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**Revisão taxonômica das espécies de *Hisonotus* Eigenmann &
Eigenmann (Siluriformes: Loricariidae) da bacia do rio Uruguai e
sistema da laguna dos Patos**

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Resumo

O gênero *Hisonotus* compreende aproximadamente 25 espécies válidas, sendo um grupo de hipoptopomatíneos amplamente distribuídos nas bacias hidrográficas do sudeste da América do Sul. Entre elas destacam-se com um grande número de espécies as bacias dos rios Paraná com sete espécies, Uruguai com oito espécies e o sistema da laguna dos Patos com 12 espécies. No presente estudo o objetivo principal foi revisar a composição taxonômica do gênero na bacia do rio Uruguai e no sistema da laguna dos Patos. A bacia do rio Uruguai conta com as espécies de *Hisonotus*: *H. nigricauda*, *H. ringueleti*, *H. aky*, *H. charrua*, e as novas espécies aqui descritas, *H. sp.* “Chapecó”, *H. sp.* “Passo Fundo”, *H. sp.* “Ariranhas” e *H. sp.* “Canoas”. Nesta revisão *H. candombe* é considerado sinônimo de *H. ringueleti* e *Epactionotus aky* é transferida para o gênero *Hisonotus*. O sistema da laguna dos Patos apresenta as seguintes espécies: *H. nigricauda*, *H. laevior*, *H. taimensis*, *H. armatus*, *H. charrua*, *H. aff. leucofrenatus* e as novas espécies *H. sp.* “Camaquã”, *H. sp.* “Sinos”, *H. sp.* “Felício”, *H. sp.* “Prata”, *H. sp.* “Carreiro” e *H. sp.* “Passo Novo”. *Hisonotus laevior* e *H. nigricauda* são redescritas sendo *H. leptochilus* sinônimo da primeira. Entre as 18 espécies presentes na região estudada apenas uma (*H. aff. leucofrenatus*) é encontrada em outras bacias hidrográficas e duas (*H. nigricauda* e *H. charrua*) são compartilhadas entre os dois sistemas o que indicava um alto grau de endemismo destas drenagens.

Abstract

The genus *Hisonotus* presents about 25 valid species, and is a group of hypoptopomatines widely distributed in the southeastern basins of South America. Among these basins, presenting a high number of species are the rio Paraná basin with seven species—the rio Uruguai with eight species—and the laguna dos Patos system with 12 species. The main scope of this study is review the taxonomic composition of the genus in the laguna dos Patos system and in the rio Uruguai basin. The rio Uruguai basin presents the following species of *Hisonotus*: *H. nigricauda*, *H. ringueleti*, *H. aky*, *H. charrua*, and the new species herein described, *H. sp.* “Chapecó”, *H. sp.* “Passo Fundo”, *H. sp.* “Ariranhas”, and *H. sp.* “Canoas”. In this review *H. candombe* is synonym of *H. ringueleti* and *Epactionotus aky* is transferred to the genus *Hisonotus*. The laguna dos Patos system presents the following species: *H. nigricauda*, *H. laevior*, *H. taimensis*, *H. armatus*, *H. charrua*, *H. aff. leucofrenatus*, and the new species, *H. sp.* “Camaquã”, *H. sp.* “Sinos”, *H. sp.* “Felício”, *H. sp.* “Prata”, *H. sp.* “Carreiro” and *H. sp.* “Passo Novo”. *Hisonotus laevior* and *H. nigricauda* are redescribed, and *H. leptochilus* is synonym of the first. Among the 18 species present in the studied region, just one (*H. aff. leucofrenatus*) is found in other basins, and two (*H. nigricauda* e *H. charrua*) are shared between both drainages studied here, suggesting a high degree of endemism of these areas.

Apresentação

A presente dissertação reúne resultados da revisão taxonômica do gênero *Hisonotus* da bacia do rio Uruguai e do sistema da laguna dos Patos. O primeiro capítulo apresenta a descrição de uma espécie nova amplamente distribuída na laguna dos Patos. Este capítulo já foi enviado e aceito para a publicação na revista científica *Copeia*, junto com os colaboradores Pablo Lehmann, Edson Pereira, e meu orientador Roberto Reis. O capítulo II compreende a revisão taxonômica de *Hisonotus* no sistema da laguna dos Patos e conta com a redescrição de duas espécies e a descrição de seis novas espécies. Já o capítulo III apresenta a revisão taxonômica do gênero na bacia do rio Uruguai contendo a descrição de quatro novas espécies. Ambos os capítulos II e III serão submetidos para a publicação na revista da Sociedade Brasileira de Ictiologia (*Neotropical Ichthyology*), junto com o meu orientador Roberto Reis.

... life has no meaning. There is nothing called meaning in nature. Meaning is a purely human concept which we put into existence.

Fridtjof Nansen

Capítulo I

**A new species of *Hisonotus* (Siluriformes: Loricariidae:
Hypoptopomatinae) from the Laguna dos Patos Basin, Southern
Brazil.**

TITLE: A NEW SPECIES OF *HISONOTUS* (SILURIFORMES: LORICARIIDAE: HYPOPTOPOMATINAE) FROM THE LAGUNA DOS PATOS BASIN, SOUTHERN BRAZIL.

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Hisonotus armatus, a new hypoptopomatine species, is described from the Laguna dos Patos basin, Rio Grande do Sul State, southern Brazil. The new species is distinguished from other *Hisonotus* species by aspects of the morphology of the rostral plate, the arrangement of abdominal plates, and the caudal-fin color pattern.

Hisonotus armatus, nova espécie de hipoptopomatíneo, é descrita do sistema da laguna dos Patos, Rio Grande do Sul, sul do Brasil. A nova espécie se diferencia das demais do gênero *Hisonotus* pela morfologia da placa rostral, pelo arranjo das placas abdominais e pelo padrão de colorido da nadadeira caudal.

Hisonotus belongs to the Hypoptopomatinae, a monophyletic group consisting of 18 genera and more than 100 species (Schaefer, 2003 □ Reis and Carvalho, 2007) within the Loricariidae. As presently defined, *Hisonotus* consists of 15 species (Schaefer, 2003 □ Casciotta et al., 2006), occurring in the Atlantic coastal drainages of southern and southeastern Brazil, and the Paraná-Paraguay basin. Regan (1904) placed *Hisonotus*, *Parotocinclus*, and *Microlepidogaster* under the synonymy of *Otocinclus*. *Hisonotus* was thereafter retained in synonymy until resurrected by Schaefer (1998). Currently, the genus is diagnosed by its reduced or absent snout plates anterior to the nostril, the rostrum with enlarged odontodes, and the thickened plates forming the lateral rostral margin (Schaefer, 1998). Herein, we describe a new species of *Hisonotus*, widely distributed in the Laguna dos Patos basin, in southern Brazil.

MATERIAL AND METHODS

Measurements were made to the nearest 0.1 mm with digital calipers under a stereomicroscope on the left side of specimens following Boeseman (1968, fig. 5), with the exception of thoracic length, which is the distance of the origin of pectoral-fin spine to the origin of the pelvic-fin unbranched ray. Additional measurements are: suborbital depth, defined as the distance between the ventral margin of the bony orbit and ventrolateral limit of the head, and mandibular ramus, the longer axis of the dentary bone. Morphometric data were expressed as percents of standard length (SL), except subunits of the head which are expressed as percents of head length. Plate counts and nomenclature follow the schemes of serial homology proposed by Schaefer (1997). Vertebral counts included all vertebrae (including the first five vertebrae incorporated into the Weberian apparatus), with the compound caudal centrum (PU1+U1) counted as one element. Cleared and stained specimens (cs) were prepared according to the method

of Taylor and Van Dyke (1985). Scanning electron micrographs were taken from dissected alcohol preserved specimens. Species of *Hisonotus* referred to by numbers are those first mentioned in Reis and Carvalho (2007). Institutional abbreviations are as listed at <http://199.227.217.251/files/codons.pdf>, with the addition of ZVC-P for Facultad de Ciencias, Universidad de la República, Montevideo, Uruguay.

Hisonotus armatus, new species

Figure 1, Table 1

Hisonotus sp. 5, Reis and Carvalho, 2007: 84 [Catalog of fresh water fishes of Brazil].

Holotype.—MCP 41323, 44.4 mm SL, female, Brazil, Rio Grande do Sul, Pedro Osório: Arroio Arambaré, about 5 km south of Vila Basílio, on road to Pedro Osório, 31°51'51"S 052°49'24"W, 22 April 2005, R. E. Reis, P. Lehmann, and E. H. L. Pereira.

Paratypes.—All from Brazil, Rio Grande do Sul, São Gonçalo drainage: MCP 37682, 13 + 4 cs, 33.9–44.2 mm SL □ ANSP 187116, 5, 33.7–42.5 mm SL □ MZUSP 93884, 5, 37.7–45.1 mm SL, all collected with the holotype. MCP 40787, 20, 32.5–45.6 mm SL, Arroio Mata Olho, on road between Pedro Osório and Basílio, 31°54'56"S 53°00'16"W, 15 Nov 2003, R. E. Reis, P. Lehmann, M. C. Abreu, and C. S. Alho. MCP 34776, 31, 27.6–43.9 mm SL, Arroio Arambaré, on road from Pedro Osório to Herval, 31°58'37"S 53°06'15"W, 15 Nov 2003, R. E. Reis, P. Lehmann, M. C. Abreu, and C. S. Alho. MCP 25138, 9 + 3cs, 27.9–45.9 mm SL, Arroio Santa Fé on road between Pinheiro Machado and Piratini, 31°30'12"S 53°13'56"W, 21 Nov 1999, C. A. Lucena, Z. M. Lucena, E. H. L. Pereira, and V. A. Bertaco.

Non-type specimens.—All from Brazil, Rio Grande do Sul. São Gonçalo drainage: MCN 12617, 3, 37.1–37.3 mm SL, Pelotas, Arroio Pelotas on road BR116, 31°37'55"S

52°19'39"W □ MCP 25140, 4, 37.6–46.7 mm SL, Pedro Osório, Arroio Mata Olho on road between Pedro Osório and Basílio, 31°54'56"S 53°00'17"W □ MCP 25147, 2, 30.1–36.3 mm SL, Piratini, Arroio Piratinizinho on secondary road to BR-293, 31°43'02"S 52°59'34"W □ MCP 25154, 14 + 1 cs, 28.0–45.4 mm SL, Piratini, Arroio Piratinizinho on secondary road to BR-293, 31°43'02"S 52°59'34"W □ MCP 25158, 8, 34.4–45.2 mm SL, Piratini, Arroio Piratini Menor, about 500 m from road between Piratini and Pelotas, 31°30'03" S 53°05'35"W □ MCP 25159, 24, 28.9–42.1 mm SL, Piratini, Rio Piratini on road BR293, 31°43'11" S 52°54'00"W □ MCP 34777, 1, 28.5 mm SL, Herval, Arroio Arambaré, on road from Pedro Osório to Herval, 31°58'37"S 53°06'15"W □ MCP 34780, 4, 36.6–40.5 mm SL, Pedras Altas, headwaters of Arroio Alegria between Pedras Altas and Pinheiro Machado, 31°40'41" S 53°32'12"W □ MCP 37685, 13, 27.7–44.2 mm SL, Pedro Osório, stream tributary to Arroio Arambaré near Carvalho de Freitas, about 35 km from Pedro Osório, on railroad bridge, 31°51'51" S 52°49'24"W. Rio Jaguarão drainage: MCP 11307, 2, 16.9–39.2 mm SL, Jaguarão, mouth of Rio Telho on Rio Jaguarão, approx. 32°31' S 53°27' W □ MCP 27184, 5, 14.2–36.3 mm SL, Candiota, Arroio Quebra Jugo no passo dos Pinheiros, 31°32'59" S 53°46'17" W □ UFRGS 4224, 3, 32.3–38.2 mm SL, Candiota, downstream of Arroio Candiota dam, approx. 31°32' S 53°40' W. Rio Camaquã drainage: MCN 11179, 1, 34.2 mm SL, Caçapava do Sul, Arroio Seival at dam, 30°43'04" S 53°43'42" W □ MCP 11337, 5, 25.9–38.7 mm SL, Encruzilhada do Sul, Arroio dos Ladrões, 30°41' S 52°20' W □ MCP 25869, 1, 43.3 mm SL, Bagé, Arroio Camaquã Chico on road between Bagé and Lavras do Sul, 30°54'27" S 53°49'13" W □ MCP 40647, 2, 22.7–27.3 mm SL, Bagé, Arroio do Tigre, on road between Bagé and Lavras do Sul, 31°04'47" S 53°54'03" W □ MCP 40748, 1, 33.0 mm SL, Bagé, Arroio das Traíras on road BR153, 31°05'29" S 53°43'33" W □ MCP 40751, 1, 41.5 mm SL, Lavras do Sul, Arroio Mantiqueira, on road

between Bagé and Lavras do Sul, 30°54'22"S 53°58'02"W □MCP 40764, 1, 38.6 mm SL, Lavras do Sul, Arroio da Cria, on road between Bagé and Lavras do Sul, 30°57'19"S 53°57'22"W □MCP 41306, 1, 36.6 mm SL, Camaquã, Arroio Duro on road from Vila Aurora to Dom Feliciano, 30°45'34"S 51°51'57"W □UFRGS 8222, 5, 32.2–39.8 mm SL, Amaral Ferrador, creek on Fazenda Ferraria □UFRGS 8240, 1, 33.3 mm SL, Canguçu, Rio Camaquã on bridge of road RS471 □UFRGS 8975, 3, 14.7–35.3 mm SL, Encruzilhada do Sul, Arroio Abranjo, 30°53'58"S 52°32'18"W. Lago Guaíba drainage: MCN 16246, 3, 31.9–43.9 mm SL, Porto Alegre, Parque Estadual Delta do Jacuí, Saco da Pólvora, approx. 30°01'S 51°14'W □MAPA 1735, 14, 21.3–38.9 mm SL, Barra do Ribeiro, açude dos Garcia, on road BR116, 30°23'14"S 51°26'10"W □MCP 10450, 2, 41.7–49.9 mm SL, Porto Alegre, Lago Guaíba at Ilha Mauá, approx. 30°01'S 51°14'W □MCP 16010, 10, 14.8–42.3 mm SL, Viamão, Lago Guaíba at Praia de Itapuã, near to mouth of Riacho Itapuã, 30°15'0"S 51°02'20"W, UFRGS 6718, 1, 33.9 mm SL, Viamão, Lago Guaíba at Praia das Pombas, 30°20'44"S 51°01'32"W □UFRGS 8460, 1, 39.5 mm SL, Eldorado do Sul, Estação Agronômica da UFRGS. Rio Jacuí drainage: MAPA 1737, 10, 21.9–38.0, Gravataí, Arroio Passo dos Ferreiros □MAPA 1749, 1, 38.8 mm SL, Nova Petrópolis, Arroio Macaquinhos, Pinhal Alto, approx. 29°25'S 51°02'W □MAPA 2391, 3, 35.9–44.1 mm SL, Santo Antonio da Patrulha, Rio dos Sinos, bridge at Nossa Senhora de Mont Serrat, approx. 29°45'S 50°24'W □MCN 6660, 2, 24.0–37.5 mm SL, Três Coroas, Arroio Quilombo, approx. 29°27'S 50°49'W □MCN 16124, 4, 33.2–40.1 mm SL, Pinhal Grande, Rio Ferreira, 29°16'33"S 53°14'42"W □MCP 9294, 2, 23.4–34.0 mm SL, Cachoeira do Sul, Arroio Paraíso, Rincão da Porta, approx. 29°41'S 53°09'W □MCP 14640, 1, 23.7 mm SL, Caraá, Rio Caraá near Rio dos Sinos, 29°47'40"S 50°26'01"W □MCP 17166, 2, 27.1–27.9 mm SL, Porto Alegre, Rio Jacuí at Saco da Alemoa, approx. 30°00'S 51°14'W □MCP 17500, 1, 45.3 mm SL, Venâncio

Aires, Arroio at Linha Brasil, approx. 29°33'S 52°17'W □ MCP 18632, 13, 26.1–38.0 mm SL, Candelária, Rio Pardo on road from Santa Cruz do Sul to Candelária, 29°40'36"S 52°46'17"W □ MCP 25262, 5, 29.1–38.1 mm SL, Agudo, Lageado da Gringa between Linha da Ressaca and mouth of Rio Jacuizinho, 29°23'08"S 53°12'53"W □ MCP 25458, 7 + 3 cs, 16.2–42.3 mm SL, Agudo, Arroio Corupá, on road between Agudo and Dona Francisca Dam, 29°33'54"S 53°17'09"W □ MCP 25721, 5, 27.3–41.4 mm SL, Ibarama, Arroio da Gringa, about 12 km north from UHE Dona Francisca, 29°23'16"S 53°13'23"W □ MCP 25722, 3, 25.3–40.2 mm SL, Ibarama, lageado do Gringo about 2 km from UHE Dona Francisca, 29°26'49"S 53°15'36"W □ MCP 26052, 1, 35.0 mm SL, Lindolfo Collor, Arroio Feitoria, 29°34'54"S 51°14'03"W □ MCP 26528, 1, 28.7 mm SL, Santa Cruz do Sul, Rio Pardinho, downstream Corsan dam, approx. 29°40'S 52°28'W □ MCP 26542, 3, 29.6–35.6 mm SL, Agudo, Rio Jacuí downstream from Dona Francisca dam, approx. 29°31'S 53°16'W □ MCP 33557, 1, 34.7 mm SL, Santa Bárbara, Rio das Antas, near mouth of Rio Carreiro, 29°05'29"S 51°42'42"W □ MCP 38901, 6, 22.2–40.8 mm SL, Bento Gonçalves, Rio das Antas, 29°01'59"S 51°27'13"W □ MCP 40512, 6, 22.1–40.9 mm SL, Santa Maria do Herval, Rio Cadeia on Farroupilha bridge, 29°29'43"S 51°02'50"W □ UFRGS 2350, 1, 35.2 mm SL, Arroio dos Ratos, Arroio dos Ratos at bathing spot, approx. 30°03'S 51°37'W □ UFRGS 8762, 3, 29.8–36.2 mm SL, São Sepe, creek on Fazenda São Sepe, 30°14'39"S 53°41'20"W □ UFRGS 8768, 3, 31.6–35.4 mm SL, Rio Pardo, creek at Fazenda Velha □ UFRGS 8805, 5, 38.5–43.1 mm SL, Lageado, mouth of Arroio Pinheirinho on Rio Forqueta, 29°19'21"S 52°14'03"W □ Other drainages in Laguna dos Patos basin: MAPA 1747, 5, 25.8–39.9 mm SL, Camaquã, Arroio Velhaco on road BR116 between Tapes and Camaquã, approx. 30°45'S 51°38'W.

Diagnosis.—*Hisonotus armatus* differs from all congeners except *Hisonotus notatus* and *H. leucofrenatus* in having the anterior margin of the snout completely covered by odontodes (Fig. 2A, C), vs. anterior margin of the snout with a narrow or wide odontode-free band (Fig. 2B, D) and in having large plates in the abdominal median series, usually comprising one series of plates between the lateral abdominal plates (Fig. 3), vs. abdominal median series of plates small, with several plate series irregularly arranged between the lateral abdominal ones. The new species differs from *H. notatus* and *H. leucofrenatus* in the presence on the caudal fin of a series of light hyaline spots, forming a vertical light bar vs. a rounded hyaline blotch or no hyaline area in the midventral portion of caudal fin.

Description.—Morphometrics and meristics given in Table 1. Adult size moderate to large for members of this genus (maximum 46.0 mm SL). Body robust, without conspicuous keels, caudal peduncle round in cross section. Dorsal profile slightly convex from snout tip to parieto-supraoccipital bone, slightly concave posterior to rostral plate, almost straight from parieto-supraoccipital to anterior margin of nuchal plate, ascending from that point to dorsal-fin origin—straight and descending at dorsal-fin base. Profile almost straight from last dorsal-fin ray to caudal-fin origin. Greatest body depth at dorsal-fin origin. Least body depth at posterior end of caudal peduncle. Head and snout broad, snout rounded anteriorly in dorsal view, body progressively narrowing posterior of cleithrum. Snout region anteriorly to nares concave, interorbital region slightly convex to almost straight. Upper margin of orbit not elevated. Eye dorsolaterally positioned. Iris diverticulum present, large, its length more than half of pupil diameter.

Pectoral fin with six branched rays, posterior fin margin slightly rounded when depressed tip extending beyond middle of pelvic fin. Posterior margin of pectoral-fin spine smooth. Pectoral-fin axillary slit present, located below posterior bony margin of cleithral process. Pelvic fin moderately short, with five branched rays. Tip of depressed fin not reaching anal-fin origin in females, but extending beyond that point in males. Adult males with fleshy flap along dorsal margin of first thickened pelvic-fin ray. Flap widest basally and progressively narrowing distally. Dorsal fin with seven branched rays. Dorsal-fin origin located at vertical through pelvic-fin origin. Dorsal-fin spinelet present. Anal fin with five branched rays. First anal-fin pterygiophore exposed anterior to anal fin. Adipose fin absent.

Body almost entirely covered by plates except for region overlying opening of swim bladder capsule, area between pectoral girdle and lower lip, region around anus, and area around bases of paired fins. Rostral plate with posterior notch articulating with mesethmoid. Snout plates anterior to nostril reduced. Three rows of predorsal plates, including nuchal plate. Lateral median-plate series formed by 23–25 plates. Lateral line incomplete, with small gap without pores along middle length of body. Abdominal plates arranged in three rows anteriorly and irregularly arranged between pelvic-fin insertions. Lateral abdominal plates slightly larger and forming regular series. Median abdominal series usually formed by one plate row, posterior median abdominal plates sometimes smaller and greater in number (Fig. 3). Coracoid and cleithrum exposed and covered by odontodes, except for median region of cleithrum and area surrounding arrector fossa.

Head without crests in adults. Odontodes on posterior parieto-supraoccipital tip uniform in size, and not enlarged in adults. Somewhat prominent crest preceded by anterior pair of crests in small juveniles. Compound pterotic with small-to-median size

perforations along its anteroventral margin. Head, fin spines, and body plates covered with odontodes, largest odontodes found on anterior surface of all fin spines. Odontodes on head and trunk of uniform size and distribution, except for enlarged odontodes on ventral and dorsal margins of rostral plates. Plates forming lateral rostral margin thickened. Lips roundish and papillose.

Premaxillary and dentary teeth slender proximally and flattened distally□teeth bifid, with medial cusp large and rounded, lateral cusp minute and pointed. Accessory patch of teeth absent on dentary and premaxilla.

Posterior margin of caudal-fin skeleton usually with slight median notch. Notch in one specimen extends anteriorly, almost reaching half centrum of last vertebrae. Total vertebrae 29 (5 cs).

Color in alcohol.—Ground color of dorsolateral surface of head and body light to dark brown. Midlateral region of body dark gray and ventral region largely unpigmented. General color pattern of dorsal surface of body composed of dark blotches contrasting with somewhat reticular light areas. Ventrolateral portion of head more lightly pigmented with scattered dark blotches. Ventral portion of head and body pale yellowish with scattered chromatophores. Chromatophores more prominent on posterior region of lips and region surrounding base of pectoral and anal fins. All fins mostly hyaline, with chromatophores forming transverse dark bands□bands most conspicuous on unbranched rays. Dorsal fin with about seven narrow dark bands. Caudal fin darkly pigmented ventrally, unbranched rays with alternating dark and light spots. Two dorsal-most branched rays almost hyaline, except for transversal dark bands, one hyaline transverse band formed by round light spots crossing caudal fin. Some specimens with anterior portion of caudal fin lighter and forming second transverse light band with

caudal hyaline areas larger. Hyaline vertical band on caudal fin inconspicuous or even absent in juveniles.

Sexual dimorphism.—The sexual dimorphism is characterized mainly by the urogenital papilla, positioned just after the anal opening in males and absent in females. Adult males also possess a fleshy flap along the dorsal margin of first thickened pelvic-fin ray that is absent in females. In juvenile males the flap is smaller or absent. Males have a longer pelvic-fin unbranched ray that extends up to the anal-fin origin, with the spine never reaching that point in females.

Distribution and habitat.—*Hisonotus armatus* is widely distributed in the Laguna dos Patos system from the southern most Rio Jaguarão drainage, to the Rio Jacuí and Rio Taquari drainages (Fig. 4). The new species is unknown from the headwaters of the Rio Jacuí and Rio Taquari drainages. This species inhabits slow to median flowing watercourses, with clear to brown waters over sandy bottom and is found in marginal or submerged aquatic vegetation. *Hisonotus armatus* is sympatric throughout its distribution with *H. laevior* (see discussion for diagnostic features). It was also collected together with *H. nigricauda* in some localities of the Lago Guaíba drainage, with *Hisonotus* sp. 4 in the Rio Jacuí and Taquari drainages, and with *Hisonotus* sp. 6 in the upper reaches of the Rio Camaquã drainage.

Etymology.—The specific epithet, *armatus*, is from Latin meaning armed, alluding to the complete covering of odontodes on the anterior tip of the snout.

DISCUSSION

The most distinctive feature of *Hisonotus armatus* is the snout completely covered with odontodes, without an anterior odontode-free band, which easily distinguishes this new species from all other *Hisonotus* species in the Laguna dos Patos basin (a narrow naked band in *H. nigricauda*, sometimes absent in smaller specimens). The new species shares this and a few other features with the congeners *Hisonotus notatus* (type-species) and *Hisonotus leucofrenatus*, both species distributed in the southeastern Brazilian coastal drainages. These three species possess the anterior margin of the snout fully covered with odontodes, a similar pattern of abdominal plates, 23-25 median lateral plates, three predorsal plate rows, and absence of a raised tuft of odontodes on the parieto-supraoccipital.

Four species of *Hisonotus* were previously described from the Laguna dos Patos basin, *Hisonotus nigricauda*, *H. laevior*, *H. leptochilus*, and *H. taimensis*. The presence of *H. armatus*, plus five additional unnamed species listed in Reis and Carvalho (2007), is indicative of a successful group in the region as well as species richness and endemism in the Laguna dos Patos basin. Other loricariid genera with a large number of species in the basin are *Eurycheilichthys*, with eight species, seven of which are undescribed, and *Rineloricaria*, with six species.

MATERIAL EXAMINED

Hisonotus candombe: ZVC-P 5595, holotype, Uruguay, Departamento Salto, Rio Uruguay basin, arroyo Palomas. *Hisonotus charrua*: ZVC-P 5639, holotype, Uruguay, Departamento Tacuarembó, Cañada de los Pena. MCP 40256, 4 + 1 cs, same type-locality. *Hisonotus francirochai*: MCP 41341, 4, Brazil, São Paulo, Araras, stream tributary of Rio Mogi-Guaçu (Rio Grande drainage). *Hisonotus insperatus*: MZUSP 78957, holotype, Brazil, São Paulo, Botucatu, Rio Capivara (Rio Tietê drainage).

Hisonotus laevior: ANSP 21563, holotype, Brazil, Rio Grande do Sul, Rio Jacuí. MAPA 1755, 24 + 3 cs, Brazil, Rio Grande do Sul, São Sebastião do Caí, small creek in Rio Branco. *Hisonotus leptochilus*: ANSP 21564, holotype, Brazil, Rio Grande do Sul, Rio Jacuí. *Hisonotus leucofrenatus*: MZUSP 36565, 20, Brazil, São Paulo, Eldorado, small creek on the road Eldorado to Sete Barras (Rio Ribeira de Iguape drainage). *Hisonotus maculipinnis*: BMNH 1909.4.2.19–22, syntypes of *Otocinclus maculipinnis*, La Plata. *Hisonotus nigricauda*: BMNH 1891.3.16.53–62, syntypes of *Otocinclus nigricauda*, Brazil, Rio Grande do Sul, Rio Camaquã. MCP 17416, 20 + 3 cs, Brazil, Rio Grande do Sul, marsh at the side of Rio Camaquã on Pacheca. *Hisonotus notatus*: BMNH 1904.1.28.13–16, syntypes, Brazil, Rio de Janeiro, Rio Grande (Arroio Fundo) on Fazenda Santa Cruz. MCP 18098, 204 + 4 cs, Brazil, Espírito Santo, Rio São José dos Torres on road BR 101. *Hisonotus paulinus*: BMNH 1907.7.6.9, holotype of *Otocinclus paulinus*, Brazil, São Paulo, Rio Piracicaba. *Hisonotus ringueleti*: ILPLA 886, holotype, Uruguay, Rivera, creek at km 18 of route joining Santana do Livramento to Rivera (Rio Uruguay basin). *Hisonotus taimensis*: MCN 4835–4844, paratypes of *Microlepidogaster taimensis*, Brazil, Rio Grande do Sul, Santa Vitória do Palmar, new channel of Arroio Taim, Estação Ecológica do Taim. *Hisonotus* sp. 1: MCP 40942, 24, Brazil, Rio Grande Sul, Nova Prata, rio da Prata at Passo do Despraiado. *Hisonotus* sp. 2: MCP 40945, 8 + 2 cs, Brazil, Rio Grande Sul, Serafina Corrêa, rio Carreiro downstream Carreiro bathing spot. *Hisonotus* sp. 3: MCP 22701, 27 + 3 cs, Brazil, Rio Grande Sul, Cruz Alta, rio Passo Novo on road from Cruz Alta to Ibirubá. *Hisonotus* sp. 4: UFRGS 8812, 14, Brazil, Rio Grande do Sul, Lageado, mouth of Arroio Pinheirinho on Rio Forqueta. *Hisonotus* sp. 6: MCP 40748, 2, Brazil, Rio Grande do Sul, Bagé, Arroio da Traíras on road BR 153.

ACKNOWLEDGEMENTS

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Figure Legends

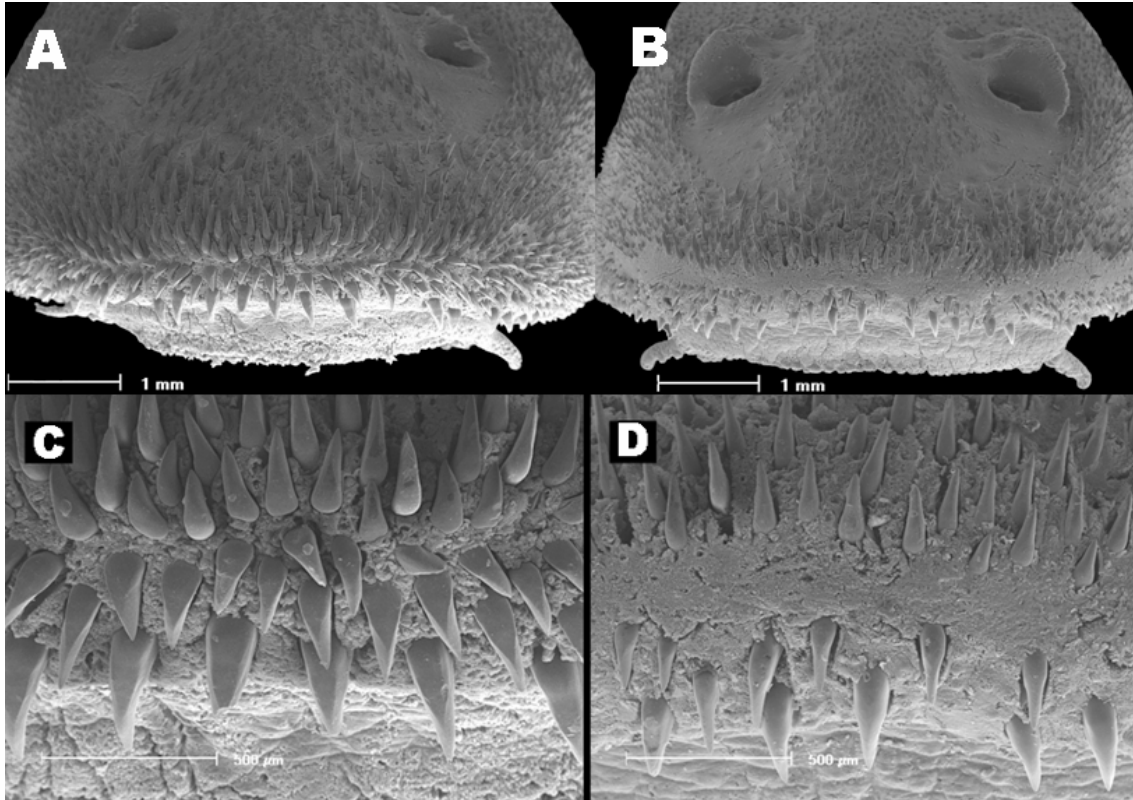


Fig. 2. Scanning electron microscope images of anterior tip of snout. *Hisonotus armatus*, MCP 37682, 40.1 mm SL (A, C), showing the snout completely covered by odontodes and *Hisonotus laevior*, MAPA 1755, 40.9 mm SL (B, D), showing a stripe devoid of odontodes.

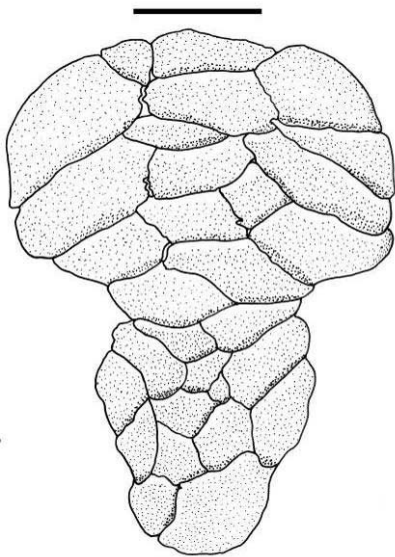


Fig. 3. Arrangement of abdominal plates in *Hisonotus armatus*, female, MCP 25138, 42.5 mm SL. Anterior toward top. Scale bar represents 2 mm.

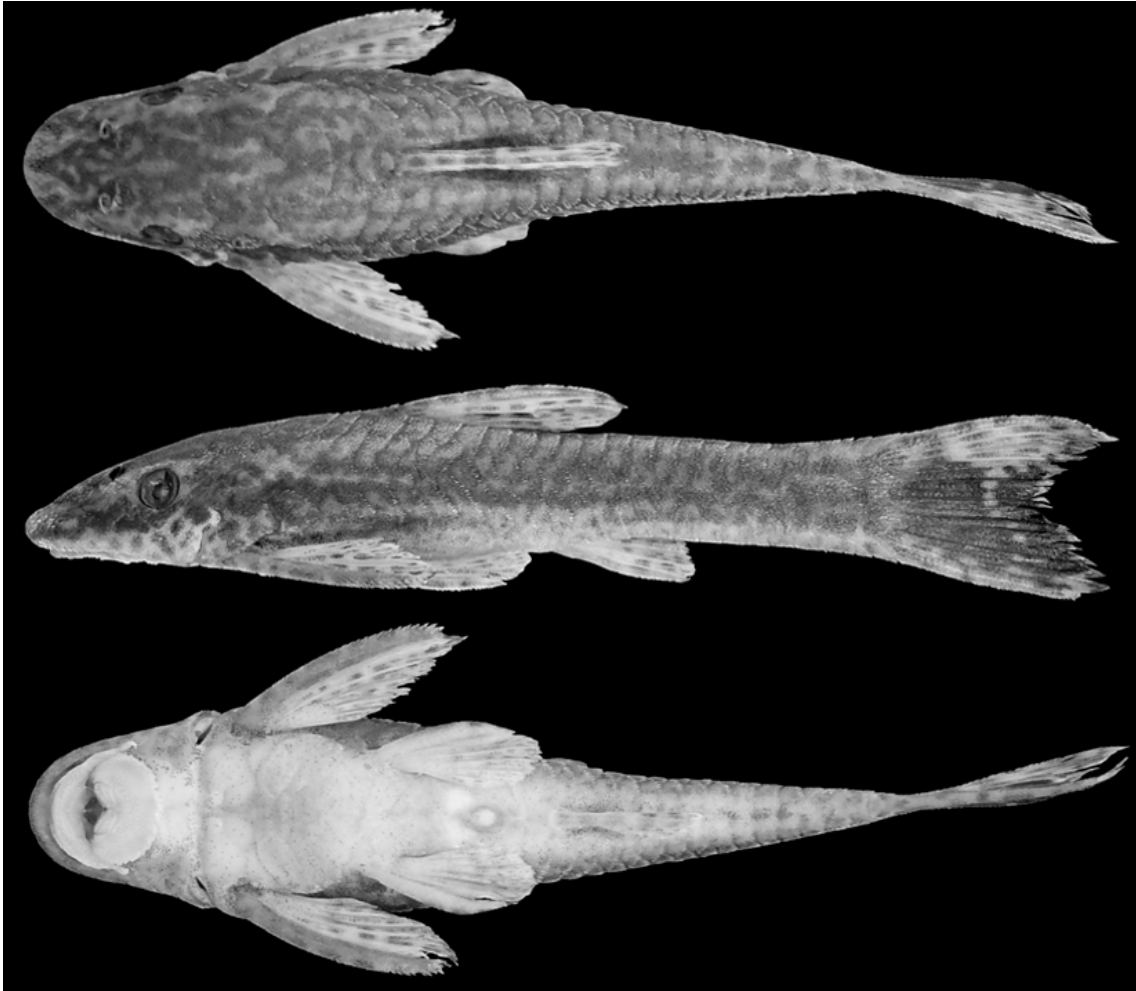


Fig. 1. *Hisonotus armatus*, holotype, MCP 41323, 44.4 mm SL, female, Brazil, Rio Grande do Sul, Pedro Osório, Arroio Arambaré, about 5 km south of Vila Basílio, on road to Pedro Osório.

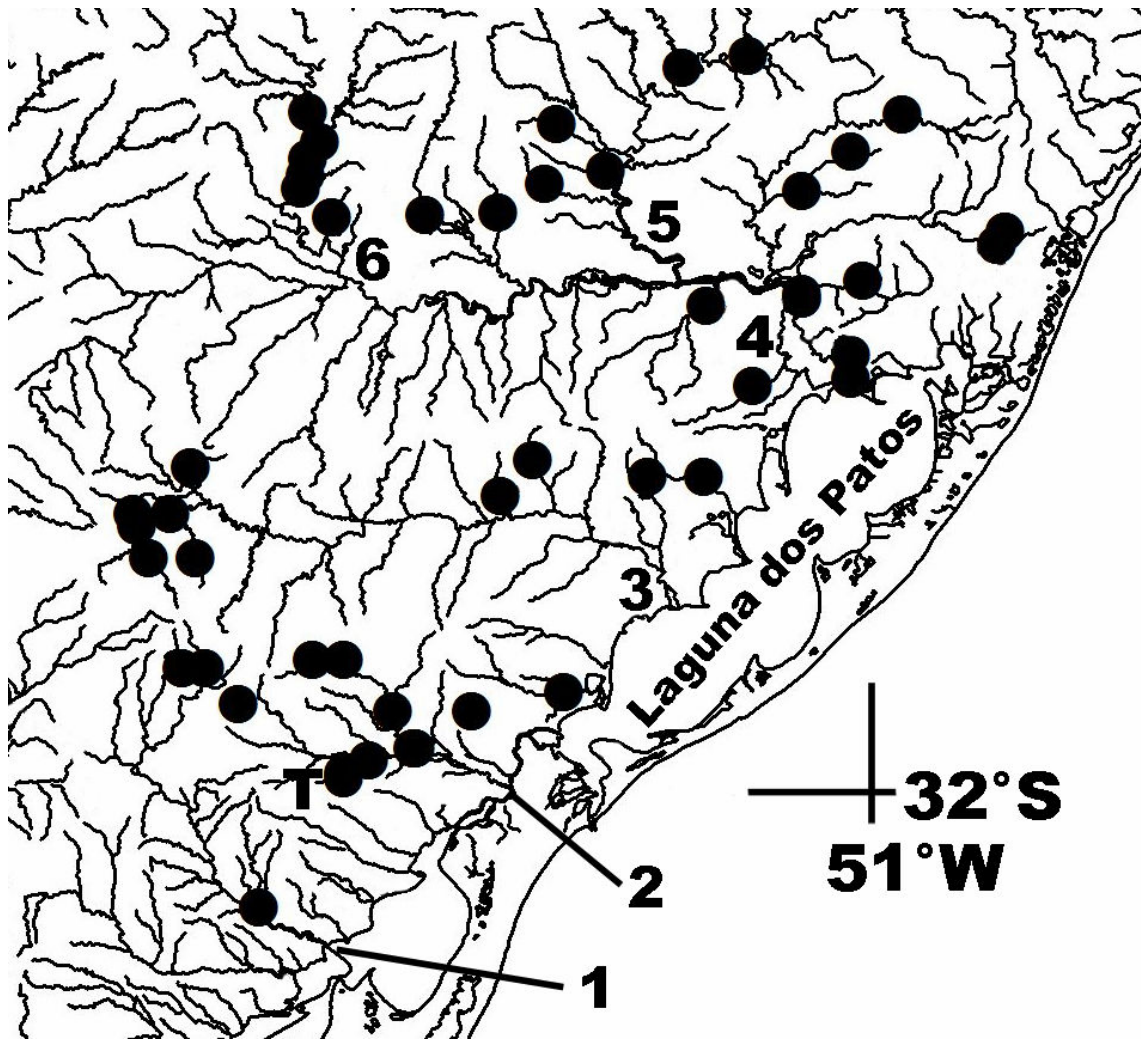


Fig. 4. Geographic distribution of *Hisonotus armatus* in the Laguna dos Patos basin, T indicates type-locality. 1 – Rio Jaguarão, 2 – Canal de São Gonçalo, 3 – Rio Camaquã, 4 – Lago Guaíba, 5 – Rio Taquari, 6 – Rio Jacuí.

TABLE 1. Morphometrics and meristics of *Hisonotus armatus* including 40 types plus 20 non-types specimens. SD = Standard deviation, n = number of specimens, and H = holotype.

	Types + non-types					
	H	n	Low	High	Mean	SD
Standard length (mm)		63	27	45.9	38.2	-
Percent of Standard Length						
Head length	34.4	63	31.7	38.2	34.3	1.22
Predorsal Length	47.4	63	44.0	51.3	46.7	1.27
Dorsal-fin spine length	26.8	63	22.5	27.7	25.2	1.36
Anal-fin spine length	16.9	63	13.7	17.9	16.2	0.98
Pectoral-fin spine length	27.2	63	20.9	28.1	25.8	1.46
Pelvic-fin spine length	17.0	63	15.1	21.4	18.1	1.68
Cleitral width	25.0	63	21.9	25.4	23.7	0.81
Thoracic length	16.9	63	14.8	18.5	16.6	0.79
Abdominal length	21.9	63	16.4	22.4	20.6	1.13
Body depth at dorsal-fin origin	19.8	63	16.2	20.9	18.5	1.01
Caudal-peduncle length	31.9	63	30.3	35.0	32.8	1.16
Caudal-peduncle length	12.0	63	9.9	12.7	11.2	0.56
Percent of Head Length						
Snout Length	50.2	63	47.1	53.3	50.2	1.32
Orbital diameter	16.7	63	14.8	18.5	16.7	0.86
Interorbital width	40.5	63	37.8	46.5	42.5	1.90
Head depth	49.9	63	43.4	53.8	49.1	2.30
Suborbital depth	18.6	63	15.7	21.6	19.1	1.10
Mandibular ramus	8.6	63	6.9	10.5	8.5	0.75
Meristics						
Left premaxillary teeth	15	61	14	21	17.7	1.69
Right premaxillary teeth	17	62	15	23	17.7	1.66
Left dentary teeth	16	63	11	19	15.0	1.39
Rigth dentary teeth	15	63	12	20	15.0	1.65
Left lateral scutes	24	63	24	25	24.3	0.48
Rigth lateral scutes	24	63	23	25	24.3	0.54

Capítulo II

**Taxonomic review of *Hisonotus* (Siluriformes: Loricariidae:
Hypoptomatinae) from the laguna dos Patos system, Southern Brazil
and Northeastern Uruguay**

1 **Taxonomic review of *Hisonotus* (Siluriformes: Loricariidae: Hypoptopomatinae) from the**
2 **laguna dos Patos system, Southern Brazil.**

3

4

Abstract

5 The species of *Hisonotus* from the laguna dos Patos system are reviewed. Two species with wide
6 distributions are redescribed: *Hisonotus laevior* and *H. nigricauda*. Six new species are described
7 from that system: *Hisonotus* sp. “Camaquã” from the rio Camaquã drainage □ *Hisonotus* sp.
8 “Felício” and *Hisonotus* sp. “Passo Novo” from rio Jacuí drainage □ *Hisonotus* sp. “Sinos”, widely
9 distributed in the tributaries of rio Jacuí basin □ *Hisonotus* sp. “Prata” and *Hisonotus* sp. “Carreiro”,
10 both endemic from the headwaters of rio Taquari drainage. *Hisonotus leptochilus* is here considered
11 junior synonym of *H. laevior*. In total, twelve species of *Hisonotus* are present in the laguna dos
12 Patos system. Their distributions are discussed, species are illustrated and a taxonomic key is
13 provided.

14

15

Resumo

16 As espécies de *Hisonotus* do sistema da laguna dos Patos são revisadas. Duas espécies com amplas
17 distribuições são redescritas: *Hisonotus laevior* e *H. nigricauda*. Seis novas espécies são descritas
18 deste sistema. *Hisonotus* sp. “Camaquã”, da drenagem do rio Camaquã □ *Hisonotus* sp. “Felício” e
19 *Hisonotus* sp. “Passo Novo”, da drenagem do rio Jacuí □ *Hisonotus* sp. “Sinos”, amplamente
20 distribuída nos tributários da bacia do rio Jacuí □ *Hisonotus* sp “Prata” e *Hisonotus* sp. “Carreiro”,
21 ambas endêmicas das cabeceiras do rio Taquari. *Hisonotus leptochilus* é considerado sinônimo
22 junior de *H. laevior*. No total, doze espécies de *Hisonotus* estão presentes no sistema da laguna dos
23 Patos sendo suas distribuições aqui discutidas. As espécies são ilustradas e uma chave de
24 identificação é fornecida.

Introduction

Hisonotus belongs to the Hypoptopomatinae, a monophyletic group of small loricariids including more than 80 species grouped in 18 genera (Schaefer, 2003 □ Reis & Carvalho, 2007), distributed in the cis-Andean drainages from Venezuela to northern Argentina. *Hisonotus* was described by Eigenmann & Eigenmann (1889) based on the following diagnostic characters: belly with large plates, eyes superior, and humeral plate imperforate. The type-species, *Hisonotus notatus*, was collected in the rio Grande (arroio Fundo), in the neighborhood of the city of Rio de Janeiro by the Emperor of Brazil, Dom Pedro II in 1865, for the Thayer Expedition (Higuchi, 1992). Regan (1904) conducted the first revision of loricariids, and placed *Hisonotus*, *Parotocinclus*, and *Microlepidogaster* under the synonymy of *Otocinclus*. After that, *Hisonotus* was considered as a junior synonym for a long period, with its species described first as *Otocinclus*, then as *Microlepidogaster*. *Hisonotus* was resurrected by Schaefer (1998), being diagnosed by reduced or absent snout plates anterior to the nostril, rostrum with enlarged odontodes, and plates forming the lateral rostral margin thickened (Schaefer, 1998, p. 387). Notwithstanding, those diagnostic features were discussed by Britski & Garavello (2007, p. 6), being considered variable among species of *Hisonotus* and not exclusive to the genus.

The position of *Hisonotus* within Hypoptopomatinae diverges to some degree in the phylogenetic analyses of the subfamily (Schaefer, 1998 □ Gauger & Buckup, 2005 □ and Lehmann, 2006). In the first analysis (Schaefer, 1998), *Hisonotus* appears relatively basal within Otothyriini, but more derived than *Parotocinclus* and “New Taxon 3”. In the hypothesis proposed by Gauger and Buckup (2005), the monophyletic status of Otothyriini is not corroborated, and *Hisonotus* is the sister group to *Parotocinclus*. Finally, Lehmann’s (2006) hypothesis corroborated the non-

48 monophyly of Otothyridini and *Hisonotus* is also relatively basal within hypoptopomatinae, more
49 derived than *Eurycheilichthys*, the paraphyletic *Parotocinclus*, and *Epactionotus*.

50 The first hypoptopomatinae species described for the laguna dos Patos system was
51 *Otocinclus nigricauda*. It was described by Boulenger (1891), based on the material collected by
52 Dr. Hermann von Ihering and Herr Sebastian Wolff in the Province (presently State) of Rio Grande
53 do Sul, which had been sent to the British Museum of Natural History. This species was transferred
54 to *Hisonotus* by Cope (1894) based on the examination of a fish collection from the Rio Jacuhy (rio
55 Jacuí) made by Mr. Herbert Smith. In that work, Cope described several new species including
56 *Hisonotus laevior* and *Hisonotus leptochilus*, and presented diagnostic comparisons between the
57 four species pertaining to the genus, at that time. After a long period, another species of *Hisonotus*
58 was described from the laguna dos Patos system, *Microlepidogaster taimensis* Buckup, 1981 from
59 the marshes of the Taim region. Nowadays, *Hisonotus* consists of 18 nominal species (Schaefer,
60 2003 □ Britski & Garavello, 2007 □ Azpelicueta et al., 2007), occurring in the Atlantic coastal
61 drainages of southern and southeastern Brazil, Río de La Plata system, laguna dos Patos system, and
62 recently extended to the Amazon basin in the rio Tapajós drainage (Britski & Garavello, 2007).

63 Buckup (1981, p. 19) had already cited the difficulties in the study of hypoptopomatines
64 from southern Brazil were in part due to the limitation of the species description and the lack of
65 recent reviews. The main purpose of this paper is to describe the taxonomic composition of the
66 genus *Hisonotus* in the laguna dos Patos system, in southern Brazil. In this work I am redescribing
67 *H. nigricauda* and *H. laevior* (senior synonym of *H. leptochilus*), and describing six new species,
68 with an identification key for *Hisonotus* in this hydrographic system. Besides that, the endemism for
69 the headwater tributaries, and for the system as a whole, is discussed. This work is part of my
70 master in sciences thesis at the Pontificia Universidade Católica do Rio Grande do Sul (PUCRS),

71 entitled taxonomic review of the species of *Hisonotus* (Siluriformes: Loriicaridae) from the rio
72 Uruguay basin and the laguna dos Patos system.

73

74

Material and Methods

75

76 **Geography.** The laguna dos Patos system is located in the southeast portion of the Brazilian
77 state of Rio Grande do Sul and a minor portion in northeastern Uruguay. The main water bodies that
78 compose the system are the laguna dos Patos (9.280 km²), the laguna Mirim (3.520 km²), and its
79 main tributaries rio Jaguarão, rio Camaquã, and rio Jacuí (Fig. 1). The entire hydrographical system
80 is connected to the Atlantic Ocean by the barra de Rio Grande in the city of Rio Grande. The system
81 is limited at north by the tributaries of rio Uruguai and rio Pelotas □ at northwest by the tributaries of
82 rio Ijuí □ at west by the tributaries of rio Ibicuí □ and at southwest by tributaries of the rio Negro, all
83 part of the rio Uruguai basin. In the eastern portion, the system is limited by the coastal plain, a
84 narrow sandy band (5 to 30 km wide), parallel to the coastal line, presenting a great number of
85 shallow lakes and lagoons, forming at the northeast portion, the rio Tramandaí system (Malabarba,
86 1989 and Schwartzbold & Schaefer, 1984). The major tributary of the laguna dos Patos system is
87 the rio Jacuí basin, which flows into the lago Guaíba in the northern portion of the laguna dos Patos.
88 That basin is formed by several tributaries, including the drainages of rio dos Sinos, rio Caí, rio
89 Taquari, and rio Jacuí itself (Fig. 1).

90

91 **Collections.** The specimens examined are deposited in the following institutions
92 (abbreviations in parentheses), listed in alphabetic order of the abbreviations: Asociación
93 Ictiológica, La Plata (AI) □ Academy of Natural Sciences of Philadelphia (ANSP) □ Natural History
94 Museum, London (BMNH) □ Coleção Ictiológica Morevy Cheffe, Pelotas (CIMF) □ Instituto de
Limnología “Dr. Raúl A. Ringuelet”, La Plata (ILPLA) □ Museo Argentino de Ciencias Naturales

95 Bernadino Rivadavia, Buenos Aires, (MACN-ict) □ Museu Anchieta, Porto Alegre (MAPA) □
96 Fundação Zoobotânica do Rio Grande do Sul/Museu de Ciências Naturais, Porto Alegre (MCN) □
97 Museu de Ciências da Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre (MCP) □
98 Muséum d'Histoire Naturelle, Geneve (MHNG) □ Museo de La Plata, La Plata (MLP) □ Museu
99 Nacional, Rio de Janeiro (MNRJ) □ Museu de Zoologia da Universidade de São Paulo, São Paulo
100 (MZUSP) □ Natuhistorisches Museum, Wien (NMW) □ Núcleo de Pesquisas em Limnologia,
101 Ictiologia e Aquicultura, Maringá (NUP) □ Universidade Federal do Rio Grande do Sul, Porto Alegre
102 (UFRGS) □ Zoologisches Sammlung des Bayerischen Staates, Munique (ZSM) □ Faculdade de
103 Ciências Universidad de La República, Montevideo (ZVC-P).

