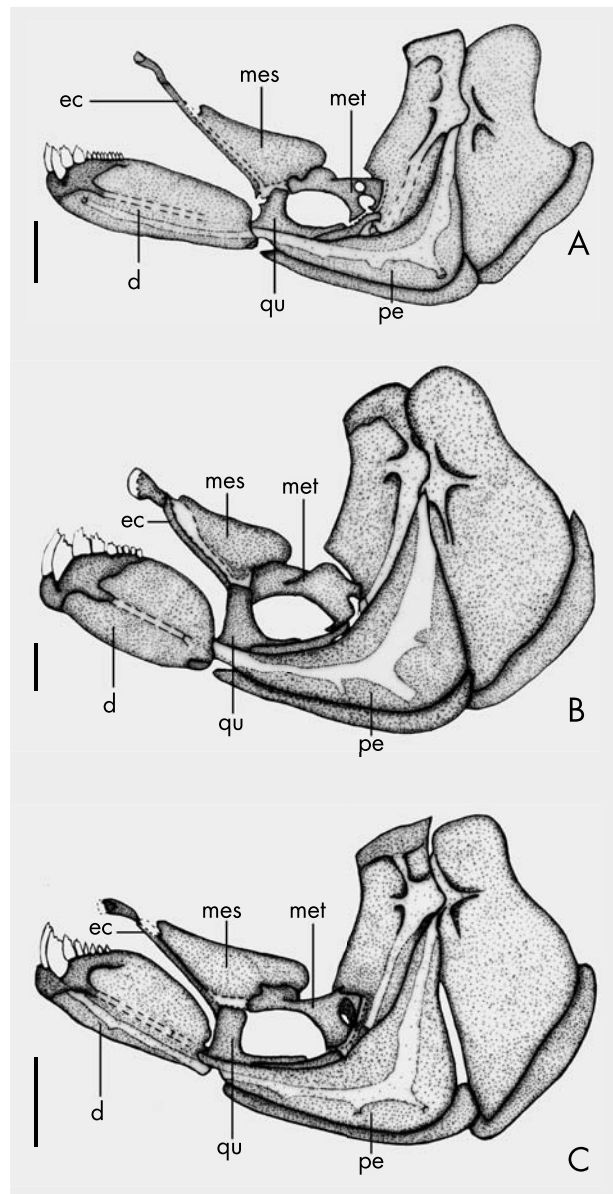
**Sexual dimorphism.** Males with 8–10 spines on fourth unbranched anal-fin ray, 8–12 hooks on first seven branched anal-fin rays and 6–8 pairs of spines on pelvic-fin rays.



**Fig. 4.** Premaxilla and maxilla *H. diancistrus* (A), *H. sovichthys* (B) and *H. fernandesi* (C). Scale = 1 mm.



**Fig. 5.** Ventral view of premaxilla *H. diancistrus* (A), *H. sovichthys* (B) and *H. fernandesi* (C). Scale = 1 mm. **or** = outer row, **ir** = inner row.



**Fig. 6.** Suspensorium of *H. diancistrus* (A), *H. sovichthys* (B) and *H. fernandesi* (C). Scale = 1 mm. **qu** = Quadrate; **d** = Dentary; **ec** = Ectopterygoid; **mes** = Mesopterygoid; **met** = Metapterygoid; **pe** = Preopercle.



**Fig. 7.** *Hyphessobrycon paucilepis* n. sp., holotype: IUQ 1897, 26.77 mm SL. Male, Embalse los Quediches, Lara, Venezuela. Scale = 0.5 cm.

**Color in alcohol.** Body light yellow, brown along dorsum. Dorsal portion of head dark. Infraorbital series and opercle silvery. Lateral part of body with dark band from posterior margin of opercle to point beneath adipose fin where it fades, then strengthens again to continue across caudal peduncle. Dark band in some individuals, extends onto upper and lower procurent rays of caudal fin and through central caudal fin rays. Posterior margin of each scale is darker. Anal fin with small dark dots on posterior tips of rays. Dorsal, pectoral, pelvic and adipose fins hyaline.

**Geographic distribution.** Coastal Caribbean drainages of Venezuela and rio Orinoco River basin (fig. 13).

**Comments.** The validity of this species has been little discussed, unlike other species described by FERANÁNDEZ-YÉPEZ (1972): *Bryconops melanurus* and *B. giacopinii* (CHERNOFF *et al.*, 1994). The identity of *H. fernandesi* was dubious because FERANÁNDEZ-YÉPEZ presented no formal diagnosis, few distinguishing characteristics, and an illustration that showed no diagnostic features. For example the teeth described are typical of any tetragonopterine: two intermaxillary rows and one on the dentary. We assume that by intermaxillary teeth FERANÁNDEZ-YÉPEZ meant premaxillary teeth. He also reported five teeth in the inner intermaxillary row, but we find six; three unbranched anal-fin rays and 18 to 26 branched rays, and 16 (11–17) pored scales in the lateral line, values that all differ from those we found (Table 2).

Since the type material used by FERANÁNDEZ-YÉPEZ (1972) was lost, we designate a neotype from the original type locality, in the context of this re-description.