104 **Morphology.** Measurements were made to the nearest 0.1 mm with digital calipers
105 under a stereomicroscope on the left side of specimens. The measurements and their abbreviations
106 are the following: Standard length (SL), measured from the anterior margin of the snout to the end
107 of vertebral column (hypural plate). Head length (HL) is the distance between the anterior margin of
108 the snout and the posterior tip of the parieto-supraoccipital process. Predorsal length (PdL) is the
109 distance between the anterior margin of the snout and the posterior portion of the dorsal-fin spinelet.
110 Dorsal-fin spine length (DL), measured from the anterior origin of dorsal-fin spine to the posterior
111 end of the dorsal-fin spine. Anal-fin unbranched ray length (AL), measured from the anterior origin
112 of anal-fin to posterior end of anal-fin unbranched ray. Pectoral-fin spine length (PL) is the distance
113 from the insertion of the pectoral-fin spine to the posterior end of the ossified portion of the spine.
114 Pelvic-fin unbranched ray length (VL) measured from the anterior origin of the pelvic fin to the
115 posterior end of the pelvic-fin unbranched ray. Cleithral width (CW) is the longer distance between
116 the lateral portions of the cleithrum. Thoracic length (TL) is the distance between the insertion of
117 the pectoral-fin spine and the insertion of the pelvic-fin unbranched ray. Abdominal length (AbL) is
118 the distance between the pelvic-fin insertions and the anal-fin origin, along the median line of the

119 body. Body depth at dorsal-fin origin (BD) is the distance between the dorsal-fin spinelet and the
120 ventral abdominal region. Caudal-peduncle length (CPL) is the distance between the posterior end
121 of the anal-fin insertion and the posterior end the vertebral column (hypural plate). Caudal peduncle
122 depth (CPD) is the transversal depth at the posterior end of caudal peduncle. Snout length (SnL) is
123 the distance from the anterior margin of the snout to nearest edge of orbit. Orbital diameter (OD) is
124 the horizontal diameter of bony orbit. Interorbital width (IW) is the least distance between orbits.
125 Head depth (HD) is the distance between the tip of parieto-supraoccipital bone to the ventral limit
126 of the body. Suborbital depth (SD) is the distance between the lower margin of the bony orbit and
127 ventrolateral limit of the head. Mandibular ramus (MR) is the width of the longer axis of the
128 dentary. All measurements are shown in Figure 2. Morphometric data are expressed as percents of
129 standard length (SL), except for subunits of the cephalic region that are expressed as percents of
130 head length (HL). Plate counts and nomenclature follow the schemes of serial homology proposed
131 by Schaefer (1997). Vertebral counts included all vertebrae (including the first five vertebrae
132 incorporated into the Weberian apparatus), with the compound caudal centrum (PU1+U1) counted
133 as one element. Accessory patch of teeth is that described by Reis & Schaefer (1992). Cleared and
134 stained specimens (c&s) were prepared according to the method of Taylor & Van Dyke (1985).
135 Whenever available, juvenile specimens were also cleared and stained. Juvenile designation was
136 used for specimens not totally covered by plates□with an anterior paired crest of odontodes on the
137 parieto-supraoccipital□and for males without a fleshy flap on the first thickened pelvic-fin ray,
138 adults presenting the opposite states. Scanning electron microscope pictures were taken from
139 dissected alcohol preserved specimens. Drawings were prepared from c&s specimens using a Zeiss
140 SV8 stereomicroscope with camera lucida. Abbreviations of bones in Figures are: F = frontal□io1-
141 io5 = infraorbitals□LEE = lateral ethmoid exposed area□NA = nasal□NP = nuchal plate□OS =
142 orbitosphenoid□PD = predorsal plates□PF = prefrontal plate□PN = pre-nasal plates□PO = prootic□

143 pr1-pr4 = postrostral plates □PS = parasphenoid □PSB = palatine sesamoid bone □PTS =
144 pterosphenoid □PT-SC = compound pterotic □RP = rostral plate □SOC = parieto-supraoccipital □SP =
145 sphenotic.

146 **Statistical analyses.** Principal component analysis (PCA) was made to check overall
147 variation among samples including differences in morphometrics among species, being an input to
148 multiple regressions. Analyses were made using all measurements listed above except for the
149 pelvic-fin unbranched ray length (VL), which is strongly correlated with the sexual dimorphism,
150 and the mandibular ramus (MR) due to be an imprecise measurement. Fin-spine measurements were
151 removed whenever presenting missing entries. PCA on covariances of logarithmically transformed
152 measurements were obtained using Past version 1.28 2004 (Ryan et al., 1995). The first principal
153 component was partitioned out, considering that it mostly accounts for size variation (Strauss, 1985).
154 Factor scores were plotted in the Sigma Plot version 6.10 2000 (Brannan et. al., 2000). Multiple
155 linear regressions were applied to describe morphometric differences among species or populations
156 of the same species.

157

158 **Results**

159 ***Hisonotus nigricauda* (Boulenger, 1891).**

160 (Figures 3-4, Table 1)

161 *Otocinclus nigricauda* Boulenger, 1891: 234 [original description, type locality: Rio Grande do Sul,
162 Brazil].-Regan, 1904:268-269 [redescription, senior synonym of *Hisonotus laevior* and
163 *Hisonotus leptochilus*].-Isbruecker, 1980:84 [listed].-Schaefer, 1991:23 [Phylogenetic
164 relationships of Hypoptopomatinae]

165 *Hisonotus nigricauda*.-Cope, 1894:97 [compared with *Hisonotus laevior* and *Hisonotus leptochilus*
166 and new generic combination].-Schaefer, 1998:383 [transferred to *Hisonotus*].-Schaefer,
167 2003:232 [listed].-Reis & Carvalho, 2007:84 [listed].-Ferraris, 2007:248 [listed].
168 *Microlepidogaster nigricauda*.-Eigenmann, 1910:413 [listed].-Gosline, 1945: 101 [listed].-Fowler,
169 1959:166-167 [listed and illustrated].-Schaefer, 1997:8 [listed].-Malabarba, 1989:150 [type-
170 locality restricted to laguna dos Patos system, probably rio Camaquã].

171
172 **Material examined.** From laguna dos Patos system, Rio Grande do Sul, Brazil: BMNH
173 91.3.16.53-62, syntypes of *Otocinclus nigricauda*, 9, 24.8-31.8 mm SL, Rio Grande do Sul, Brazil.
174 **Rio Jacuí drainage:** ANSP 21565, 2, 21.3-22.4, rio Jacuí. MCN 16246, 10, 23.7-34.1 mm SL,
175 Porto Alegre, Parque Estadual Delta do Jacuí, Saco da Pólvora, 30°01'S 51°14'W. MCP 19834, 12,
176 25.6-40.2 mm SL, Amarópolis, creek tributary of rio Jacuí in the sylviculture Santo Amaro,
177 29°55'S 51°55'W. MCP 20543, 1, 31.1 mm SL, Porto Alegre, rio Jacuí on Saco da Alemoa,
178 30°00'00"S 51°14'51"W. **Rio Vacacaí drainage:** MCP 19584, 33 + 3 c&s, 22.7-39.1 mm SL, São
179 Gabriel, bridge on road between São Gabriel and Tiaraju, 30°17'29"S 54°20'18"W. MCP 26756, 5,
180 24.2-29.5 mm SL, São Gabriel, marsh of arroio Pirai, 30°17'07"S 54°20'33"W. **Lago Guaíba**
181 **drainage:** MAPA 1737, 1, 26.7 mm SL, Gravataí, arroio Passo dos Ferreiros tributary of rio
182 Gravataí, 29°56'S 50°58'W. MCN 17416, 10, 22.0-32.3 mm SL, Tapes, arroio Guará tributary of
183 arroio Araçá on road between Barra do Ribeiro and Tapes, 30°29'14"S 51°23'39"W. MCN 18048,
184 12, 17.8-34.8 mm SL, Tapes, arroio Guará tributary of arroio Araçá on road between Barra do
185 Ribeiro and Tapes, 30°29'14"S 51°23'39"W. MCP 13781, 1, 28.4 mm SL, Eldorado do Sul, creek
186 at highway BR-290, about 2 km from highway BR-116, 30°03'S 51°23'W. MCP 13949, 10, 22.3-
187 31.8 mm SL, Eldorado do Sul, creek at highway BR-290, about 2 km from highway BR-116,
188 30°03'S 51°23'W. MCP 15059, 3, 29.4-30.6 mm SL, Gravataí, marsh at highway RS-118, about

189 500 meters from highway BR-290, 29°58'S 50°56'W. MCP 15766, 3, 27.1-30.1 mm SL, Eldorado
190 do Sul, creek at highway BR-290, about 2 km from highway BR-116, 30°03'W 51°21'S. MCP
191 21165, 4, 26.8-29.5 mm SL, Eldorado do Sul, creek at margins of highway BR-290, 30°02'36''S
192 51°20'56''W. MCP 28589, 8, 23.1-32.3 mm SL, Eldorado do Sul, creek at highway BR-290, about
193 2 km from highway BR-116, 30°03'W 51°21'S. MCP 28986, 11, 24.7-34.3 mm SL, Eldorado do
194 Sul, arroio Passo dos Carros, 30°05'S 51°23'W. UFRGS 2361, 25, 21.1-32.4 mm SL, Eldorado do
195 Sul, arroio Passo dos Carros, 30°05'S 51°23'W. **Laguna dos Patos drainage:** MCP 17677, 6, 19.8-
196 24.7 mm SL, Pelotas, old drainage channel near to Passo do Tabajara, marsh of Pontal da Barra in
197 Laranjal, 31°47'S 52°14'W. MCP 23855, 33, 23.1-34.1 mm SL, Sentinela do Sul, arroio Velhaco
198 on road between Cerro Grande do Sul and Camaquã, 30°41'22''S 51°41'51''W. MCP 23858, 4,
199 27.2-28.9 mm SL, Sentinela do Sul, arroio do Tigre tributary of arroio Velhaco on road from Cerro
200 Grande do Sul to Camaquã, 30°44'30''S 51°46'26''W. **Rio Camaquã drainage:** MCP 17416, 20 +
201 3 c&s 25.5-39.1 mm SL, Camaquã, marsh at rio Camaquã in Pacheca, 31°08'S 51°47'W. MCP
202 19701, 1, 27.2 mm SL, Encruzilhada do Sul, arroio Passo da Miséria on road between Encruzilhada
203 do Sul and Canguçu, 30°57'S 52°26'. MCP 25881, 51, 15.8-36.7 mm SL, Caçapava do Sul, creek
204 tributary of arroio Seival on road between Lavras do Sul and Caçapava do Sul, 30°44'00''S
205 53°42'04''W. MCP 25875, 1, 34.2 mm SL, Caçapava do Sul, small creek tributary to arroio Hilário
206 on road between Caçapava do Sul and Lavras do Sul, 30°44'24''S 53°44'51''W. MCP 40761, 10 + 3
207 c&s, 31.0-38.2 mm SL, Bagé, arroio Banhado Grande on highway BR-153 between Bagé and
208 Caçapava do Sul, 31°14'34''S 053°52'50''W. **São Gonçalo drainage:** MCP 17415, 32, 27.7-34.9
209 mm SL, Pelotas, dead channel of rio Pelotas, marginal of highway BR-116 in Retiro, 31°37'S
210 52°20'W. MCP 17577, 4, 25.1-31.6 mm SL, Pelotas, arroio Totó on road to colonia Z-3, 31°46'S
211 52°20'W. **Laguna Mirim drainage:** MCP 11134, 2, 28.2-35.0 mm SL, Arroio Grande, arroio
212 Xasqueiro on highway BR-116 between Pelotas and Arroio Grande, 32°09' S 53°02 W. **From rio**

213 **Uruguai basin: rio Ibicuí drainage:** MCP 9270, 10, 17.0-29.7 mm SL, Brazil, Mata, creek on road
214 Between Santa Maria and Mata, 29°33'S 54°27'W. MCP 9386, 10, 14.5-24.3 mm SL, Brazil,
215 Cacequi, rio Ibicuí on bridge between São Rafael and Cacequi, 29°41'S 54°41'W. MCP 9473, 9,
216 20.3-32.5 mm SL, Brazil, São Vicente do Sul, arroio do Salso, road from São Vicente do Sul to
217 Santiago, 29°34'S 54°42'W. MCP 9643, 33, 22.1-34.1 mm SL, Brazil, Dom Pedrito, rio Santa
218 Maria at km 246 of highway BR-293, between Dom Pedrito and Santana do Livramento, 30°59'S
219 54°42'W. MCP 14145, 1, 24.5 mm SL, Brazil, Rosário do Sul, creek on road between Rosário do
220 Sul and Santana do Livramento, 30°18'45"S 54°59'49"W. MCP 14166, 1, 34.1 mm SL, Brazil,
221 Rosário do Sul, arroio Santo Antonio on road between Rosário do Sul and Santana do Livramento,
222 30°18'S54°59'W. MCP 14214, 1, 33.2 mm SL, Brazil, Santana do Livramento, pools at side of rio
223 Santa Maria on road between Dom Pedrito and Santana do Livramento, 30°59'S 54°42'W. MCP
224 15831, 1, 25.6 mm SL, Brazil, Dom Pedrito, rio Santa Maria at km 246 of highway BR-293,
225 between Dom Pedrito and Santana do Livramento, 30°59'S 54°42'W. MCP 16161, 2, 15.5-28.9
226 mm SL, Brazil, Santana do Livramento, lateral pools on road to Campo Seco, 15 km east from
227 highway BR-158, 30°42'S 55°04'W. MCP 19593, 13, 22.3-33.5 mm SL, Brazil, São Gabriel,
228 bridge over Banhado do Inhatium, highway BR-290, 30°15'43"S 54°31'33"W. MCP 23149, 11,
229 26.0-31.4 mm SL, Brazil, São Francisco de Assis, rio Inhacunda at São Francisco de Assis going to
230 Manoel Viana, 29°32'51"S 55°08'11"W. MCP 25249, 1, 33.6 mm SL, Brazil, São Francisco de
231 Assis, rio Inhacunda at São Francisco de Assis about 500 meters from pottery, 29°32'27"S
232 55°07'45"W. MCP 25250, 4, 27.4-32.3 mm SL, Brazil, São Francisco de Assis, rio Inhacunda at
233 São Francisco de Assis going to Manoel Viana, 29°32'51"S 55°08'11"W. MCP 25251, 15, 29.1-
234 34.9 mm SL, Brazil, São Francisco de Assis, creek affluent to rio Inhacunda at São Francisco de
235 Assis about 300 meters from pottery. MCP 26865, 88 + 3 c&s, 22.7-38.5 mm SL, Brazil, Rosário
236 do Sul, arroio do Salso on the highway BR-158, affluent of rio Ibicuí da Armada, 30°22'27"S

237 55°02'07"W. MCP 27608, 14, 16.2-35.9 mm SL, Brazil, São Francisco de Assis, arroio Carai-Passo
238 on road from São Francisco de Assis to Manoel Viana, 29°31'03"S 55°10'49"W. UFRGS 8241, 23,
239 23.7-34.5 mm SL, Brazil, Rosário do Sul, creek at the margin of highway BR-290, 10 km from
240 Rosário do Sul, 30°12'S 55°03'W. **Río Negro drainage:** MCP 10000, 34, 15.4-30.1 mm SL,
241 Uruguay, Cerro Largo, lagoon 10 m from Río Negro at Arrieria, 31°50'S 54°28'W. UFRGS 7183,
242 17, 29.2-32.5 mm SL, Uruguay, Durazno, arroyo Maestre de Campo, on road to Polanco de Yi,
243 tributary of Río Yi, 33°24'55"S 56°12'06"W. UFRGS 9243, 7, 29.3-35.5, Uruguay, Rivera, arroyo
244 Batovi on ruta 27, at km 24, Rio Tacuarembó drainage. UFRGS 9241, 1, 37.3 mm SL, Uruguay,
245 Rivera, arroyo Cunãpiru on km 12 of ruta 27, Río Tacuarémbo drainage, 31°02'21"W 55°29'31"S.
246 UFRGS 9243, 5 + 1 c&s, 30.2-36.5 mm SL, Uruguay, Rivera, lateral pools and arroyo Corrales on
247 ruta 27, tributary of Río Tacuarembó, 31°23'26"S 55°15'14"W. **Other drainages and rio**
248 **Uruguai:** ILPLA 238, 9, 18.5-25.8 mm SL, Argentina, Corrientes, arroyo Cuay Grande, 28°41'S
249 56°14'W. MAPA 2493, 15, 23.6-33.6 mm SL, Brazil, Barra do Quarai, arroio Quarai-Chico, MCP
250 11568, 4, 23.2-29.1 mm SL, Brazil, Uruguaiana, rio Touro Passo, 29°38'S 56°56'W. MCP 16190,
251 2, 24.4-26.2 mm SL, Brazil, São Marcos, marginal lagoon of rio Uruguai at praia da Formosa,
252 29°30'S 56°49'W. MCN 16592, 6, 18.7-33.7 mm SL, Brazil, Itaqui, pool at side of highway BR-
253 472, in marsh drainage canal, Reserva Biológica Estadual de São Donato, 29°00'S 56°10'W. MCN
254 16639, 1, 28.9 mm SL, Brazil, Maçambará, canal at Reserva Biológica Estadual de São Donato,
255 29°00'S 56°10'W. MCN 16759, 7, 18.7-33.7 mm SL, Brazil, Itaqui, creek on highway BR-472
256 between Itaqui and São Borja, Reserva Biológica Estadual de São Donato, 29°00'S 56°10'W. MCN
257 16887, 5, 17.4-23.4 mm SL, MCN 16951, 29, 15.0-31.3 mm SL, Brazil, Itaqui, creek on highway
258 BR-472 between Itaqui and São Borja, Reserva Biológica Estadual de São Donato, 29°00'S
259 56°10'W. MCP 16964, 5, 16.1-33.9 mm SL, Brazil, Itaqui, Reserva Biológica Estadual de São
260 Donato, 29°00'S 56°10'W.

261 **Diagnosis.** *Hisonotus nigricauda* differs from its congeners, except from *Hisonotus*
262 *maculipinnis* and *Hisonotus* sp. “Prata”, by lacking the posterior portion of the lateral line (Fig. 5),
263 vs. posterior portion of lateral line present. Differs from *H. maculipinnis* and *H.* sp. “Prata” by
264 having an almost completely dark caudal fin, without hyaline areas in the middle portion, vs. caudal
265 fin presenting hyaline areas in the middle portion (see remarks for *H. maculipinnis* diagnose).

266 **Description.** Morphometrics and meristics Table 1. Adult size small to medium for members
267 of this genus (less than 40 mm in SL). Body robust, not elongated. Head and body without
268 conspicuous keels. Caudal peduncle round in cross section. Dorsal profile slightly convex from
269 snout tip to dorsal-fin origin except slightly concave profile anterior to nares. Straight and
270 posteroventrally sloped at dorsal-fin base, and almost straight from that point to caudal-fin origin.
271 Greatest body depth at dorsal-fin origin. Least body depth at posterior end of caudal peduncle.
272 Posterior profile of caudal-fin margin slightly concave. Head and snout broad, snout rounded to
273 somewhat square in dorsal view, body progressively narrowing posterior to pectoral-fin insertion.
274 Snout region anterior of nares concave, interorbital region slightly convex. Upper margin of orbit
275 somewhat elevate. Eye dorsolaterally positioned. Iris operculum present.

276 Pectoral fin I,6. Pectoral-fin posterior margin almost straight□when depressed tip extending to
277 middle of pelvic fin. Posterior margin of pectoral-fin spine smooth in adults and juveniles. Pectoral-
278 fin axillary slit present, located below posterior bony margin of cleithral process. Pelvic fin i,5. Tip
279 of depressed pelvic fin not reaching anal-fin origin in females, but extending beyond that point in
280 males. Dorsal fin II,7. Dorsal-fin origin located just posterior of vertical through pelvic-fin origin.
281 Dorsal-fin spinelet somewhat round in shape. Anal fin i,5. First anal-fin pterygiophore exposed
282 anterior to anal fin. Adipose fin absent. Caudal fin i,14,i.

283 Body almost entirely covered by plates except for region overlying opening of swim bladder
284 capsule, area between pectoral girdle and lower lip, region around anus, and area around base of

285 paired fins. Rostral plate with posterior notch articulation with mesethmoid. Rostral plate thickened,
286 with narrow odontode free band between dorsad and ventrad series of odontodes (Fig.6), odontode-
287 free area sometimes absent or inconspicuous in smaller specimens (Fig. 7). Snout plates anterior to
288 nares reduced, small unplated area between rostrum and nares (Fig. 8). Two or three rows of
289 predorsal plates (modally three□Fig. 9). Median series formed by 22–24 plates (Tab. 2). Lateral line
290 incomplete, anterior portion short, formed by one to three plates. Posterior portion of lateral line
291 absent. Median plate series usually truncated (Fig. 5). Plates of median abdominal plate series very
292 small, great in number, irregularly arranged. Lateral abdominal plates larger, forming regular series
293 of about four to seven plates on each side (Fig. 10). Coracoid and cleithrum exposed and covered by
294 odontodes, except for median region of cleithrum between arrector fossae openings and medial
295 region of coracoids.

296 Head without conspicuous crests. Head, fin-spines, and body plates covered with odontodes,
297 these larger on anterior surface of all fin spines, medially directed on pelvic fin. Odontodes on head
298 uniform in size and distribution, except for enlarged odontodes on ventral and dorsal margins of
299 rostrum (Fig. 6 and 7). Odontodes on posterior parieto-supraoccipital tip not enlarged, about same
300 size as surrounding areas. Anteroventral margin of compound pterotic with median-to-large size
301 perforations. Infraorbital canal entering infraorbital series via sphenotic. Lips roundish and
302 papillose. Maxillary barbel present.

303 Premaxillary and dentary teeth slender proximally and flattened distally□bifid, major (medial)
304 cusp large and rounded, minor (lateral) cusp pointed. Accessory patch of teeth absent on dentary
305 and premaxilla.

306 Hypurals 1-2 and 3-5 not completely fused, median notch on posterior margin of caudal-fin
307 skeleton extending anteriorly. Total vertebrae 27-28 (4 c&s), one c&s presenting 25 apparently
308 anomalous.

309 **Color in alcohol.** Ground color of dorsal and lateral surfaces gray to almost black. Dorsal
310 and dorsolateral body surfaces slightly lighter than lateral surface, except for head, which is darker.
311 Ventral surface of body heavily pigmented. Area anterior to nares lighter but not forming
312 conspicuous longitudinal light stripes. Fins mostly hyaline, except for several transverse dark bands.
313 Caudal fin almost completely dark pigmented, except for hyaline area on posterior portion of three
314 uppermost branched rays. That hyaline portion, and the unbranched rays of caudal fin with striped
315 pattern of transverse dark bars.

316 **Sexual dimorphism.** Characterized by the urogenital papilla, positioned just behind the anal
317 opening in males. Adult males also possess a developed fleshy flap along the dorsal margin of first
318 thickened pelvic-fin ray, that is absent in females. Flap slightly wider basally and progressively
319 narrowing distally. In adult males, the first and second branched rays of pelvic fin present a fleshy
320 flap in its anteromedial portion. In juvenile males all flaps are smaller or absent. Males have a
321 longer pelvic-fin unbranched ray that extends beyond the anal-fin origin, with the ray never
322 reaching that point in females.

323 **Distribution and habitat.** *Hisonotus nigricauda* is widely distributed in the laguna dos Patos
324 system and in the rio Uruguai basin. In the laguna dos Patos system that species is found mostly in
325 the lower portions of the drainages near the laguna do Patos, being absent in the upper portions of
326 rio Jacuí basin. In the same manner, *H. nigricauda* is most commonly collected in the lower
327 portions of the rio Uruguai basin, but being found in the headwaters of rio Negro, rio Quaraí, and
328 rio Ibicuí drainages (Fig. 11). *Hisonotus nigricauda* is apparently absent in the rio Uruguai basin
329 above the mouth of rio Ibicuí. This species inhabits slow flowing watercourses, of brown waters
330 running over dark organic matter and sandy bottom. The individuals were found in between
331 marginal and aquatic vegetation (Fig. 12).

332 **Remarks.** *Hisonotus nigricauda* is morphologically similar to *Hisonotus maculipinnis*
333 (Regan, 1912). Both nominal species are morphometrically identical (Fig. 13), however, they can be
334 tentatively distinguished by the following features: *H. nigricauda* presents an almost completely
335 dark caudal fin contrasting with a caudal fin presenting hyaline areas in most specimens of *H.*
336 *maculipinnis* (including the type-series), especially in juvenile specimens (Fig. 14). Moreover, most
337 specimens of *H. nigricauda* possess a narrow odontode-free area between dorsal and ventral series of
338 odontodes on the anterior margin of snout, which is not seen in *H. maculipinnis* specimens. These
339 features slightly distinguish the forms, and both seem to be part of a complex inhabiting the lower
340 portions of the Paraná-Paraguay and laguna dos Patos systems. It is possible that *H. maculipinnis*
341 and *H. nigricauda* are conspecific. Since a possible synonymization is beyond the purposes of this
342 work, the priority (older) name is used for the laguna dos Patos system (type locality) and rio
343 Uruguai basin.

344

345

***Hisonotus laevior* Cope, 1894**

346

(Figures 15-16, Table 3)

347 *Hisonotus laevior* Cope, 1894: 95-96 [original description, type locality: Rio Jacuhy, Rio Grande do
348 Sul, Brazil].-Regan, 1904:268-269 [synonym of *Otocinclus nigricauda*].-Gosline,
349 1945:101 [listed as synonym of *Microlepidogaster nigricauda*]. Fowler, 1959:167 [listed as
350 synonym of *Microlepidogaster nigricauda*].-Schaefer, 2003:322 [listed].-Reis & Carvalho,
351 2007:83 [listed].-Ferraris, 2007:248 [listed].
352 *Otocinclus laevior*.-Isbruecker, 1980:83 [listed].
353 *Microlepidogaster laevior*.-Gomes, 1947:30-32 [removed from synonym and misidentified
354 redescription].-Malabarba, 1989:150 [listed]. Schaefer, 1997:8 [listed].

355 *Hisonotus leptochilus* Cope, 1894:96 [original description, type locality: Rio Jacuhy, Rio Grande do
356 Sul, Brazil – new synonym]. Regan, 1904:268-269 [synonym of *Otocinclus nigricauda*].-
357 Gosline, 1945:101 [listed as synonym of *Microlepidogaster nigricauda*].-Fowler, 1959:167
358 [listed as synonym of *Microlepidogaster nigricauda*].-Schaefer, 2003:322-323 [listed].-Reis
359 & Carvalho, 2007:83 [listed].-Ferraris, 2007:248 [listed].

360 *Otocinclus leptochilus*.-Isbruecker, 1980:83 [listed].

361 *Microlepidogaster leptochilus*.-Malabarba, 1989:150 [listed].-Schaefer, 1997:8 [listed].

362 *Hisonotus nigricauda*, non (Boulenger, 1891).-Ribeiro et al., 2007:60 [misidentification, listed and
363 Illustrated].

364

365 **Material examined.** All from laguna dos Patos system, Rio Grande do Sul, Brazil. **Rio Jacuí**
366 **drainage:** ANSP 21253, holotype of *Hisonotus laevior*, 39.2 mm SL, rio Jacuí. ANSP 21564,
367 holotype of *Hisonotus leptochilus*, 40.9 mm SL, rio Jacuí MCP 9302, 2, 28.7-30.2 mm SL, Pantano
368 Grande, arroio Dom Marcos, 30°13'32"S 52°37'09"W. MCP 9533, 3, 23.2-27.6 mm SL, Rio Pardo,
369 arroio Francisquinho on highway BR-290 on border between Butiá and Rio Pardo, 30°09'S
370 52°08'W. MCP 19835, 12, 25.6-40.2 mm SL, Amarópolis, creek tributary of rio Jacuí in the
371 sylviculture Santo Amaro, 29°55'S 51°55'W. MCP 27329, 2, 26.0-30.2 mm SL, Butiá, arroio
372 Martins upstream of mina do Recreio, 30°09'S 51°59'W. MCP 17346, 28, 21.1-40.4 mm SL, Butiá,
373 arroio Martins upstream of mina do Recreio, 30°09'S 51°59'W. MCP 17359, 11, 18.9-31.4 mm SL,
374 Arroio dos Ratos, arroio da Porteira, 29°24'S 51°57'W. UFRGS 2577, 2, 29.7-39.9 mm SL,
375 Triunfo, arroio Gil on road between Barreto and Montenegro, 29°48'S 51°37'W. **Rio Vacacaí**
376 **drainage:** MCP 23131, 1, 33.5 mm SL, São Sepé, rio São Sepé at bridge lateral to highway BR-
377 153, about 3 km south from São Sepé, 30°11'08"S 53°33'35"W. **Rio Caí drainage:** MAPA 1755,
378 24 + 3 c&s, 19.7-43.4 mm SL, São Sebastião do Caí, creek in Rio Branco, 29°35'S 51°22'W. MCN

379 15488, 2, 30.5-30.9 mm SL, Triunfo, arroio Bom Jardim upstream SITEL, 29°50'S 51°24'W. MCN
380 15823, 2, 36.3-45.4 mm SL, Triunfo, arroio Bom Jardim upstream SITEL, 29°50'S 51°24'W. MCN
381 15809, 1, 41.6 mm SL, Triunfo, arroio Bom Jardim in front of SITEL, 29°50'S 51°23'W. MCP
382 23005, 2, 14.6-39.6 mm SL, Triunfo, arroio Bom Jardim, III Polo Petroquímico near SITEL,
383 29°50'19"S 51°23'25"W. MCP 23008, 6, 33.8-38.1 mm SL, Triunfo, arroio Bom Jardim on the
384 access road to III Polo Petroquímico, 29°50'S 51°23'W. MCP 26053, 1, 40.3 mm SL, Lindolfo
385 Collor, arroio Feitoria tributary of rio Cadeia, 29°34'54"S 51°14'03"W. MCP 26054, 2, 22.1-39.7
386 mm SL, Lindolfo Collor, arroio Feitoria tributary of rio Cadeia, 29°34'54"S 51°14'03"W. UFRGS
387 8661, 23, 31.6-43.0 mm SL, Butiá, creek on property Cerro Vermelho, 30°08'S 51°59'W. UFRGS
388 8711, 12, 33.1-43.9 mm SL, Butiá creek on property Cerro Vermelho, , 30°08'S 51°59'W. UFRGS
389 8720, 38, 30.4-46.1 mm SL, Rio Pardo, creek at fazenda Limoeiro, 29°59'S 52°22'. UFRGS 8771,
390 8, 35.5-43.8 mm SL, Pantano Grande, creek on the limit of fazenda Sanga Funda, property of
391 Aracruz, 30°08'S 52°23'W. UFRGS 8777, 2, 36.4-48.1 mm SL, Rio Pardo, creek tributary of arroio
392 Iruí on fazenda Limoeiro, 30°02'S 52°22'W. UFRGS 8786, 16, 28.8-43.6 mm SL, Pântano Grande,
393 creek on the limit of fazendas Tarumã I and Tarumã II, property of Aracruz, 30°08'S 52°23'W.
394 **Lago Guaíba drainage:** MAPA 1737, 4, 32.9-38.0 mm SL, Gravataí, arroio Passo dos Ferreiros
395 tributary to rio Gravataí, 29°56'S 50°58'W. MCP 14652, 5, 33.7-41.3 mm SL, Morungava, rio
396 Morungava and an affluent in Morungava, 29°50'S 50°54'W. MCP 41574, 2, 36.2-40.8 mm SL,
397 Gravataí, marsh at highway RS-118, about 500 meters from highway BR-290, 29°58'S 50°56'W.
398 MCP 16034, 12, 20.6-31.4 mm SL, Viamão, lago Guaíba at praia de Itapuã near to mouth of riacho
399 Itapuã, 30°15'00"S 51°02'20"W. MCP 23466, 1, 40.9 mm SL, Viamão, arroio at praia da Pedreira,
400 Parque Estadual de Itapuã, 30°21'30"S 51°02'48"W. MCP 28116 27.1-42.8 mm SL, Viamão, arroio
401 Sandu, 30°14'W 51°00'W. UFRGS 1239, 1, 38.1 mm SL, Viamão, arroio Alexandrina. **Laguna**
402 **dos Patos drainage:** MCN 2622, 1, 44.4 mm SL, Rio Grande, arroio Vieira, 32°06'S 52°09'W.

403 MCN 12682, 7, 32.0-46.7 mm SL, São Lourenço do Sul, arroio Inhuquipá (Turuçu) near Formosa,
404 31°28'S 52°05'W. MCN 17632, 3, 18.5-40.0 mm SL, Palmares do Sul, channel of lagoa dos
405 Gateados at Fazenda São Sebastião do Fundo, 30°27'S 50°39'W. MCN 17549, 1, 38.7 mm SL,
406 Palmares do Sul, channel of lagoa dos Gateados at Fazenda São Sebastião do Fundo, 30°27'S
407 50°39'W. MCN 17801, 1, 45.6 mm SL, Palmares do Sul, lagoa do Casamento west of mouth of
408 channel to lagoa dos Gateados, 30°22'S 50°39'W. MCN 18138, 2, 32.5-32.6 mm SL, Palmares do
409 Sul, south margin of lagoa do Casamento, 30°29'S 50°36'W. MCP 16016, 6, 14.7-34.8 mm SL,
410 Viamão, creek on Varzinha in Itapuã, 30°19'S 50°56'W. MCP 19068, 1, 34.2 mm SL, Rio Grande,
411 arroio Bolacha, 32°09'S 52°11'W. MCP 21375, 6, 25.6-40.5 mm SL, São José do Norte, laguna dos
412 Patos at Barra Falsa upstream dam, 31°34'19"S 51°27'35"W. MCP 23856, 10, 31.6-43.8 mm SL,
413 Sentinela do Sul, arroio Faxinal tributary of arroio Velhaco on road from Cerro Grande do Sul to
414 Camaquã, 30°43'48"S 51°45'24"W. MCP 23859, 2, 27.1-41.8 mm SL, Sentinela do Sul, arroio
415 Capivaras on road between Sentinela do Sul and Vila Aurora. 30°39'27"S 51°36'12"W. MCP
416 23860, 23, 27.6-46.2 mm SL, Tapes, arroio Texeira on highway BR-116, 30°37'26"S 51°32'45"W.
417 MCP 31157, 4, 31.7-33.2 mm SL, Rio Grande, Saco da Mangueira, 32°05'S 52°09'W. MCP 41575,
418 23, 25.1-42.7 mm SL, Sentinela do Sul, arroio do Tigre tributary of arroio Velhaco on road from
419 Cerro Grande do Sul to Camaquã, 30°44'30"S 051°46'26"W. MCP 41576, 2, 31.4-31.9 mm SL,
420 Sentinela do Sul, arroio Velhaco on road from Cerro Grande do Sul to Camaquã, 30°41'22"S
421 51°41'51"W. UFRGS 4200, 8, 18.7-37.2 mm SL, Tapes, arroio Velhaco. UFRGS 4220, 3, 22.2-
422 35.9 mm SL, Tapes, arroio Velhaco between Tapes and Camaquã, about 24 km from mouth in
423 laguna dos Patos, 30°45'S 51°38'W. UFRGS 6698, 10, 13.8-38.3 mm SL, Viamão, lagoa Negra,
424 30°21'35"S 050°58'34"W. **Rio Camaquã drainage:** MCP 23854, 12, 34.8-44.7 mm SL, Cristal,
425 creek tributary to arroio Santa Isabel on Highway BR-116, about 17 km south from Cristal,
426 30°08'55"S 52°01'50"W. MCP 23857, 21, 27.8-38.9 mm SL, Camaquã, arroio Duro on road

427 between Vila Aurora and Dom Feliciano, 30°45'34"S 51°51'57"W. MCP 25754, 4, 25.0-37.2 mm
428 SL, Camaquã, arroio Maria Ulghim on road between Camaquã and Vila Aurora, 30°49'S 50°49'W.
429 MCP 26042, 1, 42.3 mm SL, Caçapava do Sul, arroio do Banhado highway BR-153 about 8 km
430 northwest from Minas do Camaquã, 30°51'48"S 53°29'50"W. MCP 41607, 1, 36.7 mm SL,
431 Caçapava do Sul, small creek tributary to arroio Hilário on road between Caçapava do Sul and
432 Lavras do Sul, 30°44'24"S 53°44'51"W. UFRGS 8239, 4, 32.5-41.3 mm SL, Canguçu, creek
433 tributary to rio Camaquã on highway RS-471, 31°23'S 52°40'W. UFRGS 8469, 1, 31.4 mm SL,
434 Canguçu, creek tributary to rio Camaquã on divergence of highway RS-471, 31°23'S 52°40'W.
435 UFRGS 8758, 13, 23.9-40.5 mm SL, Amaral Ferrador, creek at fazenda Ferraria, 30°52'S 52°15'W.
436 **São Gonçalo drainage:** MCP 17398, 16, 30.8-40.8 mm SL, Pedro Osório, arroio Mata Olho
437 tributary of arroio Arambaré between Pedro Osório and Herval, 31°57'S 53°06'W. MCP 17406, 2,
438 37.9-38.7 mm SL, Pedro Osório, arroio Reduzino, 31°54'S 52°55'W. MCP 20821, 6, 37.8-39.4 mm
439 SL, Pedro Osório, arroio Reduzino, 31°54'S 52°55'W. MCP 21424, 13, 33.4-48.9 mm SL, Herval,
440 small creek tributary to arroio Arambaré, between Pedro Osório and Airosa Galvão, 31°58'19"S
441 53°05'39"W. MCP 21144, 4, 31.5-37.3 mm SL, Piratini, arroio Piratinzinho on lateral road to
442 highway BR-293, 31°43'02"S 52°59'34"W. MCP 25153, 19, 33.1-46.3 mm SL, Pedro Osório,
443 arroio Arambaré on road between Pedro Osório and Basílio, tributary of rio Piratini, 31°54'35"S
444 53°01'40"W. MCP 34778, 1, 37.6 mm SL, Herval, arroio Arambaré on road between Pedro Osório
445 and Herval, 31°58'37"S 53°06'15"W. MCP 34779, 8, 33.3-48.8 mm SL, Pedro Osório, arroio Mata
446 Olho on road between Pedro Osório and Basílio, 31°54'56"S 53°00'16"W. MCP 34781, 1, 43.0 mm
447 SL, Pedro Osório, arroio Arambari on road from Pedro Osório to Basílio, 31°54'35"S 53°01'41"W.
448 MCP 34781, 4, 35.3-43.0 mm SL, Pedro Osório, arroio Arambari on road from Pedro Osório to
449 Basílio, 31°54'35"S 53°01'41"W. MCP 37683, 4, 31.7- 41.7 mm SL, Pedro Osório, creek tributary
450 to arroio Arambaré near Carvalho de Freitas, about 35 km from Pedro Osório on the railroad bridge,

451 31°57'52"S 53°06'17"W. MCP 37684, 59, 28.8-49.5 mm SL, Pedro Osório, arroio Arambaré about
452 5 km south from Vila Basílio on road to Pedro Osório, 31°54'34"S 53°01'39"W. MCP 41304, 1,
453 36.2 mm SL, Pedro Osório, arroio Mata Olho on road between Pedro Osório and Basílio,
454 31°54'56"S 53°00'17". **Laguna Mirim drainage.** MCP 26074, 2, 38.9-41.22 mm SL, Rio Grande,
455 new channel of arroio Taim, Estação Ecológica do Taim, 32°37'S 52°34'W.

456 **Diagnosis.** *Hisonotus laevior* differs from its congeners, except from *Hisonotus* sp.
457 "Camaquã" and *Hisonotus taimensis* by the higher number of median plate series 25-27 vs. 20-25,
458 by the number of predorsal plates 3-4 (modally 4 □ Fig 17) vs. 2-3 predorsal plates, and by the
459 vertebral count 30-31 vs. 25-29. *Hisonotus laevior* distinguishes from *Hisonotus* sp. "Camaquã" by
460 the presence of a posterior notch articulation in the rostral plate vs. absence of a notch articulation
461 in the rostral plate, and by the possession of a rounded caudal peduncle in cross section vs. a slight
462 square caudal peduncle in cross section. *Hisonotus laevior* can be distinguished from *Hisonotus*
463 *taimensis* by the wider cleithral width 20.6-24.6% SL, mean 22.9% vs. 18.5-21.3% SL, mean 20.0%
464 (Fig 18), and by the higher body depth at dorsal-fin origin 16.2-20.8 % SL, mean 18.1% vs. 13.3-
465 16.3%, mean 15.1% (Fig 19).

466 **Description.** Morphometrics and meristics in Table 3. Adult size moderate to large for
467 members of this genus (larger specimen with 47.2 mm in SL). Body robust, somewhat elongated,
468 without conspicuous keels. Caudal peduncle round in cross section. Dorsal profile straight to
469 concave from tip of snout to nares, slightly convex from that point to dorsal-fin origin. Straight and
470 posteroventrally sloped at dorsal-fin base and almost straight from that point to caudal-fin origin.
471 Greatest body depth at dorsal-fin origin. Least body depth at posterior end of caudal peduncle.
472 Posterior profile of caudal fin concave. Head and snout broad, snout rounded to slightly square in
473 dorsal view, body progressively narrowing posterior of pectoral-fin insertion. Snout region anterior

474 of nares concave, interorbital region convex. Upper margin of orbit slightly elevated. Eye
475 dorsolaterally positioned. Iris operculum present.

476 Pectoral fin I,6. Pectoral fin posterior margin almost straight□when depressed tip extending to
477 middle of pelvic fin. Posterior margin of pectoral-fin spine smooth. Half portion of spine length
478 serrate in smaller individuals (about or less than 30 mm in SL). Pectoral-fin axillary slit present,
479 located below posterior bony margin of cleithral process. Pelvic fin i,5. Tip of depressed fin not
480 reaching anal-fin origin in females, but extending beyond that point in males. Dorsal fin II,7.
481 Dorsal-fin origin located slightly posterior of vertical through pelvic-fin origin. Dorsal-fin spinelet
482 present, laterally extended. Anal fin I,5. First anal-fin pterygiophore exposed anterior to anal fin or
483 covered by ventral plate series. Adipose fin absent. Caudal fin i,14,i.

484 Body almost entirely covered by plates except for region overlying opening of swim bladder
485 capsule, area between pectoral girdle and lower lip, region around anus, and area around base of
486 paired fins. Rostral plate with posterior notch articulation with mesethmoid. Rostral plate thickened,
487 with an odontode free band between dorsad and ventrad series of odontodes. Snout plates anterior to
488 nares reduced, large paired unplated region between rostrum and nostril. Three or four rows of
489 predorsal plates (modally four□Fig 17), smaller specimens frequently presenting three rows. Median
490 series formed by 25–27 plates (Tab. 2). Lateral line incomplete, with small gap without pores along
491 middle length of body, posterior portion of lateral line present. Median plate series extending to
492 posterior end of caudal peduncle, not truncated. (Fig. 20). Median abdominal plate series small,
493 irregularly arranged, sometimes presenting a naked area between median and lateral abdominal
494 plate series. Lateral abdominal plates larger, forming a regular series variable in number (Fig. 21).
495 Coracoid and cleithrum exposed and covered by odontodes, except for median region of cleithrum
496 between arrector fossae openings and medial region of coracoids.

497 Head without conspicuous crests. Head, fin-spines, and body plates covered with odontodes,
498 these larger on anterior surface of all fin spines, medially directed on pelvic fin. Odontodes on head
499 and trunk of uniform size and distribution, except for enlarged odontodes on ventral and dorsal
500 margin of rostrum. Anterior margin of rostrum presenting an odontode-free area. Odontodes on
501 posterior parieto-supraoccipital tip not enlarged. Anteroventral margin of compound pterotic with
502 median-to-large size perforations. Infraorbital canal entering infraorbital series via sphenotic. Lips
503 roundish and papillose.

504 Premaxillary and dentary teeth slender proximally and flattened distally□bifid, major (medial)
505 cusp large and rounded, minor (lateral) cusp pointed. Accessory patch of teeth absent on dentary
506 and premaxilla.

507 Hypurals 1-2 and 3-5 completely fused or with slight median notch on the posterior margin of
508 caudal-fin skeleton, Total vertebrae 30-31 (5 c&s).

509 **Color in alcohol.** Ground color of dorsal and lateral surfaces of body, light to dark brown.
510 Dorsal and dorsolateral surface lighter than lateral surface. Ventral surface of body almost
511 unpigmented except for scattered chromatophores. Dorsolateral surface of head and body with light
512 longitudinal stripes. Stripes narrow, beginning at tip of snout anterior to nares, passing above orbit
513 and reaching the posterior end of parieto-supraoccipital, bifurcated and inconspicuous at this point
514 and completely disappearing at vertical above dorsal-fin origin. All fins mostly hyaline, with
515 chromatophores forming narrow transverse dark bands□bands most conspicuous on unbranched
516 rays. Caudal fin completely dark brown pigmented, except for hyaline posterior portion of
517 uppermost rays. That hyaline portion, and unbranched rays of caudal fin with striped pattern of
518 transverse dark bars. Caudal fin in some specimens with inconspicuous light transverse band
519 formed by rounded clear spots.

520 **Sexual dimorphism.** Characterized by the urogenital papilla positioned just behind the anal
521 opening in males. Adult males possess a fleshy flap along the dorsal margin of first thickened
522 pelvic-fin ray, that is absent in females. Flap slightly wider basally and progressively narrowing
523 distally. Adult males presenting a fleshy flap in the medial portion of first and second branched rays
524 of pelvic fin. In juvenile males flaps are smaller or absent. Males have a longer pelvic-fin
525 unbranched thickened ray that extends beyond the anal-fin origin, with the ray never reaching that
526 point in females.

527 **Distribution and habitat.** *Hisonotus laevior* is widely distributed in the laguna dos Patos
528 system from southernmost tributaries of the laguna Mirim and canal São Gonçalo drainage to the
529 tributaries of the northern rio Jacuí basin (Fig. 22). The new species is absent in the headwaters of
530 the rio Jacuí basin. This species inhabits slow to median flowing watercourses, with clear to brown
531 waters and a sandy bottom, and is found in marginal or submerged aquatic vegetation. *Hisonotus*
532 *laevior* is sympatric along its distribution with several species of the genus. *Hisonotus laevior*
533 occurs in synpatry with *Hisonotus armatus* along almost all its distribution. *Hisonotus laevior* is
534 collected together with *H. nigricauda* in some localities of the laguna dos Patos system, mainly in
535 the lower portions of the streams. *Hisonotus laevior* occurs in the banhado do Taim together with *H.*
536 *taimensis* and in coastal plain of the Rio Grande do Sul with *Hisonotus* aff. *leucofrenatus*.

537 **Comments on synonymy.** *Hisonotus laevior* is herein designated as senior synonym of
538 *Hisonotus leptochilus* (Fig. 23). Both species were published in the same paper by Cope (1894).
539 These species were collected by H. Smith in 1882, together with a collection of fishes sent to
540 Academy of Natural Sciences of Philadelphia. The material was studied by Cope with the
541 description of several new species including the two species of *Hisonotus*, collected at rio Jacuhy
542 (rio Jacuí). According to Papavero (1973) and Malabarba (1989), H. Smith itinerary in the state of
543 Rio Grande do Sul includes several cities in the laguna dos Patos system and the localities of Cai

544 (actually São Sebastião do Cai), Jacuí (actually Restinga Seca), São João do Montenegro
545 (Montenegro), and Porto Alegre. The later localities mentioned are situated in the lower portion of
546 rio Jacuí and rio Cai drainages, where the species *H. laevior* is the most predominant taxa of the
547 genus. The descriptions of *H. laevior* and *H. leptochilus* were based on one specimen of each
548 species. The differences between these taxa according to Cope (1894:96) are: “The important
549 characters which distinguish this species [*H. leptochilus*] from the *H. laevior*, are the thin and
550 truncate lower lip with feeble tuberculation—the numerous ventral plates—the narrower orbital space,
551 and the greater hispidity, especially of the head”. Nevertheless, no substantial differences were
552 found in the lower lip tuberculation between all *Hisonotus* species examined including the
553 holotypes of *H. laevior* and *H. leptochilus*. The holotype of *H. leptochilus* presents more plates in
554 the abdominal median series than *H. laevior* (see Cope, 1894 fig. 11b and fig 12b, respectively).
555 The degree of development of abdominal plates (in *Hisonotus*) is strongly related with age, younger
556 and smaller individuals usually possessing fewer and smaller plates, than older and larger specimens.
557 However, this ontogenetic variation in the belly plating process seems not the cause for the
558 variation observed by Cope (1894), but a polymorphic feature observed within several species. The
559 Figures 21 and 24 show differences in the development of the abdominal plates in specimens of *H.*
560 *laevior*, similar variations were found in individuals of *Hisonotus* sp. “Camaquã” and cannot be
561 used to differentiate the former species from *H. leptochilus*. Another diagnostic feature used by
562 Cope (1894) to differ *H. leptochilus* from *H. laevior* was its narrower interorbital space. Although
563 the holotype of *H. leptochilus* has a narrow interorbital width (39.5% of head length, vs. 41.6% of
564 head length in the holotype of *H. laevior*), that measurement is within the range of *H. laevior*
565 (36.9-46.2% of head length—Fig. 25). Finally, no difference in the hispidity of odontodes, in any
566 portion of the body, was found that could suggests the separation of two species in the laguna dos
567 Patos system. For these reasons *Hisonotus laevior* Cope, 1894:95 is considered senior synonym of

568 *Hisonotus leptochilus* Cope, 1894:96. *Hisonotus leptochilus* is here, for the first time, suggested as
569 junior synonym of *H. laevior*, although, both species had already been considered synonym of *H.*
570 *nigricacauda* before (see synonym list).

571

572 ***Hisonotus taimensis* (Buckup, 1981).**

573 (Figure 26, Table 4)

574 *Microlepidogaster taimensis* Buckup, 1981: 19-31, (original description, type locality: novo canal
575 do arroio Taim, Estação Ecológica do Taim, Rio Grande, Rio Grande do Sul, Brasil). -
576 Buckup & Malabarba, 1983 [listed]. -Malabarba, 1989:150 [listed]. -Grosser *et al.*, 1994
577 [listed].

578 *Hisonotus taimensis*.-Schaefer, 2003: 323 [listed].-Bemvenuti & Moresco, 2005:55 [listed and
579 illustrated].-Reis & Carvalho, 2007:84 [listed].-Ferraris, 2007:248 [listed].

580 **Material examined.** All from laguna dos Patos system, Rio Grande do Sul, Brazil: MAPA
581 1054, paratype of *M. taimensis*, 1, 36.3 mm SL, Santa Vitória do Palmar, channel at km 114 on
582 highway BR-471, Estação Ecológica do Taim. MAPA 1055, 1059-1061, paratypes of *M. taimensis*,
583 4, 37.5-51.1 mm SL, Rio Grande, channel at east of lagoa do Jacaré, Estação Ecológica do Taim.
584 MAPA 1070, paratype of *Microlepidogaster taimensis*, 1, 26.1 mm SL, Santa Vitória do Palmar,
585 old course of arroio Taim, Estação Ecológica do Taim. MAPA 1013, 1014, 1016, 1018, 1019, 1024,
586 1026-1028, 1063-1065, 1067-1069, 15, 30.1-47.4 mm SL paratypes of *M. taimensis*, Rio Grande,
587 new channel of arroio Taim, Estação Ecológica do Taim. MCN 4835-4844, paratypes of *M.*
588 *taimensis*, 10, 34.7-45.9 mm SL, Rio Grande, new channel of arroio Taim, Estação Ecológica do
589 Taim. MCP 14467, 2 + 3 c&s, 21.8-42.5 mm SL, Rio Grande, new channel of arroio Taim, Estação
590 Ecológica do Taim. MCP 17417, 27 + 3 c&s, 24.6-41.8 mm SL, Rio Grande, new channel of arroio
591 Taim. MCP 21375, MCN 7660, 2, 23.9-50.0 mm SL, Rio Grande, north channel of lagoa do Jacaré,

592 Estação Ecológica do Taim. UFRGS 352-353, paratypes of *M. taimensis*, 2, 40.4-43.5 mm SL, Rio
593 Grande, new channel of arroio Taim, Estação Ecológica do Taim. UFRGS 396, paratypes of *M.*
594 *taimensis*, 1, 37.3 mm SL. Rio Grande, new channel of arroio Taim near the highway BR-471.
595 UFRGS 697, 2, 32.8-37.4, Rio Grande, Estação Ecológica do Taim. UFRGS 2462, 5, 21.1-42.3,
596 Rio Grande, Estação Ecológica do Taim, curve in the new channel of arroio Taim on highway BR-
597 471. UFRGS 2583, 1, 36.2 mm SL, Rio Grande, Estação Ecológica do Taim, southeast margin of
598 lagoa das Flores. MCN 6474, 1, 46.2 mm SL, Chuí, Barra do Chuí, 33°44'S 53°22'W. CIMC 2341,
599 2, 28.0-30.7 mm SL, Rio Grande, canal near Estação Ecológica do Taim. CIMC 2405, 67, 20.6-37.3
600 mm SL, Capão do Leão, canal São Gonçalo near sanga das Traíras.