### *Hyphessobrycon paucilepis*, new species

(Tab. 3 and Fig. 7, 10–11)

**Holotype.** IUQ 1897, 26.77 mm SL; Venezuela, Los Quediches Reservoir, overflow channel, Lara state, 03 sep. 1987.

**Paratypes.** (all from Venezuela) MBUCV-V 23710, (3) collected with holotype. IUQ 1898, (1) (C&S) collected with holotype; MBUCV-V 903, (4) (C&S); Embalse Los Quediches, en la cola del Embalse, Lara. O. Brull and cols. MBUCV-V 23706, (42); Embalse Los Quediches, en la cola del Embalse, Lara. MBUCV-V 6933, (6); Burere, carretera Carora-Cabimas. Lara. CPUCLA 532, (5); Ciénaga de Puricaure vía Carora El Venado, aproximadamente a 1 km de Puricaure, vía Quebrada Arriba, Lara, 10° 06' 26.0" N, 70° 28' 93" W.

**Diagnosis.** *Hyphessobrycon paucilepis* is distinguished from its Venezuelan congeners by having: three unbranched and eight branched rays in the dorsal fin (vs. two unbranched and nine branched rays except in *H. notidanos*, *H. oritoensis* and *H. fernandesi*), a short maxilla (vs. long maxilla), a maxilla with one pentacuspis tooth (vs. maxillary teeth tricuspid), eight teeth on the dentary (vs. 10–19, except in *H. notidanus* and *H. proteus*), a premaxilla with 2–3 teeth in the outer row (vs. 4), 28–29 lateral scales (vs. 30–34), 9 predorsal scales (vs. 12–14), an absence of sexual dimorphism (vs. presence), a dark lateral band that extends from the upper rear margin of the opercle to the caudal peduncle and continues as a rhomboidal peduncular blotch onto the middle caudal fin rays (vs. lateral band lacking rhomboidal caudal peduncle blotch).

Tab. 3. Morphological and meristic data for *H. paucilepis* sp. n. and *H. tuyensis* sp. n. Standard and total length in mm. Mean in parentheses.

	<i>H. paucilepis</i> sp. n.		<i>H. tuyensis</i> sp. n.	
	Holotype	Paratype	Holotype	Paratype
Standard length	26.77	25.49–28.53 (27.16)	30.42	24.14–31.30 (27.31)
Total length	37.79	30.40–38.56 (35.32)	39.2	30.77–41.78 (35.10)
<b>Percent Standard Length:</b>				
1. Body depth	33.77	34.56–41.98 (38.31)	35.21	31.34–41.24 (35.11)
2. Snout–dorsal fin origin	50.54	49.28–57.24 (53.01)	52.79	43.93–56.69 (53.05)
3. Snout–pectoral fin origin	28.24	26.59–34.60 (30.80)	29.42	25.08–35.78 (29.96)
4. Snout–pelvic fin origin	47.22	48.82–58.18 (53.09)	50.76	42.47–55.53 (49.41)
5. Snout–anal fin origin	64.66	67.94–76.23 (71.38)	65.45	56.03–77.65 (65.79)
6. Dorsal fin–hypurals	50.88	47.87–59.40 (52.60)	51.55	44.62–57.37 (51.29)
7. Dorsal fin–anal fin	33.58	36.41–40.17 (38.21)	34.91	32.10–43.16 (36.01)
8. Dorsal fin–pectoral fin	36.98	36.52–44.21 (41.43)	40.43	35.22–47.09 (42.21)
9. Dorsal fin length	36.48	34.95–48.37 (44.09)	23.21	21.96–31.14 (25.52)
10. Pectoral fin length	22.75	17.17–26.60 (21.67)	21.33	16.68–23.86 (20.19)
11. Pelvic fin length	16.62	14.58–23.19 (18.53)	18.47	13.91–19.97 (16.73)
12. Anal fin length	17.52	19.31–23.30 (21.29)	19.63	16.09–25.50 (19.96)
13. Caudal peduncle depth	12.25	9.84–13.69 (11.72)	12.03	10.21–14–14 (11.89)
14. Caudal peduncle length	13.84	13.32–16.08 (14.49)	13.08	10.81–19.30 (14.09)
15. Head length	27.61	27.51–31.97 (29.33)	27.65	16.02–33.90 (28.54)
<b>Percent Head Length:</b>				
16. Snout length	27.17	26.23–29.69 (28.11)	27.11	19.62–39.44 (28.12)
17. Eye diameter	45.21	37.27–46.01 (41.87)	42.93	31.5–72.77 (40.83)
18. Post orbital head length	38.24	27.01–45.73 (35.95)	46.02	39.21–83.46 (49.16)
19. Maxilla length	37.75	32.26–42.59 (36.18)	50.06	25.02–65.90 (37.30)
20. Interorbital width	44.81	42.82–50.32 (45.49)	54.34	36.67–66.41 (46.26)
21. Upper jaw length	25.70	23.31–30.29 (25.70)	20.10	12.36–35.37 (19.84)
Lateral scales	29	28–29	31	30–31
Pored lateral line scales	9	9	7	7–9
Scales between lateral line and dorsal fin	5	5	5	5
Scales between lateral line and anal fin	4	4	4	4
Scales between lateral line and pelvic fins	4	4	4	4
Predorsal scales	9	9	10	10
Dorsal fin rays	iii, 8	iii, 8	ii, 9	ii, 9
Anal fin rays	iii, 20	iii, 20–21	iii, 21	iii, 21–22
Pelvic fin rays	ii, 7	ii, 7	ii, 7	ii, 7
Pectoral fin rays	i, 10	ii, 10	ii, 11	ii, 10–11

**Description.** Morphometric and meristic data given in Table 3. Body long and deep. Dorsal profile of head oblique, slightly curved from snout to supra-occipital, body oblique from this point to dorsal-fin origin, straight from last dorsal-fin ray to base of adipose fin. Ventral profile of head and body convex from

snout to base of anal fin. Head short, snout long; jaws equal; mouth subterminal; lips soft and flexible, covering externally the outer row of premaxillary teeth; ventral part of upper jaw straight; posterior limit of maxilla not reaching anterior margin of second infraorbital.

**Osteological characters.** Premaxillary with long, rounded lateral process, overlaying mesethmoid anteriorly, and with two rows of teeth. Outer with three tricuspid teeth arranged in an irregular line. Inner row with five pentacuspoid teeth that diminish in size gradually. Maxilla long, ventral margin anteriorly convex with one pentacuspoid tooth, posteriorly straight, posterior tip in contact with the first infraorbital (fig. 10). Dentary with dorsal edge curved, ventrally undulated, posterodorsal margin convex; 7–8 teeth on anterodorsal margin; four large anterior teeth pentacuspoid, second projecting outward in all specimens examined, followed by one tricuspid tooth and 1–2 conic teeth that diminish in size medially. Metapterygoids with upper border narrow and with a large laminar prolongation on the dorso-anterior edge. Ectopterygoids long and narrow, not in contact with the quadrate, and with bands of cartilage on their posterior margins. Mesopterygoid large with convex upper edge (fig. 11).

Six infraorbitals present, the third is the longest and widest of the series, and has its ventral margin in contact with the sensory canal of preopercle, the ventral anterior margin reaches the interopercle. Antorbital anteriorly straight and posteriorly concave, upper section rounded. Supraorbital absent. Lateral ethmoid a long, concave bone that is not united to frontal and that extends to unite anteriorly with the vomer. The mesethmoid is wide and short. Epiphyseal bar extremely narrow. Supraoccipital process short. Nasal bone reduced, tubular.

Rhinosphenoid cartilaginous. Bony orbitosphenoid elongated anteriorly, with a wide straight apophysis at ventro-anterior edge; a rounded foramen present at its union with the pterosphenoid. Parasphenoid elongate, united with ventral edge of vomer by a band of cartilage, a band of cartilage present along posterior tip contacting basioccipital and prootic.

22 total gill-rakers, 14 in the upper limb and eight in the lower limb. Dorsal fin margin oblique. A short bony element present just anterior to first ray, similar to a vestigial ray. Proximal dorsal-fin pterygiophores inserted between neural spines 9 to 16; 22 proximal anal-fin pterygiophores the first three inserted between hemal spines 12 and 13. Four elongate supraneurals, thicker near their upper tips, inserted between neural spines 5 to 8. Pectoral girdle with a pointed dorsal process above cleithrum. Posttemporal with upper tip rounded, extrascapular elongate. Four proximal radials. Pelvic fin short, its tip not reaching anal-fin origin.

Pelvic girdle elongates with convex dorsal margin and straight ventral margin; situated parallel to central axis of body, pointed anteriorly. Caudal fin bifurcate with short lobes. Principal caudal rays 1/17/1 with 10/10 procurrents. Scales cycloid. Caudal fin not scaled. Anal fin with a series of six scales between the

last two simple and first eight branched anal-fin rays. 32 vertebrae. No sexual dimorphism observed.

**Color in alcohol.** Body yellow, dorsal region light brown. Snout and dorsal area of head dark. Infraorbital series and opercle silvery. Sides of body with dark lateral band extending from behind upper edge of opercle to caudal peduncle, then continuing as dark rhomboidal peduncular blotch onto middle caudal-fin rays. Posterior portions of scales dark. Anal and dorsal fins with small dark dots on interradial membranes. Pectoral, pelvic and adipose fins hyaline.

**Geographic distribution.** Known only from type locality and small adjacent drainages in Lara state, northern Venezuela (fig. 13).

**Etymology.** The name is from Greek words *pauci* = few and *lepis* = scales, referring to the low lateral and predorsal scale counts of this species.

**Comments.** *Hyphessobrycon paucilepis* is very similar to *H. fernandesi*, but differs in the number of teeth in the inner premaxilla row (5 vs. 6), the number of cusps on the outer tooth of the inner premaxilla series (3 vs. 5), teeth in outer premaxilla row (2–3 vs. 4), on maxilla (2 vs. 1), on dentary (8 vs. 10–11), vertebrae (32 vs. 30), lateral scales 28–29 vs. 30–31, pored scales (9 vs. 11–12), branched pectoral-fin rays (10 vs. 13) and dorsal fin length (34.95–48.37 % SL vs. 21.80–32.56 % SL).