601 **Diagnosis.** *Hisonotus taimensis* differs from its congeners, except from *Hisonotus* sp.
602 “Camaquã” and *Hisonotus laevior* by the larger number of lateral plates 26-29 vs. 20-25, by the
603 number of predorsal plates 3-4 (usually 4) vs. 2-3 and by vertebral count 31-32 vs 25-29 vertebrae.
604 *Hisonotus taimensis* differs from *Hisonotus* sp. “Camaquã” by the presence of a posterior notch
605 articulation in the rostral plate vs. absence of a notch articulation in the rostral plate, and by having
606 a round caudal peduncle in cross section vs. a slight square caudal peduncle in cross section.
607 *Hisonotus taimensis* can be distinguished from *H. laevior* by the narrow cleithral width 18.5-21.3%
608 SL, mean 20.0% vs. 20.6-24.6% SL, mean 22.9% (Fig 18), and by the lower body depth at dorsal-
609 fin origin 13.3-16.3% SL, mean 15.1%, vs. 16.2-20.8% SL, mean 18.1% (Fig. 19).

610 **Description.** This species was described by Buckup (1981) and will not be redescribed here.

611 **Distribution and habitat.** *Hisonotus taimensis* is known from localities nearby the laguna
612 Mirim (Fig 27). This species inhabits, at type locality, slow flowing watercourses with brown
613 waters of muddy and sandy bottom. The individuals are found in between aquatic vegetation of the
614 genus *Eichhornia*, in grasses or similar kind of submersed vegetation. According to Buckup (1981)
615 the enlarged rostral odontodes (Fig. 28) and pelvic-fin odontodes contribute to helping them cling

616 the stems and roots of *Eichhornia*. See Grosser *et al.* (1994) for detailed description of the species
617 habitat and distribution in the Taim region.

618

619 ***Hisonotus armatus* Carvalho, Lehmann, Pereira & Reis**

620 Figures 29-30, Table 5

621 *Hisonotus armatus* Carvalho, Lehmann, Pereira & Reis, *in press* [original description, type locality:
622 Brazil, Rio Grande do Sul, Pedro Osório, arroio Arambaré, about 5 km south of Vila Basílio
623 on the road to Pedro Osório].

624 *Hisonotus nigricauda* non Boulenger, 1981. - Lucena *et al.*, 1994 [listed misidentified].

625 *Hisonotus* sp. 5. - Reis & Carvalho, 2007: 84 [listed].

626

627 **Examined material.** All from laguna dos Patos system, Rio Grande do Sul, Brazil. **São Gonçalo**
628 **drainage:** MCP 41323, holotype, 44.4 mm SL, Pedro Osório, arroio Arambaré, about 5 km south of
629 Vila Basílio, on road to Pedro Osório, 31°51'51"S 052°49'24"W. MCP 37682, paratypes, 13 + 4
630 c&s, 33.9–44.2 mm SL □ ANSP 187116, 5, 33.7–42.5 mm SL □ MZUSP 93884, 5, 37.7–45.1 mm SL,
631 all collected with the holotype. MCP 40787, paratypes, 20, 32.5–45.6 mm SL, Pedro Osório, arroio
632 Mata Olho, on road between Pedro Osório and Basílio, 31°54'56"S 53°00'16"W. MCP 34776,
633 paratypes, 31, 27.6–43.9 mm SL, Herval, arroio Arambaré, on road from Pedro Osório to Herval,
634 31°58'37"S 53°06'15"W. MCP 25138, paratypes, 9 + 3c&s, 27.9–45.9 mm SL, Piratini, arroio
635 Santa Fé on road between Pinheiro Machado and Piratini, 31°30'12"S 53°13'56"W. MCN 12617,
636 3, 37.1–37.3 mm SL, Pelotas, arroio Pelotas on highway BR-116, 31°37'55"S 52°19'39"W. MCP
637 25140, 4, 37.6–46.7 mm SL, Pedro Osório, arroio Mata Olho on road between Pedro Osório and
638 Basílio, 31°54'56"S 53°00'17"W. MCP 25147, 2, 30.1–36.3 mm SL, Piratini, arroio Piratinzinho
639 on secondary road to BR-293, 31°43'02"S 52°59'34"W. MCP 25154, 14 + 1 c&s, 28.0–45.4 mm

640 SL, Piratini, arroio Piratinzinho on secondary road to BR-293, 31°43'02"S 52°59'34"W. MCP
641 25158, 8, 34.4–45.2 mm SL, Piratini, arroio Piratini Menor about 500 m from road between Piratini
642 and Pelotas, 31°30'03" S 53°05'35"W. MCP 25159, 24, 28.9–42.1 mm SL, Piratini, rio Piratini on
643 highway BR-293, 31°43'11" S 52°54'00"W. MCP 34777, 1, 28.5 mm SL, Herval, arroio Arambaré
644 on road from Pedro Osório to Herval, 31°58'37" S 53°06'15"W. MCP 34780, 4, 36.6–40.5 mm SL,
645 Pedras Altas, headwaters of arroio Alegria between Pedras Altas and Pinheiro Machado,
646 31°40'41" S 53°32'12" W. MCP 37685, 13, 27.7–44.2 mm SL, Pedro Osório, stream tributary to
647 arroio Arambaré near Carvalho de Freitas, about 35 km from Pedro Osório on railroad bridge,
648 31°51'51" S 52°49'24" W. **Rio Jaguarão drainage:** MCP 11307, 2, 16.9–39.2 mm SL, Jaguarão,
649 mouth of rio Telho on rio Jaguarão, 32°31' S 53°27' W. MCP 27184, 5, 14.2–36.3 mm SL, Candiota,
650 arroio Quebra Jugo at Passo dos Pinheiros, 31°32'59" S 53°46'17" W. UFRGS 4224, 3, 32.3–38.2
651 mm SL, Candiota, arroio Candiota downstream of dam, 31°32' S 53°40' W. **Rio Camaquã**
652 **drainage:** MCN 11179, 1, 34.2 mm SL, Caçapava do Sul, arroio Seival at dam, 30°43'04" S
653 53°43'42" W. MCP 11337, 5, 25.9–38.7 mm SL, Encruzilhada do Sul, arroio dos Ladrões, 30°41' S
654 52°20' W. MCP 25869, 1, 43.3 mm SL, Bagé, arroio Camaquã Chico on road between Bagé and
655 Lavras do Sul, 30°54'27" S 53°49'13" W. MCP 40647, 2, 22.7–27.3 mm SL, Bagé, arroio do Tigre
656 on road between Bagé and Lavras do Sul, 31°04'47" S 53°54'03" W. MCP 40748, 1, 33.0 mm SL,
657 Bagé, arroio das Traíras on highway BR-153, 31°05'29" S 53°43'33" W. MCP 40751, 1, 41.5 mm
658 SL, Lavras do Sul, arroio Mantiqueira on road between Bagé and Lavras do Sul, 30°54'22" S
659 53°58'02" W. MCP 40764, 1, 38.6 mm SL, Lavras do Sul, arroio da Cria on road between Bagé and
660 Lavras do Sul, 30°57'19" S 53°57'22" W. MCP 41306, 1, 36.6 mm SL, Camaquã, arroio Duro on
661 road from Vila Aurora to Dom Feliciano, 30°45'34" S 51°51'57" W. UFRGS 8222, 5, 32.2–39.8 mm
662 SL, creek on Fazenda Ferraria, Amaral Ferrador. UFRGS 8240, 1, 33.3 mm SL, Canguçu, rio
663 Camaquã on bridge of highway RS-471. UFRGS 8975, 3, 14.7–35.3 mm SL, Encruzilhada do Sul,

664 arroio Abranjo, 30°53'58"S 52°32'18"W. **Lago Guaíba drainage:** MCN 16246, 3, 31.9–43.9 mm
 665 SL, Porto Alegre, Parque Estadual Delta do Jacuí, Saco da Pólvora, 30°01'S 51°14'W. MAPA
 666 1735, 14, 21.3–38.9 mm SL, Barra do Ribeiro, açude dos Garcia, on highway BR-116, 30°23'14"S
 667 51°26'10"W. MAPA 1737, 10, 21.9–38.0, Gravataí, arroio Passo dos Ferreiros, MCP 10450, 2,
 668 41.7–49.9 mm SL, Porto Alegre, lago Guaíba at ilha Mauá, 30°01"S 51°14". MCP 16010, 10, 14.8–
 669 42.3 mm SL, Viamão, lago Guaíba at praia de Itapuã, near to mouth of riacho Itapuã, 30°15'00"S
 670 51°02'20"W. UFRGS 6718, 1, 33.9 mm SL, Viamão, lago Guaíba at Praia das Pombas, 30°20'44"S
 671 51°01'32"W. UFRGS 8460, 1, 39.5 mm SL, Eldorado do Sul. Estação Agronômica da UFRGS, **Rio**
 672 **dos Sinos drainage:** MAPA 2391, 3, 35.9–44.1 mm SL. Santo Antonio da Patrulha, rio dos Sinos
 673 at Nossa Senhora de Mont Serrat, 29°45'S 50°24'W. MCN 6660, 2, 24.0–37.5 mm SL, Três
 674 Coroas, arroio Quilombo, 29°27'S 50°49'W. □MCP 14640, 1, 23.7 mm SL, Caraá, rio Caraá near
 675 rio dos Sinos, 29°47'40"S 50°26'01"W. **Rio Caí drainage:** MAPA 1749, 1, 38.8 mm SL, Nova
 676 Petrópolis, arroio Macaquinhos at Pinhal Alto, 29°25'S 51°02'W. MCP 26052, 1, 35.0 mm SL,
 677 Lindolfo Collor, arroio Feitoria, 29°34'54"S 51°14'03"W. MCP 40512, 6, 22.1–40.9 mm SL, Santa
 678 Maria do Herval, rio Cadeia on Farroupilha bridge, 29°29'43"S 51°02'50"W. **Rio Taquari**
 679 **drainage:** MCP 33557, 1, 34.7 mm SL, Santa Bárbara, rio das Antas, near mouth of rio Carreiro,
 680 29°05'29"S 51°42'42"W. MCP 38901, 6, 22.2–40.8 mm SL, Bento Gonçalves, rio das Antas,
 681 29°01'59"S 51°27'13"W. MCP 41549, 4, 12.8–19.0 mm SL, Cotiporã, rio Carreiro on road between
 682 Dois Lageados and Cotiporã, 28°59'43"S 051°45'16"W. UFRGS 8805, 5, 38.5–43.1 mm SL,
 683 Lageado, mouth of arroio Pinheirinho on rio Forqueta, 29°19'21"S 52°14'03"W. **Rio Jacuí**
 684 **drainage:** MCN 16124, 4, 33.2–40.1 mm SL, Pinhal Grande, rio Ferreira, 29°16'33"S
 685 53°14'42"W. MCP 9294, 2, 23.4–34.0 mm SL, Cachoeira do Sul, arroio Paraíso at Rincão da Porta,
 686 29°41'S 53°09"W. MCP 17166, 2, 27.1–27.9 mm SL, Porto Alegre, rio Jacuí at Saco da Alemoa,
 687 30°00'S 51°14'W. MCP 17500, 1, 45.3 mm SL, Venâncio Aires, arroio at linha Brasil, 29°33'S

688 52°17'W. MCP 18632, 13, 26.1–38.0 mm SL, Candelária, rio Pardo on road from Santa Cruz do
689 Sul to Candelária, 29°40'36"S 52°46'17"W. MCP 25262, 5, 29.1–38.1 mm SL, Agudo, lageado da
690 Gringa between linha da Ressaca and mouth of rio Jacuizinho, 29°23'08"S 53°12'53"W. MCP
691 25458, 7 + 3 cs, 16.2–42.3 mm SL, Agudo, arroio Corupá on road between Agudo and Dona
692 Francisca dam, 29°33'54"S 53°17'09"W. MCP 25721, 5, 27.3–41.4 mm SL, Ibarama, arroio da
693 Gringa, about 12 km north from Dona Francisca dam, 29°23'16"S 53°13'23"W. MCP 25722, 3,
694 25.3–40.2 mm SL, Ibarama, lageado do Gringo about 2 km from Dona Francisca dam, 29°26'49"S
695 53°15'36"W. MCP 26528, 1, 28.7 mm SL, Santa Cruz do Sul, rio Pardino downstream Corsan
696 dam, 29°40'S 52°28'W. MCP 26542, 3, 29.6–35.6 mm SL, Agudo, rio Jacuí downstream Dona
697 Francisca dam, 29°31'S 53°16'W. UFRGS 2350, 1, 35.2 mm SL, Arroio dos Ratos, arroio dos
698 Ratos at bathing spot, 30°03'S 51°37'W. UFRGS 8768, 3, 31.6–35.4 mm SL, rio Pardo, creek at
699 Fazenda Velha. **Rio Vacacaí drainage:** UFRGS 8762, 3, 29.8–36.2 mm SL, São Sepé, creek on
700 Fazenda São Sepe, 30°14'39"S 53°41'20"W. **Laguna dos Patos drainage:** MAPA 1747, 5, 25.8–
701 39.9 mm SL, Camaquã, arroio Velhaco on highway BR-116 between Tapes and Camaquã, 30°45'S
702 51°38'W.

703 **Diagnosis.** *Hisonotus armatus* differs from all congeners except *Hisonotus notatus* and *H.*
704 *leucofrenatus* by having the anterior margin of the snout completely covered by odontodes vs.
705 anterior margin of the snout with a narrow or wide odontode-free band and by having large plates
706 in the abdominal median series, usually comprising one series of plates between the lateral
707 abdominal plates vs. abdominal median series of plates small, with several plate series irregularly
708 arranged between the lateral abdominal plates. *Hisonotus armatus* differs from *H. notatus* and *H.*
709 *leucofrenatus* by the presence on caudal fin of a series of light hyaline spots, forming a vertical light
710 bar vs. a rounded hyaline blotch or no hyaline area in the midventral portion of caudal-fin.

711 **Description.** This species was described in chapter I and will not be repeated here.

712 **Distribution and habitat.** *Hisonotus armatus* is widely distributed in the laguna dos Patos
713 system from the southern rio Jaguarão to the northern rio Jacuí drainage (Fig. 31). The new species
714 is unknown from the headwaters of the rio Jacuí and rio Taquari drainages. That species inhabits
715 slow to median flowing watercourses, with clear to brown waters over sandy bottom and is found in
716 marginal or submerged aquatic vegetation. *Hisonotus armatus* is sympatric through its distribution
717 with *H. laevior*. It was also collected together with *H. nigricauda* in some localities of the lago
718 Guaíba drainage, with *Hisonotus* sp. “Sinos” in the rio Jacuí drainage, and with *Hisonotus* sp.
719 “Camaquã” in the upper rio Camaquã drainage.

720

721 *Hisonotus* sp. “Camaquã”, new species

722 Figures 32-33, Table 6

723 *Hisonotus* sp. 6. -Reis & Carvalho (2007: 84) [listed].

724

725 **Holotype.** MCP uncataloged, 45.0 mm SL, female, Brazil, Rio Grande do Sul, Lavras do Sul,
726 small creek tributary of arroio das Lavras on road from Lavras do Sul to Bagé, 30°50'18”S
727 053°55'43”W, 31 Jul 2006, T. P. Carvalho, A. R. Cardoso, J. M. Wingert.

728 **Paratypes.** All from laguna dos Patos system, Rio Grande do Sul, Brazil. **Rio Camaquã**
729 **drainage:** MCP 40757, 4, 35.4-41.6 mm SL, collected with the holotype. MCP 25803, 5, 31.8-34.9
730 mm SL, Bagé, arroio do Tigre, on secondary road between Bagé and Lavras do Sul, 27 Apr 2000,
731 C. A. Lucena, J. P. Silva & V. A. Bertaco, 31°04'47”S 53°54'03”W. MCP 25924, 1 + 2 c&s 34.8-
732 44.4 mm SL, Lavras do Sul, arroio da Mantiqueira on secondary road between Bagé and Lavras do
733 Sul, 30°54'24”S 053°58'06”W, 26 April 2000, C. A. Lucena, J. P. Silva & V. A. Bertaco. MCP
734 40762, 3, 31.6-41.8 mm SL, Lavras do Sul, arroio da Mantiqueira on secondary road between Bagé
735 and Lavras do Sul, 30°54'24”S 053°58'06”W, 31 Jul 2006, T. P. Carvalho, A. R. Cardoso & J. M.

736 Wingert. MCP 40749, 2, 35.5-39.0 mm SL, Bagé, arroio das Traíras on highway BR-153,
737 31°05'29"S 053°43'33"W, 1 Aug 2006, T. P. Carvalho, A. R. Cardoso & J. M. Wingert. MCP
738 40763, 1, 51.7 mm SL, Lavras do Sul, small creek tributary to arroio das Lavras, about 2 km from
739 Lavras on road to Bagé, 30°50'02"S 053°53'52"W, 31 Jul 2006, T. P. Carvalho, A. R. Cardoso & J.
740 M. Wingert.

741 **Non-type material.** UFRGS 8966, 43 + 3 c&s 17.4-39.2 mm SL, Brazil, Rio Grande do Sul,
742 Encruzilhada do Sul, small creek in Encruzilhada do Sul tributary to rio Camaquã drainage,
743 30°35'17"S 052°33'54"W, 14 Dec 2006, J. Anza & R. Hirano.

744 **Diagnosis.** *Hisonotus* sp. "Camaquã" differs from its congeners by the absence of rostral
745 plate posterior notch articulation with the mesethmoid, rostral plate is reduced and thinned, with an
746 unplated area, medially between the dorsad and ventrad series of odontodes vs. presence of a rostral
747 plate with the posterior notch articulation with the mesethmoid, rostral plates thickened. The new
748 species also distinguishes from other species of *Hisonotus*, except *H. laevior* and *H. taimensis*, by
749 its great number of median plate series 25-27 vs. low number of median plate series 20-25 by
750 having four predorsal plates vs. three predorsal plates, and by having 30-31 vertebrae vs. 25-29.
751 *Hisonotus* sp. "Camaquã" further differs from *H. laevior* and *H. taimensis* by having caudal
752 peduncle slightly square in cross section vs. round peduncle in cross section.

753 **Description.** Morphometrics and meristics in Table 6. Adult size large for members of this
754 genus (a female reaching 51.7 mm SL). Body elongate, without conspicuous keels. Caudal peduncle
755 slightly square in cross section. Dorsal profile convex from snout to parieto-supraoccipital tip,
756 slightly convex from that point to dorsal-fin origin straight and posteroventrally sloped from
757 dorsal-fin origin to caudal-fin origin. Greatest body depth at dorsal-fin origin. Least body depth at
758 posterior end of caudal peduncle. Posterior profile of caudal-fin margin concave. Head and snout
759 broad, snout rounded anteriorly in dorsal view, body progressively narrowing posterior of pelvic-fin

760 insertion. Snout region anterior of nares not depressed, interorbital region convex. Upper margin of
761 orbit slightly elevated. Eye dorsolaterally positioned. Iris operculum present.

762 Pectoral fin I,6. Pectoral-fin posterior margin almost straight□when depressed tip extending
763 beyond middle of pelvic fin (tip of pectoral-fin reaching just anterior third of pelvic fin in some
764 specimens). Posterior margin of pectoral-fin spine serrate. In juveniles entire length of spine is
765 serrate, reduced to distal portion of spine in adults. Pectoral-fin axillary slit present, located below
766 posterior bony margin of cleithral process. Pelvic fin i,5. Tip of depressed fin not reaching anal-fin
767 origin in females, but extending beyond that point in males. Dorsal fin II,7. Dorsal-fin origin
768 located slightly posterior of vertical through pelvic-fin origin. Dorsal-fin spinelet present, laterally
769 extended. Anal fin i,5. First anal-fin pterygiophore exposed anterior to anal fin. Adipose fin absent.
770 Caudal fin i,14,i.

771 Body almost entirely covered by plates except for region overlying opening of swim bladder
772 capsule, area between pectoral girdle and lower lip, region around anus, and area around base of
773 paired fins. Rostral plate without posterior notch articulation with mesethmoid, rostral plate reduced
774 and thinned, rostral area between dorsad and ventrad series of odontodes unplated medially.
775 Prenasal plates anterior to nares present, not reduced (Fig. 34). Four rows of predorsal plates (Fig
776 35). Median series formed by 25–27 plates (Tab. 2). Lateral line incomplete, with small gap without
777 pores along middle length of body. Median plates series reaching the posterior end of caudal
778 peduncle, not truncated (Fig. 36). Median abdominal plates small, irregularly arranged, often
779 leaving naked area between median and lateral abdominal plate series. Lateral abdominal plates
780 larger, forming a regular series of about five to seven plate in each side (Fig. 37). Coracoid and
781 cleithrum exposed and covered by odontodes, except for median region of cleithrum between
782 arrector fossae opening.

783 Head without conspicuous crests. Odontodes on posterior parieto-supraoccipital tip not
784 enlarged in adults, slightly enlarged odontodes in juvenile specimens. Head, fin-spines, and body
785 plates covered with odontodes, these larger on anterior surface of all fin spines, medially directed in
786 pelvic fin. Odontodes on head and trunk of uniform size and distribution, except for enlarged
787 odontodes on ventral margin of rostrum, ventrad series of odontodes sometimes absent in medial
788 portion of rostrum plate. Dorsad series slightly enlarged compared to remainder odontodes.
789 Rostrum anterior margin with wide free-odontode band (Figs. 38-39). Compound pterotic with
790 median-to-large size perforations from middle portion to ventral margin. Infraorbital canal entering
791 infraorbital series via sphenotic. Lips roundish and papillose. Maxillary barbel present.

792 Premaxillary and dentary teeth slender proximally and flattened distally□bifid, major (medial)
793 cusp large and rounded, minor (lateral) cusp pointed (Fig. 40 C). Accessory patch of teeth absent on
794 dentary and premaxilla.

795 Hypurals 1-2 and 3-5 completely fused on the posterior margin of caudal-fin skeleton. In
796 juveniles not completely fused. Total vertebrae 31 (3 c&s).

797 **Color in alcohol.** Ground color of dorsal and lateral surfaces of body light to dark gray,
798 brownish in some specimens. Dorsal and ventrolateral regions slightly lighter, darker in lateral
799 surface forming a longitudinal band. Ventral surface of body less pigmented than lateral and dorsal
800 portions, belly region with small scattered chromatophores. Dorsolateral surface of head and body,
801 with light longitudinal stripes. Stripes beginning on rostrum anterior to nares, passing above orbit
802 and reaching the posterior end of parieto-supraoccipital, bifurcating at this point and disappearing
803 lateral to dorsal-fin base. Light longitudinal stripe on trunk located at lateral line. Tip of parieto-
804 supraoccipital and corners of square caudal peduncle lighter than surrounding areas. All fins mostly
805 hyaline, with chromatophores forming transverse dark bands (inconspicuous in pelvic fin)□bands
806 most conspicuous on unbranched rays. Caudal fin dark pigmented ventrally, unbranched rays with

807 striped pattern. Upper branched rays of caudal fin, almost hyaline except for transversal dark bands.
808 Middle portion of caudal fin with hyaline transverse band formed by round light spots. larger
809 specimens with second hyaline band located posteriorly, on lower caudal lobe.

810 **Sexual dimorphism.** Characterized by the urogenital papilla, positioned just behind the anal
811 opening in males. Adult males possess a fleshy flap along the dorsal margin of first thickened
812 pelvic-fin ray, that is absent in females. Flap widest basally and progressively narrowing distally.
813 Adult males with first branched ray of pelvic fin presenting a feeble fleshy flap in its medial
814 portion. In juvenile males, flaps are smaller or absent. Males have a longer pelvic-fin thickened
815 unbranched ray that extends up to the anal-fin origin, with the spine never reaching that point in
816 females.

817 **Distribution and habitat.** *Hisonotus* sp. “Camaquã” is endemic to the upper reaches of rio
818 Camaquã drainage in the laguna dos Patos system, southern Brazil (Fig. 27). This species inhabits
819 slow to median flow, clear water and a sandy bottom, and is found in marginal or aquatic
820 submersed vegetation (Fig. 41). *Hisonotus* sp. “Camaquã” is collected together with *Hisonotus*
821 *armatus* in some localities.

822 **Geographic variation.** Some morphological differences were observed between a population
823 of a north tributary in the left margin of the rio Camaquã drainage, near city of Encruzilhada do Sul,
824 and the population of the tributaries in the southwestern portion of the rio Camaquã drainage, near
825 city of Lavras do Sul. Specimens from southwestern tributaries possesses a longer pectoral-fin spine
826 19.2-25.7% SL, mean 23.5% vs. 17.7-20.7% SL, mean 19.5% in the by north tributary population
827 (Fig. 42). The southwestern population is relatively darker and possesses a conspicuous light
828 transversal band on the middle portion of the caudal fin contrasting with the population near
829 Encruzilhada do Sul, which presents a lighter overall coloration, and lighter areas on the anterior
830 portion of the upper and lower caudal-fin lobes (Fig. 33). Another feature presented by the

831 population of Encruzilhada do Sul is the often absence of the ventrad series of odontodes along the
832 middle margin of the snout, which leaves a wide free-odontode area at the anterior margin of the
833 snout (Fig. 39). For these reasons, specimens from lot UFRGS 8966 from Encruzilhada do Sul are
834 listed as non-types.

835

836 ***Hisonotus* sp. “Carreiro”, new species**

837 Figure 43, Table 7

838 *Hisonotus* sp. 2. -Reis & Carvalho (2007: 84) [listed].

839

840 **Holotype.** MCP uncataloged, 35.4 mm SL, female, Brazil, Rio Grande do Sul, Serafina
841 Corrêa, rio Carreiro downstream Carreiro bathing spot, 28°42'10”S 051°50'57”W, 25 Out 2006, T.
842 P. Carvalho & V. A. Bertaco.

843 **Paratypes.** All from Brazil, Rio Grande do Sul, rio Carreiro drainage, MCP 40495, 8 + 2
844 c&s, 27.5-31.2 mm SL, collected with the holotype. MCP 41548, 1, 32.0 mm SL, collected at type
845 locality, 11 Jan 2006, J. P. Silva & T. P. Carvalho. MCP 40943, 3, 33.6-35.8 mm SL, Guabiju,
846 arroio Guabiju on secondary road between Guabiju and vila São Jorge, 28°30'49”S 051°41'22”W,
847 24 Out 2006, T. P. Carvalho & V. A. Bertaco. MCN 16361, 3, 34.4-35.4 mm SL, Nova Araçá,
848 arroio Guabiju on road between Guabiju and vila São Jorge, 28° 30'S 51°41'W, Out 2000, W.
849 Koch. UFRGS 6961, 7, 31.7-37.8 mm SL, Serafina Corrêa, rio Carreiro, 28°44' 51°50', Nov 2004,
850 J. Anza.

851 **Diagnosis.** *Hisonotus* sp. “Carreiro” differs from its congeners, except *Hisonotus*
852 *francirochai* and *Hisonotus* sp. “Prata” by the presence of a conspicuous tuft of enlarged odontodes
853 on the tip of the parieto-supraoccipital vs. odontodes on the tip of parieto-supraoccipital similar in
854 size, not enlarged or slightly enlarged. Differs from *H. francirochai* by having the anterior portion

855 of snout with a narrow odontode-free band (Fig. 44) vs. snout completely covered with odontodes,
856 without an anterior odontode-free band. *Hisonotus* sp. “Carreiro” can be distinguished from
857 *Hisonotus* sp. “Prata” by having a longer dorsal-fin spine 24.3-29.0% SL, mean 26.6% vs. 22.6-
858 25.5% SL, mean 24.5% (Fig. 45) longer pectoral-fin spine 24.7-29.0% SL, mean 26.7 % vs. 22.0-
859 25.6% SL, mean 24.0% (Fig. 46) and by its general color pattern of the body, which is yellowish in
860 life and pale yellow to light brown in alcohol preserved specimens vs. a dark green general color
861 pattern of the body in life and a dark gray to dark brown color in alcohol preserved specimens.

862 **Description.** Morphometrics and meristics in Table 7. Adult size small to medium for
863 members of this genus (maximum size 37.8 mm SL). Body relatively stocky, not elongated, without
864 conspicuous keels. Caudal peduncle round in cross section. Dorsal profile slightly concave from tip
865 of snout to nares, convex from nares to tip of parieto-supraoccipital, almost straight and
866 posterodorsally inclined from that point to dorsal-fin origin. Dorsal-fin base straight and
867 posteroventrally sloped, almost straight to slightly concave from posterior end of dorsal-fin base to
868 caudal-fin origin. Greatest body depth at dorsal-fin origin. Least body depth at middle of caudal
869 peduncle. Posterior profile of caudal fin concave. Head and snout broad, snout rounded in dorsal
870 view, body progressively narrowing posterior of pectoral-fin insertion. Snout region anterior of
871 nares concave, interorbital region convex. Upper margin of orbit somewhat elevated. Eye
872 dorsolaterally positioned. Iris operculum present.

873 Pectoral fin I,6. Pectoral-fin posterior margin almost straight when depressed tip extending
874 beyond middle of pelvic fin. Posterior margin of pectoral-fin spine smooth in adults, juveniles with
875 feeble serrae at distal portion. Pectoral-fin axillary slit present, located below posterior bony margin
876 of cleithral process. Pelvic fin i,5. Tip of depressed fin not reaching anal-fin origin in females, but
877 extending beyond that point in males. Dorsal fin II,7. Dorsal-fin origin located just posterior of
878 vertical through pelvic-fin origin. Dorsal-fin spinelet present, laterally extended, one c&s specimen

879 lacking spinelet. Anal fin with i,5. First anal-fin pterygiophore exposed anterior to anal fin. Adipose
880 fin absent. Caudal fin i,14,i.

881 Body almost entirely covered by plates except for region overlying opening of swim bladder
882 capsule, area between pectoral girdle and lower lip, region around anus, and area around base of
883 paired fins. Rostral plate with posterior notch articulation with mesethmoid. Rostral plate thickened,
884 with narrow odontode-free band between dorsad and ventrad series of odontodes (Fig. 44),
885 sometimes absent at medial portion of some specimens. Snout plates anterior to nares reduced,
886 small unplated area between rostrum and nostril at lateral portion. Two or three rows of predorsal
887 plates (rarely two). Median series formed by 22–24 plates (Tab. 2). Lateral line incomplete, with
888 small gap without pores along middle length of body. Median plate series truncated (Fig. 47).
889 Abdominal plates arranged in three rows anteriorly and irregularly arranged between pelvic-fin
890 insertions. Lateral abdominal plates slightly larger and forming regular series. Median abdominal
891 series usually formed by one plate row. Area between lateral and median abdominal plate series
892 naked in some specimens (Fig. 48). Coracoid and cleithrum exposed and covered by odontodes,
893 except for median region of cleithrum between arrector fossae openings and medial region of
894 coracoids.

895 Head without conspicuous crests. Odontodes on parieto-supraoccipital tip greatly enlarged,
896 arranged in rounded patch. Odontodes approximately five times larger than those of surrounding
897 areas. Head, fin-spines, and body plates covered with odontodes, these larger on anterior surface of
898 all fin spines, and on ventral and dorsal margin of rostrum medially. Odontodes medially directed in
899 pelvic-fin thickened unbranched ray. Anteroventral margin of compound pterotic with median-to-
900 large size perforations. Infraorbital series entering infraorbital canal via sphenotic. Lips roundish
901 and papillose, posterior border of lower lip fimbriate. Maxillary barbel present.

902 Premaxillary and dentary teeth slender proximally and flattened distally□bifid, major (medial)
903 cusp large and rounded, minor (lateral) minute pointed. Accessory patch of teeth absent on dentary
904 and premaxilla.

905 Hypurals 1-2 and 3-5 almost completely fused, a median notch on the posterior margin of
906 caudal-fin skeleton extending anteriorly. Total vertebrae 28 (2 c&s).

907 **Color in alcohol.** Ground color of dorsal and lateral surfaces pale yellow to light brown.
908 Dorsal and lateral body surfaces with scattered dark brown round spots. Dorsal and lateral portions
909 of head darker than body. Ventral and ventrolateral surface of body yellowish except for scattered
910 chromatophores, these grouped forming spots on ventral surface of caudal peduncle. Region
911 anterior to nares lighter than surrounding areas, but not forming conspicuous longitudinal light
912 stripes posterior to that point. Fins mostly brown pigmented, sometimes with light transverse bands,
913 forming a striped pattern. Caudal fin almost completely brown, except for a pair of somewhat round
914 hyaline areas in the middle portion of upper and lower lobes. Unbranched rays of caudal fin with
915 alternating transverse light bars and dark areas.

916 **Sexual dimorphism.** Characterized by the urogenital papilla, positioned just behind the anal
917 opening in males. Adult males also possess a developed fleshy flap along the dorsal margin of first
918 thickened pelvic-fin ray that is absent in females. Flap slightly wider basally and progressively
919 narrowing distally. In males, first and second branched rays of pelvic fin with a fleshy flap in its
920 medial portion. In juvenile males, flaps are smaller or absent. Males have a longer pelvic-fin
921 thickened unbranched ray that extends far beyond the anal-fin origin, with the pelvic-fin ray
922 reaching just to the origin of anal fin in females.

923 **Distribution and habitat.** *Hisonotus* sp. “Carreiro” is endemic from the upper portions of the
924 rio Carreiro drainage a tributary of the rio Taquari, which flows into the rio Jacuí basin in the
925 laguna dos Patos system (Fig. 49). This species inhabits relative high altitudes, above 400 m, the

926 habitat in rio Carreiro is a rapid flow watercourse, a wide river with about 0.5 m deep, with clear
927 water and rocky bottom (Fig. 50). The specimens were caught between aquatic vegetation of the
928 genus *Echinodorus* which form green islands on the faults of the rocky substrate. The arroio
929 Guabiju is a small stream about 3 m wide and up to 1 m deep, with clear water, of sandy and rocky
930 bottom. There, the species is caught in marginal submersed vegetation. *Hisonotus* sp. “Carreiro” is
931 sympatric with the Hypoptopomatinae *Eurycheilichthys* sp. 1 in arroio Guabiju.

932

933 ***Hisonotus* sp. “Prata”, new species**

934 Figure 51, Table 8

935 *Hisonotus* sp. 1 in Reis & Carvalho (2007: 84) [listed].

936

937 **Holotype.** MCP uncataloged, 31.8 mm SL, female, Brazil, Rio Grande do Sul, Nova Prata,
938 rio da Prata on Passo do Despraiado, 28°38’01”S 051°36’51”W, 24 Oct 2006, T. P. Carvalho & V.
939 A. Bertaco.

940 **Paratypes.** All from Brazil, Rio Grande do Sul, rio da Prata drainage, MCP 40492, 24, 19.5-
941 33.2 mm SL—collected with the holotype. MCP 22204, 9 + 3 c&s, 14.3-29.3 mm SL, collected at
942 type locality, 20 Jan 2006, R. E. Reis, J. P. Silva & E. H. Pereira.

943 **Diagnosis.** *Hisonotus* sp. “Prata” differs from its congeners, except *Hisonotus francirochai*
944 and *Hisonotus* sp. “Carreiro” by the presence of a conspicuous tuft of enlarged odontodes on the tip
945 of the supraoccipital (Fig. 52), vs. odontodes on the tip of parieto-supraoccipital similar in size, not
946 enlarged or slightly larger over the remaining odontodes on the parieto-supraoccipital. Differs from
947 *H. francirochai* by having the anterior portion of snout with an odontode-free band (Fig. 53) vs.
948 snout complete covered with odontodes, without anterior odontode-free band. *Hisonotus* sp. “Prata”
949 can be distinguished from *Hisonotus* sp. “Carreiro” by having a shorter dorsal-fin spine 22.6-25.5%

950 SL, mean 24.5% vs. 24.3-29.0% SL, mean 26.6% (Fig. 45) □ shorter pectoral-fin spine 22.0-25.6%
951 SL, mean 24.0 % vs. 24.7-29.0% SL, mean 26.7%. (Fig. 46) □ and by its general color pattern of
952 dorsal surface of body which is dark green in life specimens and dark gray to dark brown pattern in
953 alcohol preserved specimens vs. a yellowish pattern in life, pale yellow to light brown coloration in
954 alcohol preserved specimens.

955 **Description.** Morphometrics and meristics in Table 8. Adult size small for members of this
956 genus (maximum size 33.2 mm in the SL). Body stocky, robust, without conspicuous keels. Caudal
957 peduncle round in cross section. Dorsal profile convex from tip of snout to nares to parieto-
958 supraoccipital, convex bump at parieto-supraoccipital tip, almost straight and posterodorsally
959 inclined from that point to dorsal-fin origin. Dorsal-fin base straight and posteroventrally sloped,
960 almost straight from posterior end of dorsal-fin base to caudal-fin origin. Ventral profile almost
961 straight from snout tip to anal-fin origin, concave from that point to caudal-fin origin. Greatest body
962 depth at dorsal-fin origin. Least body depth at middle of caudal peduncle. Posterior profile of caudal
963 fin slightly concave. Head and snout broad, snout rounded in dorsal view, body progressively
964 narrowing posterior to pelvic-fin insertion. Snout region anterior of nares concave, interorbital
965 region convex. Upper margin of orbit not elevated. Eye dorsolaterally positioned. Iris operculum
966 present.

967 Pectoral fin I,6. Pectoral-fin posterior margin slightly rounded □ when depressed tip extending
968 anterior to middle of pelvic fin. Posterior margin of pectoral-fin spine smooth in adults, juveniles
969 with serrae along distal third of pectoral-fin spine. Pectoral-fin axillary slit present, located below
970 posterior bony margin of cleithral process. Pelvic fin i,5. Tip of depressed fin just reaching anal-fin
971 origin in females, but extending beyond that point in males. Dorsal II,7. Dorsal-fin origin located
972 slightly posterior to vertical through pelvic-fin origin. Dorsal-fin spinelet present, laterally

973 extended. Anal fin i,5. First anal-fin pterygiophore exposed anterior to anal fin. Adipose fin absent.
974 Caudal fin i,14,i.

975 Body almost entirely covered by plates except for region overlying opening of swim bladder
976 capsule, area between pectoral girdle and lower lip, region around anus, and area around base of
977 paired fins. Rostral plate with posterior notch articulation with mesethmoid. Rostral plate thickened,
978 with an odontode-free band between dorsad and ventrad series of odontodes (Fig. 52). Snout plates
979 anterior to nares reduced, small unplated area between rostral plate and nostril. Two or three rows
980 of predorsal plates (rarely two). Median series formed by 22–24 plates (Tab. 2). Lateral line
981 incomplete, with gap without pores along middle length of body, posterior portion of lateral line
982 sometimes absent. Median plate series truncated, not reaching posterior end of caudal peduncle
983 (Fig. 54). Abdominal plates arranged in three rows anteriorly and irregularly arranged between
984 pelvic-fin insertions. Lateral abdominal plates slightly larger and forming regular series. Median
985 abdominal series usually formed by one plate row. Naked area between lateral and median
986 abdominal plate series in most specimens (Fig. 55). Coracoid and cleithrum exposed and covered by
987 odontodes, except for median region of cleithrum between arrector fossae openings and medial
988 region of coracoids.

989 Head without conspicuous crests. Odontodes on parieto-supraoccipital tip greatly enlarged,
990 raised odontodes arranged in rounded patch, approximately five times larger than those of
991 surrounding areas (Fig. 52). Head, fin-spines, and body plates covered with odontodes, these larger
992 on anterior surface of all fin spines, and on ventral and dorsal margin of rostrum. Odontodes
993 medially directed on pelvic-fin thickened unbranched ray. Anteroventral margin of compound
994 pterotic with median-to-large size perforations. Infraorbital canal entering infraorbital series via
995 sphenotic. Lips roundish and papillose, posterior margin of lower lip fimbriate. Maxillary barbel
996 present.

997 Premaxillary and dentary teeth slender proximally and flattened distally□bifid, major (medial)
998 cusp large and rounded, minor (lateral) minute pointed (Fig. 40B). Accessory patch of teeth absent
999 on dentary and premaxilla.

1000 Hypurals 1-2 and 3-5 completely fused, without median notch on the posterior margin of
1001 caudal-fin. Total vertebrae 28 (2 c&s).

1002 **Color in alcohol.** Ground color of dorsal and lateral surfaces dark gray. Dorsal and lateral
1003 body surfaces with rounded darker gray spots. Dorsal and lateral portions of head darker than body,
1004 except for lighter cheek region. Ventral surface of body pale yellow, except for scattered
1005 chromatophores, these forming spots on ventral surface of caudal peduncle. Region anterior to nares
1006 lighter than surrounding areas, but not forming longitudinal light stripes beyond this point. Parieto-
1007 supraoccipital tip lighter than remaining dorsal surface. Fins mostly gray pigmented, presenting
1008 light transverse bands, forming a striped pattern. Caudal fin almost completely dark pigmented,
1009 except for a pair of rounded to somewhat triangular hyaline areas in the middle portion of upper and
1010 lower lobes. Unbranched rays of caudal fin with striped pattern of transverse light bars. Ground
1011 color in life dark green.

1012 **Sexual dimorphism.** Characterized by the urogenital papilla, positioned just behind the anal
1013 opening in males. Adult males also possess a developed fleshy flap along the dorsal margin of first
1014 thickened pelvic-fin ray, that is absent in females. Flap slightly wider basally and progressively
1015 narrowing distally. In juvenile males, flap smaller or absent. Males have a longer thickened pelvic-
1016 fin unbranched ray that extends beyond anal-fin origin, with pelvic-fin ray reaching just to anal-fin
1017 origin in females.

1018 **Distribution and habitat.** *Hisonotus* sp. “Prata” is endemic to the rio da Prata, tributary of
1019 rio das Antas, in the rio Taquari drainage, which is a tributary to the rio Jacuí basin in the laguna
1020 dos Patos system. Rio da Prata, in the type-locality, is a rapid flow watercourse, wide and shallow,

1021 with an average depth of 0.5 m, shallower in most of its extension, with clear water, rocky bottom
1022 and great amounts of submersed vegetation (Fig. 56). The specimens are caught between aquatic
1023 vegetation, most individuals associated with plants of the genus *Echinodorus*, which form green
1024 islands on the faults of the rocky substrate. *Hisonotus* sp. “Prata” is collected in the vegetation with
1025 the Hypoptopomatinae *Eurycheilichthys* sp. 2.

1026

1027 *Hisonotus* sp. “Sinos”, new species

1028 Figures 57-58, Table 9

1029

1030 *Hisonotus* sp. 4 in Reis & Carvalho (2007: 84) [listed].

1031

1032 **Holotype.** MCP uncataloged, 38.2 mm SL, female, Brazil, Rio Grande do Sul, Caraá, rio dos
1033 Sinos, brigde 7 km north of Caraá, road to Fundo Quente, 29°47’S 050°19’W, 12 Jan 1995, L. R.
1034 Malabarba, P. Buckup, A. R. Cardoso & G. Guazelli.

1035 **Paratypes.** All from Brazil, Rio Grande do Sul, rio Jacuí basin, **rio dos Sinos drainage:**
1036 MCP 17643, 10, 11.3-39.2 mm SL, collected with the holotype. MCP 14619, 8 + 3 c&s, 28.3-42.0
1037 mm SL, Caraá, rio do Sinos, about 5 km north of Caraá, 29°46’S 050°20’W, 17 Jan 1991, N. A.
1038 Menezes, R. E. Reis & E. H. L. Pereira. MCP 17620, 9, 30.0-40.3 mm SL, Caraá, rio dos Sinos, at
1039 praia João Fernandes, about 4 km of Caraá and 5 km of vila Rodolfo Tetour, 29°45’53”S
1040 050°25’41”W, 12 Jan 1995, L. R. Malabarba, P. Buckup, A. R. Cardoso & G. Guazelli.

1041 **Non-type material.** All from Brazil, Rio Grande do Sul, laguna dos Patos system. **Rio Jacuí**
1042 **drainage:** MCP 25459 15, 16.3-38.7 mm SL, Ibarama, lageado do Gringo about 2 km from
1043 hidroelétrical power plant Dona Francisca, 29°26’49”S 53°15’36”W. MCP 25719, 15 + 3 c&s,
1044 24,1-39,1 mm SL, Ibarama, lageado do Gringo about 2 km from hidroelétrical power plant Dona

1045 Francisca, 29°26'49"S 53°15'36"W. MCP 26223, 3, 21.5-39.3 mm SL, Ibarama, lagoado do Gringo
1046 about 2 km from hidroeletrical power plant Dona Francisca, 29°26'49"S 53°15'36"W. MCP 26568,
1047 6, 26.5-36.8 mm SL, Nova Palma, arroio Caemborá near Caemborá, 29°28'50"S 053° 17'50"W.
1048 **Rio Taquari drainage:** MCP 38766, 15 + 3 c&s, 16.9-38.2 mm SL, Lageado, arroio Saraquá, near
1049 Botanic Garden of Lageado, 29°27'42"S 052°00'14"W. UFRGS 8812, 14, 32.5-39.9 mm SL,
1050 Lageado, mouth of arroio pinheirinho with rio Forqueta. 29°19'21"S 052°14'03"W. MCP 41550, 4,
1051 14.6-20.0 mm SL, Cotiporã, rio Carreiro at bridge on road between Dois Lageados and Cotiporã,
1052 29°59'43"S 51°45'16"W. **Rio Caí drainage:** MAPA ex 1749, 1, 40.4 mm SL, Nova Petrópolis,
1053 arroio Macaquinhos tributary of rio Cadeia. MAPA 1750, 1, 40,6 mm SL, Nova Petrópolis, rio
1054 Cadeia, between Joaneta and Pinhal Alto. **Rio dos Sinos drainage:** MAPA 1868, 3, 32.9-41.2 mm
1055 SL, Santo Antonio da Patrulha, rio dos Sinos, bridge at Santo Antonio da Patrulha. MAPA ex-
1056 2391, 4, 29.7-41.2 mm SL, Santo Antonio da Patrulha, rio dos Sinos, bridge at Nossa Senhora de
1057 Monte Serrat. MCN 6455, 1, 38.7 mm SL, Três Coroas, arroio José Velho between Canastra Alta
1058 and Linha Café. MCN 6863, 1, 39,3 mm SL, Três Coroas, arroio Quilombo at Sander. **Lago**
1059 **Guaíba drainage:** MCP 23875, 3, 29.7-35.2 mm, arroio Itajacu, Glorinha, tributary of rio Gravataí,
1060 29°47'34"S 50°42'07"W.

1061 ***Hisonotus* cf. "Sinos":** All from Brazil, Rio Grande do Sul, laguna dos Patos system. **Rio**
1062 **Jacuí drainage:** MCP 26855, 3, 36.0-41.7 mm SL, Julio de Castilhos, arroio Tipiáia, about 13 km
1063 north of Julio de Castilhos on road to Cruz Alta, 29°06'14"S 53°34'24"W. MCP 41074, 4, 39.0-
1064 44.2 mm SL, arroio Tipiáia (or arroio Passo dos Buracos), on road from Júlio de Castilhos to Cruz
1065 Alta, 29°06'48"S 053°39'01"W.

1066 **Diagnosis.** *Hisonotus* sp. "Sinos" differs from its congeners, except from *H. ringueleti*, *H.*
1067 *charrua*, *H. nigricauda*, *H. taimensis*, *H. laevior*, *Hisonotus* sp. "Camaquã", *Hisonotus* sp. "Prata",
1068 *Hisonotus* sp. "Carreiro", *Hisonotus* sp. "Passo Novo", and *Hisonotus* sp. "Felício" by having the

1069 anterior margin of the snout with an odontode-free band (Fig. 59) □vs. anterior margin of the snout
1070 complete covered by odontodes. Differs from those above, except *Hisonotus ringueleti*, *Hisonotus*
1071 sp. “Prata”, and *Hisonotus* sp. “Carreiro” by the caudal-fin pigmentation, when well defined,
1072 composed of a dark background with a pair of hyaline areas, in the middle portion of upper and
1073 lower lobes, vs. a dark background without hyaline areas or a transverse hyaline band at the middle
1074 of caudal-fin length. *Hisonotus* sp. “Sinos” differs from *H. ringueleti* by having the posterior
1075 margin of the pectoral fin smooth vs. posterior portion of spine serrate. Differs from *Hisonotus* sp.
1076 “Prata” and *Hisonotus* sp. “Carreiro” by the absence of a raised tuft of odontodes on the posterior
1077 parieto-supraoccipital tip on adults, juvenile specimens presenting slightly enlarged odontodes at
1078 this portion (Fig. 60), vs. a conspicuous tuft of enlarged odontodes at posterior supraoccipital tip.

1079 **Description.** Morphometrics and meristics in Table 9. Adult size moderate for members of
1080 this genus (larger than 40.0 mm in SL). Body stocky, robust, without conspicuous keels. Caudal
1081 peduncle round in cross section. Dorsal profile convex from tip of snout to dorsal-fin origin, except
1082 for almost straight portion anterior to parieto-supraoccipital. Dorsal-fin base straight and
1083 posteroventrally sloped, straight to slightly concave from posterior end of dorsal-fin base to caudal-
1084 fin origin. Ventral profile almost straight from snout tip to anal-fin origin, concave from this point
1085 to caudal-fin origin. Greatest body depth at dorsal-fin origin. Least body depth at middle of caudal
1086 peduncle. Posterior profile of caudal-fin margin pronounced concave. Head and snout broad, snout
1087 rounded to slightly pointed in dorsal view, body progressively narrowing posterior of pelvic-fin
1088 insertion. Snout region anterior of nares slightly concave, interorbital region convex. Upper margin
1089 of orbit slightly elevate. Eye dorsolaterally positioned. Iris operculum present.

1090 Pectoral fin I,6, posterior-fin margin almost straight, when depressed tip extending beyond
1091 middle of pelvic fin. Posterior margin of pectoral-fin spine smooth in adults, juveniles with serrae
1092 along distal half of pectoral-fin spine. Pectoral-fin axillary slit present, located below ventral margin

1093 of cleithral process. Pelvic fin i,5. Tip of depressed fin almost reaching anal-fin origin in females,
1094 but extending far beyond anal fin origin in males. Dorsal II,7. Dorsal-fin origin located slightly
1095 posterior of vertical through pelvic-fin origin. Dorsal-fin spinelet somewhat rounded. Anal fin i,5.
1096 First anal-fin pterygiophore exposed anterior to anal fin. Adipose fin absent. Caudal fin i,14,i.

1097 Body almost entirely covered by plates except for region overlying opening of swim bladder
1098 capsule, area between pectoral girdle and lower lip, region around anus, and areas around base of
1099 paired fins. Rostral plate with posterior notch articulation with mesethmoid. Rostral plate thickened,
1100 with odontode-free band between dorsad and ventrad series of odontodes (Fig. 59). Snout plates
1101 anterior to nares reduced, small unplated area at lateral portion between rostral plate and prenasal
1102 plates. Three rows of predorsal plates. Median series formed by 22–24 plates (Tab. 2). Lateral line
1103 incomplete, with gap without pores along middle length of body. Median plate series complete, not
1104 truncated (Fig. 61). Abdominal plates arranged in three rows anteriorly and irregularly arranged
1105 between pelvic-fin insertions. Lateral abdominal plates slightly larger and forming regular series.
1106 Median abdominal series usually formed by one row, pre-anal shield region formed by small to
1107 median size plates (Fig. 62). Coracoid and cleithrum exposed and covered by odontodes, except for
1108 median region of cleithrum between arrector fossae openings and medial region of coracoids.

1109 Head without conspicuous crests. Odontodes on parieto-supraoccipital tip slightly larger than
1110 those of surrounding areas, mostly in smaller specimens (Fig. 60). Head, fin-spines, and body plates
1111 covered with odontodes, these larger on anterior surface of all fin spines, and on ventral margin of
1112 rostrum, slightly enlarged on dorsal margin. Odontodes medially directed on pelvic-fin unbranched
1113 ray. Anterior margin of compound pterotic with median-to-large size perforations. Infraorbital canal
1114 entering infraorbital series via sphenotic. Lips roundish and papillose, posterior margin of lower lip
1115 fimbriate. Maxillary barbel present.

1116 Premaxillary and dentary teeth slender proximally and flattened distally□bifid, major (medial)
1117 cusp rounded to spatulate, minor (lateral) minute pointed (Fig. 40A). Accessory patch of teeth
1118 absent on dentary and premaxilla.

1119 Hypurals 1-2 and 3-5 almost completely fused or with slight median notch on the posterior
1120 margin of caudal-fin skeleton. Total vertebrae 27-29 (3 c&s).