## *Hyphessobrycon tuyensis*, new species

(Tab. 3, Fig. 9, 10–12)

**Holotype.** IUQ 1914, 30.42 mm SL; Venezuela, río Capaya, río Tuy drainage, Miranda, 10° 19' 20" N and 66° 15' 12" W, 17 May 1986. **Paratypes.** (all from Venezuela) MHNLS 9207, (17) collected with holotype; MBUCV-V 3661, (6); río Tuy, en pozo aislado del curso principal cerca de Ocumare del Tuy, Miranda. MBUCV-V 3665, (3); río Tuy, en pozo aislado del curso principal cerca de Ocumare del Tuy, Miranda. MBUCV-V 27964, (5); río Tuy cerca de puerto Turarito, Miranda. MBUCV-V 901, (2) (C and T); río Cuira, afluente del río Tuy, Miranda. MBUCV-V 908, (2) (C&S); río Tuy, pozo aislado del curso principal, cerca de Ocumare del Tuy.

**Diagnosis.** *Hyphessobrycon tuyensis* differs from congeners in having four teeth in the inner premaxilla row (vs. five); seven pored scales in lateral line (vs.



**Fig. 8.** *Hyphessobrycon tuyensis* n. sp., holotype: IUQ 1914, 30.42 mm SL. river Tuy, Miranda, Venezuela. Scale = 0.5 cm.

8–16, except in *H. compressus* with 7–9); six dentary teeth (vs. 7–19); two foramina in maxilla (vs. none); mouth subterminal (vs. terminal); a long bony laminar prolongation on postcleithrum 3 that is  $\frac{3}{4}$  of the length of that bone (vs. bony prolongation small); and a continuous dark lateral band from posterior edge of opercle through central caudal-fin rays (except in *H. sovichthys*).

**Description.** Morphometric and meristic data given in Table 3. Body long, not deep, fusiform. Dorsal profile of head and body oblique from snout to dorsal-fin origin; straight between base of last dorsal-fin ray and caudal-fin base. Ventral profile of head and body convex from snout to anal-fin base. Head short; snout long; jaws equal; mouth subterminal; lips soft and flexible, not covering the outer row of premaxilla teeth. Ventral part of mandible straight; posterior limit of maxilla reaching anterior margin of second infraorbital.

**Osteological characters.** Premaxilla with lateral process short and pointed, inserted over lateral margin of mesethmoid, and with two rows of teeth, the outer row with four tricuspid teeth arranged in a irregular line; the inner with four pentacuspid teeth that diminish gradually in size from inner to outer tooth (fig. 10). Maxilla long, anteriorly convex and undulated, with one lobulate tooth, posteriorly undulated, with two rounded foramina in antero-medial section. A canal is present from the upper foramen and the antero-superior region of the maxilla above the tooth (fig. 10). Dentary with dorsal margin convex and ventrally oblique, upper posterior margin undulated, with 5–6 teeth on upper anterior edge; four large front heptacuspid teeth followed two conic teeth that diminish in size medially. Meckel's cartilage extends along entire medial surface. Metapterygoids with upper border wide and with three laminar prolongations on dorsal margin, and a sharp bony apophysis on ventro-posterior mar-

gin that projects towards symplectic, two foramina present in posterior section. Ectopterygoids long and narrow in contact with quadrate, no bands of cartilage present. Mesopterygoids large and with upper margin undulated, same size as ectopterygoids. Symplectic and quadrate above the preopercle (fig. 11).

Six infraorbitals present, the first inserted underneath second infraorbital and with rounded apophysis on anterior margin, third infraorbital the longest and widest of series, its ventral margin in contact with the sensory canal of preopercle. Antorbital anteriorly convex, posteriorly concave, upper region rounded, in contact with maxilla and first infraorbital. Mesethmoid wider posteriorly. Supraoccipital process long. Nasal bone reduced. In dorsal view the cranium shows a compression of the bones, making the mouth subterminal. Supraorbital absent.

Rhinosphenoid absent. Orbitosphenoid with small foramen in medial region. Parasphenoid elongate and not divided, united along ventral surface with vomer by cartilage; without cartilage at posterior tip. 20 gill rakers on first arch, 12 in the upper limb and eight in the lower limb. Border of dorsal fin oblique. With a small bony element similar to a vestigial ray present just anterior to first dorsal-fin ray. Proximal pterygiophores of dorsal fin inserted between neural spines 9 to 16; 22 proximal anal-fin pterygiophores, the first three inserted between hemal spines 12 and 13. Four elongate supraneurals, thicker in upper region.

Posttemporal with upper tip sharp, extrascapular with anterior region wide. Third postcleithral long and curved with a laminar bony undulated process on posterior margin that is  $\frac{3}{4}$  of the length of third postcleithral (fig. 12). Five proximal radials. Caudal fin bifurcate with long pointed lobes. Principal caudal rays 1/17/1 and 8/8 procurent. Scales cycloid. Caudal without scales. Anal fin with sheath of two series of accessory scales five to six scales in first row and three in second, between the last three simple rays and the first four branched. 32 vertebrae.