1121 **Color in alcohol.** Ground color of dorsal and lateral light to dark brown. Dorsal and lateral
1122 surfaces of head darker than body, except for a light area in ventrolateral region contrasting with
1123 dark blotches. Region anterior to nares lighter than surrounding areas, forming paired longitudinal
1124 light stripes from snout tip to posterior end of parieto-supraoccipital, bifurcating and inconspicuous
1125 after that point. Midlateral surface of body darkish, forming a darker brown wide longitudinal stripe
1126 above lateral line. Ventral surface of body pale yellow, sometimes with scattered rounded blotches,
1127 mostly on cheeks and belly. Unbranched rays of pectoral, pelvic, dorsal, and anal fins mostly brown
1128 pigmented, except for narrow lighter bands, forming a striped pattern. Branched rays of these fins
1129 mostly hyaline except for darker transverse bands. Caudal fin most dark brown pigmented, except
1130 for a pair of hyaline areas, somewhat triangular, on the anterior portion of upper and lower lobes
1131 caudal fin rays. Hyaline areas, sometimes contacting each other at middle of caudal fin, forming an
1132 hour-glass-like mark. Posterior portion of the branched rays of caudal-fin hyaline. Unbranched rays
1133 of caudal fin with striped pattern of transverse light bars. In life, ground color of dorsum and flanks
1134 bright green (Fig. 58).

1135 **Sexual dimorphism.** Characterized by the urogenital papilla, positioned just behind the anal
1136 opening in males. Adult males also possess a developed fleshy flap along the dorsal margin of first
1137 thickened pelvic-fin ray, that is absent in females. Flap slightly wider basally and progressively
1138 narrowing distally. Presence of a fleshy flap on medial portion of the first and second branched rays
1139 of pelvic fin. In juvenile males, flaps are smaller or absent. Males have a longer pelvic-fin that

1140 extends far beyond the anal-fin origin, with the pelvic fin never reaching the anal-fin origin in
1141 females.

1142 **Distribution and habitat.** *Hisonotus* sp. “Sinos” is widely distributed in the rio Jacuí basin
1143 from the eastern rio Gravataí and rio dos Sinos drainage to the lower portions of the western rio
1144 Jacuí drainage (Fig. 49). In the rio Jacuí basin, the new species was not found in the southern
1145 tributaries or in the headwaters of rio Jacuí and rio Taquari drainages. This species inhabits medium
1146 to fast flow watercourses, with clear waters with sandy or rocky bottoms, being collected in
1147 marginal or aquatic submersed vegetation. *Hisonotus* sp. “Sinos” is sympatric along almost its
1148 entire distribution with *Hisonotus armatus*.

1149 **Geographic variation.** The specimens from arroio Tipiáia (Fig. 49) differ to a degree in
1150 pigmentation from other populations in the rio Jacuí basin. These specimens of arroio Tipiáia differ
1151 from other conspecifics by the darker pigmentation of caudal fin, which present reduced hyaline
1152 areas to complete dark brown in some specimens, contrasting with a pair of hyaline triangular areas
1153 on upper and lower lobes and no pigments at posterior portion of caudal fin rays (Fig. 63). The
1154 condition observed in the caudal-fin pigmentation in specimens from arroio Tipiáia, resemble that
1155 of *Hisonotus* sp. “Passo Novo” or *Hisonotus* sp. “Felício”. However, when well defined, the hyaline
1156 areas in the specimens from arroio Tipiáia clearly are alike the triangular hyaline areas presented by
1157 other populations of *Hisonotus* sp. “Sinos”. A PCA was performed to compare morphometric data
1158 of that population to others of *Hisonotus* sp. “Sinos”, in rio Jacuí, rio Taquari, and rio dos Sinos
1159 (type locality). No discriminant differences were found between the populations of *Hisonotus* sp.
1160 “Sinos”, except when compared with the species *Hisonotus* sp. “Passo Novo” (Fig. 64). For these
1161 reasons, I tentatively identified these specimens from arroio Tipiáia as belonging to the species
1162 *Hisonotus* cf. “Sinos”, and restricted the type series to specimens near to type-locality.

1163 ***Hisonotus* sp. “Passo Novo”, new species**

Figure 65, Table 10

1164

1165 *Hisonotus* sp. 3 in Reis & Carvalho (2007: 84) [listed].

1166

1167 **Holotype.** MCP uncataloged, 41.5 mm SL, female, Brazil, Rio Grande do Sul, Cruz Alta, Rio
1168 Passo Novo, on road from Cruz Alta to Ibirubá, rio Jacuí drainage, 28°38'43"S 053°33'35"W, 2
1169 Apr 1999, R. E. Reis, E. H. L. Pereira & V. A. Bertaco.

1170 **Paratypes.** All from Brazil, Rio Grande do Sul, rio Jacuí drainage: MCP 22701, 27 + 3 c&s,
1171 26.3-41.1 mm SL, collected with the holotype. MCP 41072, 21 46, 29.0-41.0 mm SL, collected at
1172 the type locality, 13 Dec 2006, T. P. Carvalho & A. R. Cardoso.

1173 **Diagnosis.** *Hisonotus* sp. "Passo Novo" differs from its congeners, except from *H. ringueleti*,
1174 *H. charrua*, *H. nigricauda*, *H. taimensis*, *H. laevior*, *Hisonotus* sp. "Camaquã", *Hisonotus* sp.
1175 "Prata", *Hisonotus* sp. "Carreiro", *Hisonotus* sp. "Sinos", and *Hisonotus* sp. "Felício" by having the
1176 anterior portion of snout with an odontode-free band (Fig. 66), vs. snout completely covered with
1177 odontodes. It Differs from those above, except from *H. laevior*, *H. taimensis*, and *Hisonotus* sp.
1178 "Felício", by a darkly pigmented caudal fin, without a hyaline area in the middle portion vs. caudal
1179 fin presenting hyaline areas in the middle portion. *Hisonotus* sp. "Passo Novo" differs from *H.*
1180 *laevior*, *H. taimensis*, and by *Hisonotus* sp. "Felício" by having the abdominal median plate series
1181 large, one or two series of plates regularly arranged between the lateral abdominal series (Fig. 67)
1182 vs. abdominal median plate series with several small plates irregularly arranged between the lateral
1183 abdominal plates in *H. laevior* and *H. taimensis*, or abdominal median series absent, midline
1184 portion of the belly naked without plates in *Hisonotus* sp. "Felício".

1185 **Description.** Morphometrics and meristics in Table 10. Adult size small to median for
1186 members of this genus (usually less than 40.0 mm SL). Body relatively stocky, robust, without
1187 conspicuous keels. Caudal peduncle round in cross section. Dorsal profile convex from tip of snout

1188 to parieto-supraoccipital tip, slightly convex from that point to dorsal-fin origin. Dorsal-fin base
1189 straight and posteroventrally sloped, straight from posterior end of dorsal-fin base to caudal-fin
1190 origin. Ventral profile almost straight from snout tip to anal-fin origin, concave from this point to
1191 caudal-fin origin. Greatest body depth at dorsal-fin origin. Least body depth at posterior end of
1192 caudal peduncle. Posterior profile of caudal fin concave to slightly forked. Head and snout broad,
1193 snout rounded to slightly square in dorsal view, body progressively narrowing posterior of pelvic-
1194 fin insertion. Snout region anterior of nares concave, interorbital region convex. Upper margin of
1195 orbit slightly elevated. Eye dorsolaterally positioned. Iris operculum present.

1196 Pectoral fin I,6. Pectoral-fin posterior margin slightly rounded to straight, when depressed tip
1197 extending just anterior to middle of pelvic fin. Posterior margin of pectoral-fin spine smooth in
1198 adults, juveniles with feeble serrae along distal third of pectoral-fin spine. Pectoral-fin axillary slit
1199 present, located below posterior bony margin of cleithral process. Pelvic fin i,5. Tip of depressed fin
1200 just reaching anal-fin origin in females, but extending far beyond that point in males. Dorsal-fin II,
1201 7. Dorsal-fin origin located slightly posterior to vertical through pelvic-fin origin. Dorsal-fin
1202 spinelet slight laterally extended. Anal i,5. First anal-fin pterygiophore exposed anterior to anal fin.
1203 Adipose fin absent. Caudal fin i,14,i.

1204 Body almost entirely covered by plates except for region overlying opening of swim bladder
1205 capsule, area between pectoral girdle and lower lip, region around anus, and area around base of
1206 paired fins. Rostral plate with posterior notch articulation with mesethmoid. Rostral plate thickened,
1207 with odontode-free area between dorsad and ventrad series of odontodes (Fig. 66). Snout plates
1208 anterior to nares reduced, small unplated area at lateral portion between rostral plate and nostril.
1209 Three rows of predorsal plates. Median series formed by 22–24 plates (Tab 2). Lateral line
1210 incomplete, with gap without pores along middle length of body. Median plate series truncated, not
1211 reaching posterior end of caudal peduncle (Fig. 68). Abdominal plates arranged in three rows

1212 anteriorly and irregularly arranged between pelvic-fin insertions. Lateral abdominal plates slightly
1213 larger and forming regular series. Median abdominal series formed by one or two plate series, pre-
1214 anal shield region formed by median to large plates (Fig. 67). Coracoid and cleithrum exposed and
1215 covered by odontodes, except for median region of cleithrum between arrector fossae openings and
1216 medial region of coracoids.

1217 Head without conspicuous crests. Odontodes on parieto-supraoccipital tip slightly larger than
1218 those of surrounding areas, most in smaller specimens. Head, fin-spines, and body plates covered
1219 with odontodes, these larger on anterior surface of all fin spines, and on ventral margin of rostrum
1220 slightly enlarged in dorsal margin. Odontodes medially directed on pelvic-fin unbranched ray.
1221 Anterior margin of compound pterotic with median-to-large size perforations. Infraorbital canal
1222 entering infraorbital series via compound pterotic. Lips roundish and papillose, posterior margin of
1223 lower lip fimbriate. Maxillary barbel present.

1224 Premaxillary and dentary teeth slender proximally and flattened distally□bifid, major (medial)
1225 cusp large and rounded, minor (lateral) minute pointed. Accessory patch of teeth absent on dentary
1226 and premaxilla.

1227 Hypurals 1-2 and 3-5 almost completely fused, with slight median notch on the posterior
1228 margin of caudal-fin skeleton. Total vertebrae 27-28 (2 c&s).

1229 **Color in alcohol.** Ground color of dorsal and lateral surfaces pale to dark brown. Dorsal and
1230 lateral body surfaces with rounded gray spots. Dorsal and lateral portions of head darker than body,
1231 except for a lighter area in the ventrolateral region contrasting with dark blotches. Ventral surface of
1232 body pale yellow, except for scattered chromatophores. Region anterior to nares lighter than
1233 surrounding areas, forming a longitudinal light stripe from snout tip to posterior end of parieto-
1234 supraoccipital. Unbranched rays of fins mostly brown pigmented, sometimes presenting hyaline
1235 transverse bands, forming a striped pattern. Caudal fin almost completely brown pigmented, except

1236 for a hyaline area on the posterior end of upper caudal fin rays. Unbranched rays of caudal fin with
1237 alternating transverse light bars and dark areas. General color pattern in life dark green (Fig. 69)

1238 **Sexual dimorphism.** Characterized by the urogenital papilla, positioned just behind the anal
1239 opening in males. Adult males also possess a developed fleshy flap along the dorsal margin of first
1240 thickened pelvic-fin ray, that is absent in females. Flap slightly wider basally and progressively
1241 narrowing distally. Presence of a fleshy flap in the medial portion of the first and second branched
1242 rays of pelvic fin. In juvenile males, flaps smaller or absent. Males have longer pelvic-fin
1243 unbranched ray that extends far beyond anal-fin origin, with pelvic-fin reaching just to anal-fin
1244 origin in females.

1245 **Distribution and habitat.** *Hisonotus* sp. “Passo Novo” is endemic to the upper rio Jacuí
1246 basin, in the laguna dos Patos system. The new species is known only from the rio Passo Novo an
1247 affluent of the rio Ingá tributary of the upper portion of rio Jacuí basin (Fig. 49). This species
1248 inhabits a median to fast flowing watercourse, with clear to brown waters running over sand or
1249 stones. Being found in marginal submersed grasses, *Hisonotus* sp. “Passo Novo” could be collected
1250 in the vegetation together with *Eurycheilichthys limulus*. Rio Passo Novo in the type-locality is a
1251 small creek, about 3m wide and shallow with a maximum depth of 0.5 m at 400 m above sea level
1252 (Fig. 70). The stream is somewhat degraded, crossing the urban area of Cruz Alta, and has
1253 deforested riparian vegetation and amounts of rubbish along the margins.

1254

1255 ***Hisonotus* sp. “Felício”, new species**

1256 Figure 71, Table 11

1257

1258 **Holotype.** MCP uncataloged, 43,0 mm SL, female, Brazil, Rio Grande do Sul, Júlio de
1259 Castilhos, arroio Felício on road from Nova Palma to Júlio de Castilhos, 29°19'04"S 53°37'54"W,
1260 12 Dec 2006, T. P. Carvalho & A. R. Cardoso.

1261 **Paratypes.** All from Brazil, Rio Grande do Sul, rio Jacuí drainage: MCP 41073, 11+2 c&s,
1262 37.4-44.3 mm SL, collected with the holotype. MCP 26802, 1, 43.0 mm SL, at type locality, 28
1263 Nov 2000, L. Malabarba, V. Bertaco, M. Azevedo, J. Bastos & C. Ricken.

1264 **Diagnosis.** *Hisonotus* sp. "Felício" differs from its congeners, except from *H. ringueleti*, *H.*
1265 *charrua*, *H. nigricauda*, *H. taimensis*, *H. laevior*, *Hisonotus* sp. "Camaquã", *Hisonotus* sp. "Prata",
1266 *Hisonotus* sp. "Carreiro", *Hisonotus* sp. "Sinos", and *Hisonotus* sp. "Passo Novo" by having the
1267 anterior margin of the snout with an odontode-free band (Fig. 72) vs. anterior margin of the snout
1268 complete covered by odontodes. It differ from those above by its lack of the median abdominal
1269 plate series, leaving a large naked abdominal area, plates at ventral midline restricted to small
1270 platelets at pre-anal shield region (Fig. 73) □ vs. presence of the median abdominal plate series, pre-
1271 anal shield region plated.

1272 **Description.** Morphometrics and meristics in Table 11. Adult size moderate to large for
1273 members of this genus (larger than 40.0 mm in the SL). Body robust, without conspicuous keels.
1274 Caudal peduncle round in cross section, slightly flattened dorsally. Dorsal profile convex from tip
1275 of snout to dorsal-fin origin. Dorsal-fin base straight and posteroventrally sloped, straight from
1276 posterior end of dorsal-fin base to caudal-fin origin. Ventral profile somewhat concave from snout
1277 tip to posterior portion of head, almost straight from that point to anal-fin origin. Concave at anal
1278 fin base and straight from that point to caudal-fin origin. Greatest body depth at dorsal-fin origin.
1279 Least body depth at middle of caudal peduncle. Posterior profile of caudal-fin margin slightly
1280 concave. Head and snout broad, snout rounded to slightly pointed in dorsal view, body
1281 progressively narrowing posterior of pectoral-fin insertion. Snout region anterior of nares straight,

1282 not depressed□interorbital region straight to slightly convex. Upper margin of orbit not elevated.

1283 Eye dorsolaterally positioned. Iris operculum present.

1284 Pectoral fin I,6. Pectoral-fin posterior margin almost straight, when depressed tip extending
1285 beyond middle of pelvic fin. Posterior margin of pectoral-fin spine smooth in adults, smaller
1286 specimens with feeble serrae along posterior third of pectoral-fin spine. Pectoral-fin axillary slit
1287 present, located below ventral margin of cleithral process. Pelvic fin i,5. Tip of depressed fin just
1288 reaching anal-fin origin in females, but extending far beyond that point in males. Dorsal II,7.
1289 Dorsal-fin origin located slightly posterior of vertical through pelvic-fin origin. Dorsal-fin spinelet
1290 laterally extended. Anal fin i,5. First anal-fin pterygiophore exposed anterior to anal fin. Adipose fin
1291 absent. Caudal fin i,14,i.

1292 Body almost entirely covered by plates except for region overlying opening of swim bladder
1293 capsule, area □between pectoral girdle and lower lip, region around anus, and base of paired fins, and
1294 belly region between lateral abdominal plate series. Rostral plate with posterior notch articulation
1295 with mesethmoid. Rostral plate thickened, with odontode-free area between dorsad and ventrad
1296 series of odontodes (Fig. 72). Snout plates anterior to nares reduced, small unplated area at lateral
1297 portion between rostral plate and prenasal plates. Three rows of predorsal plates. Median series
1298 formed by 23–24 plates (Tab. 2). Lateral line incomplete, with gap without pores along middle
1299 length of body. Median plate series not truncated, reaching posterior end of caudal peduncle (Fig.
1300 74). Median abdominal plate series absent. Irregularly arranged platelets in pre-anal shield region,
1301 absent in some specimens. Lateral abdominal plates relative small and forming regular series of
1302 three to six plates in each side (Fig. 73). Coracoid and cleithrum exposed and covered by
1303 odontodes, except for median region of cleithrum between arrector fossae openings and medial
1304 region of coracoids.

1305 Head without conspicuous crests. Odontodes on parieto-supraoccipital tip slightly larger than
1306 those of surrounding areas. Head, fin-spines, and body plates covered with odontodes, these larger
1307 on anterior surface of all fin spines, and on ventral margin of rostrum, slightly enlarged on dorsal
1308 margin of rostrum. Anteroventral margin of compound pterotic with median-to-large size
1309 perforations. Infraorbital canal entering infraorbital series via sphenotic. Lips roundish and
1310 papillose, posterior margin of lower lip fimbriate. Maxillary barbel present.

1311 Premaxillary and dentary teeth slender proximally and flattened distally□bifid, major (medial)
1312 cusp round□minor (lateral) minute pointed. Accessory patch of teeth absent on dentary and
1313 premaxilla.

1314 Hypurals 1-2 and 3-5 completely fused or with median notch on posterior margin of caudal-
1315 fin skeleton. Total vertebrae 29 (2 c&s).

1316 **Color in alcohol.** Ground color of dorsal and lateral surfaces brownish to gray. Dorsal and
1317 lateral portions of head darker than body, except for a yellowish area, contrasting with dark
1318 blotches, in the ventrolateral region of head. Region anterior to nares lighter than surrounding areas,
1319 forming a paired longitudinal light stripe from snout tip to posterior end of parieto-supraoccipital,
1320 bifurcating and inconspicuous since that point. Ventral surface of body pale yellow, with scattered
1321 chromatophores, mostly grouped on cheeks and bases of pectoral fin forming dark blotches.
1322 Unbranched rays of pectoral, pelvic, dorsal, and anal fins mostly brown, except for narrow lighter
1323 bands, forming a striped pattern. Branched rays of these fins mostly hyaline except for darker
1324 transverse bands. Caudal mostly dark brown, except for a hyaline area on posterior portion of upper
1325 rays. Unbranched rays of caudal fin with striped pattern of transverse light bars. In life, ground
1326 color of dorsum and flanks dark green.

1327 **Sexual dimorphism.** Characterized by the urogenital papilla, positioned just behind the anal
1328 opening in males. Adult males also possess a developed fleshy flap along the dorsal margin of first

1329 thickened pelvic-fin ray, that is absent in females. Flap slightly wider basally and progressively
1330 narrowing distally. Presence of a fleshy flap in the medial portion of first and second branched rays
1331 of pelvic fin. In juvenile males, flaps smaller or absent. Males have longer pelvic fin that extends far
1332 beyond anal-fin origin, with the pelvic fin just reaching anal-fin origin in females.

1333 **Distribution and habitat.** *Hisonotus* sp. “Felício” is known only from the arroio Felício, a
1334 stream affluent to the rio Soturno that is a western tributary of rio Jacuí basin (Fig. 49). This species
1335 inhabits a median to fast flowing watercourse, with clear water running over sand or rocks, being
1336 collected mostly in the marginal submersed vegetation composed of bamboos (Fig. 75).

1337

1338 ***Hisonotus* spp.** In addition to the species formally included in this revision, two other
1339 species are present in the laguna dos Patos system. One of them, tentatively identified here as
1340 *Hisonotus* aff. *leucofrenatus* (Fig. 76), is distributed along the coastal plan at eastern laguna dos
1341 Patos in Rio Grande do Sul (Fig. 27) and is sympatric with *H. laevior* in this region. *Hisonotus* aff.
1342 *leucofrenatus* can be distinguished from all other congeners by the combination of having the snout
1343 completely covered by odontodes, without an anterior odontode-free band, by its caudal fin
1344 coloration, which is almost completely pigmented without a hyaline area in the midventral portion
1345 of the caudal fin, and by the number of predorsal and lateral plates, three and 24-25 respectively.
1346 This taxon is found also in the rio Tramandaí system, where it has been misidentified by Gomes
1347 (1947) in the resurrection and redescription of *Hisonotus laevior*. Although the three specimens
1348 used in the redescription of Gomes (1947) were not examined, extensive material from the same
1349 river (rio Maquiné) and other localities in the rio Tramandaí system were examined. *Hisonotus*
1350 *laevior* is absent in this system being *H. aff. leucofrenatus* the only *Hisonotus* in that region. The
1351 tentative identification of this taxon is due to its high degree of similarity with *H. leucofrenatus* (see
1352 discussion for details).

1353 The other species, identified here as *Hisonotus charrua* (Fig. 77), is known only from the
 1354 arroio dos Pires, a stream tributary to rio Piratini in the upper portions of the São Gonçalo drainage
 1355 (Fig. 27). *Hisonotus charrua* can be diagnosed by the combination of an odontode-free area in the
 1356 anterior margin of the snout, by its coloration on caudal fin, which presents a hyaline transverse
 1357 band in the middle portion, and by the number of predorsal and lateral plates, three and 23-25
 1358 respectively. No differences were found between *Hisonotus charrua* from the rio Uruguai basin and
 1359 arroio dos Pires in the laguna dos Patos system (see discussion for details). Here both species are
 1360 illustrated and included in the taxonomic key, however, their identification should be limited to
 1361 those areas mentioned above.

1362 **Material examined.** *Hisonotus* aff. *leucofrenatus*: MCN 17790, 1, 33.2 mm SL, lagoa do
 1363 Casamento at southeast coast of ilha Grande, Palmares do Sul, 30°24'11"S 50°36'56"W. MCN
 1364 18137, 5, 25.4-28.9 mm SL, lagoa do Casamento at southern margin, Palmares do Sul, 30°29'S
 1365 50°35'W. MCP 21373, 1, 36.4 mm SL, laguna dos Patos at Barra Falsa, downstream dam, São José
 1366 do Norte, 31°34'19"S 51°27'35"W. MCP 41630, 7, 26.3-39.0 mm SL, laguna dos Patos at Barra
 1367 Falsa, upstream dam, São José do Norte, 31°34'19"S 51°27'35"W. *Hisonotus charrua*: MCP
 1368 25139, 15 + 2 c&s, 32.4-46.4 mm SL, arroio dos Pires on bridge of railroad at Passo dos Pires, São
 1369 Gonçalo drainage, Pinheiro Machado, 31°38'S 53°27'W.

1370

1371 **Key to the species of *Hisonotus* from the laguna dos Patos system**

- 1372 **1a.** Dorsal and ventral series of odontodes along anterior margin of the snout separated by a narrow
 1373 or large odontode-free band2
 1374 **1b.** Absence of an odontode-free band, anterior margin of snout completely covered by
 1375 odontodes.....11

1376	2a. Presence of a tuft of enlarged odontodes on the parieto-supraoccipital tip, odontodes with	
1377	aproximately four to five times larger than the surrounding areas	3
1378	2b. Absence of a tuft of enlarged odontodes on the parieto-supraoccipital tip, odontodes with	
1379	aproximately same size or slightly larger than surrounding areas	4
1380	3a. Pectoral-fin spine short (22.0-25.6% of SL, mean 24.0%), just reaching the vertical trough	
1381	dorsal-fin origin □ general color pattern in life dark green, in alcohol grayish	
1382	.....<i>Hisonotus</i> sp. "Prata" (rio da Prata, in the rio Taquari drainage).	
1383	3b. Pectoral-fin spine long (24.7 -29.0 % of SL, mean 26.7%), far surpassing the vertical trough	
1384	dorsal-fin origin □ general color pattern in life yellowish, in alcohol yellow to brownish	
1385	.....<i>Hisonotus</i> sp. "Carreiro" (rio Carreiro, in the rio Taquari drainage).	
1386	4a. Three predorsal plate series, 22-25 plates in median series, and 27-29 vertebrae.....	5
1387	4b. Three or four predorsal plate series (modally four), 25-29 plates in median series, and 30-32	
1388	vertebrae	9
1389	5a. Caudal fin with paired hyaline areas (somewhat triangular) at the middle portion of lower and	
1390	upper lobes	<i>Hisonotus</i> sp. "Sinos" (rio Jacuí basin)
1391	5b. Caudal fin mostly dark, or presenting a transversal hyaline band at the middle portion	6
1392	6a. Posterior portion of lateral line absent □ median abdominal plate series composed of several	
1393	small plates, irregularly arranged	<i>Hisonotus nigricauda</i> (lower portions
1394	of laguna dos Patos system and rio Uruguai basin)	
1395	6b. Posterior portion of lateral line present, median abdominal plate series absent or composed of	
1396	larger plates, arranged in one to three series	7
1397	7a. Caudal fin with transversal hyaline band.....	<i>Hisonotus charrua</i> (upper rio Piratiní drainage)
1398	7b. Caudal fin mosly dark, without transversal hyaline band.....	8

1399	8a. Median abdominal plate series present, formed by one or two series of median to large plates □	
1400	median lateral plate series truncated, not reaching the posterior end of caudal peduncle	
1401	.....<i>Hisonotus</i> sp. “Passo Novo”(upper rio Jacuí drainage)	
1402	8b. Median abdominal plate series absent, scattered platelets at pre-anal shield region □median	
1403	lateral plate series not truncated, reaching the posterior end of caudal peduncle	
1404	.....<i>Hisonotus</i> sp. “Felício” (lower rio Jacuí drainage)	
1405	9a. Caudal peduncle slightly square in cross section □odontode-free band on snout wide □rostral	
1406	plate thin without the posterior notch articulation with the mesethmoid.....	
1407	.....<i>Hisonotus</i> sp. “Camaquã” (rio Camaquã drainage)	
1408	9b. Caudal peduncle round in cross section □odontode-free band on snout narrow □rostral plate thick	
1409	with a posterior notch articulation	10
1410	10a. Body relatively slender, body shallow at dorsal-fin origin (body depth 13.3-16.3% in SL)	
1411	.....<i>Hisonotus taimensis</i> (lower portions of laguna Mirim)	
1412	10b. Body relatively robust, body deep at dorsal-fin origin (body depth 16.2-20.8 % in SL)	
1413	..... <i>Hisonotus laevior</i> (laguna dos Patos system)	
1414	11a. Posterior portion of lateral line absent □small plates in the median abdominal series, irregularly	
1415	arranged	
1416	<i>Hisonotus nigricauda</i> (lower portions of laguna dos Patos system and	
1417	rio Uruguai basin).	
1418	11b. Posterior portion of lateral line present □large plates in median abdominal series regularly	
1419	arranged usually in a single row	12
1420	12a. Caudal fin with a transversal hyaline band, dorsal surface of head and body with dark marks	
1421	contrasting with somewhat reticular light areas..... <i>Hisonotus armatus</i> (laguna	
1422	dos Patos system)	

1422 **12b.** Caudal fin mostly dark, without a transversal hyaline band□dorsal surface of head and body
1423 yellowish to pale brown, without dark marks.....*Hisonotus* aff. *leucofrenatus* (eastern coastal
1424 plain of laguna dos Patos)

1425

1426

Discussion

1427

1428 *Hisonotus* was resurrected by Schaefer (1998) and diagnosed by having reduced or absent
1429 snout plates anterior to nares, yielding a large paired unplated region in either side of midline from
1430 rostrum to nostril, and by having the margins of rostral plates thickened with enlarged odontodes
1431 (Schaefer, 1998, p. 387). However, the monophyly of the genus have been questioned by several
1432 authors (Britski & Garavello, 2003, 2007 and Azpelicueta et al., 2007), because some species do not
1433 present the diagnostic characters proposed by Schaefer (1998). As stated by Britski & Garavello
1434 (2007) some specimens of *Hisonotus notatus*, the type species, do not present reduction in plates
1435 anterior to nares. Moreover, these authors argue that the condition of the thickened rostral plates is
1436 shared with other hypoptopomatinae taxa, as for example *Parotocinclus*, and cannot be considered
1437 exclusive to *Hisonotus*. Apparently no specimens of *H. notatus* was examined by Schaefer for his
1438 proposed diagnosis (1998). The *H. notatus* cited in the material examined (Schaefer 1998, p. 399,
1439 *Hisonotus notatus*: CAS 56717 Brazil: rio Ribeira do Iguape) is likely a misidentification since that
1440 species do not occurs in the rio Ribeira de Iguape and the only species of the genus occurring in that
1441 basin is *H. leucofrenatus* (Oyakawa et al., 2006 and pers. obs.). In fact, my examination indicates
1442 that *H. notatus* as well other species of the genus do not present an unplated area anterior to nares
1443 (Fig. 78 and Fig. 34). However, the reduction in different degrees of the prenasal plates anterior to
1444 nostril occur in most species of *Hisonotus* (Fig. 79 and Fig. 8). This character state condition should

1445 be tested to find out wheter it constitutes a synapomorphy for *Hisonotus* with posterior reversions or
1446 rather a derived feature for some species within the genus.

1447 Another character used by Schaefer refers to the truncation of the median lateral plate series
1448 on the posterior end of caudal peduncle (Schaefer, 1998, ch. 33). According to Schaefer's topology
1449 (1998) the truncation involving the median series evolved independently in *Hisonotus* and
1450 *Microlepidogaster*. This character was discussed by Britski & Garavello (2003, 2007), and reported
1451 as being highly variable. Bristski & Garavello also noted that *H. notatus* and *H. nigricauda* have a
1452 complete median plate series, being variable in individuals of same species or even bilaterally
1453 variable in the same individual. Therefore, they conclude that this character is inappropriate to
1454 define the genus. I agree with those authors and confirm the presence of the complete median series
1455 in *H. notatus* (Fig. 80), in other *Hisonotus* species, and a polymorphic nature of this character in *H.*
1456 *nigricauda*. However, from 13 cleared and stained specimens examined of *H. nigricauda*, only
1457 three (two specimens in just one side) present a complete median series, in most specimens the last
1458 one or two plates in dorsal and ventral series contact each other at lateral midline. Among the
1459 species of *Hisonotus* described in this work, having the truncation of median series, *H. nigricauda*
1460 is unique showing variation of this feature. For these reason, that characteristic could be useful to
1461 diagnose some species within *Hisonotus* and, if not derived for the genus as stated by Schaefer
1462 (1998), its a feature shared by some species.

1463 Besides that, *Hisonotus*, as stated by Schaefer (1998, character 37), do not present the fourth
1464 infraorbital expanded ventrally, which is a reversal within Otothyriini in *Hisonotus* and
1465 *Pseudotocinclus*. However, my examination indicates a ventrally expanded fourth infraorbital in
1466 *Hisonotus* (Fig. 81), rejecting Schaefer's proposition, and not being useful to diagnosis *Hisonotus*.

1467 Another derived feature presented by *Hisonotus* in Schaefer's hypothesis (1998) is the
1468 enlarged swimbladder capsule. Most species of *Hisonotus* clearly present an enlarged swimbladder

1469 capsule that extends just to the joint between the Weberian complex centrum and the sixth centrum.
1470 However, in some species (e.g. *Hisonotus armatus*) the swimbladder capsule extends anteriorly to
1471 the joint of the Weberian complex centrum and the sixth centrum. This character should be
1472 reanalyzed since the degree of expansion of the swimbladder capsule is highly variable in the
1473 supposed derived condition. Besides that, the homoplastic condition of this character, appearing
1474 independently in different hypoptopomatinae taxa is weekly useful as a diagnostic character for
1475 *Hisonotus*.

1476 In the context of a non-diagnosable *Hisonotus*, Britski and Garavello described three species
1477 of *Hisonotus*, *H. insperatus* (2003), and *H. chromodontus* plus *H. luteofrenatus* (2007). These
1478 species do not present most of the mentioned diagnostic features of the genus and *H. chromodontus*
1479 and *H. luteofrenatus* strangely extended the distribution of the genus into the Amazon basin in the
1480 rio Tapajós drainage. The Amazon taxa seems to be the same species treated as New Taxon 3 in
1481 Schaefer (1998), which remains undescribed nowadays. According to Schaefer (1998 p. 387) New
1482 Taxon 3 can be defined among other characters by its rostrum pointed and elongated□thickened
1483 paired rostral plate□dorsal and ventral margins of trunk plates without odontode ridges□and pectoral
1484 arrector fossae open. This features fit with those presented by *H. luteofrenatus* and it is likely that
1485 these species represent Schaefer’s New taxon 3. Moreover, most of the material examined by
1486 Schaefer (1998) come from the rio Xingú basin, neighbor to the rio Tapajós basin, in which *H.*
1487 *luteofrenatus* is also encountered (per. obs.). In Schaefer’s analysis, the New Taxon 3 is basal
1488 within Otothyriini and not closely related to *Hisonotus*. In the same manner, Gauger & Backup
1489 (2005) included both *H. luteofrenatus* and *H. chromodontus* in their phylogeny as part of the seven
1490 unnamed taxa. These species of *Hisonotus* do not grouped with *Hisonotus notatus* in both
1491 hypotheses proposed by Gauger & Backup (2005). Lehmann (2006□named “new taxon TT”) also
1492 analyzed the species of *Hisonotus* described by Britski & Garavello (2003 and 2007) and did not

1493 find these species related to *Hisonotus*, but forming a well supported clade relatively basal in
1494 Hypoptopomatinae. For these reasons, these taxa should be removed from *Hisonotus* in a future
1495 phylogenetic analysis. Excluding these, there are no evidences to support the paraphyly of the
1496 remaining *Hisonotus* species.

1497 Some character states shared by the species of *Hisonotus* could be tentatively polarized and
1498 therefore constituting derived features for groups of species. In this manner some relationships are
1499 putatively inferred. Three species of *Hisonotus* in the laguna dos Patos system present some
1500 features which are likely synapomorphies for these species. *Hisonotus laevior*, *H. taimensis*, and *H.*
1501 sp. “Camaquã” have an increased number of vertebrae, predorsal plates, and lateral plates,
1502 contrasting with other species of *Hisonotus*. These species have 30-32 vertebrae which seems to be
1503 a derived feature contrasting with the low number of other species of Hypoptopomatinae > 29
1504 vertebrae (Schaefer, 1997). Moreover, this putative clade presents 3-4 (modally 4) predorsal plates,
1505 and 25-29 lateral plates, versus 2-3 (modally 3) predorsal plates, and 20-25 lateral plates in other
1506 species of *Hisonotus*. The above mentioned derived features might be related with the elongated
1507 body presented by the species.

1508 Other derived feature presented by species of *Hisonotus* described by Aquino et al. (2001) is
1509 the odontode-free area between the dorsad and ventrad series of odontodes. Most hypoptopomatines
1510 having thickened rostral plates present no odontode-free band, being its anterior portion of rostrum
1511 completely covered by odontodes (eg. *Epactionotus bilineatus*, *Parotocinclus maculicauda*, and
1512 *Hisonotus notatus* □ Fig. 82-84 respectively). Contrastingly, a large number of species of *Hisonotus*
1513 presents a band devoid of odontodes on the anterior portion of the snout. The width of the
1514 odontode-free band is somewhat variable between species of *Hisonotus*, however, its presence
1515 seems to be homologous.

1516 Some species of *Hisonotus* present a peculiar green coloration in life (Fig. 58, 69). That
1517 color pattern and the capacity to change color was described and discussed by Azpelicueta et al.
1518 (2004) for *Hisonotus aky*. The greenish coloration was previously observed among
1519 hypoptopomatines by Retzer et al. (1999), who shown that *Acestridium dichromum* is able to
1520 change color (greenish to brownish) for camouflage. Field examination of this feature revealed that
1521 the green color pattern is more widespread among species of *Hisonotus* and not exclusive to *H. aky*.
1522 In the other hand, some species of *Hisonotus* never presented this green pattern, even when
1523 collected syntopically with species presenting the green coloration (eg. *Hisonotus armatus* collected
1524 with the “green” *Hisonotus* sp. “Sinos”). This green feature is shared by several species of
1525 *Hisonotus* inhabiting the rio Uruguai basin and the laguna dos Patos system, and its homology
1526 should be tested in a phylogenetic framework.

1527

1528 **Geographic distribution.** Twelve species of *Hisonotus* are herein reported for the laguna
1529 dos Patos system. That diversity greatly surpasses that presented by other hydrographic basins. As
1530 cited previously by Carvalho et al. (in press), *Hisonotus* is not the only high diverse genus of
1531 loricariids in that system, which indicates a species richness and endemisms for that region. From
1532 the species of *Hisonotus* treated in this review only three are not endemic to the laguna dos Patos
1533 system (*Hisonotus nigricauda*, *Hisonotus* aff. *leucofrenatus*, and *Hisonotus charrua*).

1534 *Hisonotus nigricauda* has a wide distribution compared to other congeners, and is likely to
1535 be part of a widespread taxa (see remarks for *H. nigricauda*) distributed in the lower portions of Río
1536 de La Plata and laguna dos Patos systems. The species is present in the marshlands of the rio
1537 Vacacaí drainage and rio Ibicuí headwaters. The watershed of these drainages is located in a flat
1538 region separated from each other by no more than a few hundred meters. During periods of
1539 floodings, both drainages maybe connected permitting fish, which lives in these marsh habitats, to

1540 disperse from one to the other. Recently, several fishes pertaining to rio Uruguai basin
1541 (*Aphyocharax anistsi*, *Acestrorhynchus pantaneiro*, *Pyrrhulina australis*, etc...) were caught in the
1542 rio Vacacaí drainage. The probable cause of these recent introductions is the connection of these
1543 two drainages by irrigation channels used in the rice culture. Since *Hisonotus nigricauda* has a wide
1544 distribution in the system, and syntypes collection predates the rice culture in Rio Grande do Sul,
1545 the human-influenced introduction hypothesis is rejected. Therefore its dispersion is likely to be
1546 part of a historical event. *Hisonotus nigricauda* distribution overlaps that presented by *Otocinclus*
1547 *flexilis* Cope, 1894 (Schaefer, 1997), and both are frequently collected together in slow flowing,
1548 lowland watercourses. Recently, Lehmann (2006, p. 403) proposed the resurrection of *Otocinclus*
1549 *arnoldi* Regan, 1909, which is distributed in the Río de La Plata system, from the synonym of *O.*
1550 *flexilis* to the laguna dos Patos system. That split, based on morphological traits, between
1551 monophyletic assemblages distributed in both laguna dos Patos system and rio Uruguai basin is
1552 common (e.g. *Heterocheiroidon jacuiensis*/*H. yatai* □ *Parapimelodus valenciennes*/*P. nigribarbis* and
1553 *Bunocephalus doriae*/*Bunocephalus* sp. nov.). The laguna dos Patos system is thought to have been
1554 formed in the quaternary and apparently its origins includes captures of some rio Uruguai
1555 headwaters (Beurlen, 1970). Since the vicariance, populations from these isolated river systems can
1556 be morphologically recognized as different lineages, receiving different formal names. That could
1557 suggest the split between *Hisonotus nigricauda* from laguna dos Patos system and rio Uruguai
1558 basin, however, no apparent difference is found between these two geographically isolated
1559 populations hence considered as a single species.

1560 Also noteworthy is the presence of *Hisonotus* aff. *leucofrenatus* in the laguna dos Patos
1561 system. That species has a punctuated distribution in that region contrasted with its wider
1562 distributions in neighboring basins. *Hisonotus leucofrenatus* Miranda Ribeiro, 1908 was described
1563 from the rio Ribeira de Iguape basin, a Brazilian Atlantic coastal drainage in southern São Paulo

1564 state. No difference was found between examined populations from rio Ribeira do Iguape and rio
1565 Tramandaí and both can be diagnosed by identical traits. Recently, a kariological characterization
1566 by Andreato *et al.* (2006) of *H. leucofrenatus* and other species of *Hisonotus*, revealed no
1567 differences between *H. leucofrenatus* populations along the coastal drainages from Ribeira de
1568 Iguape to rio Itapocú drainage at northeast Santa Catarina, indicating not only morphological
1569 similarity, related here, but karyotype homogeneity. An accurate review of *Hisonotus leucofrenatus*
1570 populations from Brazilian eastern coastal drainages should be made to discover whether they
1571 constitute a complex of similar species or a single species. Considering the wide range of that
1572 species the term “*aff.*” is used to refer to the populations from the rio Tramandaí system and eastern
1573 laguna dos Patos. Malabarba and Isaia (1992) recorded several species shared between the lower
1574 portions of rio Tramandaí system and laguna dos Patos system, and discussed the relationships
1575 between those areas. According to them the dispersion between the laguna dos Patos system and the
1576 rio Tramandaí system was the main source of the fish fauna of coastal plain. *Hisonotus aff.*
1577 *leucofrenatus* presents a distribution similar to that presented by other hypoptopomatine, *Otothyris*
1578 *rostrata*, which is complementary to the pattern described above. *Otothyris rostrata* is known from
1579 the lower portions of rivers draining to the coast of Santa Catarina and Rio Grande do Sul states and
1580 laguna dos Patos system, while the genus *Otothyris* is distributed along the Atlantic coastal
1581 drainages from Bahia state to southern Brazil (Garavello *et al.* 1998). Both, *O. rostrata* and *H. aff.*
1582 *leucofrenatus* are widely distributed in the lowlands of northern coastal drainages, therefore their
1583 presence in the laguna dos Patos system is likely to be due to dispersion through the coastal plain of
1584 southern Brazil. A review of the geological origin of the coastal province of Rio Grande do Sul state
1585 is presented by Schwarbold & Schäfer (1984), and according to them, the eastern coastal plain in
1586 southern Brazil was formed during the pleistocene glaciations. In that period, the laguna Mirim and
1587 laguna dos Patos were formed as freshwater habitats, however becoming part of a marine

1588 environment during sea transgressions. The presence of *Hisonotus* aff. *leucofrenatus* in the laguna
1589 dos Patos system should be relatively recent, since its actual distribution area in the eastern laguna
1590 dos Patos coastal plain was submerged by sea water during the Sangamon interglacial period
1591 (80.000 years).

1592 The distribution of *Hisonotus charrua* is also puzzling. That species is widely distributed in
1593 the rio Uruguai basin contrasting with single collecting site in the laguna dos Patos system. The
1594 headwaters of the rio Piratini are relatively close to the headwaters of the rio Negro, and a stream
1595 capture event between those drainages could have been the responsible for the interchange of *H.*
1596 *charrua* from rio Uruguay basin to laguna dos Patos system. However, no subsequent dispersion of
1597 that species occurred in the São Gonçalo drainage. Recently, specimens of *Jenynsia onca*, which is
1598 widespread in the rio Negro and rio Ibicuí drainage tributaries to the rio Uruguay basin (Lucinda et
1599 al., 2002), were collected in a single nearby locality near in the rio Camaquã drainage. That finding
1600 reinforces that dispersion through streams capture events without subsequent dispersion of the
1601 species may be frequent. Additional samples from the headwater fish fauna of those drainages is
1602 necessary for a better understanding of the complex faunal pattern of these regions.

1603 Several species of *Hisonotus* presented in this review are endemic to the headwaters of the
1604 rio Jacuí basin. Two of them (*Hisonotus* sp. “Carreiro” and *Hisonotus* sp. “Prata) are collected in
1605 fast flowing watercourses of high altitudes, which are uncommon habitats to *Hisonotus*. Both can be
1606 caught syntopically with species of *Eurycheilichthys*. That genus is endemic to southern Brazil and
1607 restricted to the high altitudes of the Serra Geral formation in Rio Grande do Sul and Santa Catarina
1608 states (Reis & Schaefer, 1998), presenting a great diversity in the rio Taquari drainage (Reis, in
1609 prep.). According to Liedke (2007), who study the inter- and intraspecific relationships of the
1610 genus, one possible explanation for the high degree of endemicity in the headwaters of rio Taquari
1611 drainage is its features. The headwaters of the Taquari basin present a high declivity and shallow

1612 riverbeds where most species are isolated from each other by deeper sections of large rivers or by
1613 waterfall barriers. For both *Eurycheilichthys* and *Hisonotus* the mountain relief on which the
1614 Taquari drainage flows is responsible for dividing species distribution. That allopatry is observed in
1615 the species *Hisonotus* sp. “Carreiro” whose distribution in the rio Carreiro drainage is limited to the
1616 upper reaches upstream the Salto do Carreiro fall. The species was never caught downstream that
1617 waterfall, but other species of the genus, *Hisonotus* sp. “Sinos” and *Hisonotus armatus*, are
1618 collected in that region of rio Carreiro. The distribution of some species of *Hisonotus* is coincident
1619 with that presented by some *Eurycheilichthys*. *Hisonotus* sp. “Passo Novo” can be collected with
1620 *Eurycheilichthys limulus* in the upper rio Jacuí drainage, as well as *Hisonotus* sp. “Carreiro” and
1621 *Hisonotus* sp. “Prata” are sympatric with two different undescribed species of *Eurycheilichthys*. The
1622 events which promoted the divergence of both groups are likely to be related. Liedke (2007)
1623 hypothesized that *Eurycheilichthys pantherinus* (distributed in several tributaries of rio Uruguai) as
1624 sister group of a clade containing *Eurycheilichthys limulus* (upper rio Jacuí) and a clade of several
1625 undescribed species in upper rio Taquari. According to the author, using a molecular clock
1626 estimation, the vicariance of *Eurycheilichthys* clades should had occurred in the early and late
1627 Pleistocene, which predates the separation of rio Uruguai and rio Jacuí drainages. Therefore the
1628 presence of most derived forms of the genus in the rio Jacuí and rio Taquari, are more likely to be
1629 capture events between its headwater streams. Besides, some *Hisonotus* seem to have congruent
1630 distributions with those presented by other families of fishes. For instance, *Cyanocharax tipiaia*
1631 (Malabarba & Weitzmann, 2003) has exactly the same distribution of *Hisonotus* sp. “Felicio” and
1632 *Hisonotus* sp. cf. “Sinos”. That pattern could suggest some endemic areas within rio Jacuí basin. As
1633 proposed by those authors, *Cyanocharax tipiaia* is hypothesized as the sister group of all
1634 *Cyanocharax* species from the rio Uruguai basin, indicating that stream capture events between that
1635 portion of rio Jacuí and rio Uruguai basin may occurred. I want therefore mention that the rio Jacuí

1636 basin is relatively well sampled and this congruence is not due to collecting site bias, but seems to
1637 be a natural overlap of species distribution.

1638 Contrasting with the species of *Hisonotus* present in the headwaters of the rio Jacuí basin, a
1639 putative clade of the genus formed by *H. taimensis*, *H. laevior*, and *Hisonotus* sp. “Camaquã” are
1640 distributed in relatively lower portions of the laguna dos Patos system. Along with the fact that
1641 these species are not alopatric, the lower portions of the laguna dos Patos system do not present
1642 clear geographical barriers. *Hisonotus laevior* and *H. taimensis* are morphologically very similar and
1643 can be differed only by morphometric features of a relatively more elongated and lower body of the
1644 latter species. A similar body form is observed between *Rineloricaria cadeae* and *Rineloricaria*
1645 *longicauda*, distinguished only by morphometric traits also related to a lower body shape of the
1646 later (cf. Rodriguez & Reis, in press). Although we lack a phylogenetic hypothesis for both groups,
1647 the similarity with their relatives inhabiting more elevated regions seems to indicate a close
1648 relationship between them. Geographic distributions of *Hisonotus taimensis* and *Rineloricaria*
1649 *longicauda* species are mostly overlapping, with species inhabiting the coastal plans of southern
1650 Brazil. That similarity in body shape seems to play a significant role in the adaptation for lowland
1651 habits for both *H. taimensis* and *R. longicauda*. In the same manner, *Heptapterus sympterigium*,
1652 which is distributed throughout the coastal lowlands of eastern Rio Grande do Sul state (Buckup
1653 1988), present some morphological specializations compared to its relative, *Hepapterus mustelinus*,
1654 inhabiting the upstream portions of the laguna dos Patos system. As previously discussed the
1655 eastern coastal plain of laguna dos Patos system is relatively recent (Schwarbold & Schäfer, 1984),
1656 therefore the speciation events of species inhabiting these portion should postdate the pleistocene
1657 formation of the coastal plain.

1658 As demonstrated by *Hisonotus* and other taxa, the fish fauna of the laguna dos Patos system
1659 seems to have a hybrid nature, receiving both elements from upper and lower portions of the rio
1660 Uruguai basin, as well as from coastal atlantic drainages of southeastern Brazil.
1661

1662 **Comparative Material.** *Epactionotus bilineatus*: MCP 29293, 29 + 3 c&s, Brazil, Rio Grande do
1663 Sul, arroio das Bananeiras. *Eurycheilichthys pantherinus*: MCP 35042, 17 + 3 c&s, Brazil, Rio
1664 Grande do Sul, rio dos Touros on road from Rondinha to Silveira. *Lampiella gibosa*: MCP 31588, 1
1665 + 1 c&s, Brazil, São Paulo, rio Bonito tributary to Rio Pardo. *Eurycheilichthys* sp. 1: MCP 40973,
1666 1, Brazil, Rio Grande do Sul, arroio Guabiju. *Eurycheilichthys* sp. 2: MCP 35062, 25, Brazil, Rio
1667 Grande do Sul, rio da Prata at Passo do Respraiado. *Hisonotus aky*: AI 124, holotype of
1668 *Epactionotus aky*, Argentina, Misiones, arroyo Garibaldi. AI 125, 7 + 1 c&s, paratypes of
1669 *Epactionotus aky*, collected with the holotype. *Hisonotus candombe*: ZVC-P 5595, holotype,
1670 Uruguay, Salto, arroyo Palomas. *Hisonotus charrua*: ZVC-P 5639, holotype, Uruguay,
1671 Tacuarembó, Canãda de los Peña. MCP 40256, 4 + 1 cs, same type-locality. *Hisonotus*
1672 *chromodontus*: MCP 35873, 194 + 5 c&s, Brazil, Mato Grosso, rio Sauê-Uina on highway BR-364.
1673 *Hisonotus depressicauda*: MCP 20100, 2, Brazil, São Paulo, rio Taiaçupeba near electrical station of
1674 Tijuco Preto, tributary of rio Tiête drainage. *Hisonotus depressinotus*: MZUSP 86167, 6, Brazil,
1675 Paraná, creek tributary to rio Tibagi. *Hisonotus francirochai*: MCP 41341, 4, Brazil, São Paulo,
1676 stream tributary of rio Mogi-Guaçu. *Hisonotus insperatus*: MZUSP 78957, holotype, Brazil, São
1677 Paulo, rio Capivara. MZUSP 78958, 5, collected with the holotype. MZUSP 78966, 7, paratypes,
1678 Brazil, São Paulo, rio Capivara. *Hisonotus* aff. *leucofrenatus*: MCP 20722, 3, Brazil, Rio Grande do
1679 Sul, creek tributary to rio Maquiné near Maquiné. MCP 21342, 7, Brazil, Rio Grande do Sul, canal
1680 between lagoa Emboaba and lagoa Emboabinha. MCP 22454, 5, Brazil, Rio Grande do Sul, canal
1681 between lagoa Emboaba and lagoa Emboabinha. MCP 29298, 2, Brazil, Rio Grande do Sul, rio Três

1682 Forquilhas on vila Itati. UFRGS 4986, 4, Brazil, Rio Grande do Sul, arroio Água Parada tributary to
 1683 rio Maquiné. *Hisonotus leucofrenatus*: MCP 11540, 60 + 3 c&s, Brazil, Santa Catarina, rio Cubatão
 1684 (north). MZUSP 36565, 20, Brazil, São Paulo, small creek on road from Eldorado to Sete Barras.
 1685 MZUSP 60220, 11, Brazil, São Paulo, córrego Fria. *Hisonotus luteofrenatus*: MCP 32670, 9 + 1
 1686 c&s, Brazil, Mato Grosso, igarapé Ribeirão Preto on highway MT-338. MCP 32666, 2, Brazil,
 1687 Mato Grosso, rio Azul on highway MT-140. *Hisonotus maculipinnis*: BMNH 1909.4.2.19–22,
 1688 syntypes of *Otocinclus maculipinnis*, La Plata. BMNH 1934. 8. 20. 321-5, San Lorenzo, Paraguay.
 1689 BMNH 1934.8.20:220-240, + 500, Paraguay, near Asunción. ANSP 187011, 507, Argentina,
 1690 Corrientes, side channels and backwaters of Rio Paraná and lower Río Guayquiraró, about 25 km
 1691 south from Esquina. ILPLA 235, 6 + 1, Argentina, Corrientes, Arroyo Batel. MACN 3240, +50,
 1692 Argentina, Buenos Aires. MACN 7594, +50, Argentina Santa Fé, Arroyo Ciquenã. *Hisonotus*
 1693 *notatus*: BMNH 1904.1.28.13–16 □ MNRJ 28882, 3 □ NWM 45380-4, NMW 45380-7, NMW 45381-
 1694 6, NMW 45381-4 □ ANSP 166924, 6 □ all syntypes, Brazil, Rio de Janeiro, rio Grande (arroio Fundo)
 1695 on fazenda Santa Cruz. MCP 18098, 204 + 4 cs, Brazil, Espírito Santo, rio São José dos Torres on
 1696 road BR 101. *Hisonotus paulinus*: BMNH 1907.7.6.9, holotype of *Otocinclus paulinus*, Brazil, São
 1697 Paulo, rio Piracicaba. *Hisonotus ringueleti*: ILPLA 886, holotype, Uruguay, Rivera, creek at km 18
 1698 of route joining Santana do Livramento to Rivera. ILPLA 883, 95, and MLP 9536, 4, paratypes,
 1699 collected with the holotype. *Hisonotus yasi*: AI 159, 4, paratypes of *Epactionotus yasi*, Argentina,
 1700 Misiones, Arroyo Lobo. NUP 790, 15, Brazil, Paraná, Caxias reservoir. UFRGS 4187, 2, Brazil,
 1701 Paraná, Ampére, small creek tributary to rio dos Macacos. *Microlepidogaster perforatus*: MCP
 1702 17717, 4 + 1 c&s, Brazil, Minas Gerais, rio Carandaí. *Otothyropsis marapoama*: MCP 38303,
 1703 paratypes, 9 + 1 c&s, Brazil, São Paulo, córrego Cubatão. *Otocinclus flexilis*: MCP 17414, 11 + 2
 1704 c&s, Brazil, Rio Grande do Sul, Capão do Leão, arroio Itaeté at Passo das Pedras. *Parotocinclus*

1705 *maculicauda*: MCP 31591, 50 + 4 c&s, Brazil, São Paulo, rio Bonito tributary to Rio Pardo. MCP
1706 20087, 17, Brazil, Paraná, Cerro Azul, arroio Ribeirão Bonito.

1707

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1724

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1853

1854 **Figure Legends**

1855

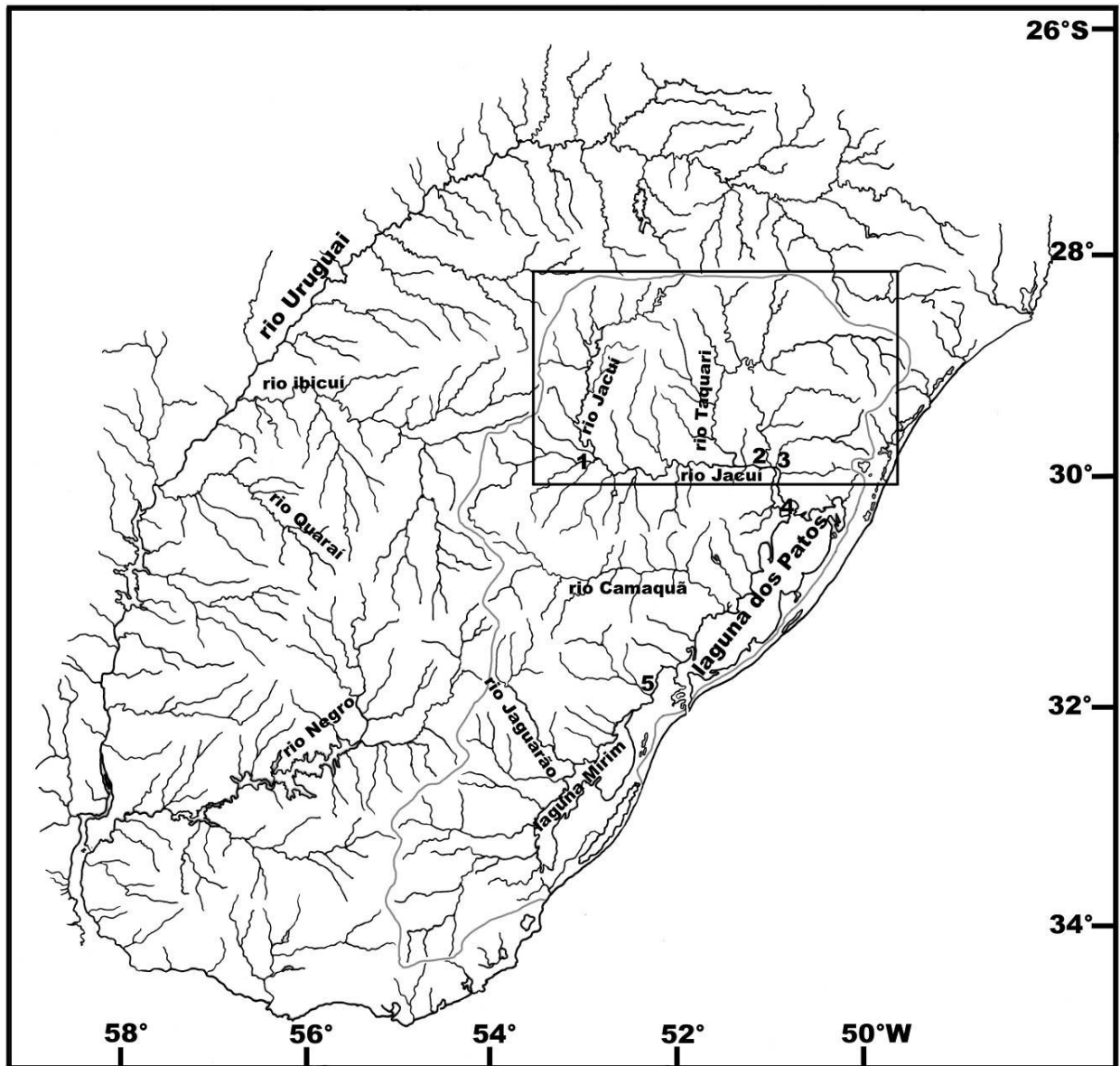
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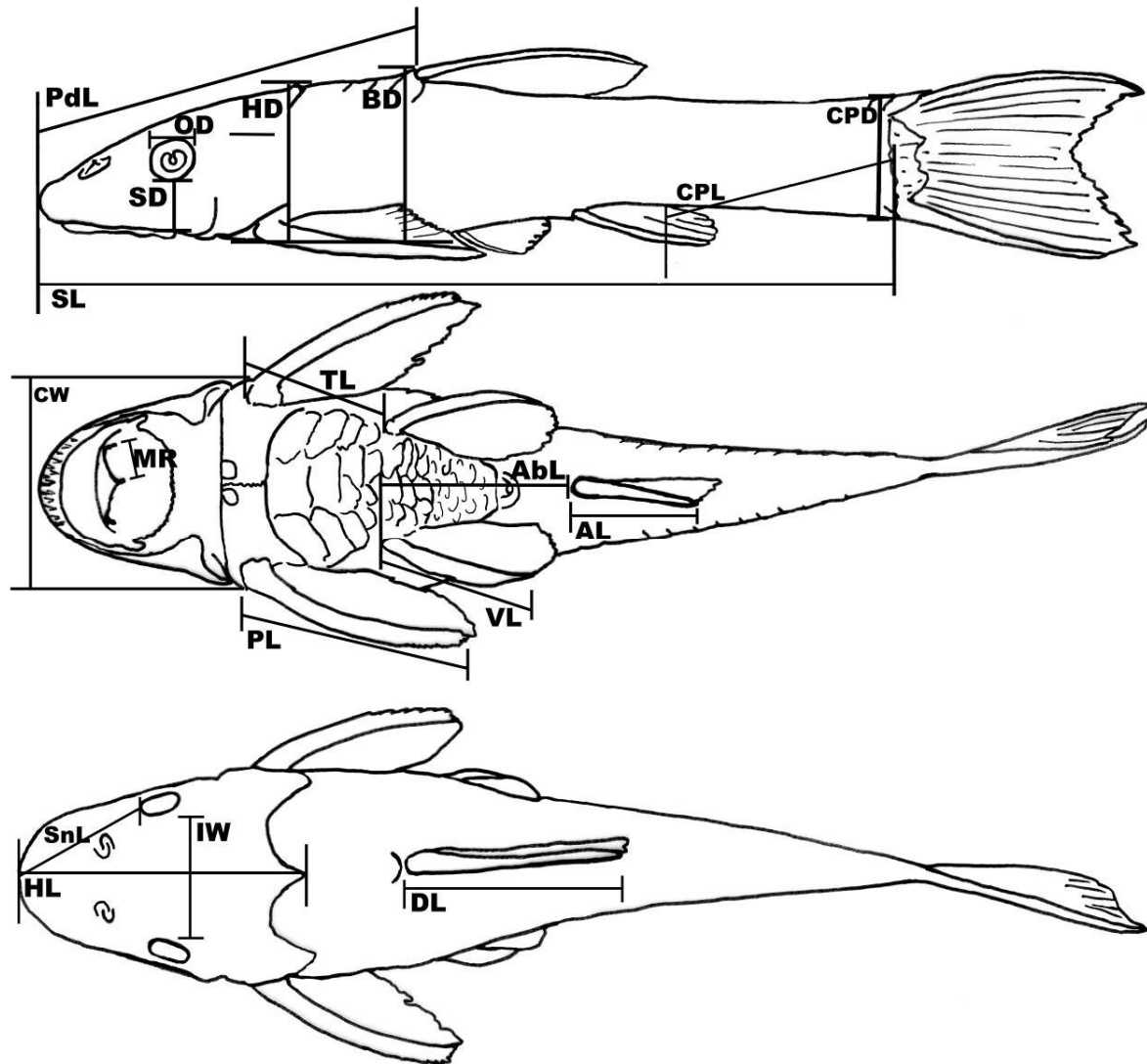


1861
 1862 Figure 1. Drainage map of lagoona dos Patos system (circulate area) and the neighboring rio Uruguai
 1863 basin. Rectangle represents the rio Jacuí basin. 1-mouth of rio Vacacaí drainage □2-mouth of rio Cai
 1864 drainage □3-mouth of rio dos Sinos drainage □4-lago Guaíba □5-São Gonçalo drainage.

1865

1866

1867



1868
 1869 Figure 2. Measurements and terminology: **SL**, standard length **HL**, head length **PdL**, predorsal
 1870 length **DL**, dorsal-fin spine length **AL**, First anal-fin unbranched ray length **PL**, pectoral-fin spine
 1871 length **VL**, First pelvic-fin unbranched ray length **CW**, cleithral width **TL**, thoracic length **AbL**,
 1872 abdominal length **BD**, body depth at dorsal-fin origin **CPL**, caudal peduncle length **CPD**, caudal
 1873 peduncle depth **SnL**, snout length **OD**, orbital diameter **IW**, interorbital width **HD**, head depth
 1874 **SD**, suborbital depth **MR**, mandibular ramus.



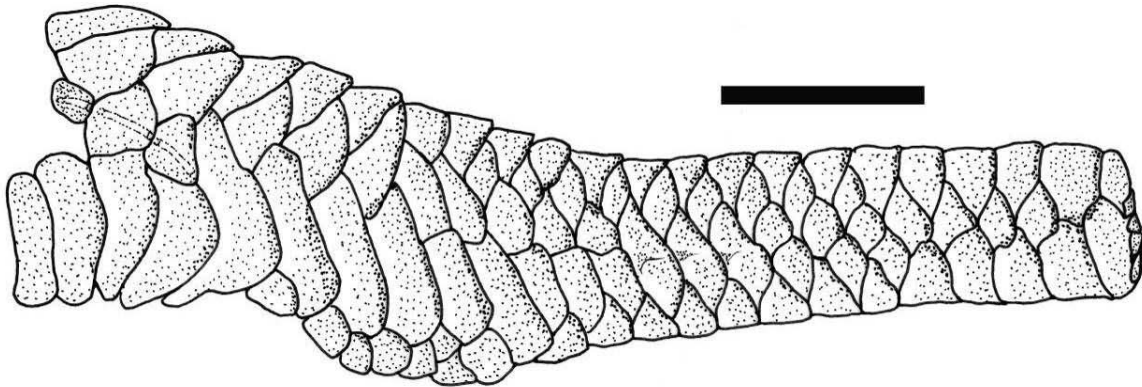
1875

1876 Figure 3. Syntype of *Otocinclus nigricauda*, BMNH 91.3.16.53-62, female, 29.9 mm SL, Rio

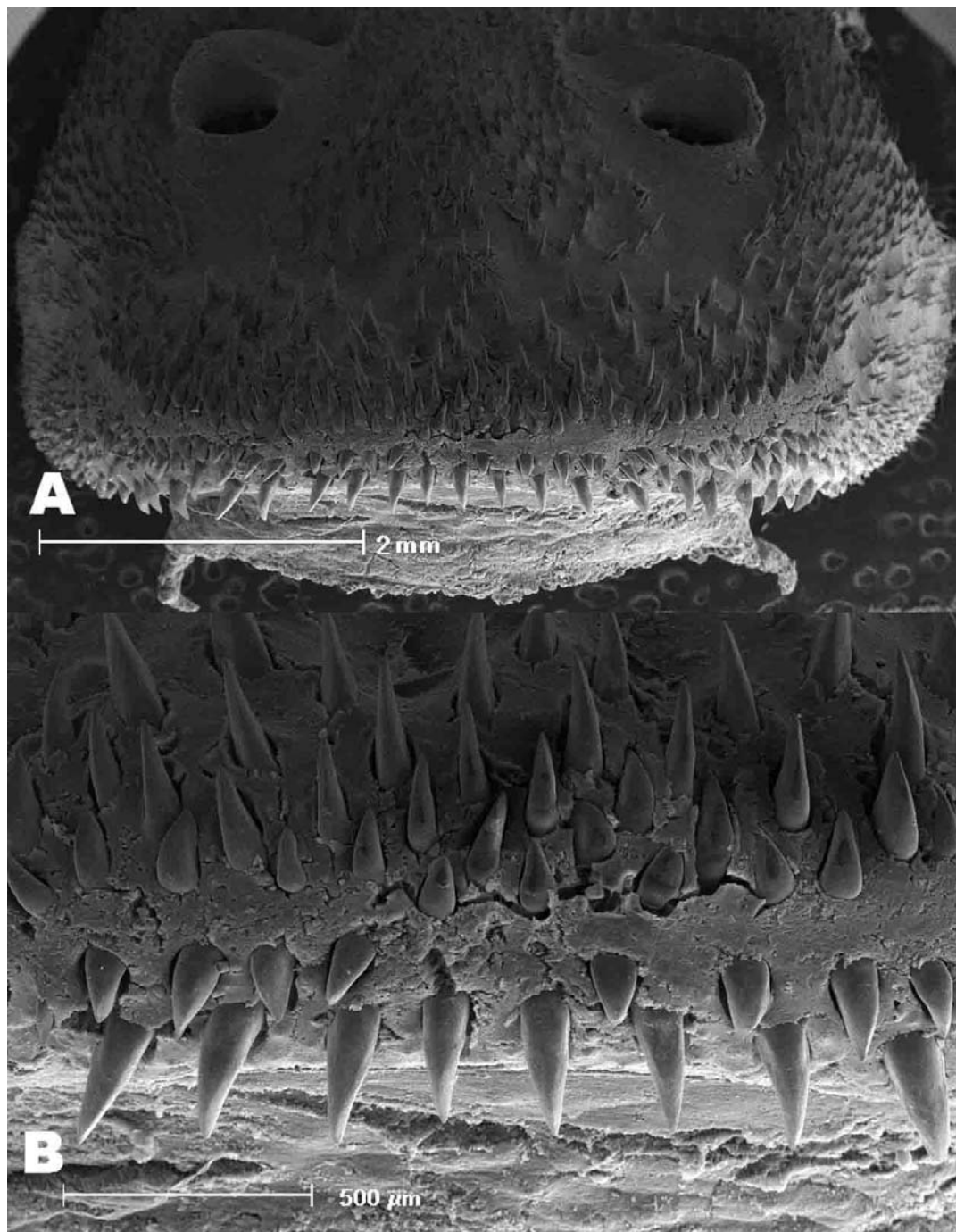
1877 Grande do Sul, Brazil.



1878
1879 Figure 4. *Hisonotus nigricauda*, MCP 40761, female, 37.2 mm SL. Arroio Banhado Grande on road
1880 between Bagé and Caçapava do Sul, Bagé, Brazil.



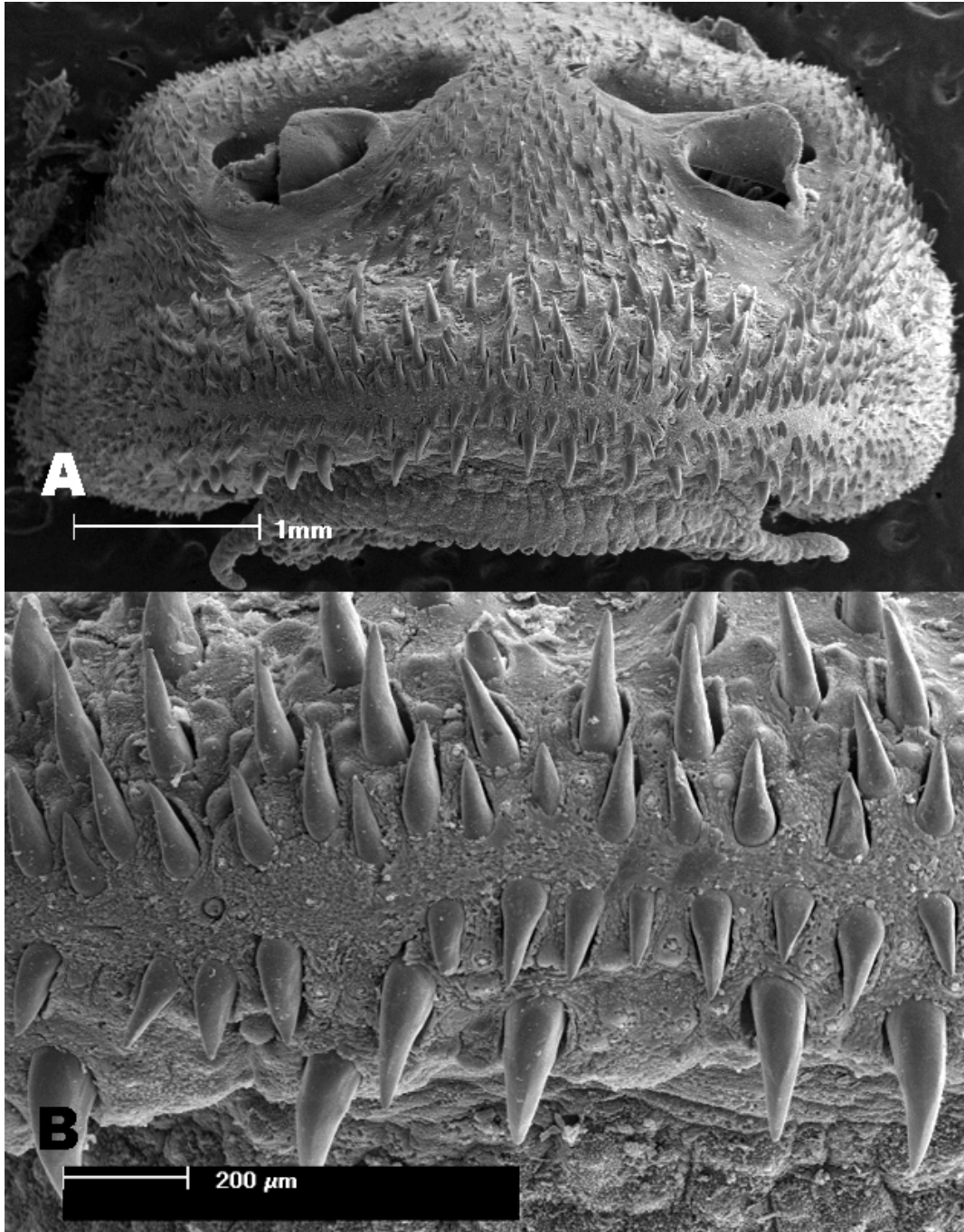
1881
1882 Figure 5. Trunk lateral plate series of *Hisonotus nigricauda*, lateral view of left side, MCP 40761,
1883 37.4 mm SL. Scale bar 4 mm.



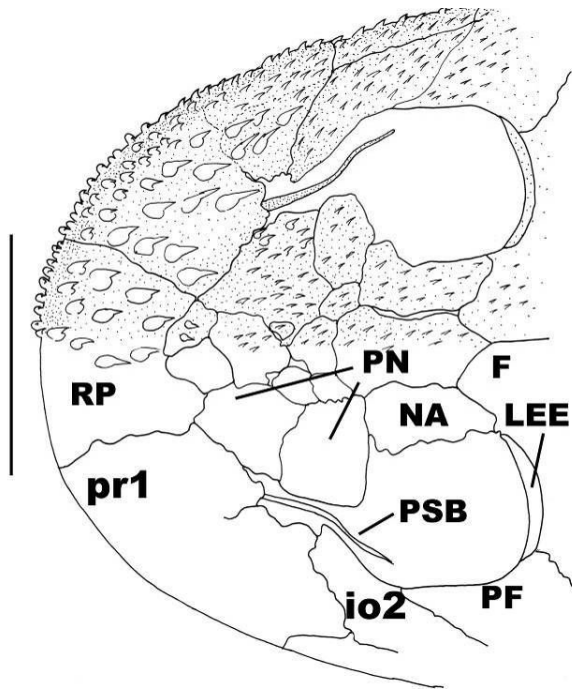
1884

1885 Figure 6. Scanning electron micrograph of anterior rostral margin of *Hisonotus nigricauda*, MCP

1886 17416, 36.7 mm SL. A-anterior view of rostrum □ B-magnification of medial portion.



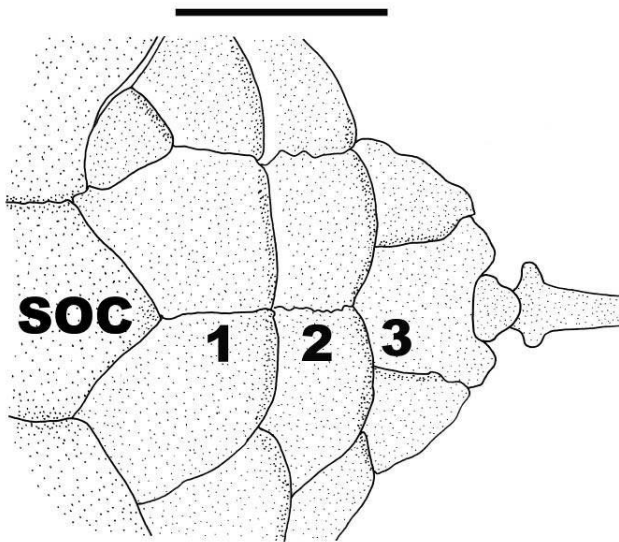
1887
1888 Figure 7. Scanning electron micrograph of anterior rostral margin of a small specimen of *Hisonotus*
1889 *nigricauda*, MCP 26865, 28.3 mm SL. A-anterior view of rostrum □ B-magnification of medial
1890 portion.



1891

1892 Figure 8. Snout in dorsal view of *Hisonotus nigricauda* showing reduced snout plates, MCP 19548

1893 35.4 mm SL. Scale bar 2 mm.

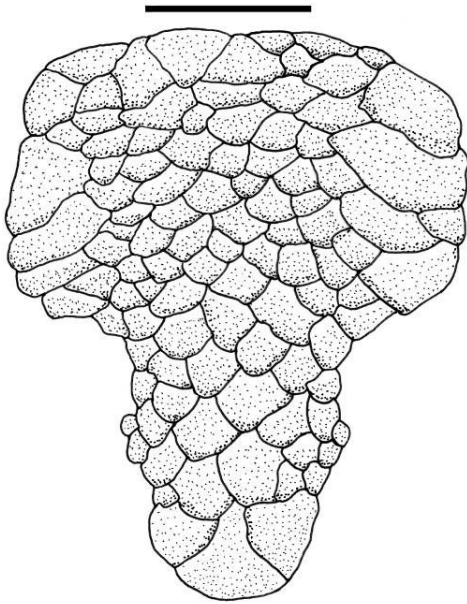


1894

1895 Figure 9. Predorsal region in dorsal view of *Hisonotus nigricauda* showing arrangement of

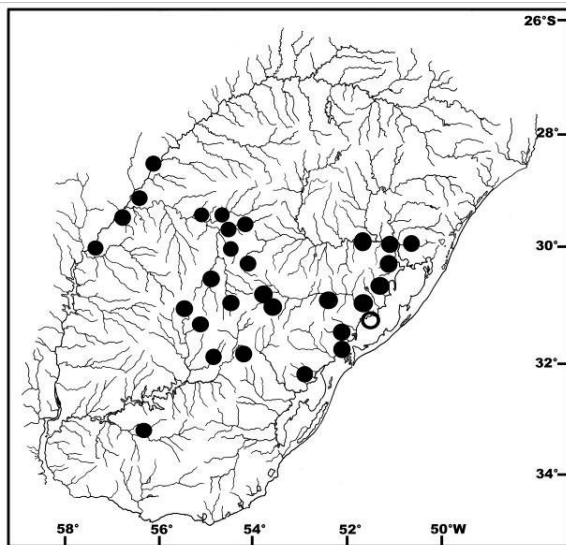
1896 predorsal plates, MCP 40761 32.4 mm SL. 1-2 – paired predorsal plates, 3 – nuchal plate, SOC –

1897 parieto-supraoccipital. Anterior portion toward left. Scale bar 2 mm.



1898

1899 Figure 10. Arrangement of abdominal plates, *Hisonotus nigricauda*, MCP 40761, 37.4 mm SL
 1900 anterior portion toward top. Scale bar 2 mm.



1901

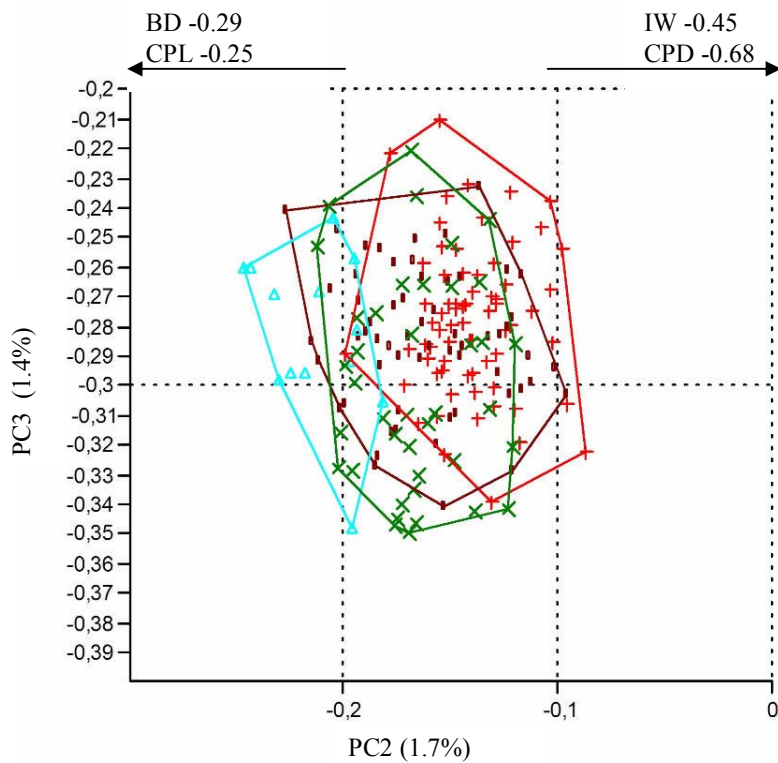
1902

1903 Figure 11. Drainage map of laguna dos Patos system and rio Uruguai basin showing distribution of
 1904 *Hisonotus nigricauda*. Open symbol designate the probably type locality □ some symbols represent
 1905 more than one collecting locality.



1906

1907 Figure 12. Arroio Banhado Grande, slow flowing stream collecting site of *Hisonotus nigricauda*.



1908

1909 Figure 13. Principal component analysis of 14 morphometric data of *H. nigricauda*/*H. maculipinnis*

1910 complex. Stronger loadings on the second principal component. Red crosses = *H. nigricauda*

1911 including syntypes (laguna dos Patos system) □ Brown squares = *H. nigricauda* (rio Uruguay basin) □
1912 Green X = *H. maculipinnis* including syntypes (lower Río Paraná and La Plata) □ Blue triangles = *H.*
1913 *maculipinnis* (lower Río Paraguay).
1914



1915
1916 Figure 14. Syntype of *Otocinclus maculipinnis*, BMNH 1909.4.2.19-22, female, 26.0 mm SL, from
1917 “La Plata”.



1918

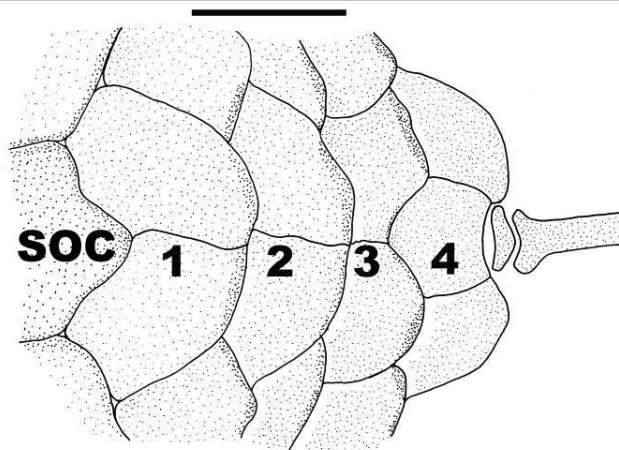
1919 Figure 15. Holotype of *Hisonotus laevior*, ANSP 21253, female, 39.2 mm SL. Rio Jacuí, Brazil.



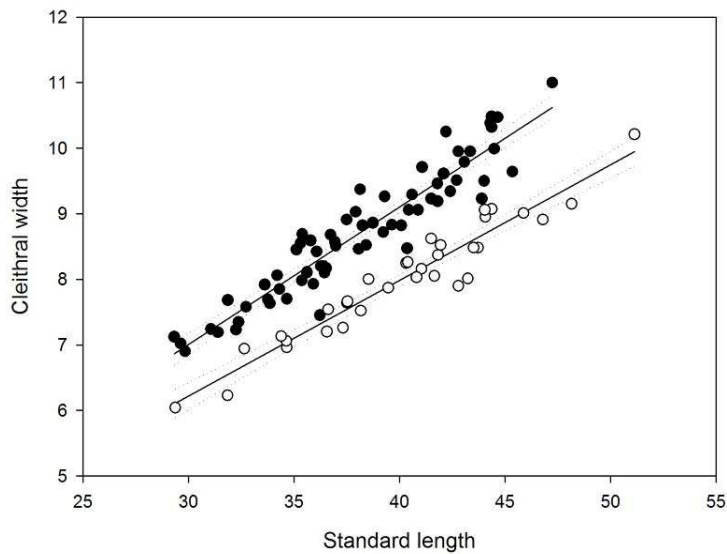
1920

1921 Figure 16. *Hisonotus laevior*, MCN 12682, female, 46.0 mm SL, arroio Inhuquipá, São Lourenço

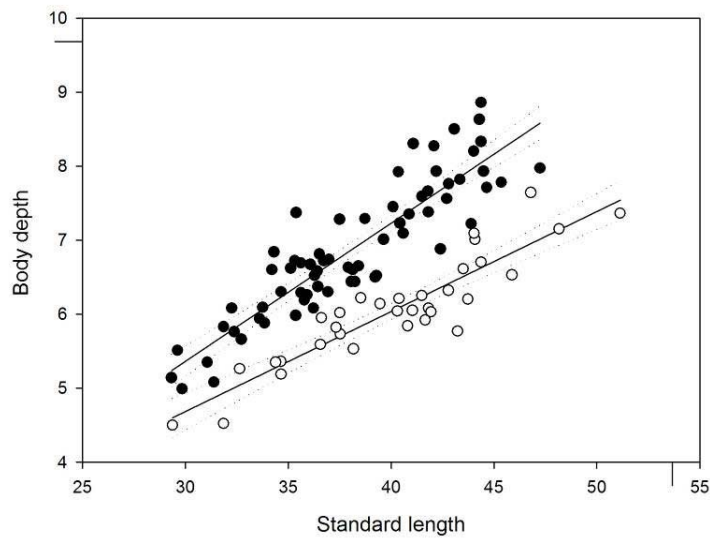
1922 do Sul, Brazil.



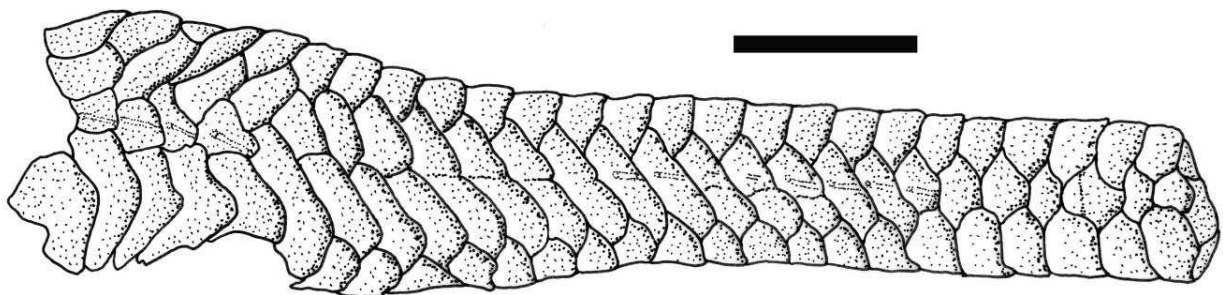
1923
 1924 Figure 17. Predorsal region in dorsal view of *Hisonotus laevior* showing arrangement of predorsal
 1925 plates, MCP 23854 38.7 mm SL. 1-3 – paired predorsal plates, 4 – nuchal plate, SOC – parieto-
 1926 supraoccipital. Anterior portion toward left. Scale bar 2 mm.



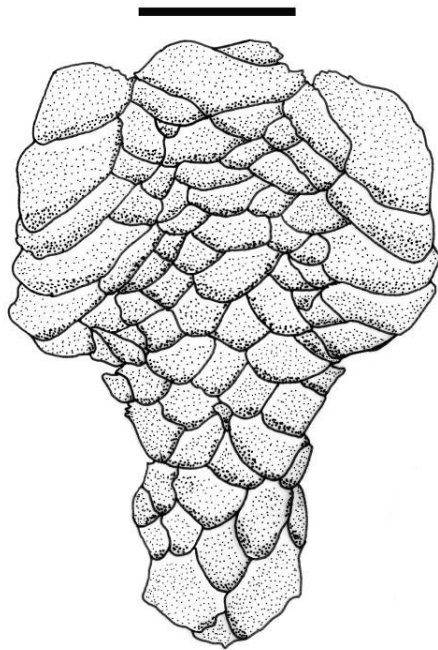
1927
 1928 Figure 18. Cleithral width as a function of standard length for *Hisonotus laevior* (black circles)
 1929 against *Hisonotus taimensis* (open circles). Dotted lines represent confidence intervals of 95%.



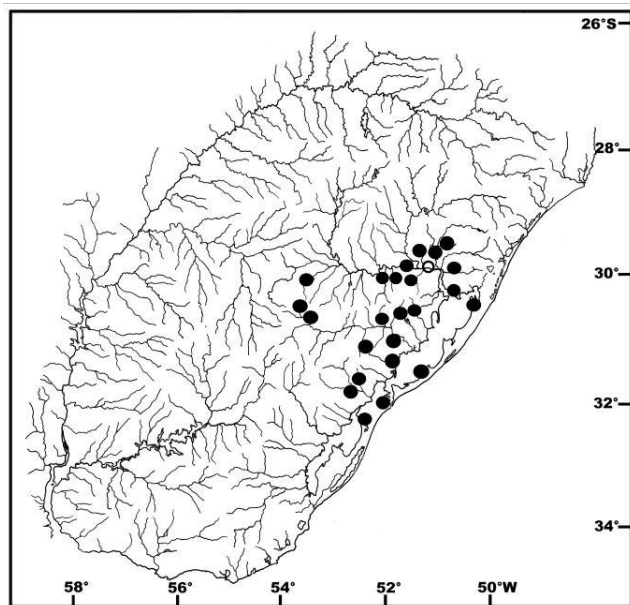
1930
 1931 Figure 19. Body depth at dorsal-fin origin as a function of standard length for *Hisonotus laeavor*
 1932 (black circles) against *Hisonotus taimensis* (open circles). Dotted lines represent 95% confidence
 1933 limits.



1934
 1935 Figure 20. Trunk lateral plates of *Hisonotus laeavor*, lateral view of left side, MCP 23854 41.8 mm
 1936 SL. Scale bar 4 mm.
 1937



1938
 1939 Figure 21. Arrangement of abdominal plates, *Hisonotus laevior*, MAPA 1755, 35.3 mm SL.
 1940 Anterior portion toward top. Scale bar 2 mm.

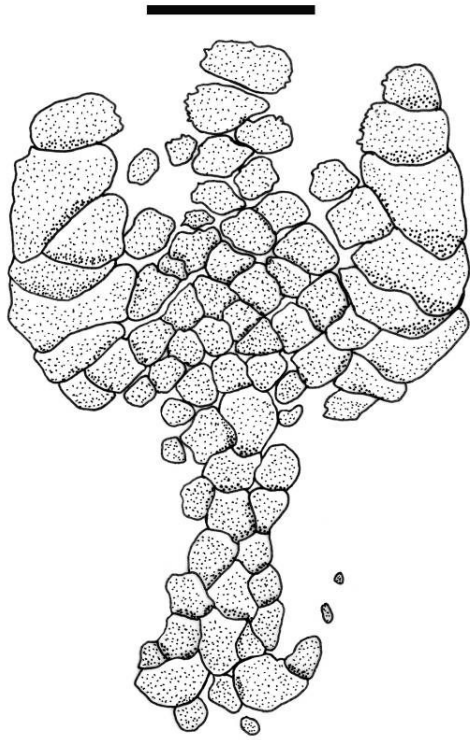


1941
 1942 Figure 22. Drainage map of laguna dos Patos system and rio Uruguai basin showing distribution of
 1943 *Hisonotus laevior*. Open symbol designate approximately the type locality—some symbols represent
 1944 more than one collecting locality.

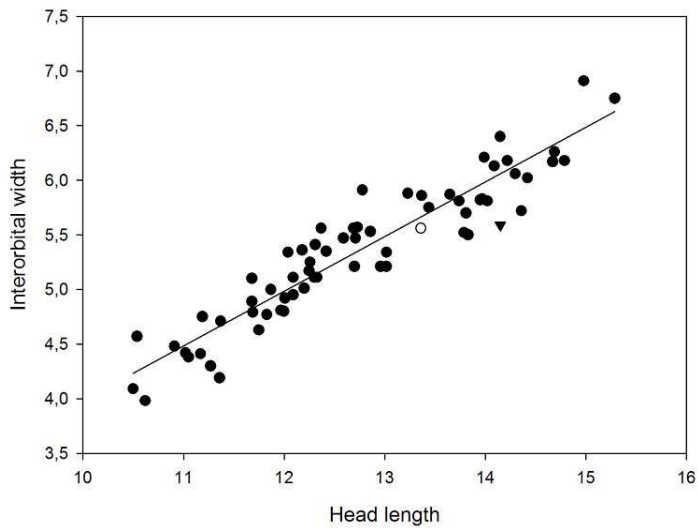


1945

1946 Figure 23. Holotype of *Hisonotus leptochilus*, ANSP 21564, female, 40.9 mm SL. Rio Jacuí, Brazil.



1947
 1948 Figure 24. Arrangement of abdominal plates in *Hisonotus laevior*, showing variation in the plating
 1949 pattern, MCP 23854, 41.8 mm SL. Anterior portion toward top. Scale bar 2 mm.

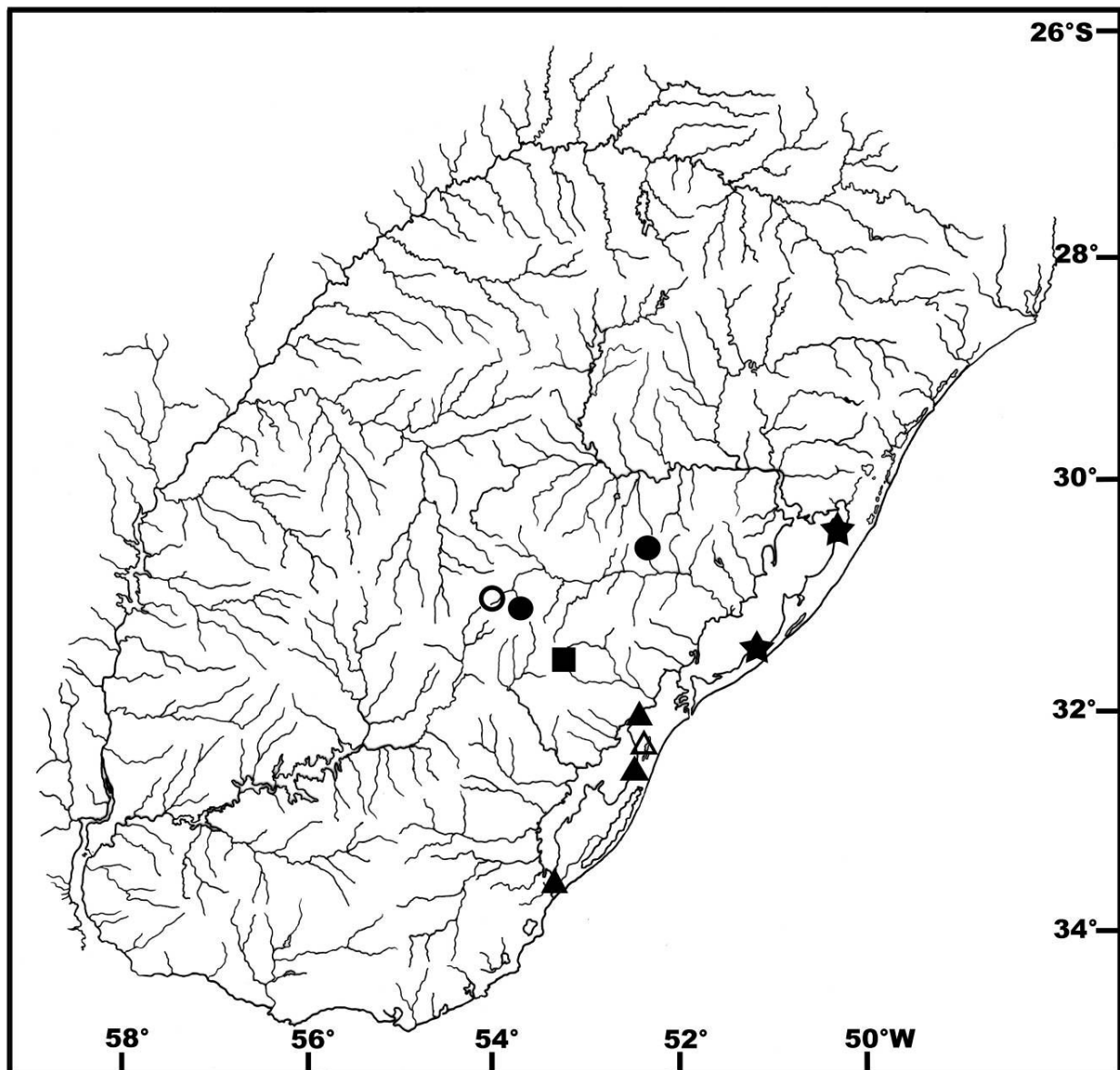


1950
 1951 Figure 25. Interorbital width as a function of head length of *Hisonotus laevior*. Open circle is
 1952 holotype of *H. laevior* and triangle is holotype of *H. leptochilus*.

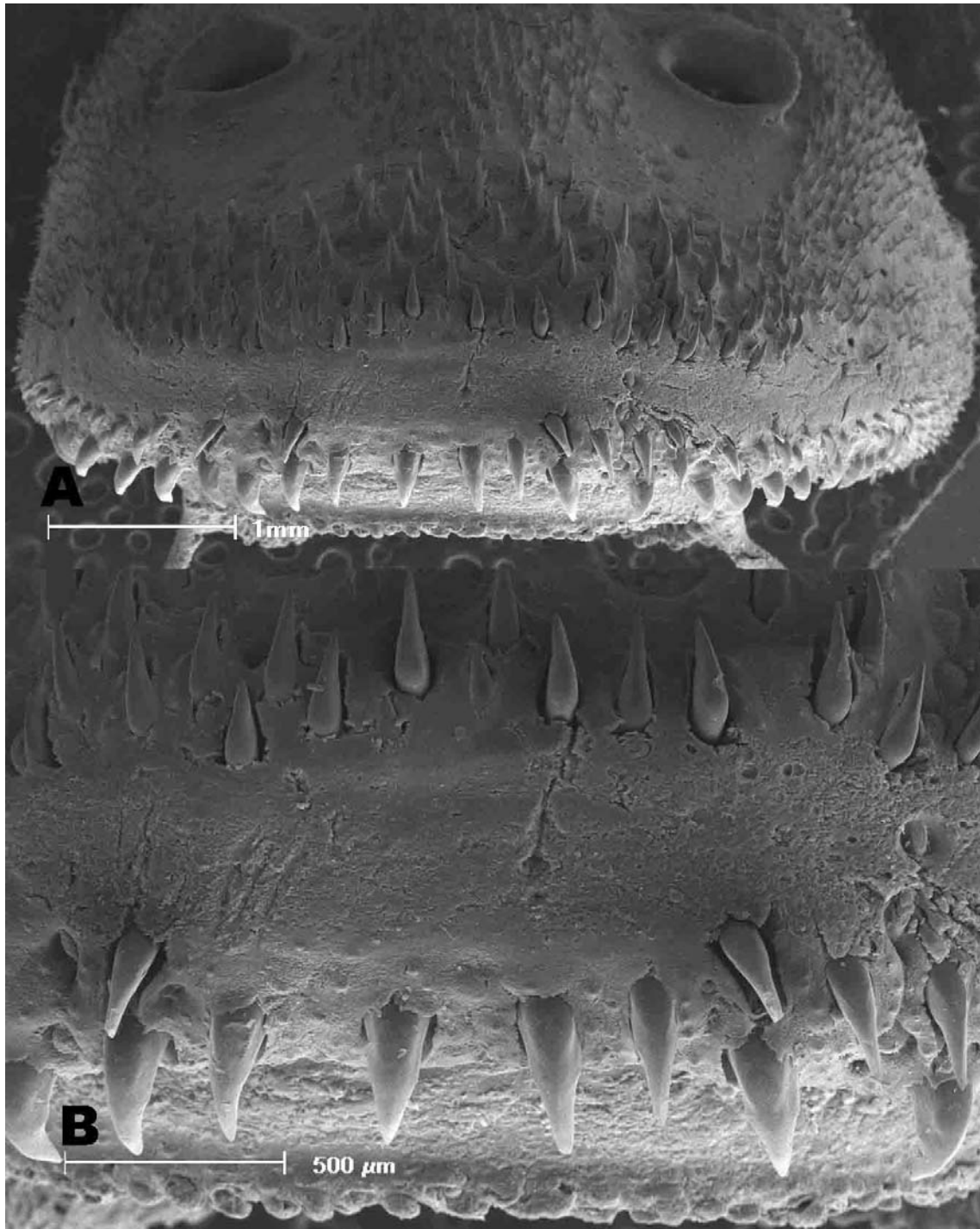


1953

1954 Figure 26. Paratype of *Hisonotus taimensis*, MAPA 1068, female, 46.5 mm SL. New channel of
1955 arroio Taim, Estação Ecológica do Taim, Rio Grande, Brazil.



1956
 1957 Figure 27. Drainage map of laguna dos Patos system and rio Uruguai basin showing distribution of
 1958 *Hisonotus* species in the former. Some symbols represent more than one collecting locality. Open
 1959 symbols represent type localities. *Hisonotus taimensis* (triangles) □ *Hisonotus* sp. "camaquã"
 1960 (circles) □ *Hisonotus* aff. *leucofrenatus* (star) □ and *Hisonotus charrua* (square).



1961
1962 Figure 28. Scanning electron micrograph of snout anterior rostral margin of *Hisonotus taimensis*,
1963 MCP 17417, 20,8 mm SL. A-anterior view of rostrum □ B-magnification of medial portion.



1964

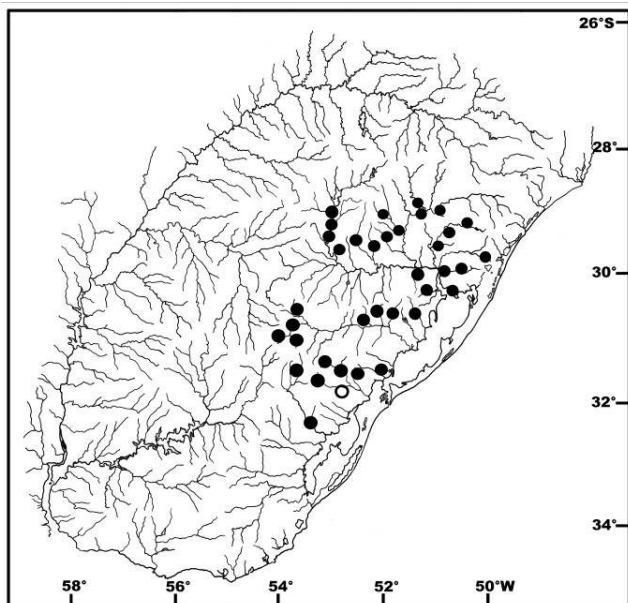
1965 Figure 29. Holotype of *Hisonotus armatus*, MCP 41323, female, 44.4 mm SL. Arroio Arambaré,

1966 about 5 km south of Vila Basílio, on road to Pedro Osório, Pedro Osório, Brazil.



1967

1968 Figure 30. Live specimen of *Hisonotus armatus*, Uncataloged. rio Piratini, Rio Grande do Sul,
1969 Brazil. Photo: J. Pezzi.



1970

1971 Figure 31. Drainage Map of laguna dos Patos system and rio Uruguai basin showing distribution of
1972 *Hisonotus armatus*. Open symbol designates the type locality □ some symbols represent more than
1973 one collecting locality.



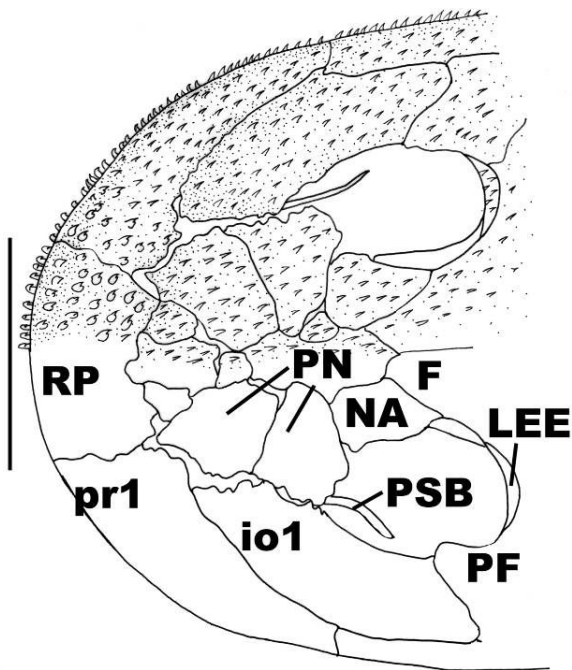
1974
1975 Figure 32. Holotype of *Hisonotus* sp. "Camaquã", MCP uncatalog, female, 45.0 mm SL. Small
1976 creek tributary of arroio das Lavras on road from Lavras do Sul to Bagé, Lavras do Sul, Brazil,



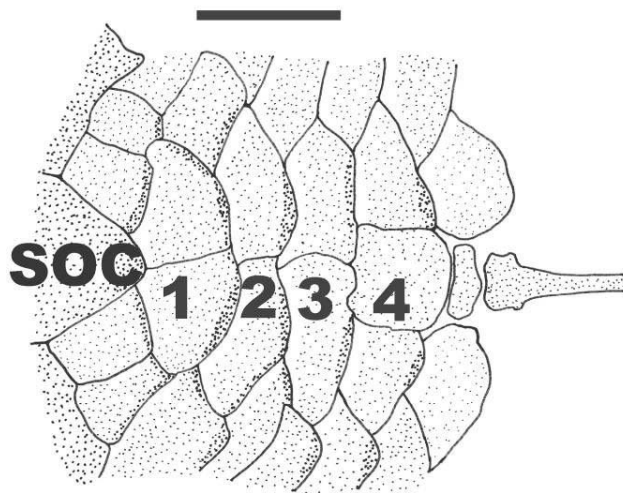
1977

1978 Figure 33. *Hisonotus* sp. “Camaquã”, UFRGS 8966, female, 38.6 mm SL. Small creek in

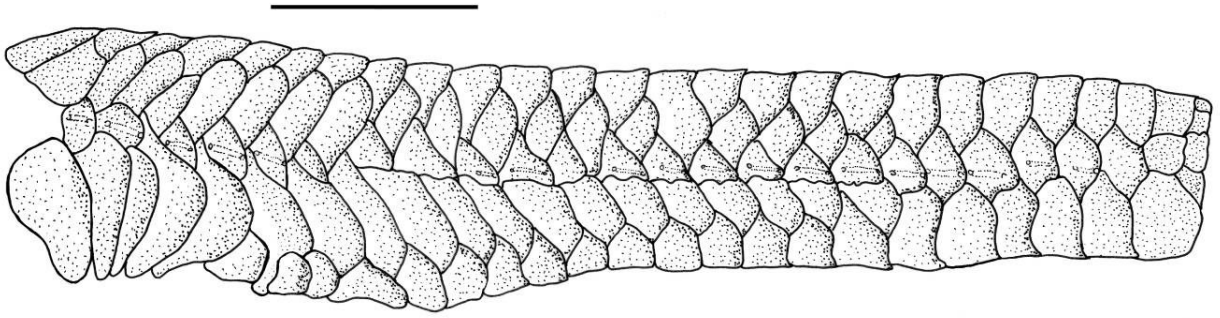
1979 Encruzilhada do Sul tributary to rio Camaquã drainage, Encruzilhada do Sul, Brazil.