**Sexual dimorphism.** Males with 7–10 pairs of spines from fourth unbranched anal-fin ray to sixth branched ray and four or five pairs of spines on first three branched pelvic-fin rays.

**Color in alcohol.** Body light brown, dark brown dorsally. Dorsal area of head dark. Infraorbital series and opercle dark yellow. Sides of body with dark band, continuous from posterior margin of opercle through middle caudal fin rays. No humeral or caudal spots. Small dark dots present at base of anal fin. Posterior margins of scales of dorsal and lateral surfaces delineated with dark chromatophores. Anal and dorsal fins with small dark dots on posterior tips of rays. Pectoral, pelvic and adipose fins hyaline.

**Geographic distribution.** Known only from type locality (fig. 13) in the Tuy River drainage of northern Venezuela.

**Etymology.** The specific name refers to the Tuy River of the Caribbean slope of north central, Venezuela where the type series was collected.

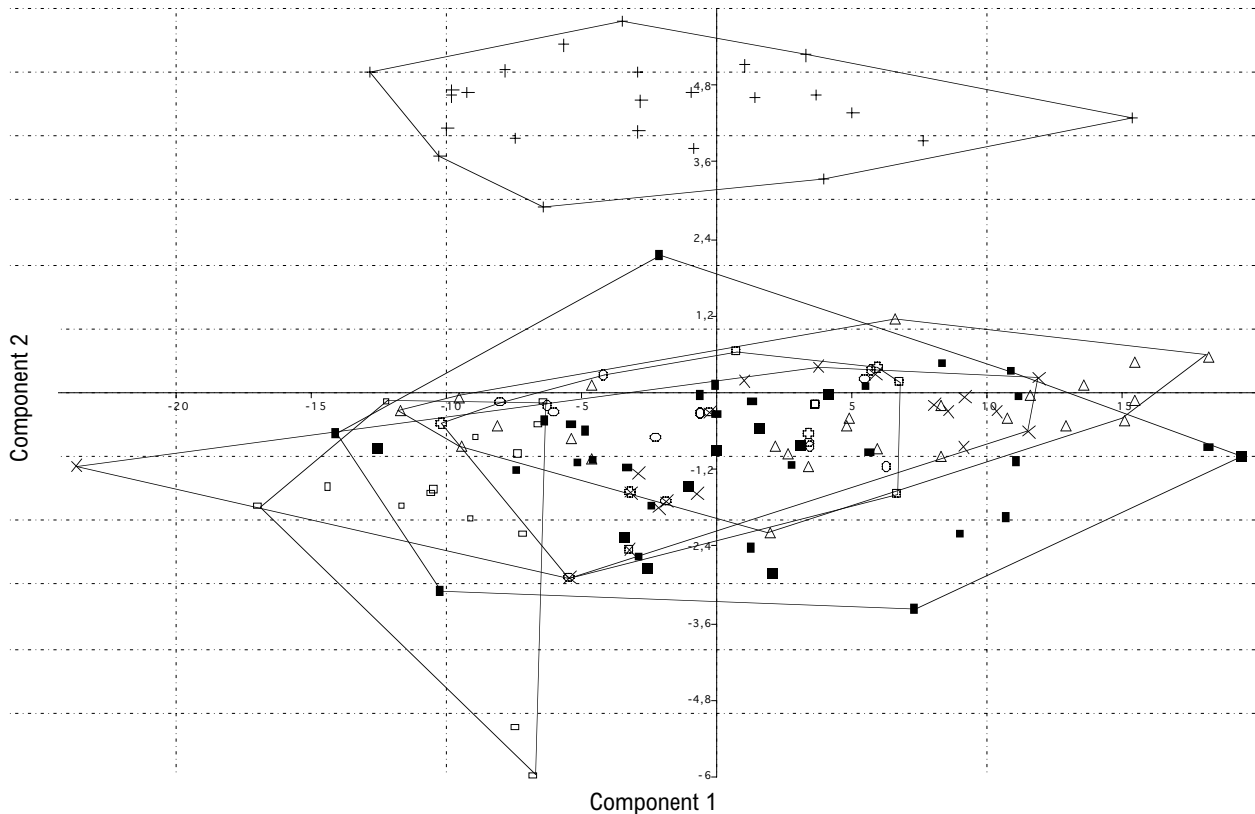
**Comments.** *Hyphessobrycon tuyensis* is restricted in both distribution and abundance in the Tuy River drainage. This species is described using specimens deposited in Venezuelan institutions that were collected during the decades of the 60's and the 80's. Today, their habitat has been strongly impacted by the influx of domestic sewage that has caused severe eutrophication. As a result, the conservation status of this species is probably critical, if indeed it still exists in the wild. This species is very similar to *H. sovichthys* but can be distinguished by the number of cusps on the maxillary teeth (5 vs. 7), the number of dentary teeth (6 vs. 8), vertebra (34 vs. 32), proximal pectoral-fin radials (5 vs. 4), branched anal-fin rays (21–22 vs. 19–21), pored lateral line scales (7–9 vs. 9–10), predorsal scales (10 vs. 11), the distance between the snout and the pectoral fin (25.08–35.78 % SL vs. 16.16–27.67% SL in *H. sovichthys*) and the eye diameter (31.51–72.77 % SL vs. 26.76–40.22 % SL in *H. sovichthys*).

## Key to the species of the *Hyphessobrycon heterorhabdus*-group present in Venezuela

1. Body depth 27 % SL or less; 14–16 branched anal-fin rays; maxillary teeth absent; dark spot present on upper caudal-fin lobe; five infraorbitals present ..... *H. diancistrus*
- 1b. Body depth 28 % or more SL; 17–22 branched anal-fin rays; maxilla with teeth; no spot on upper caudal lobe; six infraorbitals present ..... **2**
2. Anal fin with four unbranched rays; 11–12 pored scales in lateral line; 13 branched pectoral-fin rays; 30 total vertebrae; maxillary tooth tricuspid ..... *H. fernandezii*
- 2b. Anal fin with three unbranched rays; 7–9 pored lateral line scales; 10–12 branched pectoral-fin rays; total vertebrae 32–35; maxillary tooth with 5–7 cusps ..... **3**
3. Maxillary tooth with seven cusps; 9–10 pored lateral line scales; five scales between lateral line and pelvic-fin origin; 11 predorsal scales ..... *H. sovichthys*
- 3b. Maxillary tooth with five cusps; 7–9 pored lateral line scales; four scales between lateral line and pelvic-fin origin; 9–10 predorsal scales ..... **4**
4. Caudal peduncle with dark blotch; eight teeth on dentary; 28–29 lateral scales; nine predorsal scales; premaxilla with 2–3 teeth in outer row; dorsal fin with three unbranched rays and eight branched; adult males without hooks on rays of anal fin (no sexual dimorphism) ..... *H. paucilepis* n. sp.
- 4b. No dark blotch on caudal peduncle; six teeth on dentary; 30 a 32 lateral scales; ten predorsal scales; premaxilla with four teeth in outer row; dorsal fin with two unbranched rays and nine branched; adult males with hooks on rays of anal fin (sexual dimorphism present) ..... *H. tuyensis* n. sp.

## Discussion

The genus *Hyphessobrycon* is no exception to the general problematic condition of many components of the family Characidae which is rife with systematic and taxonomic problems. Alpha taxonomy is especially uncertain, and most groups lack phylogenetic hypotheses. Among the characters that define *Hyphessobrycon* we have (EIGENMANN, 1921): 1) ventral margin of third infraorbital not in contact with preopercle, a condition that while present in the type species *H. compressus*, is not present in the species of the *Hyphessobrycon heterorhabdus* group examined in this study, nor in any other cis-Andean species of the genus we examined; 2) five teeth in the inner premaxillary row; however, *H. compressus*, has seven teeth in the inner row. Since, again, all examined cis-Andean species of the genus have only five it is necessary to find other characters to define the genus *Hyphessobrycon*. Furthermore, the characters used to define *Hyphessobrycon* at this time are present in many other characid genera (*Hemigrammus* GILL, *Moenkhausia* EIGENMANN, *Astyanax* BAIRD



**Fig. 9.** Representation of the first two principal components (component 1 is the X axis, component 2 is the Y axis) from morphometric data of *H. compressus* (□), *H. diancistrus* (+), *H. soviichthys* (×), *H. fernandesi* (■), *H. paucilepis* (Δ), *H. tuyensis* (○).

& GIRARD) and thus are not useful to reflect phylogenetic relationships (CARVALHO *et al.*, 2008).

One objective of this study, besides recognizing and differentiating the species in the *H. heterorhabdus* group, was to search for novel characters that may be synapomorphies for groups of *Hyphessobrycon* species. Among potentially useful characters we found a common, and somewhat unusual dorsal–fin ray count of (iii, 8) in *Hyphessobrycon fernandesi*, *H. paucilepis*, *H. notidanus* (CARVALHO & BERTACO, 2006), *H. oritoensis* of the river Putumayo in Colombia (GARCÍA-ALZATE *et al.*, 2008) and *H. ocaseoensis* n. sp. of the Cauca River in northern Colombia (GARCÍA-ALZATE & ROMÁN-VALENCIA, 2008).