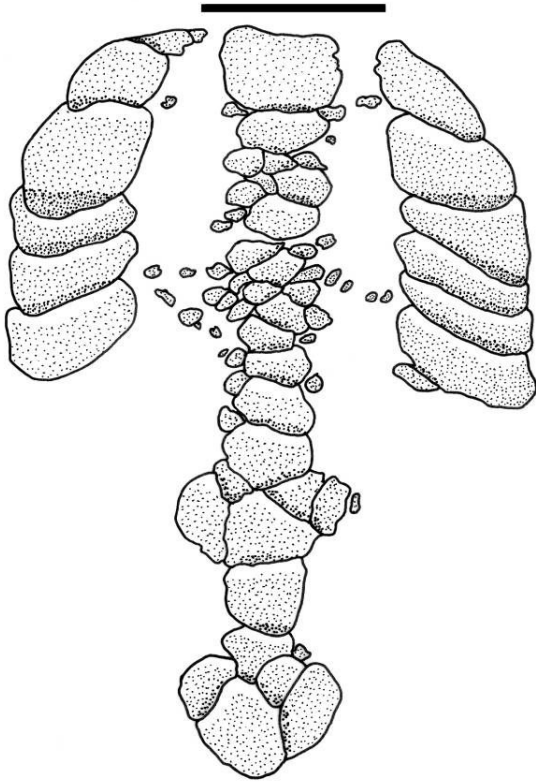
1980
 1981 Figure 34. Snout in dorsal view of *Hisonotus* sp. “Camaquã” showing prenasal region completely
 1982 covered by plates, MCP 22294 35,4 mm SL. Scale bar 2 mm.



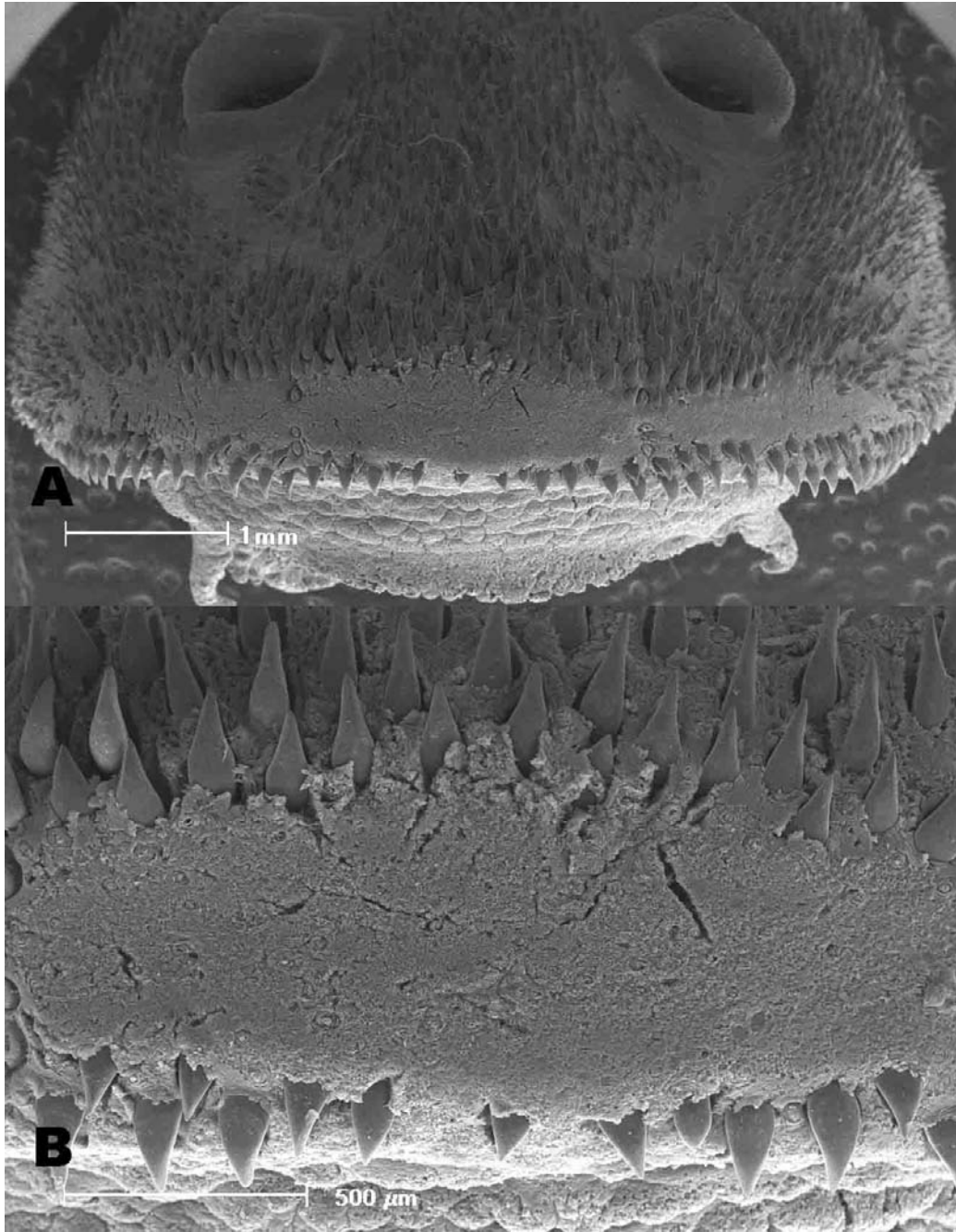
1983
 1984 Figure 35. Predorsal region in dorsal view of *Hisonotus* sp. “Camaquã” showing arrangement of
 1985 predorsal plates, UFRGS 8966, 35.8 mm SL. 1-3 – paired predorsal plates, 4 – nuchal plate, SOC –
 1986 parieto-supraoccipital. Anterior portion toward left. Scale bar 2 mm.
 1987



1988
1989 Figure 36. Trunk lateral plates of *Hisonotus* sp. "Camaquã", lateral view of left side, MCP 25924,
1990 44.4 mm SL. Scale bar 4 mm.



1991
1992 Figure 37. Arrangement of abdominal plates, *Hisonotus* sp. "Camaquã", MCP 25924, 44.4 mm SL.
1993 Anterior portion toward top. Scale bar 2 mm.

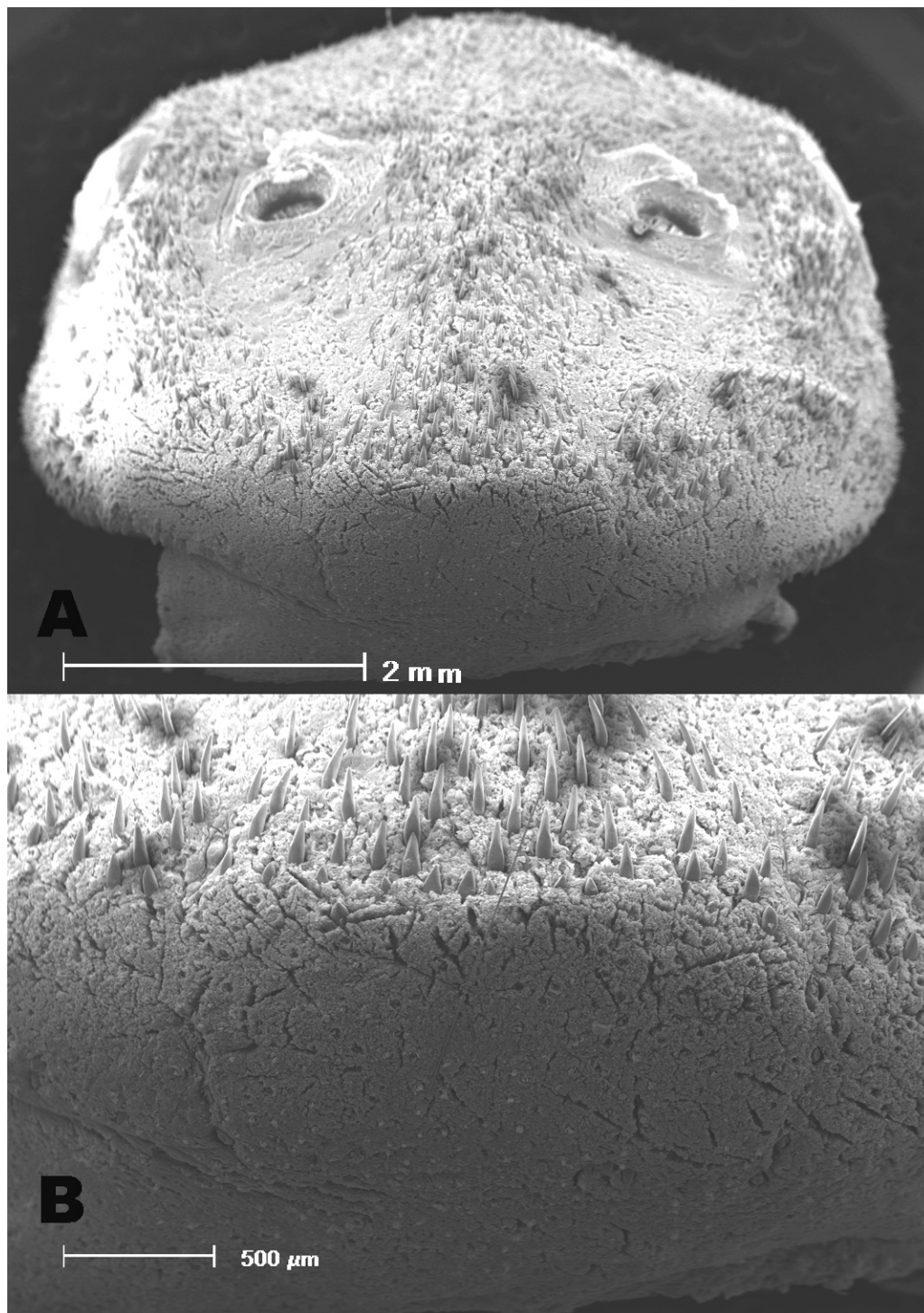


1994

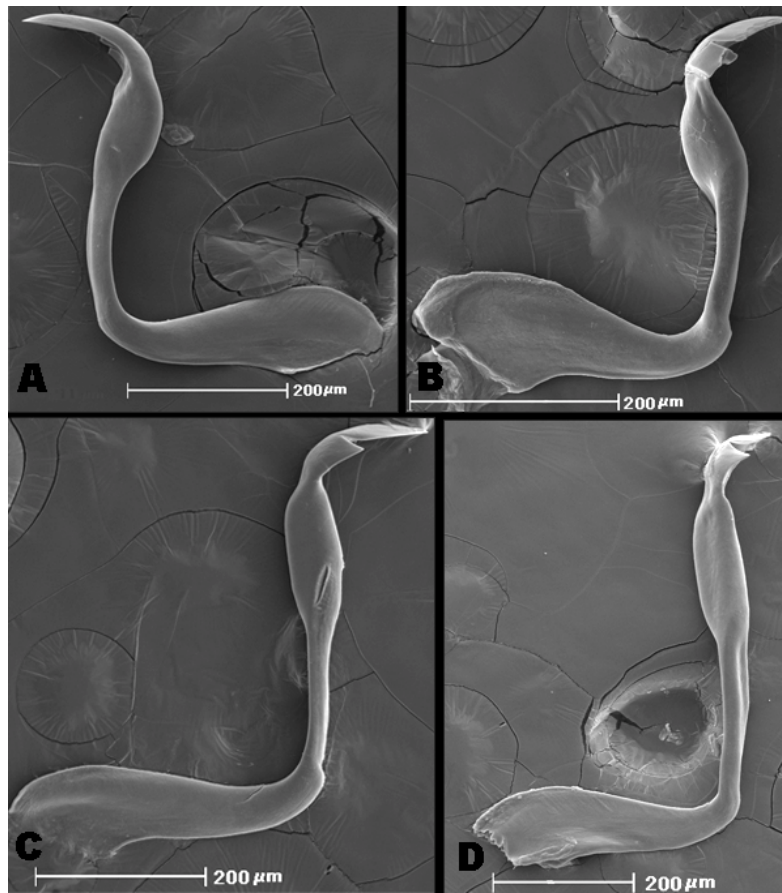
1995 Figure 38. Scanning electron micrograph of snout anterior rostral margin of *Hisonotus* sp.

1996 “Camaquã”, MCP 25924, 40.2 mm SL. A-anterior view of rostrum □ B-magnification of medial

1997 portion.



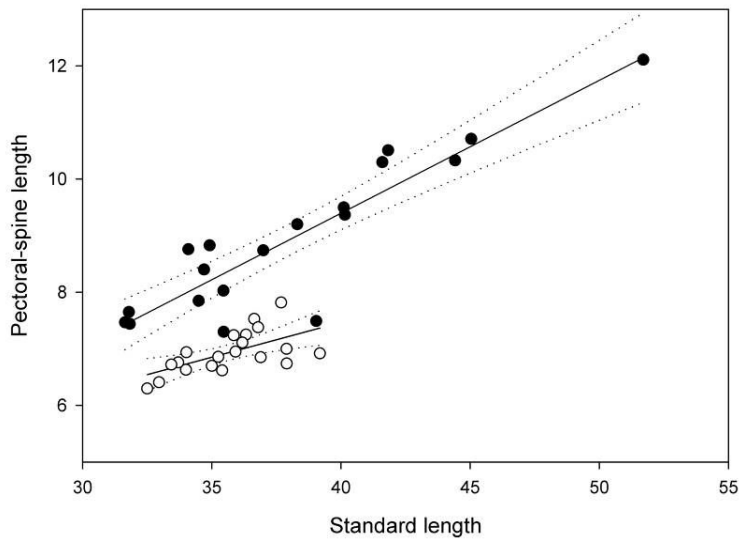
1998
1999 Figure 39. Scanning electron micrograph of snout anterior rostral margin of *Hisonotus* sp.
2000 “Camaquã” showing the absence of the rostral ventrad series of odontodes, UFRGS 8966, 34.7 mm
2001 SL. A-anterior view of rostrum □ B-magnification of medial portion.



2002
 2003 Figure 40. Dentary teeth of *Hisonotus* species of laguna dos Patos system. A- *Hisonotus* sp.
 2004 “Sinos”, MCP 14619, 41.9mm SL. B- *Hisonotus* sp. “Prata”, MCP 22204, 28.9 mm SL. C-
 2005 *Hisonotus* sp. “Camaquã”, MCP 25924, 44. 4 mm SL. D- *Hisonotus armatus*, MCP 37682, 40.4
 2006 mm SL.



2007
 2008 Figure 41. Type locality of *Hisonotus* sp. “Camaquã”. Small creek tributary to arroio das Lavras,
 2009 Lavras do Sul, Brazil.



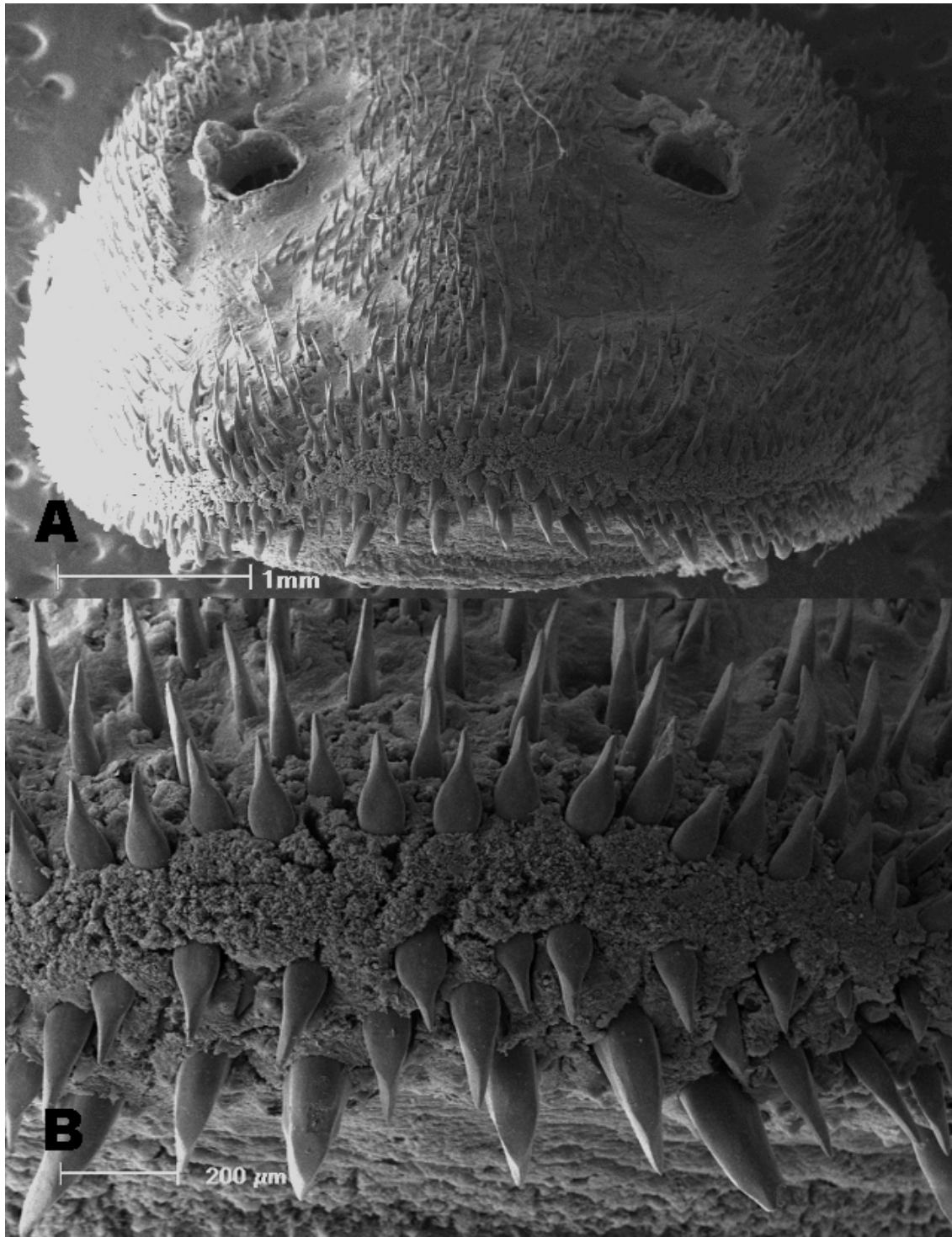
2010
 2011 Figure 42. Pectoral-fin spine length as a function of standard length in *Hisonotus* sp. “Camaquã”,
 2012 showing variation within the species. Open circles designate the population of Encruzilhada do Sul,
 2013 black circle designate the population near Lavras do Sul.



2014

2015 Figure 43. Holotype of *Hisonotus* sp. “Carreiro”, MCP uncataloged, female, 35.4 mm SL. Rio

2016 Carreiro downstream Carreiro bathing spot, Serafina Corrêa, Brazil.

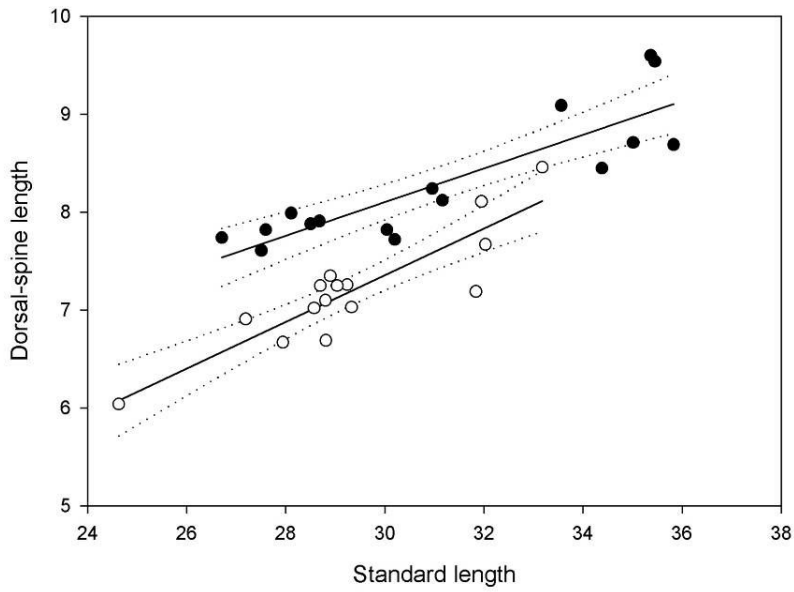


2017

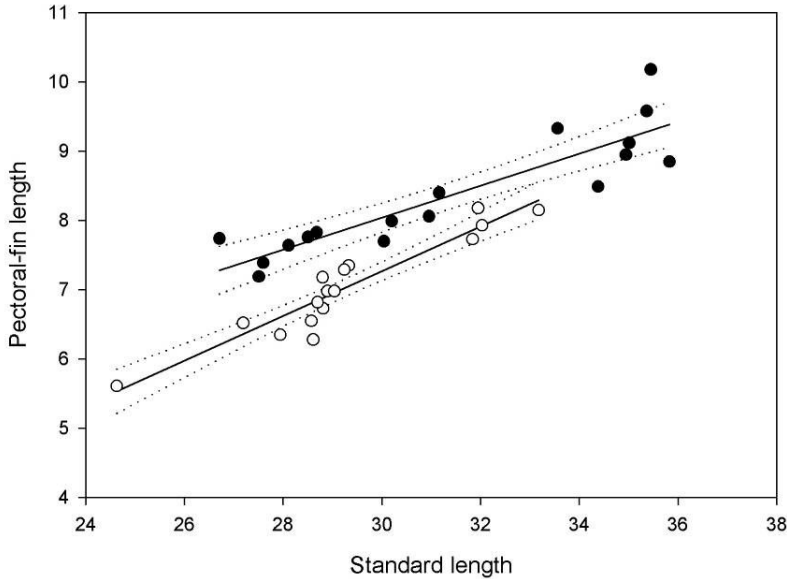
2018 Figure 44. Scanning electron micrograph of snout anterior rostral margin of *Hisonotus* sp.

2019 “Carreiro”, MCP 40945, 30.0 mm SL. A-anterior view of rostrum □ B-magnification of medial

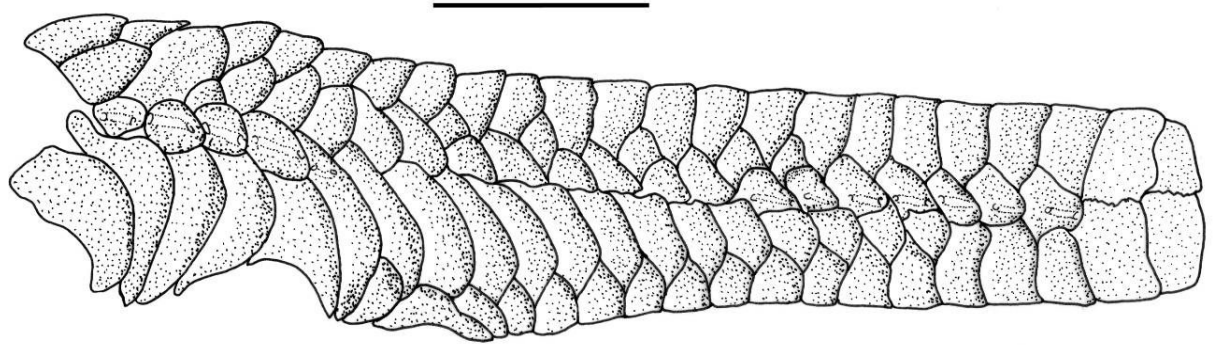
2020 portion.



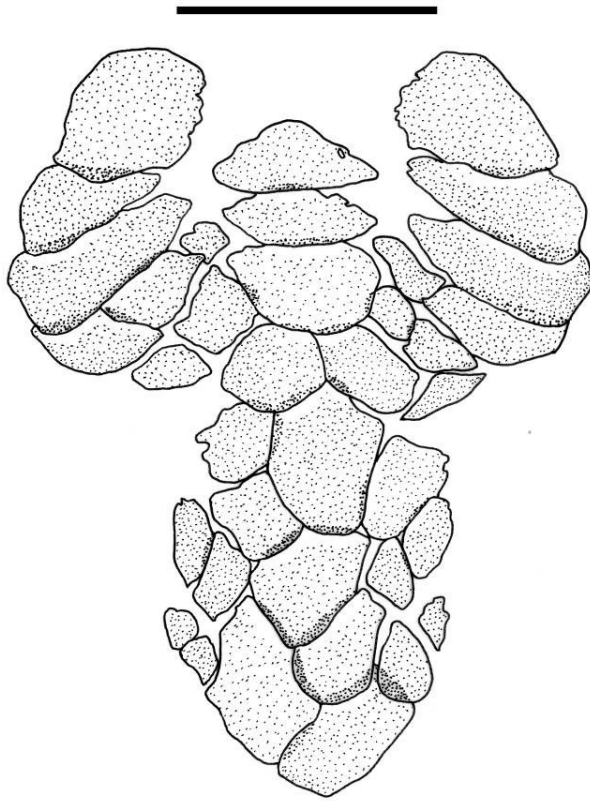
2021
 2022 Figure 45. Dorsal-fin spine length as a function of standard length for *Hisonotus* sp. “Carreiro”
 2023 (black circles) against *Hisonotus* sp. “Prata” (open circles). Dotted lines represent 95% confidence
 2024 limits.



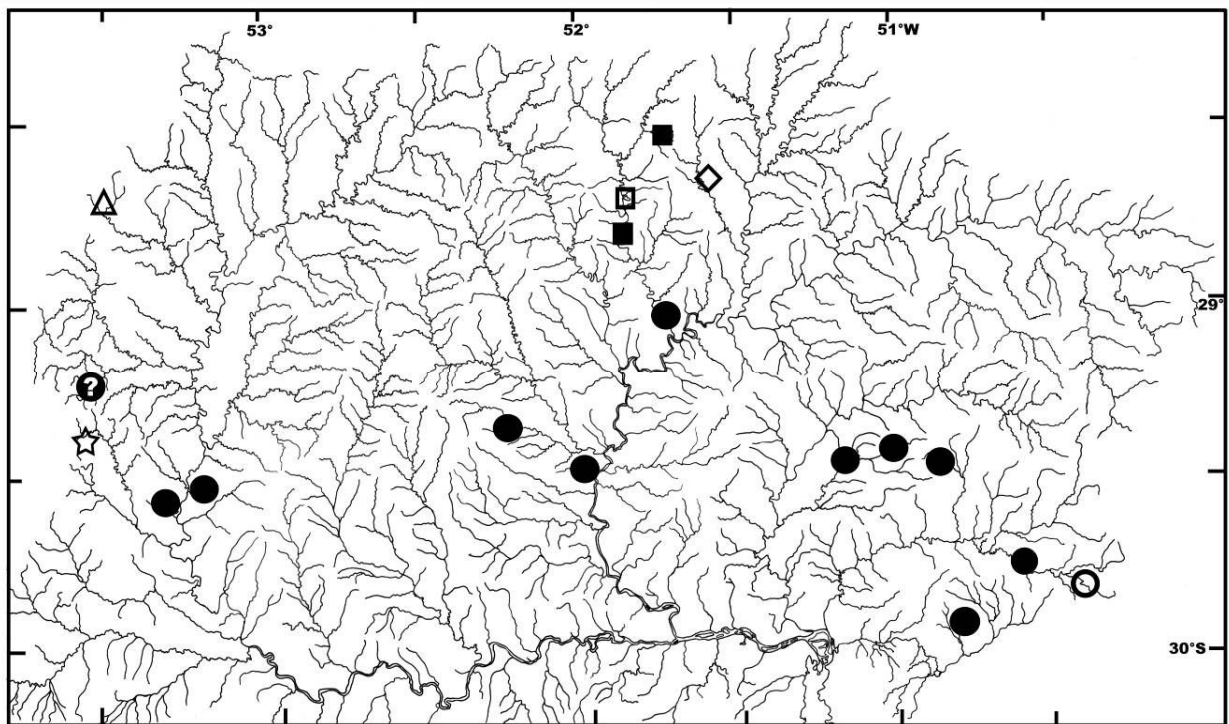
2025
 2026 Figure 46. Pectoral-fin spine length as a function of standard length for *Hisonotus* sp. “Carreiro”
 2027 (black circles) against *Hisonotus* sp. “Prata” (open circles). Dotted lines represent 95% confidence
 2028 limits.



2029
2030 Figure 47. Trunk lateral plates of *Hisonotus* sp. "Carreiro", lateral view of left side, MCP 40945,
2031 31.2 mm SL. Scale bar 4 mm.



2032
2033 Figure 48. Arrangement of abdominal plates, *Hisonotus* sp. "Carreiro", MCP 40954, 31.2 mm SL.
2034 Anterior portion toward top. Scale bar 2 mm.



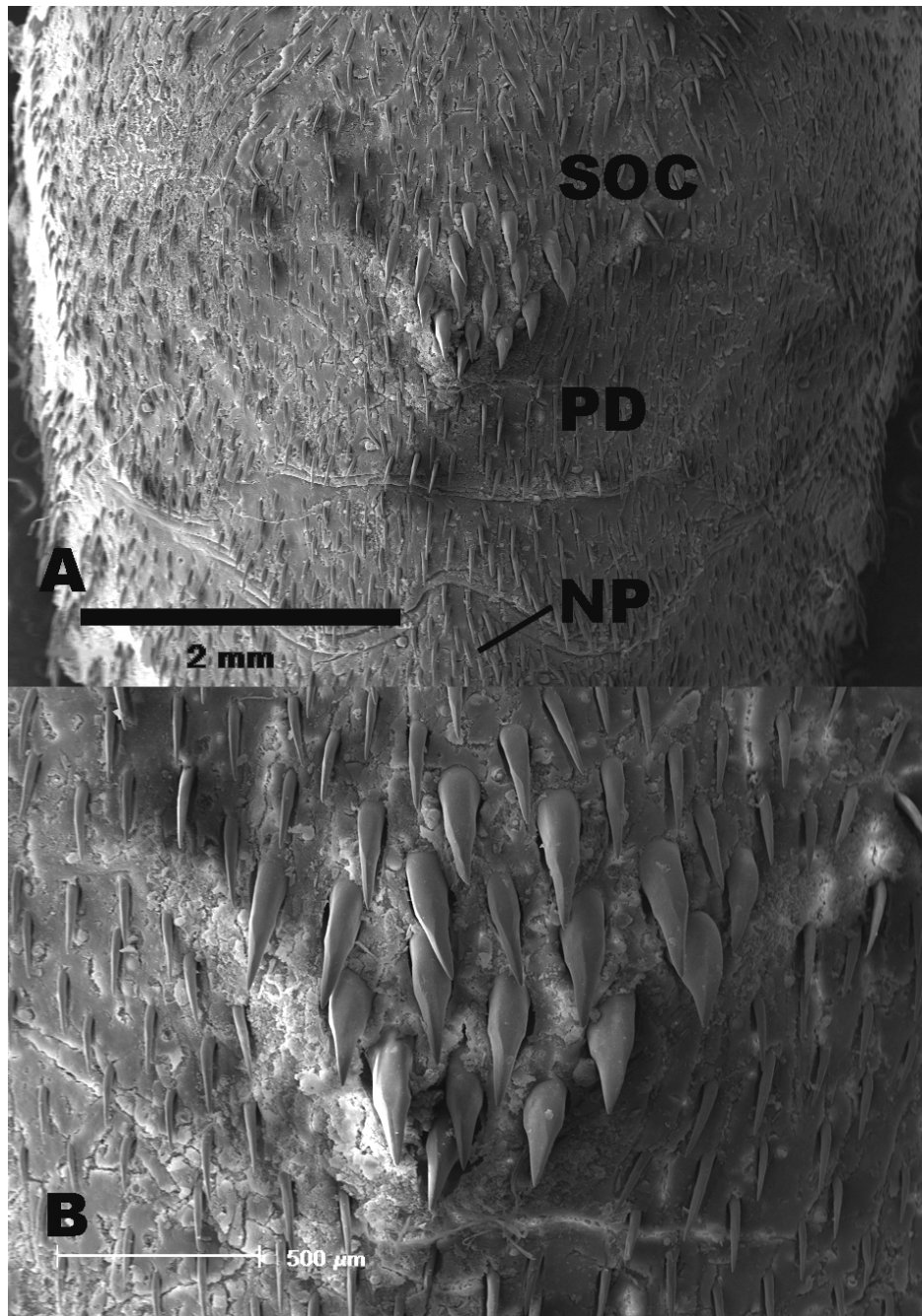
2035
 2036 Figure 49. Drainage map of rio Jacuí basin showing distribution of *Hisonotus* species. Some
 2037 symbols represent more than one collecting locality. Open symbols represent type locality.
 2038 *Hisonotus* sp. “Carreiro” (squares) □ *Hisonotus* sp. “Prata” (diamond) □ *Hisonotus* sp. “Passo Novo”
 2039 (Triangle) □ *Hisonotus* sp. “Felicio” (star) □ *Hisonotus* sp. “Sinos” (circles), questionable record
 2040 represents arroio Tipiáia locality.



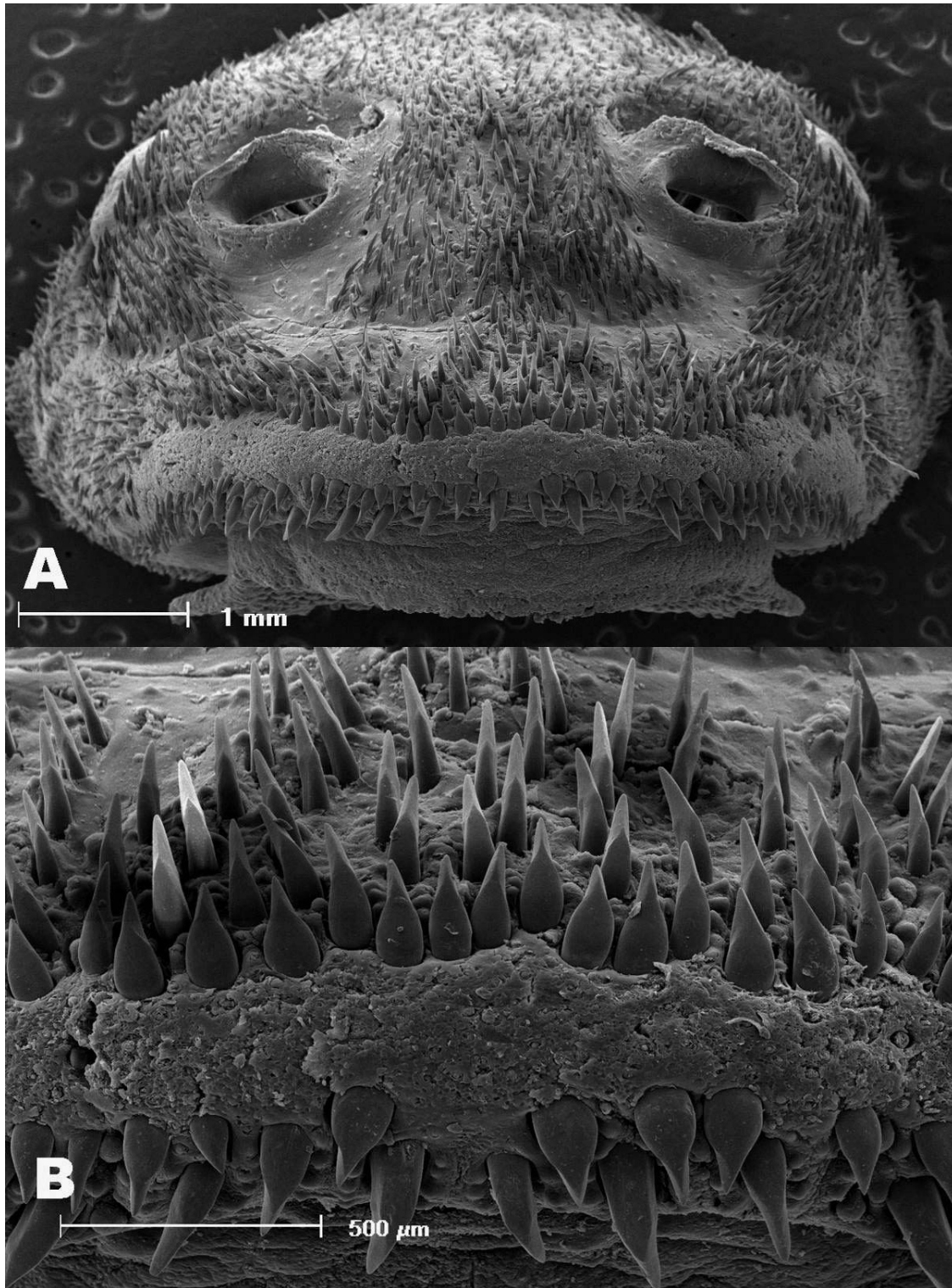
2041
2042 Figure 50. Type locality of *Hisonotus* sp. “Carreiro”. Rio Carreiro downstream of Carreiro bathing
2043 pool, Serafina Corrêa, Brazil.



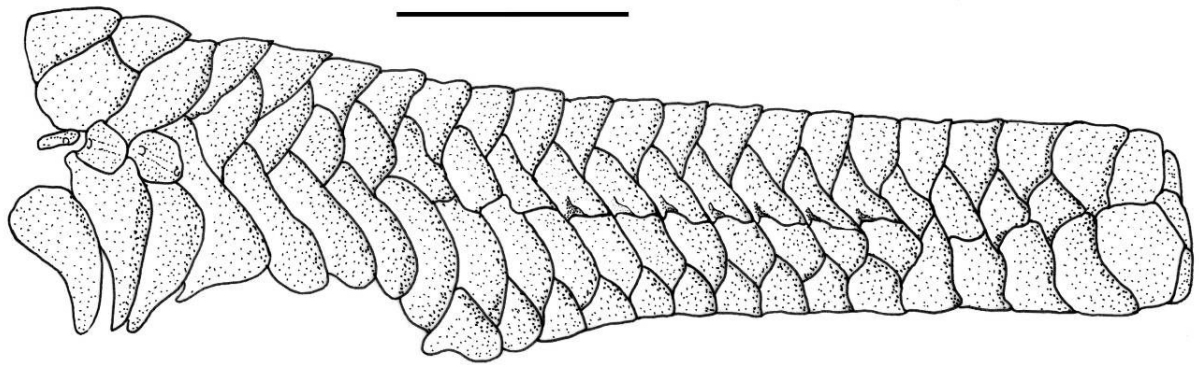
2044
2045 Figure 51. Holotype of *Hisonotus* sp. "Prata", MCP uncataloged, female, 31.8 mm SL. Rio da Prata
2046 on Passo do Despraiado, Nova Prata, Brazil.



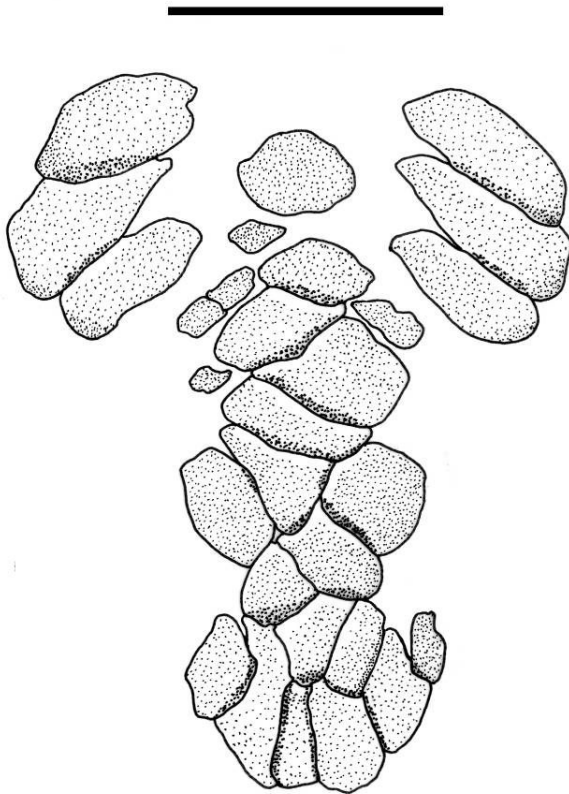
2047
 2048 Figure 52. Scanning electron micrograph of predorsal region of *Hisonotus* sp. “Prata”, showing the
 2049 raised tuft of odontodes in the posterior tip of parieto-supraoccipital. MCP 22204, 29.2 mm SL. A-
 2050 dorsal view of predorsal region. B-magnification of raised odontodes. SOC – parieto-supraoccipital
 2051 PD - paired predorsal plates NP - nuchal plate.



2052
2053 Figure 53. Scanning electron micrograph of snout anterior rostral margin of *Hisonotus* sp. “Prata”,
2054 MCP 22204, 29.2 mm SL. A-anterior view of rostrum □ B-magnification of medial portion.



2055
2056 Figure 54. Trunk lateral plates of *Hisonotus* sp. "Prata", lateral view of left side, MCP 22204, 28.9
2057 mm SL. Scale bar 4 mm.



2058
2059 Figure 55. Arrangement of abdominal plates, *Hisonotus* sp. "Prata", MCP 22204, 28.9 mm SL.
2060 Anterior portion toward top. Scale bar 2 mm.



2061
2062 Figure 56. Type locality of *Hisonotus* sp. “Prata”. Rio da Prata at Passo do Despraiado, Nova Prata,
2063 Brazil.



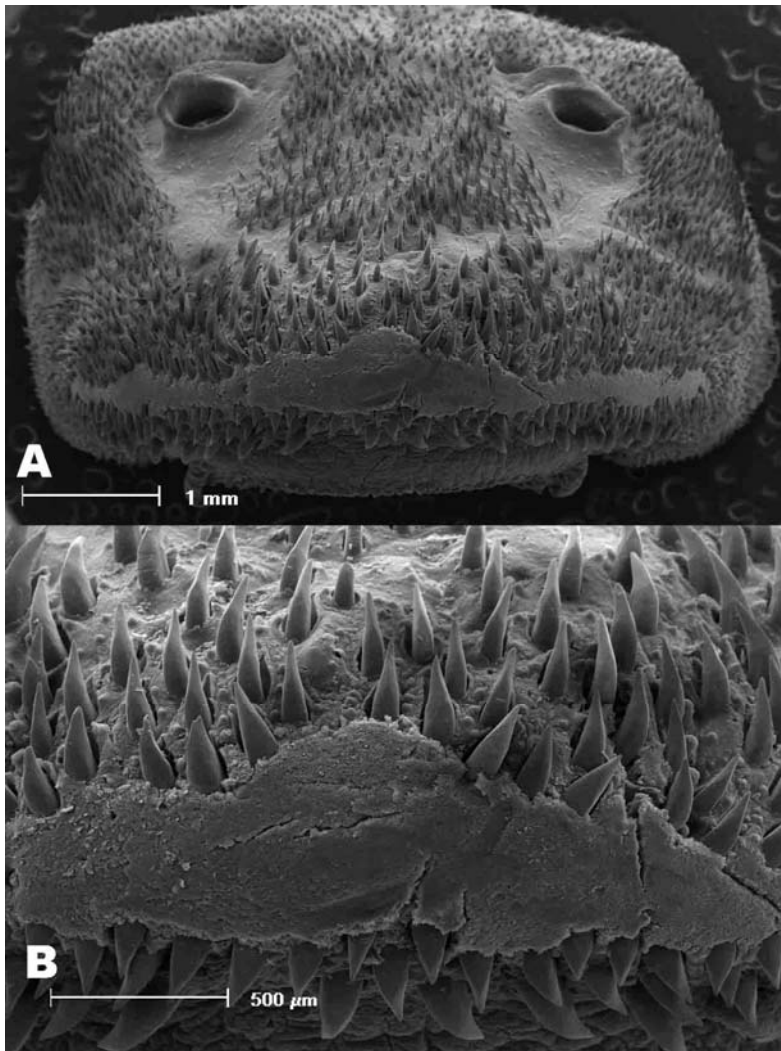
2065

2066 Figure 57. Holotype of *Hisonotus* sp. “Sinos”, MCP uncataloged, female, 38.2 mm SL. Rio dos

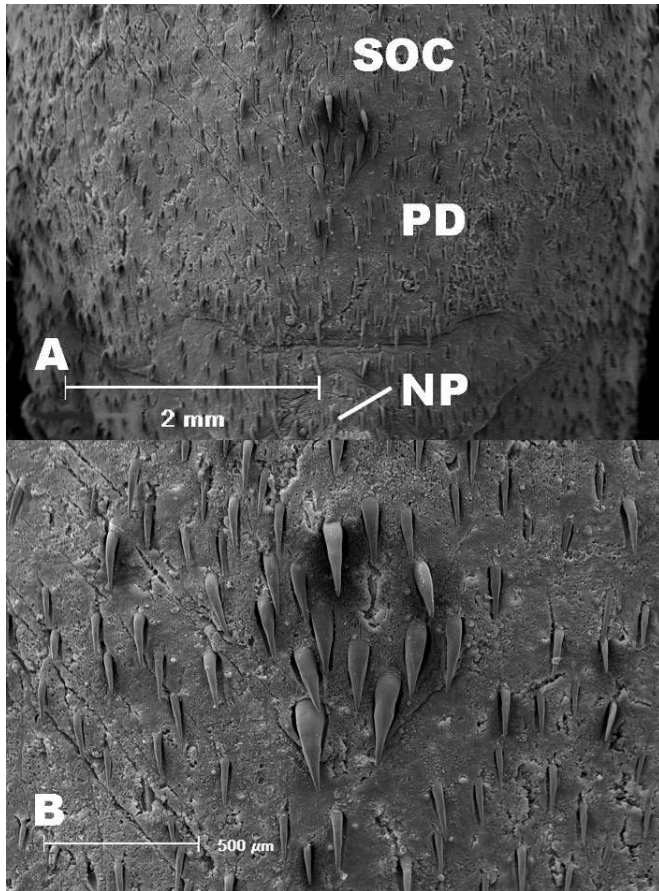
2067 Sinos, bridge 7 km north from Caraá, road to Fundo Quente, Caraá, Brazil.



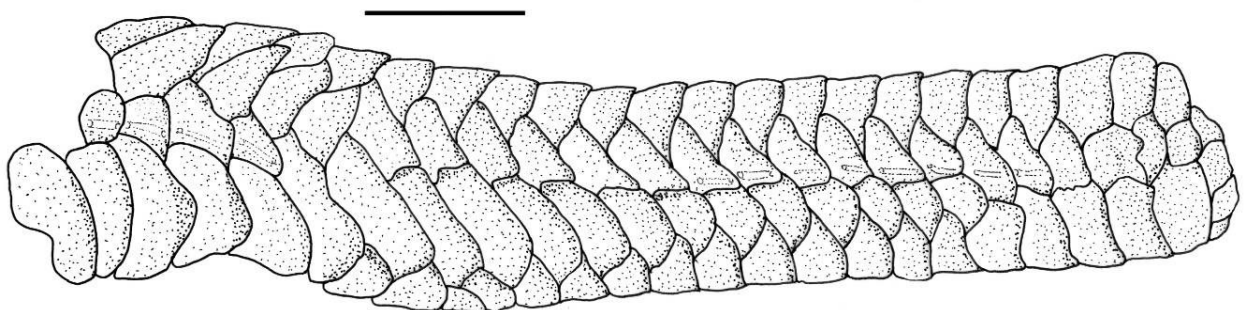
2068
2069 Figure 58. Live specimen of *Hisonotus* sp. “Sinos”, UFRGS 8812, female, SL unrecorded. Mouth
2070 of arroio pinheirinho with rio Forqueta, Lageado, Brazil. Photo: L. Malabarba.



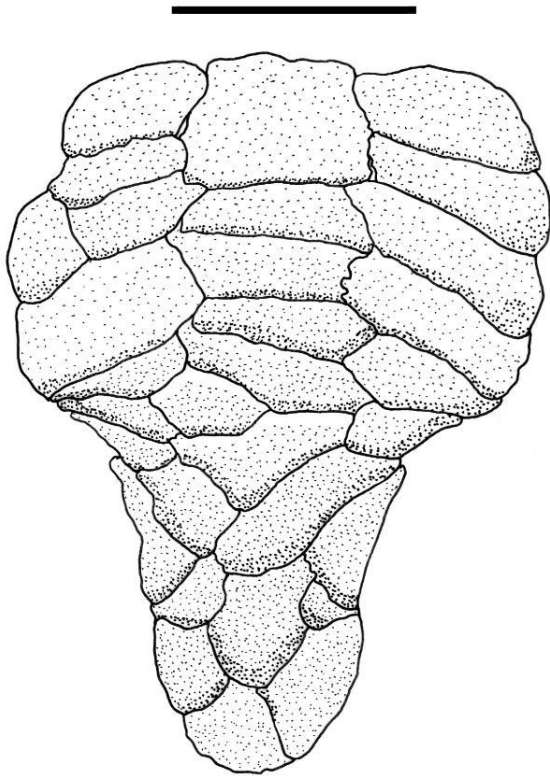
2071
2072 Figure 59. Scanning electron micrograph of snout anterior rostral margin of *Hisonotus* sp. “Sinos”,
2073 MCP 17643, 38.5 mm SL. A-anterior view of rostrum □ B-magnification of medial portion.



2074
 2075 Figure 60. Scanning electron micrograph of predorsal region of *Hisonotus* sp. “Sinos”, showing the
 2076 enlarged odontodes in the posterior tip of parieto-supraoccipital of a juvenile. MCP 26568, 30.4 mm
 2077 SL. A-dorsal view of predorsal region. B-magnification of raised odontodes. SOC – parieto-
 2078 supraoccipital □ PD - paired predorsal plates □ NP - nuchal plate.



2079
 2080 Figure 61. Trunk lateral plates of *Hisonotus* sp. “Sinos”, lateral view of left side, MCP 14619, 41.3
 2081 mm SL. Scale bar 4 mm.



2082

2083 Figure 62. Arrangement of abdominal plates, *Hisonotus* sp. "Sinos", MCP 14619, 41.3 mm SL.

2084 Anterior portion toward top. Scale bar 2 mm.

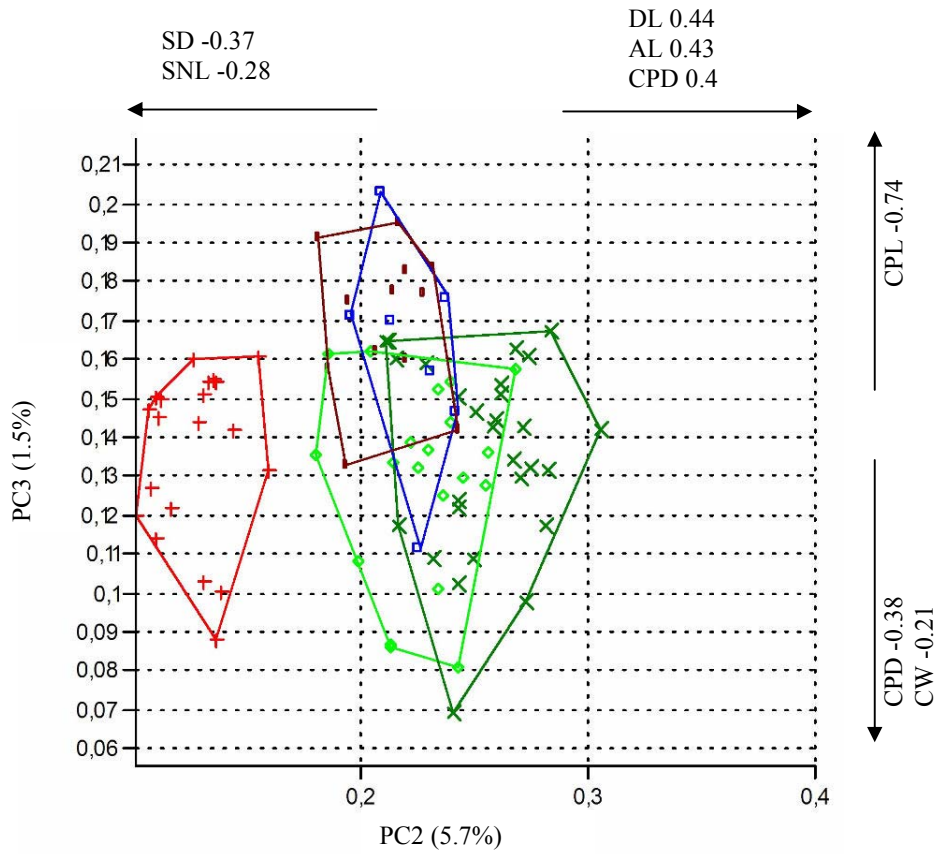


2085

2086 Figure 63. *Hisonotus* cf. "Sinos", showing variation on caudal-fin pigmentation, MCP 41074,

2087 female, 41.6 mm SL. Arroio Passo dos Buracos (Tipiáia) on road from Júlio de Castilhos to Cruz

2088 Alta, Cruz Alta, Brazil.



2089

2090 Figure 64. Principal component analysis of 17 morphometric data of *Hisonotus* species from rio

2091 Jacuí basin. Stronger loadings on the second and third principal components. Red crosses =

2092 *Hisonotus* sp. “Passo Novo” □ brown dots = *Hisonotus* sp. “Felício” □ dark green exes = *Hisonotus* sp.

2093 “Sinos” (type specimens/rio dos Sinos) □ light green diamonds = *Hisonotus* sp. “Sinos” (non types

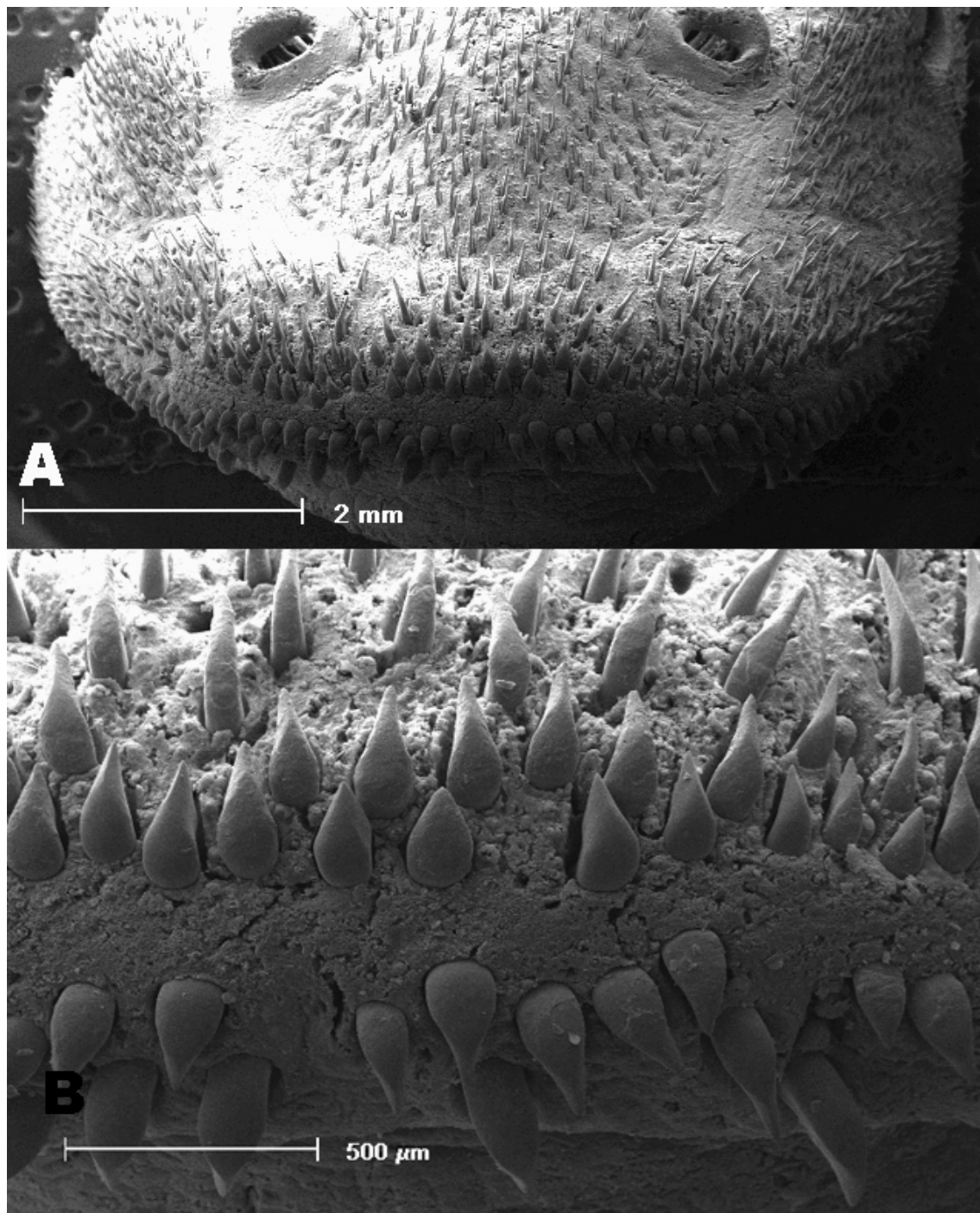
2094 rio Taquari/rio Jacuí) □ blue squares = *Hisonotus* cf. “Sinos”.



2095

2096 Figure 65. Holotype of *Hisonotus* sp. "Passo Novo", MCP uncatalog, female, 41.5 mm SL. Rio

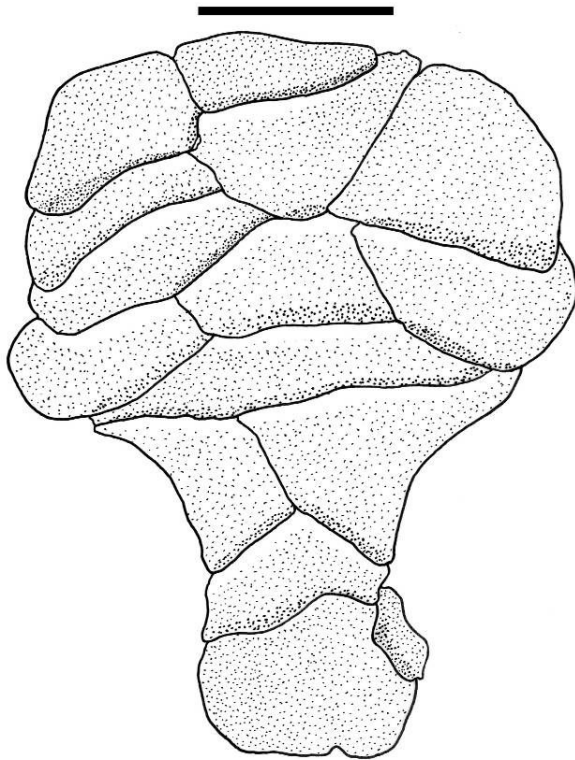
2097 Passo Novo on road from Cruz Alta to Ibirubá, Cruz Alta, Brazil.



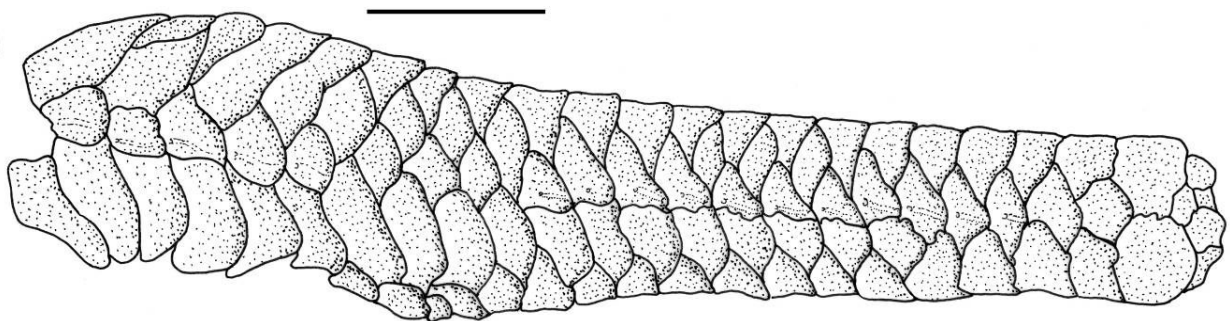
2098

2099 Figure 66. Scanning electron micrograph of snout anterior rostral margin of *Hisonotus* sp. “Passo

2100 Novo”, MCP 22701, 41.1 mm SL. A-anterior view of rostrum □ B-magnification of medial portion.



2101
2102 Figure 67. Arrangement of abdominal plates, *Hisonotus* sp. "Passo Novo", MCP 22701, 40.1 mm
2103 SL. Anterior portion toward top. Scale bar 2 mm.



2104
2105 Figure 68. Trunk lateral plates of *Hisonotus* sp. "Passo Novo", lateral view of left side, MCP 22701,
2106 40.1 mm SL. Scale bar 4 mm.



2107
2108 Figure 69. Live specimen of *Hisonotus* sp. “Passo Novo”, MCP 41072, female, SL unrecorded. Rio
2109 Passo Novo on road from Cruz Alta to Ibirubá, Cruz Alta, Brazil.



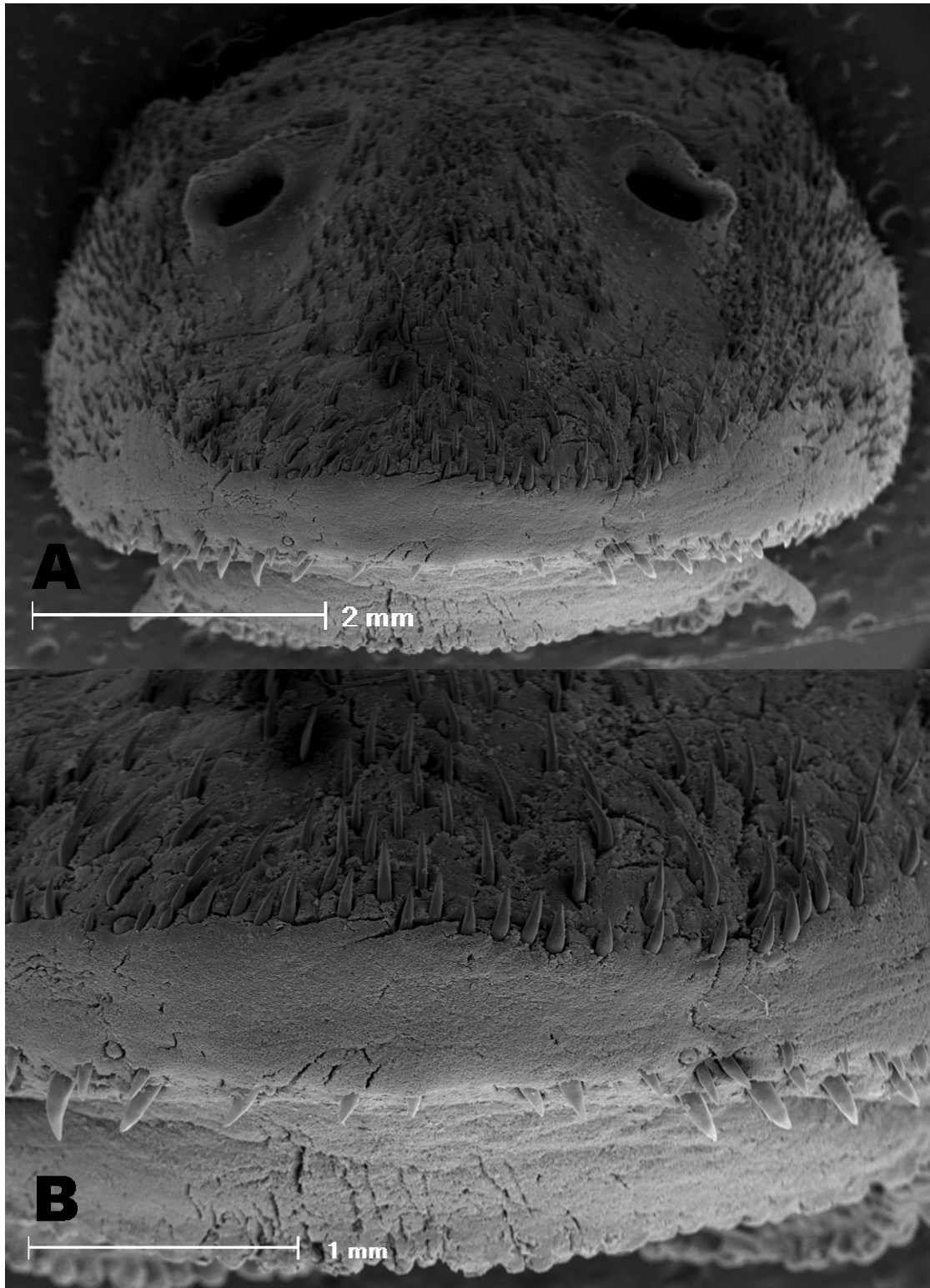
2110
2111 Figure 70. Type locality of *Hisonotus* sp. “Passo Novo”. Rio Passo Novo on road from Cruz Alta to
2112 Ibirubá, Cruz Alta, Brazil.



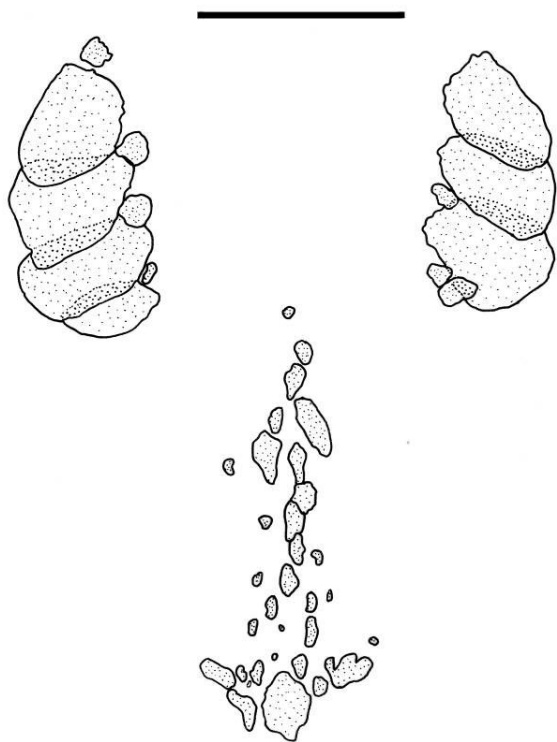
2113

2114 Figure 71. Holotype of *Hisonotus* sp. “Felício”, MCP uncataloged, female, 43.0 mm SL. Arroio

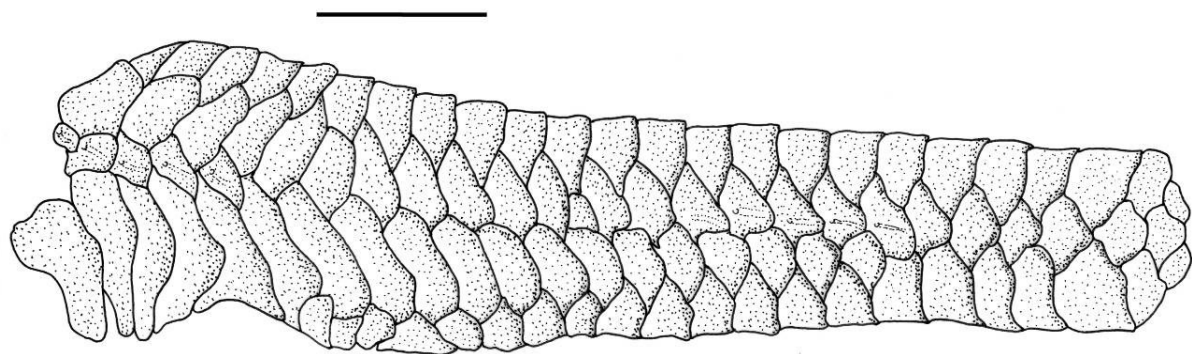
2115 Felício on road from Nova Palma to Júlio de Castilhos, Júlio de Castilhos, Brazil.



2116
2117 Figure 72. Scanning electron micrograph of snout anterior rostral margin of *Hisonotus* sp. “Felício”,
2118 MCP 41073, 39.3 mm SL. A-anterior view of rostrum □ B-magnification of medial portion.



2119
2120 Figure 73. Arrangement of abdominal plates, *Hisonotus* sp. “Felício”, MCP 41073, 39.8 mm SL.
2121 Anterior portion toward top. Scale bar 2 mm.



2122
2123 Figure 74. Trunk lateral plates of *Hisonotus* sp. “Felício”, lateral view of left side, MCP 41073, 39.8
2124 mm SL. Scale bar 4 mm.
2125



2126

2127 Figure 75. Type locality of *Hisonotus* sp. “Felício”. Arroio Felício on road from Nova Palma to
2128 Júlio de Castilhos, Júlio de Castilhos, Brazil.



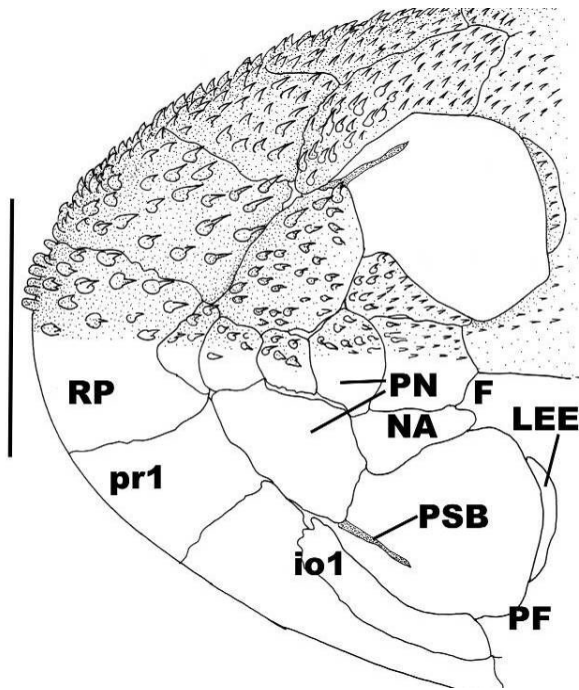
2129

2130 Figure 76. *Hisonotus* aff. *leucofrenatus*, MCN 17790, male, 36.3 mm SL. Lagoa do Casamento at
2131 southeast coast of Ilha Grande, Palmares do Sul, Brazil.

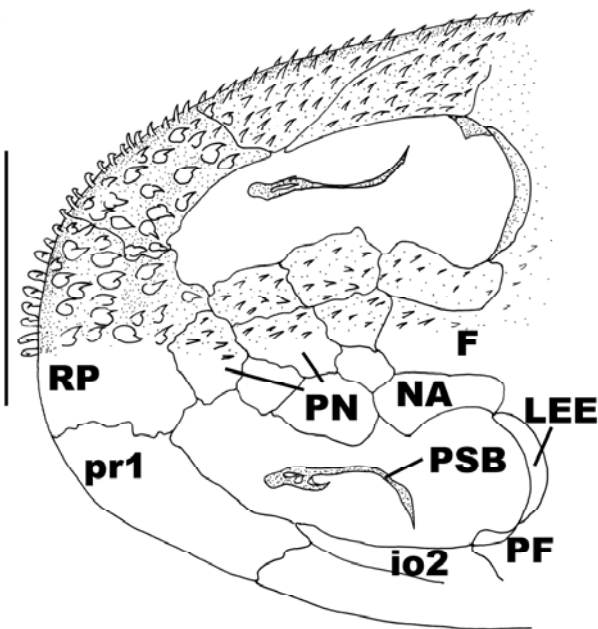


2132

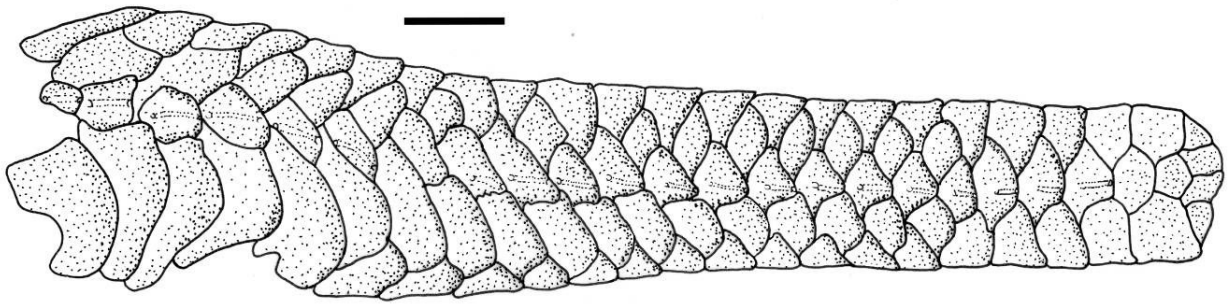
2133 Figure 77. *Hisonotus charrua*, MCP 25139, female, 46.4 mm SL. Arroio dos Pires on the bridge of
2134 railroad at Passo dos Pires, Pinheiro Machado, Brazil.



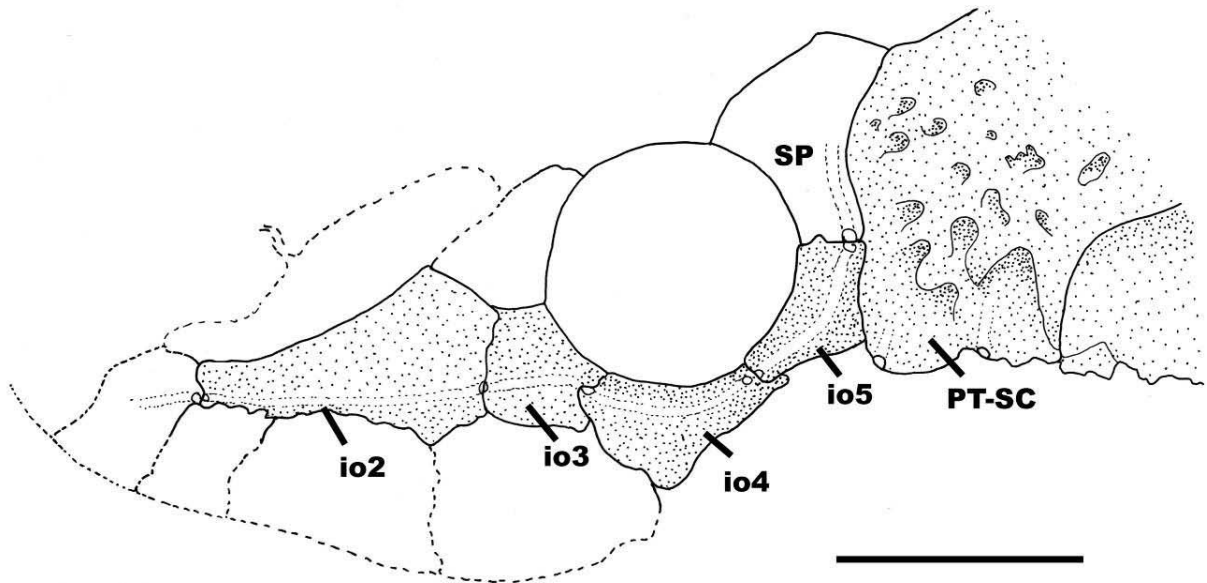
2135
 2136 Figure 78. Snout in dorsal view of *Hisonotus notatus*, showing prenasal region completely covered
 2137 by plates, MCP 18089 30.4 mm SL. Scale bar 2 mm.



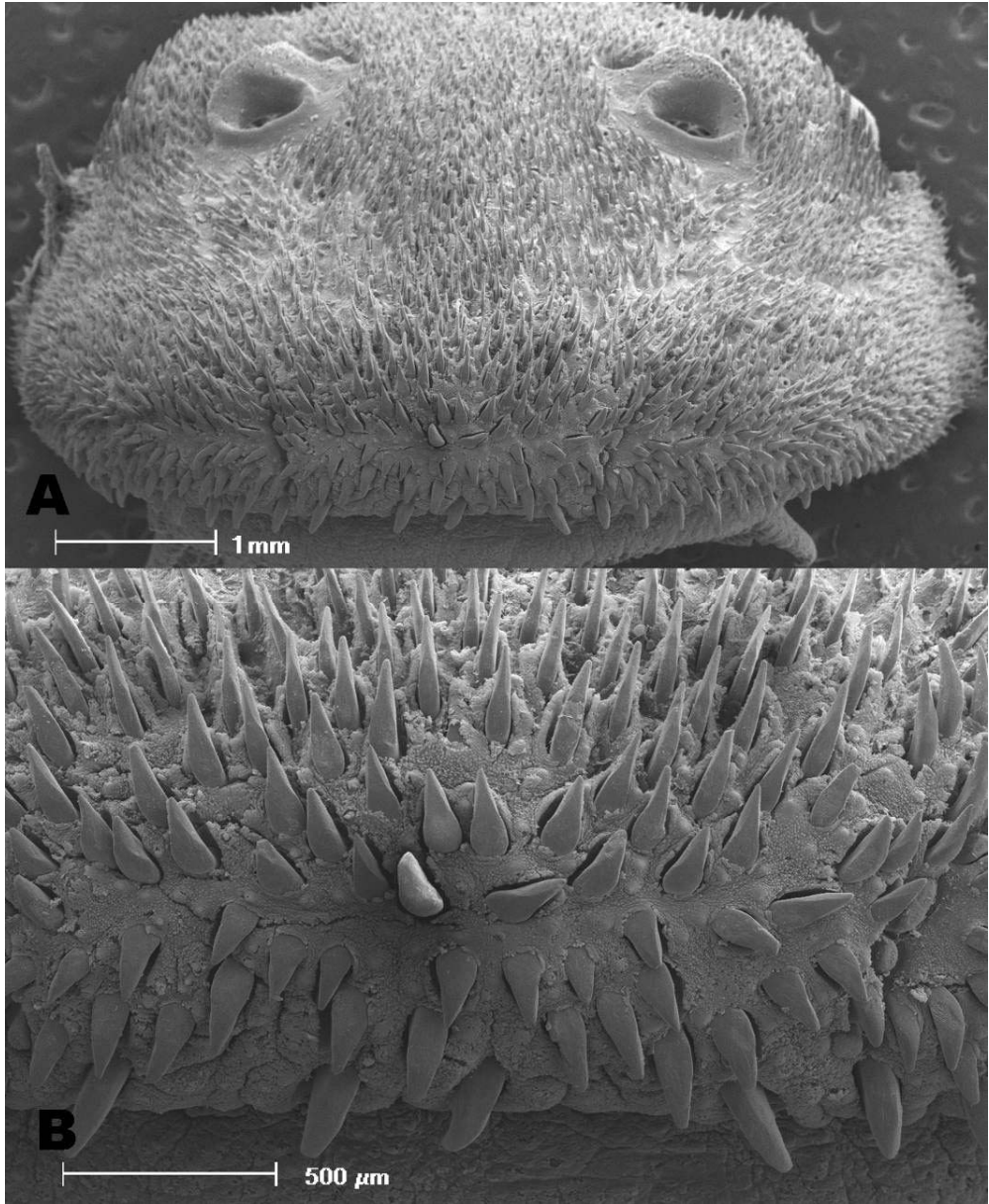
2138
 2139 Figure 79. Snout in dorsal view of *Hisonotus taimensis*, showing unplatated prenasal region, MCP
 2140 17417, 35.3 mm SL. Scale bar 2 mm.



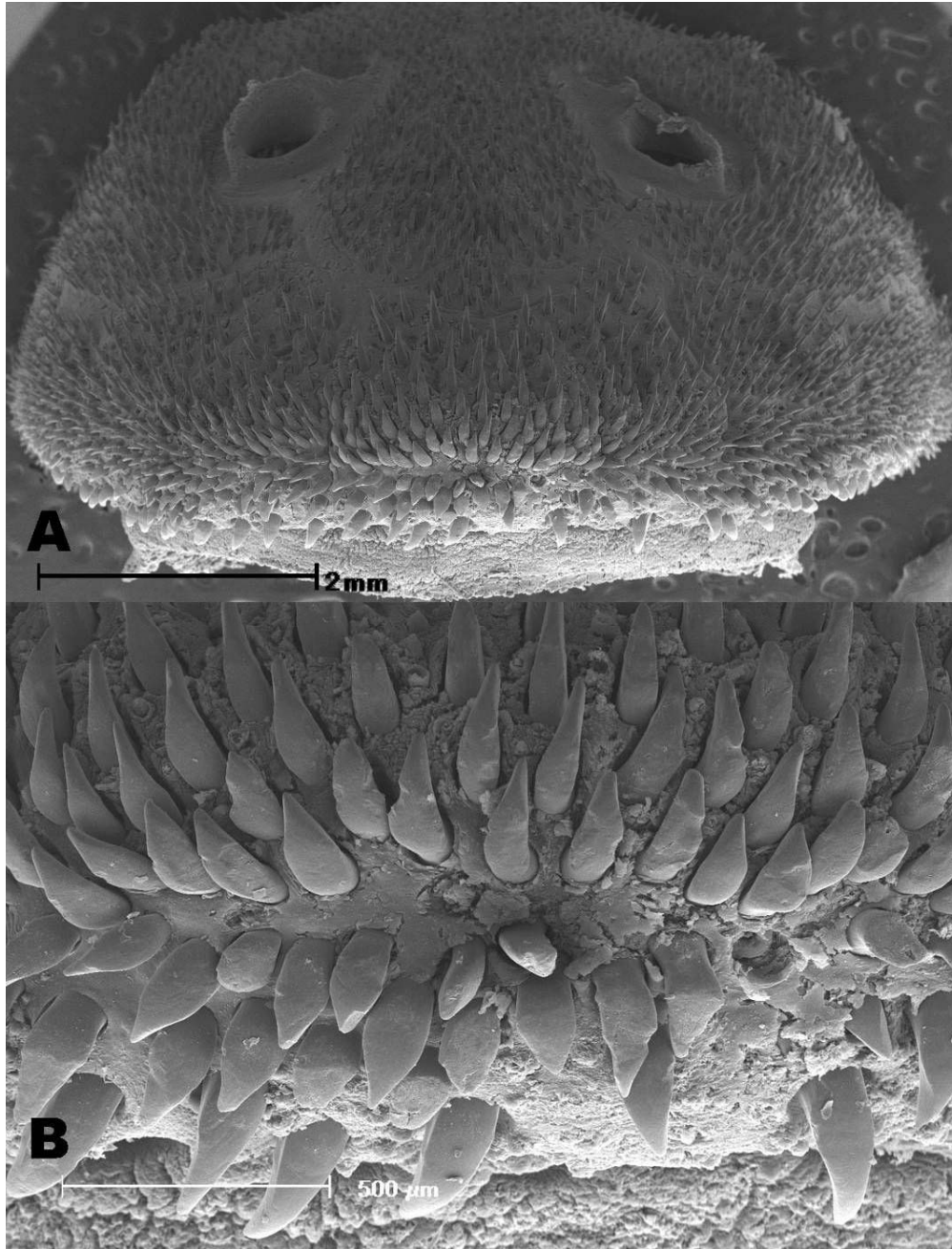
2141
 2142 Figure 80. Trunk lateral plates of *Hisonotus notatus*, lateral view of left side, showing a complete
 2143 median series. MCP 18098, 41.3 mm SL. Scale bar 4 mm.



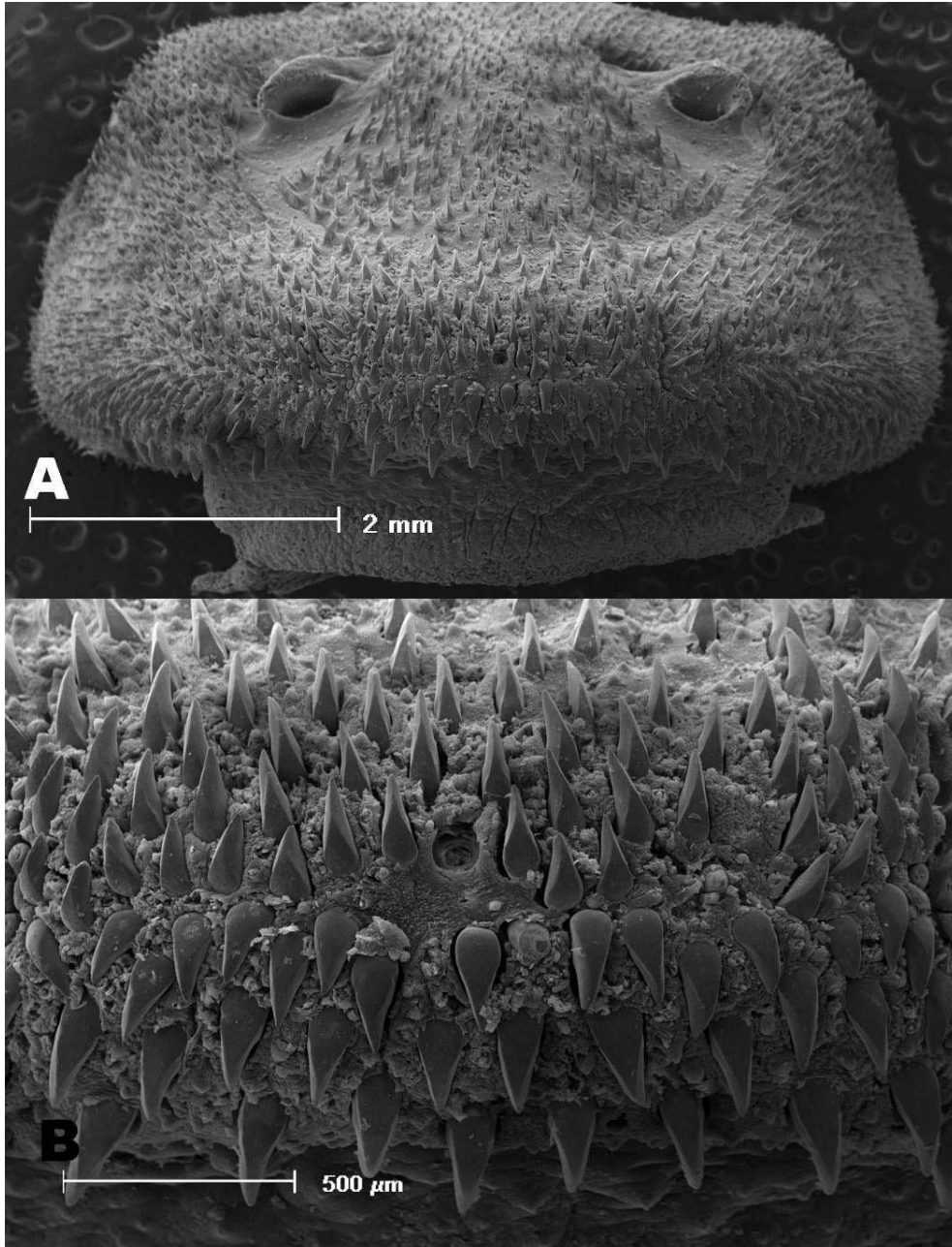
2144
 2145 Figure 81. Skull in dorsolateral view of *Hisonotus ringueleti*, MCP 11215 37,1 mm SL, showing
 2146 ventrally expanded infraorbital four.



2147
2148 Figure 82. Scanning electron micrograph of snout anterior rostral margin of *Epactionotus*
2149 *bilineatus*, MCP 29293, 38.0 mm SL. A-anterior view of rostrum □ B-magnification of medial
2150 portion.



2151
2152 Figure 83. Scanning electron micrograph of snout anterior rostral margin of *Parotocinclus*
2153 *maculicauda*, MCP 20087, 40.4 mm SL. A-anterior view of rostrum □ B-magnification of medial
2154 portion.



2155

2156 Figure 84. Scanning electron micrograph of snout anterior rostral margin of *Hisonotus notatus*,

2157 MCP 18098, 40.4 mm SL. A-anterior view of rostrum □ B-magnification of medial portion.

Table 1. Morphometrics and meristics of *Hisonotus nigricauda*. SD = Standard deviation. n = number of specimens.

	Syntypes					Laguna dos Patos					Rio Uruguai				
	n	Low	High	Mean	SD	n	Low	High	Mean	SD	n	Low	High	Mean	SD
Standard length (mm)	9	24.8	31.8	27.6	60	25.06	39.24	32.37	-	60	24.1	38.5	30.1	-	
Percents of Standard Length															
Head length	9	33.2	39.1	36.6	1.77	60	34.1	40.8	36.0	1.16	60	34.0	38.9	36.4	1.10
Predorsal length	9	44.5	49.6	47.6	1.57	60	44.9	48.8	46.8	0.86	60	44.6	51.0	47.5	1.24
Dorsal-fin spine length	8	22.6	26.5	24.4	1.21	59	23.7	28.7	26.3	1.25	59	22.7	28.7	25.4	1.12
Anal-fin unbranched ray length	8	16.3	19.0	17.9	1.00	58	16.3	21.4	18.7	1.10	60	15.9	20.4	17.8	0.90
Pectoral-fin spine length	9	23.2	27.7	25.6	1.33	60	22.4	31.2	26.7	1.62	60	23.8	30.4	27.1	1.22
Pelvic-fin unbranched ray length	9	14.6	18.7	16.3	1.23	60	14.3	22.1	16.8	1.95	59	12.9	19.7	15.9	1.60
Cleithral width	9	23.7	25.8	24.8	0.74	60	23.4	27.3	25.2	0.77	60	23.4	27.7	25.1	0.94
Thoracic length	9	16.2	19.7	18.3	1.11	60	15.8	19.4	17.7	0.88	60	15.8	19.3	17.7	0.82
Abdominal length	9	18.0	20.6	19.2	1.00	60	18.3	21.6	19.7	0.71	60	18.1	21.5	19.7	0.87
Body depth at dorsal fin origin	9	18.2	20.3	18.8	0.66	60	17.7	21.6	19.2	0.89	60	17.3	21.9	19.1	0.99
Caudal-peduncle length	9	28.6	33.1	31.2	1.56	60	29.9	34.6	31.9	1.10	60	28.0	35.1	31.0	1.55
Caudal-peduncle length	9	9.8	10.6	10.2	0.23	60	10.0	12.2	11.0	0.43	60	9.4	11.3	10.3	0.51
Percents of Head Length															
Snout Length	9	44.6	47.2	45.8	0.79	60	40.0	49.8	47.2	1.44	60	44.7	50.6	47.4	1.30
Orbital diameter	9	18.3	20.7	19.6	0.76	60	16.1	20.2	18.2	0.99	60	15.3	20.1	17.7	0.95
Interorbital width	9	35.9	41.9	39.2	1.75	60	38.3	47.6	43.4	1.79	60	37.4	48.5	42.2	2.29
Head depth	9	43.8	51.2	47.5	2.73	60	41.0	56.6	49.4	2.93	60	44.5	53.4	48.6	2.07
Suborbital depth	9	13.5	16.4	15.0	0.98	60	14.4	20.4	17.4	1.34	60	14.3	19.3	16.3	1.08
Mandibular ramus	9	6.1	9.3	7.5	0.97	59	6.6	9.5	8.1	0.78	60	5.8	9.7	7.5	0.85
Meristics															
Left premaxillary teeth	7	10	14	12.1	1.35	56	11	19	14.4	1.61	55	10	17	13.6	1.59
Right premaxillary teeth	7	11	15	12.7	1.50	52	11	19	14.4	1.66	59	10	17	13.3	1.54
Left dentary teeth	9	10	12	11.4	0.88	56	10	16	12.8	1.50	60	10	15	11.9	1.45
Right dentary teeth	6	10	11	10.7	0.52	54	11	16	12.6	1.40	56	10	15	11.9	1.36
Left lateral scutes	9	23	24	23.3	0.50	60	22	24	23.0	0.64	60	22	24	23.3	0.65
Right lateral scutes	9	23	24	23.3	0.50	60	22	24	23.1	0.57	60	22	24	23.3	0.63

2159 **Table 2.** Frequency distribution for left and right lateral plate counts of species of *Hisonotus* in the
 2160 laguna dos Patos system. n = number of specimens.

Species	Left Lateral Plates								n	Mean
	22	23	24	25	26	27	28	29		
<i>laevior</i>				29	32	6			67	25.7
<i>taimensis</i>					3	15	13	2	33	27.4
“Camaquã”				5	12	2			19	25.8
<i>armatus</i>			41	22					63	24.3
“Sinos”	4	30	21						55	23.3
“Passo Novo”	4	14	2						20	22.9
“Felício”		1	11						12	23.9
“Prata”	3	11	2						16	22.9
“Carreiro”	6	8	3						17	22.9
<i>nigricauda</i>	11	36	13						60	23.0

Species	Right Lateral Plates								n	Mean
	22	23	24	25	26	27	28	29		
<i>laevior</i>				28	34	5			67	25.7
<i>taimensis</i>					8	13	10	2	33	27.2
“Camaquã”				7	10	2			19	25.7
<i>armatus</i>		3	40	20					63	24.3
“Sinos”	4	34	17						55	23.2
“Passo Novo”	7	13							20	22.7
“Felício”		2	10						12	23.8
“Prata”	4	9	3						16	22.9
“Carreiro”	3	12	2						17	22.8
<i>nigricauda</i>	6	40	14						60	23.1

2162 **Table 3.** Morphometrics and meristics of *Hisonotus laevior*. SD = Standard deviation. n = number
 2163 of specimens. H = holotype of *H. laevior*. h = holotype of *H. leptochilus*.

	Types			Non-types			
	H	h	n	Low	High	Mean	SD
Standard length (mm)	39.2	40.9	65	29.3	47.2	38.0	-
Percents of Standard Length							
Head length	34.1	34.6	65	30.6	36.9	33.6	1.39
Predorsal length	45.1	48.2	65	43.2	49.8	46.4	1.34
Dorsal-fin spine length	-	19.6	65	20.6	26.6	23.4	1.33
Anal-fin unbranched ray length	14.3	-	64	14.1	20.0	17.2	1.27
Pectoral-fin spine length	23.5	22.4	65	20.5	26.2	23.5	1.34
Pelvic-fin unbranched ray length	15.2	0.0	65	13.1	20.1	16.5	1.84
Cleithral width	22.2	22.2	65	20.6	24.6	22.9	0.85
Thoracic length	15.2	15.7	65	15.1	20.3	17.3	0.95
Abdominal length	19.9	19.4	65	18.0	21.9	19.9	0.79
Body depth at dorsal-fin origin	16.6	18.0	65	16.2	20.8	18.1	1.03
Caudal-peduncle length	33.2	33.8	65	31.0	37.0	33.7	1.31
Caudal-peduncle depth	11.1	11.1	65	9.2	12.5	10.8	0.68
Percents of Head Length							
Snout Length	50.0	47.8	65	44.7	52.5	48.6	1.32
Orbital diameter	14.2	16.2	65	14.8	19.0	16.6	0.89
Interorbital width	41.6	39.5	65	36.9	46.2	41.9	1.95
Head depth	44.9	48.1	65	42.8	53.4	48.1	2.20
Suborbital depth	18.3	17.7	65	15.9	21.8	18.6	1.05
Mandibular ramus	7.6	8.2	65	7.0	11.1	8.8	0.86
Meristics							
Left premaxillary teeth	19	-	63	14	23	18.1	2.27
Right premaxillary teeth	17	17	62	14	23	18.1	2.12
Left dentary teeth	-	-	64	12	21	16.0	1.80
Right dentary teeth	15	15	64	11	20	16.1	2.07
Left lateral scutes	26	26	65	25	27	25.6	0.65
Right lateral scutes	26	26	65	25	27	25.6	0.62

2164 **Table 4.** Morphometrics and meristics of *Hisonotus taimensis*, including 23 types and 10 non-type
 2165 specimens. SD = Standard deviation, n = number of specimens.

	Types + non-types				
	n	Low	High	Mean	SD
Standard length (mm)	33	29.4	51.1	40.2	-
Percents of Standard Length					
Head length	33	29.2	35.3	31.6	1.54
Predorsal length	33	40.8	46.4	43.4	1.42
Dorsal-fin spine length	30	19.9	24.5	22.0	1.26
Anal-fin unbranched ray length	32	13.0	17.8	15.8	1.13
Pectoral-fin spine length	33	19.7	24.1	21.9	1.10
Pelvic-fin unbranched ray length	33	13.1	19.8	15.3	1.48
Cleithral width	33	18.5	21.3	20.0	0.67
Thoracic length	33	15.0	18.3	16.1	0.79
Abdominal length	33	17.4	20.5	18.7	0.69
Body depth at dorsal fin origin	33	13.3	16.3	15.1	0.83
Caudal-peduncle length	33	33.4	38.7	35.8	1.34
Caudal-peduncle length	33	8.8	11.0	9.8	0.50
Percents of Head Length					
Snout length	33	42.8	51.6	49.3	1.69
Orbital diameter	33	14.6	18.1	16.2	0.87
Interorbital width	33	35.9	45.1	40.0	2.04
Head depth	33	38.1	47.7	43.2	2.16
Suborbital depth	33	13.5	18.6	16.7	1.05
Mandibular ramus	33	6.6	9.8	8.1	0.63
Meristics					
Left premaxillary teeth	33	14	20	16.7	1.26
Right premaxillary teeth	33	13	20	16.5	1.73
Left dentary teeth	33	11	19	14.1	1.62
Rigth dentary teeth	32	11	17	14.4	1.46
Left lateral scutes	33	26	29	27.4	0.75
Rigth lateral scutes	33	26	29	27.2	0.88

2166 **TABLE 5.** Morphometrics and meristics of *Hisonotus armatus* including 40 types plus 20 non-types
 2167 specimens. SD = Standard deviation, n = number of specimens, and H = holotype.

	Types + non-types					
	H	n	Low	High	Mean	SD
Standard length (mm)		63	27	45.9	38.2	-
Percent of Standard Length						
Head length	34.4	63	31.7	38.2	34.3	1.22
Predorsal Length	47.4	63	44.0	51.3	46.7	1.27
Dorsal-fin unbranched ray length	26.8	63	22.5	27.7	25.2	1.36
Anal-fin spine length	16.9	63	13.7	17.9	16.2	0.98
Pectoral-fin unbranched ray length	27.2	63	20.9	28.1	25.8	1.46
Pelvic-fin spine length	17.0	63	15.1	21.4	18.1	1.68
Cleithral width	25.0	63	21.9	25.4	23.7	0.81
Thoracic length	16.9	63	14.8	18.5	16.6	0.79
Abdominal length	21.9	63	16.4	22.4	20.6	1.13
Body depth at dorsal-fin origin	19.8	63	16.2	20.9	18.5	1.01
Caudal-peduncle length	31.9	63	30.3	35.0	32.8	1.16
Caudal-peduncle length	12.0	63	9.9	12.7	11.2	0.56
Percent of Head Length						
Snout Length	50.2	63	47.1	53.3	50.2	1.32
Orbital diameter	16.7	63	14.8	18.5	16.7	0.86
Interorbital width	40.5	63	37.8	46.5	42.5	1.90
Head depth	49.9	63	43.4	53.8	49.1	2.30
Suborbital depth	18.6	63	15.7	21.6	19.1	1.10
Mandibular ramus	8.6	63	6.9	10.5	8.5	0.75
Meristics						
Left premaxillary teeth	15	61	14	21	17.7	1.69
Right premaxillary teeth	17	62	15	23	17.7	1.66
Left dentary teeth	16	63	11	19	15.0	1.39
Rigth dentary teeth	15	63	12	20	15.0	1.65
Left lateral scutes	24	63	24	25	24.3	0.48
Rigth lateral scutes	24	63	23	25	24.3	0.54

2168 **Table 6.** Morphometrics and meristics of *Hisonotus* sp. “Camaquã”. SD = Standard deviation, n =
 2169 number of specimens, H = holotype.

	types						non-types					
	H	n	Low	High	Mean	SD	n	Low	High	Mean	SD	
Standard length (mm)	45.0	19	31.6	51.7	38.08		20	32.5	39.2	35.7		
Percents of Standard Length												
Head length	31.0	19	30.4	36.3	33.5	1.94	20	31.7	34.8	33.4	0.77	
Predorsal length	44.4	19	42.7	47.9	45.4	1.63	20	44.4	48.1	46.3	1.08	
Dorsal-fin spine length	22.2	19	20.8	24.2	23.1	0.84	20	19.8	23.9	22.3	1.22	
Anal-fin unbranched ray length	17.4	19	16.1	18.8	17.6	0.85	20	16.2	24.4	17.9	1.61	
Pectoral-fin spine length	23.8	19	19.2	25.7	23.5	1.53	20	17.7	20.7	19.5	0.86	
Pelvic-fin unbranched ray length	14.8	19	13.9	21.3	17.2	2.17	20	14.1	20.3	16.2	2.01	
Cleithral width	21.1	19	21.0	23.3	22.1	0.68	20	20.9	23.1	22.1	0.64	
Thoracic length	16.4	19	14.6	17.7	16.0	0.70	20	14.9	18.0	16.3	0.89	
Abdominal length	20.0	19	18.3	20.3	19.1	0.61	20	19.4	22.1	20.7	0.71	
Body depth at dorsal-fin origin	17.8	19	17.0	18.9	18.0	0.59	20	17.9	21.5	19.3	1.04	
Caudal-peduncle length	34.6	19	33.6	37.2	35.3	1.15	20	32.1	36.1	34.3	0.89	
Caudal-peduncle length	11.1	19	10.5	12.8	11.9	0.60	20	10.3	12.1	11.5	0.48	
Percents of Head Length												
Snout Length	50.2	19	47.3	52.7	50.3	1.29	20	46.7	50.4	48.2	0.95	
Orbital diameter	15.5	19	12.1	18.1	16.0	1.24	20	15.1	17.5	16.1	0.64	
Interorbital width	45.2	19	38.5	46.7	42.6	2.46	20	40.6	44.7	42.4	1.26	
Head depth	50.7	19	44.8	53.3	48.9	2.51	20	47.6	54.0	50.9	1.78	
Suborbital depth	20.6	19	16.7	23.5	20.0	1.64	20	18.1	22.9	20.4	1.25	
Mandibular ramus	8.5	19	7.0	9.3	7.9	0.65	20	7.5	9.8	8.6	0.62	
Meristics												
Left premaxillary teeth	16	19	11	17	14,1	1,89	19	11	16	14.3	1.25	
Right premaxillary teeth	15	19	12	16	14,3	1,75	20	12	17	14.6	1.19	
Left dentary teeth	15	19	11	16	12,9	1,96	20	9	13	11.7	1.18	
Right dentary teeth	13	18	11	15	12,6	1,51	20	10	13	12.1	0.85	
Left lateral scutes	25	19	22	23	22.9	0.35	20	25	26	25.5	0.51	
Right lateral scutes	25	19	22	24	23.1	0.64	20	25	26	25.4	0.49	

2170 **Table 7.** Morphometrics and meristics of *Hisonotus* sp. “Carreiro”. SD = Standard deviation, n =
 2171 number of specimens, H = holotype.

	types					
	H	n	Low	High	Mean	SD
Standard length (mm)	35.4	17	26.7	35.8	31.4	
Percents of Standard Length						
Head length	36.0	17	34.8	37.7	36.1	0.83
Predorsal length	47.6	17	43.9	50.0	46.8	1.49
Dorsal-fin spine length	26.9	17	24.3	29.0	26.6	1.47
Anal-fin unbranched ray length	18.9	16	17.7	21.7	19.3	1.06
Pectoral-fin spine length	28.7	17	24.7	29.0	26.7	1.20
Pelvic-fin unbranched ray length	17.3	17	16.6	21.5	18.4	1.47
Cleithral width	26.4	17	23.5	26.5	24.9	0.86
Thoracic length	18.7	17	16.6	19.7	18.0	0.89
Abdominal length	19.9	17	18.1	20.8	19.7	0.75
Body depth at dorsal-fin origin	22.9	17	19.7	22.9	20.7	0.91
Caudal-peduncle length	31.4	17	30.9	34.6	32.6	1.17
Caudal-peduncle length	12.7	17	11.4	13.2	12.5	0.51
Percents of Head Length						
Snout length	49.9	17	45.6	51.0	48.1	1.82
Orbital diameter	16.7	17	15.6	18.7	17.3	0.87
Interorbital width	41.1	17	37.2	42.5	40.0	1.65
Head depth	57.1	17	49.3	57.1	52.5	2.59
Suborbital depth	21.5	17	18.7	22.2	20.4	1.17
Mandibular ramus	8.3	17	7.1	9.6	8.6	0.77
Meristics						
Left premaxillary teeth	14	16	11	16	13.3	1.29
Right premaxillary teeth	-	16	11	15	12.8	1.34
Left dentary teeth	12	17	10	16	12.4	1.46
Rigth dentary teeth	13	17	10	14	11.9	1.20
Left lateral scutes	24	17	22	24	22.8	0.73
Rigth lateral scutes	24	17	22	24	22.9	0.56

2172 **Table 8.** Morphometrics and meristics of *Hisonotus* “Prata”. SD = Standard deviation, n = number
 2173 of specimens, H = holotype.

	types					
	H	n	Low	High	Mean	SD
Standard length (mm)	31.8	16	24.6	33.2	29.3	
Percents of Standard Length						
Head length	37.2	16	36.4	38.6	37.3	0.72
Predorsal length	48.2	16	45.1	49.1	46.9	1.21
Dorsal-fin spine length	22.6	15	22.6	25.5	24.5	0.87
Anal-fin unbranched ray length	18.0	16	17.1	19.4	18.3	0.65
Pectoral-fin spine length	24.3	16	22.0	25.6	24.0	1.01
Pelvic-fin unbranched ray length	16.3	16	15.7	21.3	18.5	1.78
Cleithral width	25.9	16	24.3	27.9	25.9	0.91
Thoracic length	19.2	16	16.2	19.4	17.9	0.91
Abdominal length	20.3	16	18.5	23.8	20.1	1.36
Body depth at dorsal-fin origin	22.7	16	20.4	23.0	21.5	0.81
Caudal-peduncle length	32.3	16	30.2	34.5	32.4	1.33
Caudal-peduncle depth	12.5	16	11.8	13.4	12.4	0.39
Percents of Head Length						
Snout length	46.6	16	45.1	49.5	47.4	1.37
Orbital diameter	15.1	16	15.1	17.9	16.6	0.88
Interorbital width	36.8	16	36.8	40.6	38.7	1.28
Head depth	56.4	16	51.5	57.7	54.5	1.74
Suborbital depth	23.4	16	20.3	23.6	22.2	1.11
Mandibular ramus	8.9	16	8.2	10.3	9.2	0.72
Meristics						
Left premaxillary teeth	13	16	12	16	14.0	1.03
Right premaxillary teeth	12	16	12	15	13.6	0.89
Left dentary teeth	13	16	11	14	12.9	0.81
Rigth dentary teeth	13	16	12	15	13.1	0.89
Left lateral scutes	23	16	22	24	22.9	0.57
Rigth lateral scutes	23	16	22	24	22.9	0.68

2174 **Table 9.** Morphometrics and meristics of *Hisonotus* sp. “Sinos”. SD = standard deviation, n =
 2175 number of specimens, and H = holotype.

	types						non-types					
	H	n	Low	High	Mean	SD	n	Low	High	Mean	SD	
Standard length (mm)	38.2	28	29.0	42.0	34.5	-	39	27.1	44.3	37.0	-	
Percents of Standard Length												
Head length	33.8	28	32.2	35.7	33.9	0.91	39	32.1	38.4	34.5	1.49	
Predorsal Length	45.8	28	42.7	47.7	45.0	1.18	39	43.0	48.9	45.9	1.25	
Dorsal-fin spine length	28.3	27	23.6	29.8	27.5	1.35	39	21.8	28.4	25.3	1.63	
Anal-fin unbranched ray length	18.4	28	15.5	20.9	18.7	1.19	39	16.4	20.4	18.1	0.87	
Pectoral-fin spine length	28.5	28	25.4	29.3	27.2	1.06	39	23.4	29.3	26.4	1.42	
Pelvic-fin unbranched ray length	16.6	28	13.8	21.3	17.7	1.97	39	13.9	22.3	17.0	1.85	
Cleithral width	23.8	28	21.8	25.4	23.5	0.73	39	22.2	25.8	24.0	0.95	
Thoracic length	17.4	28	15.8	18.7	17.4	0.63	39	15.6	19.8	17.6	0.74	
Abdominal length	18.8	28	17.7	20.6	19.1	0.64	39	17.1	20.8	19.2	0.86	
Body depth at dorsal-fin origin	21.9	28	18.0	22.0	20.6	0.82	39	18.9	22.9	20.6	0.82	
Caudal-peduncle length	32.5	28	30.5	35.2	33.5	1.22	39	30.6	37.6	33.7	1.51	
Caudal-peduncle depth	14.0	28	12.8	14.5	13.7	0.48	39	11.8	15.2	13.1	0.81	
Percents of Head Length												
Snout Length	49.6	28	47.7	52.3	49.4	1.18	39	45.9	50.2	48.3	1.16	
Orbital diameter	17.0	28	15.8	19.7	17.6	0.96	39	15.7	20.0	17.3	0.99	
Interorbital width	42.5	28	38.8	45.7	42.6	1.51	39	38.3	47.1	42.0	2.27	
Head depth	57.2	28	51.8	58.9	54.9	2.16	39	49.4	59.0	54.0	2.12	
Suborbital depth	20.9	28	17.6	21.3	19.7	0.99	39	17.4	22.7	20.0	1.30	
Mandibular ramus	8.6	28	7.0	10.5	8.8	0.87	39	7.3	10.1	8.8	0.67	
Meristics												
Left premaxillary teeth	18	28	13	20	16.0	1.88	38	11	20	15.7	2.20	
Right premaxillary teeth	18	28	13	19	15.9	1.81	37	11	20	15.5	2.29	
Left dentary teeth	18	28	13	19	15.1	1.82	38	11	18	14.1	2.12	
Righth dentary teeth	16	28	12	19	14.8	1.85	37	10	18	14.2	2.07	
Left lateral scutes	23	28	23	24	23.4	0.50	39	22	24	23.4	0.68	
Righth lateral scutes	23	28	22	24	23.3	0.66	39	22	24	23.4	0.54	

2176 **Table 10.** Morphometrics and meristics of *Hisonotus* sp. “Passo Novo”. SD = Standard deviation, n
 2177 = number of specimens, H = holotype.