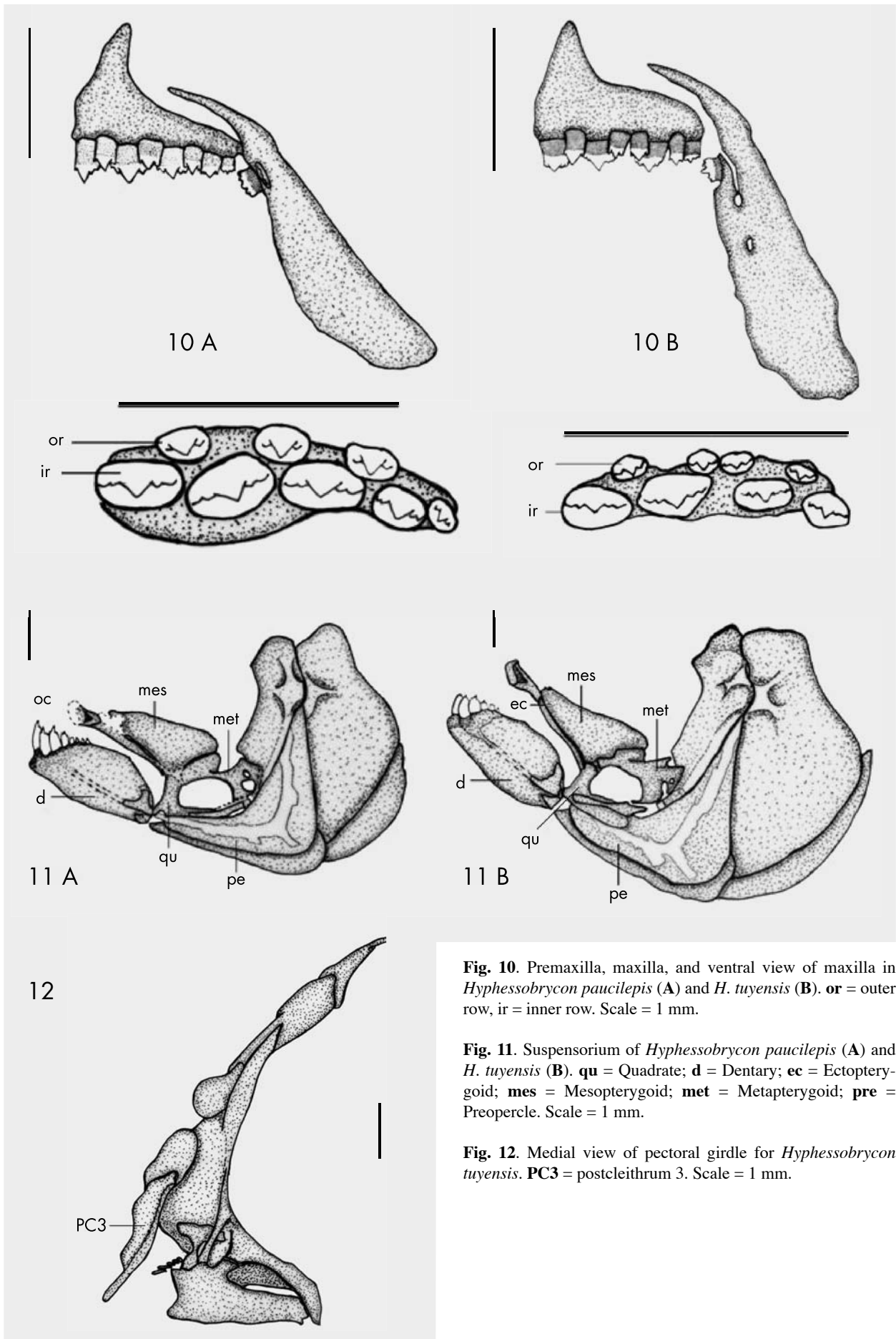
Another potentially useful character was seen in those species having the second dentary tooth projecting forward, outside of the line formed by the other teeth in *H. proteus* EIGENMANN, *H. poecilioides* EIGENMANN, *H. heterorhabdus* (ULREY), *H. notidanus* CARVALHO & BERTACO, *H. vilmae* GÉRY, *H. melanostichos* CARVALHO & BERTACO, *H. agulha* FOWLER, *H. oritoensis* GARCÍA-ALZATE *et al.*, and two new species soon to be described from Colombia. Our results indicate that the described cis–Andean species probably do not belong in the genus *Hyphessobrycon*. This coincides with WEITZMAN & MALABARBA's (1998) observation that about 66 % of the species currently assigned to

*Hyphessobrycon* would need to be transferred to other genera.

The difficulties that arise when trying to distinguish the numerous *Hyphessobrycon* species are many. Primary among them is the poor description of the type species and the numerous descriptions of new species based on ambiguous characters that overlap with others, many based only on color patterns, as is the case for *Hyphessobrycon georgetti* GÉRY, 1961; *H. auca* ALMIRÓN *et al.*, 2004; *H. nigricinctus* ZARSKÉ & GÉRY, 2004; *H. borealis* ZARSKÉ *et al.*, 2006; *H. isiri* ALMIRÓN *et al.*, 2006 to name but a few. Also, the use of combinations of characters makes it difficult to diagnose the species and to compare specific characters used to define the species.

It is generally accepted that *Hyphessobrycon* is not monophyletic, but there is no hard evidence to support this assertion (LIMA & COSTA, 2001; LUCENA, 2003; ZARSKÉ & GÉRY, 2004; BERTACO & MALABARBA, 2005; CARVALHO *et al.*, 2008). Constructing a phylogeny is a daunting task because of the very large number of species in the genus. The type species *Hyphessobrycon compressus*, is from Mexico, the northernmost limit of the range of the genus and so far there is no evidence supporting a relationship between it with the other species Central America nor those from north of the Andes, nor the many trans-Andean species (WEITZMAN & PALMER, 1997: 3) And so, a detailed comparison of





**Fig. 10.** Premaxilla, maxilla, and ventral view of maxilla in *Hyphessobrycon paucilepis* (A) and *H. tuyensis* (B). **or** = outer row, **ir** = inner row. Scale = 1 mm.

**Fig. 11.** Suspensorium of *Hyphessobrycon paucilepis* (A) and *H. tuyensis* (B). **qu** = Quadrate; **d** = Dentary; **ec** = Ectopterygoid; **mes** = Mesopterygoid; **met** = Metapterygoid; **pre** = Preopercle. Scale = 1 mm.

**Fig. 12.** Medial view of pectoral girdle for *Hyphessobrycon tuyensis*. **PC3** = postcleithrum 3. Scale = 1 mm.

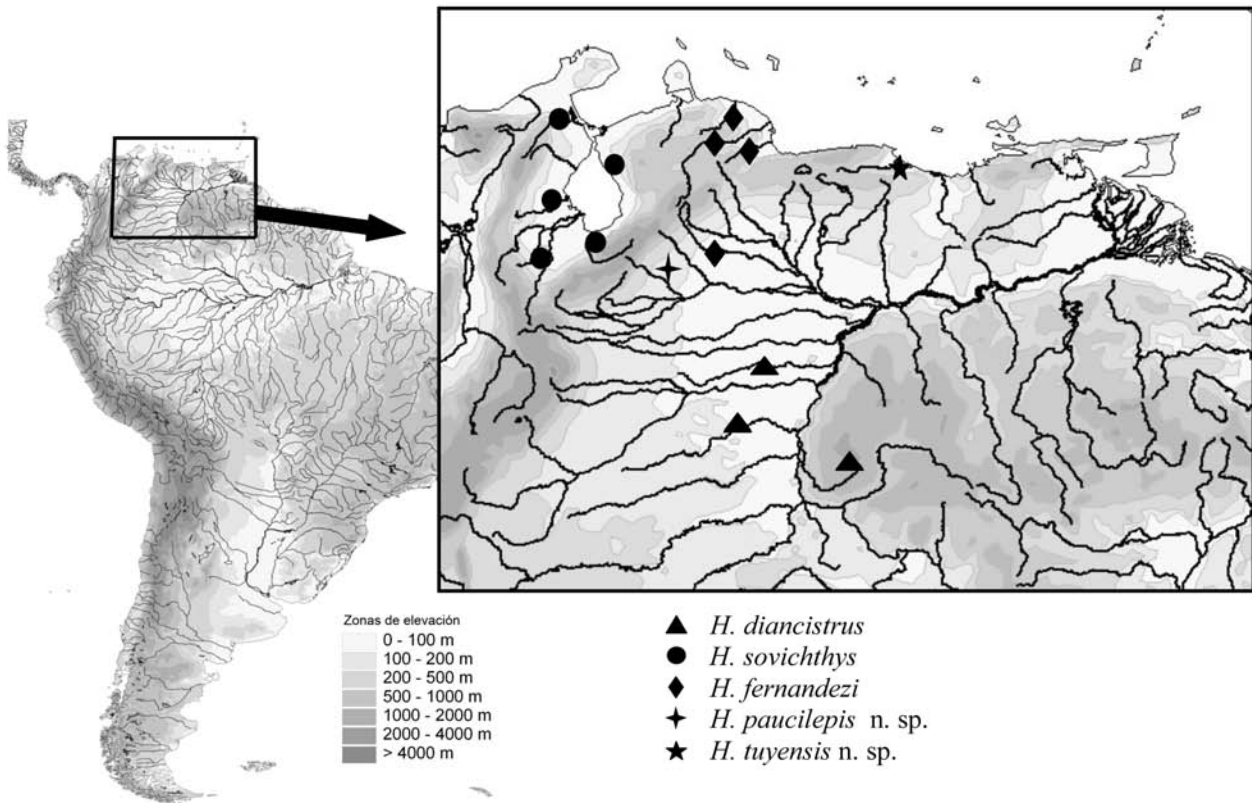


Fig. 13. Geographic distribution of the *Hyphessobrycon heterorhabdus*-group in Venezuela.

characters based on current cladistic methods remains to be done.

MALABARBA & WEITZMAN (2003) separated a large group of characids previously listed as *incertae sedis* within Characidae: *Astyanax*, *Hemigrammus*, *Hyphessobrycon*, among others, using the presence of bony hooks on the fins and separated them from species of Clade A (*Bryconamericus* EIGENMANN, *Hemibrycon* GÜNTHER, *Creagrutus* GÜNTHER, among others) by several synapomorphies: principally the presence of four teeth in the inner row of the premaxillary. This hypothesis is not very satisfactory, because those characters are too variable and thus fail to uniquely define the group. As an example *Hyphessobrycon paucilepis* lacks bony hooks on the fins and *H. tuyensis* has four teeth in the inner premaxillary row (fig. 12).

The preliminary relationships and differences detected here between cis- and trans-Andean species of *Hyphessobrycon* as well as their current geographical distributions, are consistent with a vicariant event caused by the final uplift of the Mérida Cordillera of the Andes about 8 million years ago, and the subsequent change in the course of the river Orinoco to overflow the El Baúl arch and eventually reach its current delta, a pattern already noted in several other fishes (HOORN *et al.* 1995; DÍAZ DE GAMERO, 1996; ALBERT *et al.*, 2006).

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