	Types					
	H	n	Low	High	Mean	SD
Standard length (mm)	41.5	20	31.8	41.5	35.9	
Percent of Standard Length						
Head length	35.3	20	32.9	37.9	35.6	1.22
Predorsal length	48.5	20	45.2	49.3	47.4	1.22
Dorsal-fin spine length	23.8	20	22.6	25.4	23.8	0.79
Anal-fin spine length	17.2	20	14.9	17.2	16.3	0.72
Pectoral-fin spine length	25.8	20	24.4	26.8	25.4	0.62
Pelvic-fin spine length	15.8	20	15.2	19.0	17.1	1.07
Cleithral width	25.5	20	23.4	26.2	24.8	0.69
Thoracic length	16.4	20	15.9	18.4	17.4	0.61
Abdominal length	20.1	20	18.2	20.4	19.6	0.67
Body depth at dorsal-fin origin	20.9	20	19.4	21.6	20.4	0.60
Caudal-peduncle length	32.9	20	30.3	34.9	33.0	1.37
Caudal-peduncle length	11.8	20	11.0	13.4	12.0	0.58
Percent of Head Length						
Snout Length	47.9	20	47.8	54.8	50.3	1.62
Orbital diameter	15.0	20	14.1	16.9	15.5	0.66
Interorbital width	42.4	20	40.1	45.8	42.8	1.48
Head depth	53.4	20	48.9	54.9	51.6	1.46
Suborbital depth	20.3	20	19.1	24.0	21.0	1.07
Mandibular ramus	9.1	20	7.2	9.5	8.5	0.65
Meristics						
Left premaxillary teeth	19	20	15	21	17.9	1.35
Right premaxillary teeth	18	20	16	20	17.8	1.36
Left dentary teeth	17	20	14	19	16.0	1.56
Righth dentary teeth	15	20	13	20	16.0	1.59
Left lateral scutes	23	20	22	24	22.9	0.55
Righth lateral scutes	23	20	22	23	22.7	0.49

2178 **Table 11.** Morphometrics and meristics of *Hisonotus* sp. “Felício”. SD = Standard deviation, n =
 2179 number of specimens, H = holotype.

	Types					
	H	n	Low	High	Mean	SD
Standard length (mm)	43.0	12	37.5	44.3	40.2	-
Percent of Standard Length						
Head length	33.0	12	32.1	35.7	33.6	1.01
Predorsal length	44.6	12	43.0	47.1	45.3	1.19
Dorsal-fin spine length	24.0	12	21.8	24.9	23.5	0.92
Anal-fin spine length	17.6	12	16.5	19.2	17.7	0.66
Pectoral-fin spine length	25.1	12	23.4	26.4	24.8	0.84
Pelvic-fin spine length	16.0	12	14.4	22.3	17.2	2.02
Cleithral width	23.3	12	22.2	24.7	23.2	0.76
Thoracic length	17.0	12	17.0	18.5	17.6	0.52
Abdominal length	19.2	12	17.9	20.6	19.3	0.80
Body depth at dorsal-fin origin	20.7	12	18.9	21.6	20.5	0.67
Caudal-peduncle length	35.7	12	32.3	36.2	34.5	1.12
Caudal-peduncle depth	12.0	12	11.8	13.5	12.6	0.60
Percent of Head Length						
Snout Length	48.6	12	46.1	49.5	48.1	1.05
Orbital diameter	16.2	12	16.2	18.9	17.2	0.86
Interorbital width	42.8	12	39.9	47.1	43.8	2.22
Head depth	55.1	12	51.9	55.8	53.5	1.39
Suborbital depth	19.4	12	18.4	22.2	20.2	1.17
Mandibular ramus	8.9	12	8.1	9.7	8.8	0.51
Meristics						
Left premaxillary teeth	17	12	16	20	17.6	1.16
Right premaxillary teeth	17	12	15	20	17.6	1.31
Left dentary teeth	15	12	13	18	15.8	1.48
Rigth dentary teeth	17	12	14	18	15.9	1.08
Left lateral scutes	24	12	23	24	23.9	0.29
Rigth lateral scutes	24	12	23	24	23.8	0.39

Capítulo III

**The species of *Hisonotus* (Siluriformes: Loricariidae: Hypoptopomatinae) of the
rio Uruguai basin, southeastern South America**

1 **The species of *Hisonotus* (Siluriformes: Loricariidae: Hypoptopomatinae) of the rio Uruguai**
2 **basin, southeastern South America**

3

4

Abstract

5

6 The species of *Hisonotus* from the rio Uruguai basin are reviewed. Four new species are described
7 from the upper course of rio Uruguai basin in Brazil: *Hisonotus* sp. “Canoas” from the rio Canoas
8 drainage □ *Hisonotus* sp. “Ariranhas” from rios Rancho Grande and Ariranhas □ *Hisonotus* sp. “Passo
9 Fundo”, from rio Passo Fundo drainage □ and *Hisonotus* sp. “Chapecó” from rio Chapecó. The
10 species *Epactionotus aky*, described from arroyo Yabotí-Guazú drainage in Argentina, is transferred
11 to the genus *Hisonotus* and rediagnosed. *Hisonotus candombe* is considered a junior synonym of *H.*
12 *ringueleti*. The new taxa, together with *H. nigricauda*, *H. ringueleti*, and *H. charrua* constitute the
13 genus in the rio Uruguai basin. The species are illustrated, and a taxonomic key for *Hisonotus* in the
14 rio Uruguay basin and laguna dos Patos system is provided. Their distributions are mapped and
15 discussed under biogeographic patterns previously proposed for the rio Uruguai basin.

16

17

Resumo

18 As espécies de *Hisonotus* da bacia do rio Uruguai são revisadas. Quatro novas espécies são
19 descritas do alto curso do rio Uruguai no Brasil: *Hisonotus* sp. “Canoas” da drenagem do rio
20 Canoas □ *Hisonotus* sp. “Ariranhas” dos rios Rancho Grande e Ariranhas □ *Hisonotus* sp. “Passo
21 Fundo” da drenagem do rio “Passo Fundo” □ e *Hisonotus* sp. “Chapecó” do rio Chapecó. A espécie
22 *Epactionotus aky*, descrita para a drenagem do arroyo Yabotí-Guazú na Argentina, é transferida para
23 o gênero *Hisonotus*. *Hisonotus candombe* é considerado sinônimo junior de *H. ringueleti*. Os novos
24 taxóns, junto com *H. nigricauda*, *H. ringueleti* e *H. charrua* constituem o gênero *Hisonotus* na

25 bacia do rio Uruguai. As espécies são ilustradas, e uma chave de indentificação para as espécies da
26 bacia do rio Uruguai e do sistema da laguna dos Patos é fornecida. As distribuições dos *Hisonotus*
27 são mapeadas e discutidas dentro dos padrões biogeográficos previamente propostos para a bacia do
28 rio Uruguai.

29

30

Introduction

31

32 The rio Uruguai (called Río Uruguay in Argentina and Uruguay) is the smallest of the three
33 major Río de la Plata tributaries. The river extends over 1838 km, with a drainage area of about
34 365,000 km² (Di Persia & Neiff, 1986), rising in the Serra Geral formation of southern Brazil, and
35 flowing into the Río de la Plata estuary between Uruguay and Argentina. Its main tributaries are the
36 Río Negro in Uruguay, rio Quaraí (Río Cuareim) in the border between Brazil and Uruguay and the
37 rios Ibicuí and Ijuí in Brazil. The distributional patterns of the ichthyofauna in the rio Uruguai basin
38 were previously discussed by Lucena & Kullander, 1992, Winberger et al., 1998, Aquino et al.,
39 2001, Miquelarena & Lopez, 2004, and Rican & Kullander, 2006. These studies agreed that the rio
40 Uruguai presents endemic ichthyofaunal components, mostly in its upper portions. Lucena &
41 Kullander, (1992: 157), suggested five general distributional patterns of fishes in the rio Uruguai
42 basin based on the distribution of several taxa, in which almost all species from that basin could be
43 included. According to Miquelarena & López (2004), the basin can be divided in three portions by
44 its geographical and ichthyofaunal attributes. The upper rio Uruguai presents a high degree of
45 endemism of its species. Contrasting, the middle and lower courses have a low degree of endemism.

46 *Hisonotus* together with *Otocinclus flexilis* Cope, 1894 and *Eurycheilichthys pantherinus* Reis
47 & Schaefer, 1992 and *Epactionotus aky* Azpelicueta, Casciotta, Almirón & Körber, 2004 are the
48 known representatives of Hypoptopomatinae from the rio Uruguai basin. Until recently, studies on

49 the genus *Hisonotus* were almost absent for that region, and the first species of *Hisonotus* from the
50 rio Uruguai basin was described in 2001, *Hisonotus ringueleti* Aquino, Schaefer & Miquelarena,
51 2001. Previous to the description of *H. ringueleti* the study of *Hisonotus* in the rio Uruguai basin
52 was limited to the distributional data of *H. maculipinnis* provided by Aquino (1997), in the
53 redescription of that species. Despite its brief history, the number of papers on Hypoptopomatinae
54 from the rio Uruguay basin have greatly increased, and several species have been described since
55 then (Azpelicueta et al., 2004, Almiron et al., 2006, and Casciotta et al., 2006).

56 In this work I review the taxonomic composition of *Hisonotus* from the rio Uruguai basin,
57 and describe four new species. Besides that, the generic allocation of *Epactionotus aky* is
58 questioned, and therefore included in the genus *Hisonotus*. At last, the implications of the species
59 distribution in the biogeographic context of the rio Uruguai basin are discussed. This work is part of
60 my Master in Sciences thesis at the Pontificia Universidade Católica do Rio Grande do Sul
61 (PUCRS), entitled taxonomic review of the species of *Hisonotus* (Siluriformes: Loricariidae) from
62 the rio Uruguay basin and the laguna dos Patos system.

63

64

Material and Methods

65

66 **Geography.** In this review, the rio Uruguai basin (Fig. 1) is divide in three portions (upper,
67 middle and lower). The upper course is situated upstream to the remarkable Saltos de Yucumã
68 (saltos del Moconá) a 10-meters high, longitudinal waterfall situate above the mouth of arroyo
69 Yaboty-Guazú. The middle and lower courses are situated downstream to Saltos de Yucumã and
70 separated from each other by Salto Grande, site of the homonymous hydroelectric dam. The portion
71 downstream from Salto Grande to the mouth at Río de La Plata estuary is named lower rio Uruguai
72 basin. Names of geographic localities, except country, are given in the language of the country of

73 origin to avoid transferal of English style onto South American place names, following Schaefer
74 (1997). English names are used for countries. In making reference to rivers spanning or bordering
75 more than one geopolitical (and language) unit, I use the Portuguese spelling (e.g. rio Uruguai, rio
76 Negro, rio Quarai).

77 **Collections.** The specimens examined are deposited in the following institutions
78 (abbreviations in parentheses), listed in alphabetic order of the abbreviations: Asociación
79 Ictiológica, La Plata (AI) □ Academy of Natural Sciences, Philadelphia (ANSP) □ Natural History
80 Museum, London (BMNH) □ Coleção Ictiológica Morevy Cheffe, Pelotas (CIMF) □ Instituto de
81 Limnología “Dr. Raúl A. Ringuelet”, La Plata (ILPLA) □ Museo Argentino de Ciencias Naturales
82 Bernadino Rivadavia, Buenos Aires, (MACN-ict) □ Museu Anchieta, Porto Alegre (MAPA) □
83 Fundação Zoobotânica do Rio Grande do Sul/Museu de Ciências Naturais, Porto Alegre (MCN) □
84 Museu de Ciências e tecnologia da Pontifícia Universidade Católica do Rio Grande do Sul, Porto
85 Alegre (MCP) □ Muséum d’Histoire Naturelle, Geneve (MHNG) □ Museo de La Plata, La Plata
86 (MLP) □ Museu Nacional, Rio de Janeiro (MNRJ) □ Museu de Zoologia da Universidade de São
87 Paulo, São Paulo (MZUSP) □ Natuhistorisches Museum, Wien (NMW) □ Núcleo de Pesquisas em
88 Limnologia, Ictiologia e Aquicultura, Maringá (NUP) □ Universidade Federal do Rio Grande do Sul,
89 Porto Alegre (UFRGS) □ Zoologisches Sammlung des Bayerischen Staates, Munique (ZSM) □
90 Faculdade de Ciências Universidad de La República, Montevideo (ZVC-P).

91 **Morphology.** Measurements were made to the nearest 0.1 mm with digital calipers under a
92 stereomicroscope on the left side of specimens. The measurements and its abbreviations follow
93 those presented in chapter II. Morphometric data are expressed as percents of standard length (SL),
94 except for subunits of the head, which are expressed as percents of head length (HL). Plate counts
95 and nomenclature follow the schemes of serial homology proposed by Schaefer (1997). Vertebral
96 counts included all vertebrae (including the first five vertebrae incorporated into the Weberian

97 apparatus), with the compound caudal centrum (PU1+U1) counted as one element. Cleared and
98 stained specimens (c&s) were prepared according to the method of Taylor & Van Dyke (1985).
99 Whenever available, juvenile specimens were cleared and stained. Juvenile designation was used for
100 specimens not totally covered by plates with an anterior paired crest of odontodes on the parieto-
101 supraoccipital and for males without a fleshy flap on the first thickened pelvic-fin ray, adults
102 presenting the opposite states. Scanning electron microscope pictures were taken from dissected
103 alcohol preserved specimens. Drawings were prepared using a Zeiss SV8 stereomicroscope with
104 camera lucida.

105

106

Results

107

Hisonotus nigricauda (Boulenger, 1891).

108

(Figure 2, Table 1)

109 *Otocinclus nigricauda* Boulenger, 1891: 234 [original description, type locality: Rio Grande do Sul,

110 Brazil].-Regan, 1904:268-269 [redescription, senior synonym of *Hisonotus laevior* and

111 *Hisonotus leptochilus*].-Isbruecker, 1980:84 [listed].-Schaefer, 1991:23 [Phylogenetic

112 relationships of Hypoptopomatinae]

113 *Hisonotus nigricauda*.-Cope, 1894:97 [compared with *Hisonotus laevior* and *Hisonotus leptochilus*

114 and new generic combination].-Schaefer, 1998:383 [transferred to *Hisonotus*].-Schaefer,

115 2003:232 [listed].-Reis & Carvalho, 2007:84 [listed].-Ferraris, 2007:248 [listed].

116 *Microlepidogaster nigricauda*.-Eigenmann, 1910:413 [listed].-Gosline, 1945: 101 [listed].-Fowler,

117 1959:166-167 [listed and illustrated].-Schaefer, 1997:8 [listed].-Malabarba, 1989:150 [type-

118 locality restricted to laguna dos Patos system, probably rio Camaquã].

119

120 **Material examined.** From laguna dos Patos system, Rio Grande do Sul, Brazil: BMNH
121 91.3.16.53-62, syntypes of *Otocinclus nigricauda*, 9, 24.8-31.8 mm SL, Rio Grande do Sul, Brazil.
122 **Rio Jacuí drainage:** ANSP 21565, 2, 21.3-22.4, rio Jacuí. MCN 16246, 10, 23.7-34.1 mm SL,
123 Porto Alegre, Parque Estadual Delta do Jacuí, Saco da Pólvora, 30°01'S 51°14'W. MCP 19834, 12,
124 25.6-40.2 mm SL, Amarópolis, creek tributary of rio Jacuí in sylviculture Santo Amaro, 29°55'S
125 51°55'W. MCP 20543, 1, 31.1 mm SL, Porto Alegre, rio Jacuí on Saco da Alemoa, 30°00'00''S
126 51°14'51''W. **Rio Vacacaí drainage:** MCP 19584, 33 + 3 c&s, 22.7-39.1 mm SL, São Gabriel,
127 bridge on road between São Gabriel and Tiaraju, 30°17'29''S 54°20'18''W. MCP 26756, 5, 24.2-
128 29.5 mm SL, São Gabriel, marsh of arroio Pirai, 30°17'07''S 54°20'33''W. **Lago Guaíba drainage:**
129 MAPA 1737, 1, 26.7, Gravataí, arroio Passo dos Ferreiros tributary of rio Gravataí, 29°56'S
130 50°58'W. MCN 17416, 10, 22.0-32.3 mm SL, Tapes, arroio Guarú tributary of arroio Araçá on road
131 between Barra do Ribeiro and Tapes, 30°29'14''S 51°23'39''W. MCN 18048, 12, 17.8-34.8 mm SL,
132 Tapes, arroio Guarú tributary of arroio Araçá on road between Barra do Ribeiro and Tapes,
133 30°29'14''S 51°23'39''W. MCP 13781, 1, 28.4 mm SL, Eldorado do Sul, creek at highway BR-290,
134 about 2 km from highway BR-116, 30°03'S 51°23'W. MCP 13949, 10, 22.3-31.8 mm SL, Eldorado
135 do Sul, creek at highway BR-290, about 2 km from highway BR-116, 30°03'S 51°23'W. MCP
136 15059, 3, 29.4-30.6 mm SL, Gravataí, marsh at highway RS-118, about 500 meters from highway
137 BR-290, 29°58'S 50°56'W. MCP 15766, 3, 27.1-30.1 mm SL, Eldorado do Sul, creek at highway
138 BR-290, about 2 km from highway BR-116, 30°03'W 51°21'S. MCP 21165, 4, 26.8-29.5 mm SL,
139 Eldorado do Sul, creek at margins of highway BR-290, 30°02'36''S 51°20'56''W. MCP 28589, 8,
140 23.1-32.3 mm SL, Eldorado do Sul, creek at highway BR-290, about 2 km from highway BR-116,
141 30°03'W 51°21'S. MCP 28986, 11, 24.7-34.3 mm SL, Eldorado do Sul, arroio Passo dos Carros,
142 30°05'S 51°23'W. UFRGS 2361, 25, 21.1-32.4 mm SL, Eldorado do Sul, arroio Passo dos Carros,
143 30°05'S 51°23'W. **Laguna dos Patos:** MCP 17677, 6, 19.8-24.7 mm SL, Pelotas, old drainage

144 channel near to Passo do Tabajara, marsh of Pontal da Barra in Laranjal, 31°47'S 52°14'W. MCP
145 23855, 33, 23.1-34.1 mm SL, Sentinela do Sul, arroio Velhaco on road between Cerro Grande do
146 Sul and Camaquã, 30°41'22"S 51°41'51"W. MCP 23858, 4, 27.2-28.9 mm SL, Sentinela do Sul,
147 arroio do Tigre tributary of arroio Velhaco on road from Cerro Grande do Sul to Camaquã,
148 30°44'30"S 51°46'26"W. **Rio Camaquã drainage:** MCP 17416, 20 + 3 c&s 25.5-39.1 mm SL,
149 Camaquã, marsh at rio Camaquã in Pacheca, 31°08'S 51°47'W. MCP 19701, 1, 27.2 mm SL,
150 Encruzilhada do Sul, arroio Passo da Miséria on road between Encruzilhada do Sul and Canguçu,
151 30°57'S 52°26'. MCP 25881, 51, 15.8-36.7 mm SL, Caçapava do Sul, creek tributary of arroio
152 Seival on road between Lavras do Sul and Capaçava do Sul, 30°44'00"S 53°42'04"W. MCP 25875,
153 1, 34.2 mm SL, Caçapava do Sul, small creek tributary to arroio Hilário on road between Caçapava
154 do Sul and Lavras do Sul, 30°44'24"S 53°44'51"W. MCP 40761, 10 + 3 c&s, 31.0-38.2 mm SL,
155 Bagé, arroio Banhado Grande on highway BR-153 between Bagé and Caçapava do Sul, 31°14'34"S
156 053°52'50"W. **São Gonçalo drainage:** MCP 17415, 32, 27.7-34.9 mm SL, Pelotas, dead channel of
157 rio Pelotas, marginal of highway BR-116 in Retiro, 31°37'S 52°20'W. MCP 17577, 4, 25.1-31.6
158 mm SL, Pelotas, arroio Totó on road to colonia Z-3, 31°46'S 52°20'W. **Laguna Mirim drainage:**
159 MCP 11134, 2, 28.2-35.0 mm SL, Arroio Grande, arroio Xasqueiro on highway BR-116 between
160 Pelotas and Arroio Grande, 32°09' S 53°02' W. From rio Uruguai basin: **rio Ibicuí drainage:** MCP
161 9270, 17.0-29.7 mm SL, Brazil, Mata, Creek on road Between Santa Maria and Mata, 29°33'S
162 54°27'W. MCP 9386, 10, 14.5-24.3 mm SL, Brazil, Cacequi, rio Ibicuí on the bridge between São
163 Rafael and Cacequi, 29°50'S 54°47'W. MCP 9473, 9, 20.3-32.5 mm SL, Brazil, São Vicente do
164 Sul, arroio do Salso, road from São Vicente do Sul to Santiago, 29°34'S 54°42'W. MCP 9643, 33,
165 22.1-34.1 mm SL, Brazil, Dom Pedrito, rio Santa Maria at km 246 of highway BR-293 between
166 Dom Pedrito and Santana do Livramento, 30°59'S 54°42'W. MCP 14145, 1, 24.5 mm SL, Brazil,
167 Rosário do Sul, creek on road between Rosário do Sul and Santana do Livramento, 30°18'45"S

168 54°59'49"W. MCP 14166, 1, 34.1 mm SL, Brazil, Rosário do Sul, arroio Santo Antonio on road
169 between Rosário do Sul and Santana do Livramento, 29°50'S 54°47'W. MCP 14214, 1, 33.2 mm
170 SL, Brazil, Santana do Livramento, pools at side of rio Santa Maria on road between Dom Pedrito
171 and Santana do Livramento, 30°59'S 54°42'W. MCP 15831, 1, 25.6 mm SL, Brazil, Dom Pedrito,
172 rio Santa Maria at km 246 of highway BR-293, between Dom Pedrito and Santana do Livramento,
173 30°59'S 54°42'W. MCP 16161, 2, 15.5-28.9 mm SL, Brazil, Santana do Livramento, lateral pools
174 on road to Campo Seco, 15 km east from highway BR-158, 30°42'S 55°04'W. MCP 19593, 22.3-
175 33.5 mm SL, Brazil, São Gabriel, bridge over banhado do Inhatium, highway BR-290, 30°15'43"S
176 54°31'33"W. MCP 23149, 11, 26.0-31.4 mm SL, Brazil, São Francisco de Assis, rio Inhacunda at
177 São Francisco de Assis on road to Manuel Viana, 29°32'51"S 55°08'11"W. MCP 25249, 1, 33.6
178 mm SL, Brazil, São Francisco de Assis, rio Inhacunda at São Francisco de Assis about 500 meters
179 from pottery, 29°32'27"S 55°07'45"W. MCP 25250, 4, 27.4-32.3 mm SL, Brazil, São Francisco de
180 Assis, rio Inhacunda at São Francisco de Assis on road to Manuel Viana, 29°32'51"S 55°08'11"W.
181 MCP 25251, 15, 29.1-34.9 mm SL, Brazil, São Francisco de Assis, creek affluent to rio Inhacunda
182 at São Francisco de Assis about 300 meters from pottery, 29°32'27"S 55°07'45"W. MCP 26865, 88
183 + 3 c&s, 22.7-38.5 mm SL, Brazil, Rosário do Sul, arroio do Salso on the highway BR-158, affluent
184 of rio Ibicuí da Armada, 30°22'27"S 55°02'07"W. MCP 27608, 14, 16.2-35.9 mm SL, Brazil, São
185 Francisco de Assis, arroio Carai-Passo on road from São Francisco de Assis to Manuel Viana,
186 29°31'03"S 55°10'49"W. UFRGS 8241, 23, 23.7-34.5 mm SL, Brazil, Rosário do Sul, creek at the
187 margin of highway BR-290, 10 km from Rosário do Sul, 30°12'S 55°03'W. **Río Negro drainage:**
188 MCP 10000, 34, 15.4-30.1 mm SL, Uruguay, Cerro Largo, lagoon 10 m from Río Negro at Arreria,
189 31°50'S 54°28'W. UFRGS 7183, 17, 29.2-32.5 mm SL, Uruguay, Durazno, arroyo Maestre de
190 Campo on road to Polanco de Yi, tributary of Río Yi, 33°24'55"S 56°12'06"W. UFRGS 9243, 7,
191 29.3-35.5, Uruguay, Rivera, arroyo Batovi on ruta 27 at km 24, tributary to Río Tacuarembó.

192 UFRGS 9241, Uruguay, Rivera, 1, 37.3 mm SL, arroyo Cunãpiru on km 12 of ruta 27, tributary to
193 Río Tacuarémbo, 31°02'21"W 55°29'31"S. UFRGS 9243, 5 + 1 c&s, 30.2-36.5 mm SL, Uruguay,
194 Rivera, lateral pools and arroyo Corrales on ruta 27, tributary of río Tacuarembó, 31°23'26"S
195 55°15'14"W. **Other drainages and rio Uruguai:** ILPLA, 9, 238, 18.5-25.8 mm SL, Argentina,
196 Corrientes, arroyo Cuay Grande, 28°41'S 56°14'W. MAPA 2493, 15, 23.6-33.6 mm SL, Brazil,
197 Barra do Quaraí, arroio Quaraí-Chico, 30°12'S 57°31'W. MCP 11568, 4, 23.2-29.1 mm SL, Brazil,
198 Uruguiana, rio Touro Passo, 29°38'S 56°56'W. MCP 16190, 2, 24.4-26.2 mm SL, Brazil, São
199 Marcos, marginal lagoon of rio Uruguai at praia da Formosa, 29°30'S 56°49'W. MCN 16592, 6,
200 18.7-33.7 mm SL, Brazil, Itaqui, pool at side of highway BR-472, Reserva Biológica Estadual de
201 São Donato, 29°00'S 56°10'W. MCN 16639, 1, 28.9 mm SL, Brazil, Maçambará, marsh drainage
202 canal at Reserva Biológica Estadual de São Donato, 29°00'S 56°10'W. MCN 16759, 7, 18.7-33.7
203 mm SL, Brazil, Itaqui, creek on highway BR-472 between Itaqui and São Borja, Reserva Biológica
204 Estadual de São Donato, 29°00'S 56°10'W. MCN 16887, 5, 17.4-23.4 mm SL, MCN 16951, 29,
205 15.0-31.3 mm SL, Brazil, Itaqui, creek on highway BR-472 btween Itaqui and São Borja, Reserva
206 Biológica Estadual de São Donato, 29°00'S 56°10'W. MCP 16964, 5, 16.1-33.9 mm SL, Brazil,
207 Itaqui, Reserva Biológica Estadual de São Donato, 29°00'S 56°10'W.

208 **Diagnosis.** *Hisonotus nigricauda* differs from its congeners, except *Hisonotus maculipinnis*,
209 *Hisonotus* sp. "Chapecó", and *Hisonotus* sp. "Prata", by lacking the posterior portion of the lateral
210 line vs. posterior portion of lateral line present. Differs from *H. maculipinnis*, *H.* sp. "Chapecó", and
211 *H.* sp. "Prata" by having an almost completely dark caudal fin, without hyaline areas in the middle
212 portion, vs. caudal fin presenting hyaline areas in the middle portion.

213 **Description.** This species was redescribed in chapter II and will not be repetead here.

214 **Distribution and habitat.** *Hisonotus nigricauda* is widely distributed in the laguna dos
215 Patos system and in the rio Uruguai basin. In the laguna dos Patos system the species is found

216 mostly in the lower portions of the drainages near the laguna do Patos, being absent in the upper
217 portions of rio Jacuí basin. In the same manner, *H. nigricauda* is most commonly collected in the
218 lower portions of the rio Uruguai basin, but is found in the headwaters of rio Negro, rio Quaraí, and
219 rio Ibicuí drainages (Fig. 3). *Hisonotus nigricauda* is absent in the rio Ijuí drainage, and apparently
220 not found upstream the mouth of rio Ijuí in the middle rio Uruguai basin. This species inhabits slow
221 flowing watercourses, of brown waters running over dark organic matter and sandy bottom. The
222 individuals were found in between marginal and aquatic vegetation.

223
224 ***Hisonotus ringueleti* Aquino, Schaefer & Miquelarena, 2001**

225 (Figures 4-6, Table 2)

226 *Hisonotus ringueleti* Aquino, Schaefer & Miquelarena, 2001:1-12, (type locality: Uruguay,
227 Rivera, creek at km 18 of route joining Santana do Livramento, Brazil, and Rivera, Uruguay,
228 tributary to rio Quaraí drainage.

229 *Hisonotus candombe* Casciotta, Azpelicueta, Almirón & Litz, 2006:147-152, (type locality:
230 Uruguay, Departamento Salto, río Uruguay basin, arroyo Palomas – New synonym).

231
232 **Material examined.** All from rio Uruguai basin: **Rio Quaraí drainage:** ILPLA 886,
233 holotype, 35.4 mm SL, Uruguay, Rivera, creek at km 18 of route joining Santana do Livramento,
234 Brazil, and Riveira, Uruguay, close to border, tributary to rio Quaraí drainage (ca. 31°00' S
235 55°30'W). ILPLA 883, paratypes, 95, 24.2-35.4 mm SL □ ANSP 177878, paratypes, 3 + 1 c&s, 22.8-
236 31.3 mm SL □ MCP 26154, paratypes, 3 + 1 c&s, 22.6-32.1 mm SL □ and MLP 9536, 4, 27.2-34.1
237 mm SL □ collected with the holotype. AI 187, paratypes of *H. candombe*, 3, 23.6-29.2 mm SL,
238 Uruguay, Artigas, arroyo Catalán Grande, 30°50'35" S 56°14'30" W. MCP 11215, 128 + 4 c&s
239 13.5-38.4 mm SL, Brazil, Quaraí, arroio Quaraí-Mirim on road between Quaraí and Alegrete,

240 30°18'S 56°19'W. MCP 35239, 1, 39.4 mm SL, Brazil, Quaraí, arroio Quaraí-Mirim on road from
241 Quaraí to Baltazar Brum train station about 20 km northeast from Quaraí, 30°14'38"S 56°18'23"W.
242 UFRGS 4208, 1, 31.9 mm SL, Brazil, Uruguaiana, sanga Mergulhão tributary of arroio Garupá on
243 highway BR-290. UFRGS 7763, 3, 19.7-38.3 mm SL, Uruguay, Artigas, arroyo Cuaró Grande on
244 ruta 4, 30°46'57"S 56°46'47"W. **Río Ibicuí drainage:** MCN 11383, 2, 35.5-37.7 mm SL, Brazil,
245 Alegrete, sanga do Lagoão about 20 km south of Alegrete, tributary of arroio Pai-Passo, tributary of
246 rio Ibirapuitã, MCP 11373, 3, 13.6-18.8 mm SL, Brazil, Quaraí, arroio Pai-Passo on highway RS-
247 185 between Alegrete and Santana do Livramento, 30°13'S 56°02'W. MCP 27659, 1, 36.8 mm SL,
248 Brazil, Tupaciretã, rio Santana near to locality of Jari, tributary to rio Jaguari, 29°14'33"S
249 54°16'47"W. **Río Arapey Grande drainage:** ZVC-P 5595, holotype of *Hisonotus candombe*, 28.7
250 mm SL, Uruguay, Salto, Arroyo Palomas, 31°04'43S 57°37'26"W. ZSM 32062, paratype of *H.*
251 *candombe*, 1, 25.9 mm SL □ AI 164, paratype of *H. candombe*, 25.5 mm SL □ and MHNG 2662.86,
252 paratype of *H. candombe*, 1, 26.3 mm SL, collected with the holotype. UFRGS 8029, 1, 26.3 mm
253 SL, Uruguay, Salto, creek tributary to Río Arapey Grande on ruta 4. **Other drainages of Río**
254 **Uruguay:** UFRGS 7976, 3, 32.3-40.8 mm SL, Uruguay, Artigas, arroyo Guaviyú on ruta 3,
255 30°38'S 57°41'W. UFRGS 8064, 3, 29.9-43.4 mm SL, Uruguay, Artigas, arroyo Mandiyú on ruta
256 3, 30°51'S 57°39'W. UFRGS 8573, 3, 33.5-40.6 mm SL, Uruguay, Salto, arroyo del Tala on ruta
257 31 between Artigas and Salto, 31°23'S 57°33'W.

258 **Diagnosis.** *Hisonotus ringueleti* differs from its congeners, except *Hisonotus* sp. "Camaquã",
259 by the presence of serrae along the posterior margin of the pectoral-fin spine (serrae feeble or absent
260 in larger specimens □ Fig. 7) vs. serrae absent, posterior margin smooth (juveniles of some species
261 presenting serrae along the distal half of posterior margin of pectoral-fin spine). *Hisonotus*
262 *ringueleti* differs from *Hisonotus* sp. "Camaquã" by having lower lateral plate count 22-24 (Tab. 3)

263 vs. 25-27 lateral plates□by having three predorsal plates vs. four predorsal plates□and by having
264 round caudal peduncle in cross section vs. slightly square caudal peduncle in cross section.

265 **Description.** This species was recently described by Aquino et al. (2001) and will not be
266 redescribed here.

267 **Distribution and habitat.** *Hisonotus ringueleti* is distributed in tributaries of the left margin
268 of the middle rio Uruguai basin, from the southern Río Arapey Grande in Uruguay, to the northern
269 rio Ibicuí drainage in Brazil (Fig. 8). This species inhabits small creeks of median to rapid flow
270 watercourses. Collected in clear to brown waters of sandy and rocky bottom. Captured associated
271 with marginal or aquatic submersed vegetation. *Hisonotus ringueleti* is collected together with
272 *Hisonotus charrua* along its distribution.

273 **Remarks on type-locality.** *Hisonotus ringueleti* was described from a single locality on the
274 Río Uruguay basin (Aquino et al., 2001). The type-locality is a creek tributary to the rio Quaraí at
275 km 18 of route joining Santana do Livramento, Brazil and Rivera, Uruguay (ca. 31°00'S 55°30'W).
276 However, the cities of Rivera and Santana do Livramento are separated by an avenue, without a
277 route of 18 km between each other. These cities are surrounded by the headwaters of three large
278 drainages, rio Negro, rio Quaraí, and rio Ibicuí, all tributaries to the rio Uruguai basin. The
279 approximate coordinates (ca. 31°00' S 55°30'W) as well as all localities about 18 km from Rivera
280 in Uruguay are situated in the rio Negro drainage. However, *Hisonotus ringueleti* was not found in
281 that drainage. The headwaters of rio Quaraí drainage, nearby Santana do Livramento/Rivera were
282 located at the Brazilian territory or more distant, in the Departamento of Artigas in Uruguay, which
283 seems the most probable type-locality of *Hisonotus ringueleti*.

284 **Comments on synonym.** Examination of the type-series of *Hisonotus candombe* (Fig. 7B)
285 did not reveal any consistent differences between the later and *Hisonotus ringueleti*. According to
286 Casciotta et al. (2006, p.150) *H. candombe* differs from *H. ringueleti* in having larger pectoral spine

287 serrae distributed all along the posterior margin of the pectoral spine vs. serrae smaller and placed
288 on distal two thirds of the spine. Besides that, *H. candombe* could be distinguished from *H.*
289 *ringueleti* by having five branched anal-fin rays and males with a smaller flap on first pelvic-fin
290 unbranched ray, whereas *H. ringueleti* presents four anal-fin rays and a well developed flap. A
291 disappearance of the pectoral-fin spine serrae in the ontogeny of specimens of *H. ringueleti* was
292 observed. Smaller individuals of that species present strong serrations on the posterior portion of
293 pectoral spine, decreasing in size with the development, being totally absent at about 35 mm SL
294 (Fig. 7). A similar disappearance of serrae in adults occurs in *Hisonotus* sp. “Camaquã”, and in
295 several other congeners. Since specimens used in the description of *H. candombe* are relatively
296 small (range size 22.8-30.0 mm in SL), compared to the range of the species (up to 43 mm) that
297 difference seems to be due to degree of ontogenetic development. In the same manner, a smaller
298 pelvic flap in males of *H. candombe* is related with the maturity of the individuals, and not useful to
299 diagnose the species. Lastly, the anal-fin ray count is identical in both nominal species. The
300 description of Aquino et al. (2001, tab.1) of four branched anal-fin rays for *H. ringueleti* seems to
301 be an error, since from 30 paratypes examined only one specimen presented four branched anal-fin
302 rays. Fin-ray counts do not vary considerably within or among species of *Hisonotus*, and are not
303 useful to distinguish species. Therefore *H. candombe* is considered a junior synonym of *H.*
304 *ringueleti*.

305

306 ***Hisonotus aky* (Azpelicueta, Casciotta, Almirón & Körber, 2004).**

307 (Figures 9-10, Table 4)

308 *Epactionotus aky* Azpelicueta, Casciotta, Almirón & Körber, 2004: 81-90, [original description,
309 type locality: Arroyo Garibaldi, rio Uruguay basin at Misiones, Argentina].-Liotta,
310 2005:354 [listed].

311 *Hisonotus* sp. “Argentinien”. - Evers & Seidel, 2002 [listed and illustrated].

312 *Hisonotus aky*. -Reis & Carvalho, 2007 [misidentified with *H.* sp. “Chapecó” new species].

313 **Material examined.** All from rio Uruguay basin: AI 124, holotype of *Epactionotus aky*, 29.2
314 mm SL, Argentina, Misiones, arroyo Garibaldi, tributary of arroyo Yabotí-Guazú, 26°38'46”S
315 053°59'55”W. AI 125, paratypes of *E. aky*, 7, 25.0-34.5 mm SL, same collecting data as holotype.
316 MCP 41474, 36 + 3 c&s 18.2-39.7 mm SL, Brazil, Rio Grande do Sul, Paim Filho, rio Forquilha at
317 Espraiado bathing spot on secondary road from Maximiliano de Almeida to Paim Filho, 27°40'37”S
318 51°44'11”W.

319 **Diagnosis.** *Hisonotus aky* differs from its congeners, except from *Hisonotus ringueleti*,
320 *Hisonotus* sp. “Sinos”, *Hisonotus* sp. “Prata”, *Hisonotus* sp. “Canoas”, *Hisonotus* sp. “Passo
321 Fundo”, and *Hisonotus* sp. “Passo Novo” by the presence of a narrow odontode-free band in the
322 anterior portion of snout (Fig. 11) and by its general color pattern in life, which is greenish (Fig. 12)
323 vs. presence of a snout completely covered with odontodes, without an anterior odontode-free band,
324 and general color pattern in life yellowish to light brown, or light gray. *Hisonotus aky* differs from
325 species mentioned above by its relatively narrow odontode-free band in the anterior portion of the
326 snout contrasting with a wider odontode-free area. Further, *H. aky* differs from *H. ringueleti* by
327 having the posterior portion of the pectoral fin smooth, vs. posterior portion serrated. Differs from
328 *Hisonotus* sp. “Sinos”, *Hisonotus* sp. “Prata”, *Hisonotus* sp. “Passo Novo”, and *Hisonotus* sp.
329 “Passo Fundo” by the color pattern of the caudal fin, which is composed by dark vertical bars vs
330 color pattern composed by two hyaline blotches in upper and lower lobes or caudal fin almost
331 completely dark except for light areas on posterior portion of most dorsal and ventral rays.
332 *Hisonotus aky* differs from *Hisonotus* sp. “Canoas” by having narrow longitudinal light stripes on
333 the head vs. wider longitudinal light stripes markings in the head.

334 **Description.** This species was recently described by Azpelicueta et al. (2004) and will not be
335 redescrbed here.

336 **Distribution and habitat.** *Hisonotus aky* is known only from two tributaries of the rio
337 Uruguai widely separated from each other: small affluents to arroyo Yabotí-Guazú a tributary to
338 middle Río Uruguay basin in Argentina (type-locality), and from rio Forquilha a tributary to upper
339 rio Uruguai basin in Brazil (Fig. 13). There is a large distributional hiatus between these populations
340 located in different tributaries. However, these populations are similar in morphometric data (Tab.
341 4) and no additional morphological difference was found between them, except for a more densely
342 pigmented caudal fin in specimens from rio Forquilha (Fig.13). Hence, these populations are
343 considered conspecific. The population in rio Forquilha inhabits a rapid flowing watercourse, with
344 clear to brown waters and rocky bottom. The individuals were found between aquatic vegetation of
345 the genus *Echinodorus*, which form green islands between the rocky substrate (Fig. 14).

346 **Remarks.** *Hisonotus aky* (Azpelicueta, Casciotta, Almirón & Körber, 2004) was originally
347 described in *Epactionotus* Reis & Schaefer, 1998 because of its supposed possession of three
348 synapomorphies proposed for that genus: neural spine of seventh vertebra not contacting nuchal
349 plate dorsally (contacting unpaired predorsal plates), first dorsal proximal radial contacting the
350 eighth vertebral centrum, and absence of an expanded fleshy flap on the dorsal surface of the first
351 pelvic-fin ray in males. Also, *Hisonotus aky* possesses one of the additional diagnostic characters of
352 *Epactionotus*: longitudinal light stripes on dorsal surface of head. However, the examination of type
353 specimens of *Epactionotus aky* indicates the absence of most diagnostic features for the genus. The
354 first pelvic fin without dorsal skin flap in males is a derived feature, evolving three times
355 independently in Hypoptopomatinae (*Schizolecis*, *Epactionotus*, and the clade formed by
356 *Acestridium*, *Oxyropsis*, *Hypoptopoma*, and *Nannoptopoma*) according to the topology proposed by
357 Schaefer (1998:382) and Gauger & Buckup (2005:511). The presence of a fleshy flap on the dorsal

358 surface of the first pelvic-fin ray of mature males is pleosimorphic and shared by all species of
359 *Hisonotus*, most hypoptopomatines, and *Epactionotus aky* (Fig 15). Another two synapomorphies
360 proposed by Reis & Schaefer (1998) for *Epactionotus* are, neural spine of seventh vertebra not
361 contacting the nuchal plate dorsally and first proximal radial of dorsal fin contacting the eighth
362 vertebra (Fig. 16A). These character-states are not present in *H. aky*, which shares with remaining
363 *Hisonotus* species and other hypoptopomatines (except *Microlepidogaster*) the neural spine of the
364 seventh vertebra contacting the nuchal plate, at least posteriorly and the first proximal radial of
365 dorsal fin contacting the seventh vertebra (Fig. 16B). Another character, discussed by Azpelicueta *et*
366 *al.* (2004), suggesting the inclusion of *H. aky* in *Epactionotus* is the presence of light longitudinal
367 stripes on head and trunk. Because the presence of light stripes is more widespread among
368 hypoptopomatines and appears in several species of *Hisonotus*, that feature does not diagnose *H.*
369 *aky* as belonging to the genus *Epactionotus*. Moreover, *Epactionotus aky* share with two species of
370 *Hisonotus* (*H. sp.* “Canoas” and *H. sp.* “Chapecó”) the presence of an infraorbital canal entering the
371 infraorbital series via the compound pterotic, which is a derived feature and suggests a close
372 relationship between these species. For these reasons, *Epactionotus aky* is treated here as belonging
373 to the genus *Hisonotus*.

374

375 ***Hisonotus charrua* Almirón, Azpelicueta, Casciotta & Litz, 2006**

376 (Figures 17-18, Table 5)

377 *Hisonotus charrua* Almirón, Azpelicueta, Casciotta & Litz, 2006: 87-94 [original description, type

378 locality: Uruguay, Departamento Tacuarembó, Río Uruguay basin, Cañada de Los Peña].-

379 Reis & Carvalho, 2007:83 [listed].

380 **Material examined.** from rio Uruguai basin. **Río Negro drainage:** ZVC-P 5639, holotype,
381 49.2 mm SL, Uruguay, Tacuarembó, Cañada de Los Peña, 31°39'05"S 56°12'19'W. AI 165,

382 paratypes, 5, 37.1-48.7 mm SL, collected with the holotype. MCP 9648, 1, 34.2 mm SL, Brazil,
 383 Bagé, rio Negro on bridge of highway BR-293 between Bagé and Aceguá, 31°21'S 54°03'W. MCP
 384 16177, 3, 27.1-36.1 mm SL, Brazil, Bagé, rio Piraizinho on road from Bagé to Dom Pedrito,
 385 31°17'S 54°09'W. MCP 40256, 4 + 1 c&s, 32.8-50.3 mm SL, same collecting site of holotype.
 386 UFRGS 9242, 15, 26.6-38.3 mm SL, Uruguay, Durazno, arroyo Maestre de Campo on road to
 387 Polanco de Yí, tributary of Río Yí, 33°24'55"S 56°12'06"W. UFRGS 7184, 9 + 2 c&s, 18.0-46.2
 388 mm SL, Uruguay, Rivera, lateral pools and arroyo Corrales on ruta 27, tributary of Río
 389 Tacuarembó, 31°23'26"S 55°15'14"W. UFRGS 7185, 12, 15.9-39.8 mm SL, Uruguay, Rivera,
 390 arroyo Batovi at km 24 of ruta 27, tributary of Río Tacuarémbo drainage. UFRGS 7186, 3, 15.8-
 391 20.6 mm SL, Uruguay, Tacuarémbo, arroyo Batovi on km 365 of ruta 5, about 20 km from
 392 Tacuarembó tributary of Río Tacuarembó drainage, 31°43'S 55°46'W. UFRGS 7187, 3, 16.1-28.3
 393 mm SL, Uruguay, Rivera, arroyo Cunãpiru on km 12 of ruta 27 Río Tacuarémbo drainage,
 394 31°02'21"W 55°29'31"S. **Other drainages of rio Uruguai:** MACN 7593, 1, 40.5 mm SL,
 395 Argentina, Entre Rios, Parque Nacional El Palmar. UFRGS 7977, 2, 32.7-38.5 mm SL, Artigas,
 396 Uruguay, arroyo Guaviyú on ruta 3, 30°38'00"S 57°41'16"W. UFRGS 9195, 8, 25.1-40.9 mm SL,
 397 Uruguay, Artigas, arroyo Mandiyú on ruta 3, 30°51'55"S 57°39'57"W. AI 176, paratype, 1, 35.9
 398 mm SL, Uruguay, Salto, arroyo Aspinillar in Constitución. **Uruguay coastal drainages:** MAPA
 399 1969, 15, 14.7-47.2 mm SL, Uruguay, Maldonado, San Carlos, arroyo Maldonado. MAPA 2282,
 400 57, 41.2 mm SL, Uruguay, Canelones, arroyo Tropa Vieja (bridge of Tambó) Pinamar. MCP
 401 40257, 3, 37.3-40.3 mm SL, Uruguay, Canelones, arroyo Tropa Vieja, 34°44'59"S 55°50'46"W.
 402 MCP 40258, 1, 45.7 mm, Uruguay, Canelones, SL arroyo Tropa Vieja on Interbalnearia,
 403 34°46'45"S 55°52'12"W. MCP 40255, 1, 38.8 mm SL, Uruguay, Canelones, arroyo Sauce on km
 404 38 of Ruta 7, 34°38'48"S 55°58'27"W. **Río Quaraí drainage:** AI 186, paratype, 1, 40.5 mm SL,
 405 Uruguay, Artigas, arroyo Catalán Grande, 30°50'40"S 56°12'19"W. MCP 11351, 3, 12.8-18.4 mm

406 SL, Brazil, Quaraí, small creek affluent of arroio Garupá, 30°09'S 56°13'W. MCP 19573, 41, 20.7-
407 41.5 mm SL, rio Quaraí-Mirim on road between Uruguaiiana and Quaraí, Quaraí, Brazil,
408 30°15'29"S 56°30'37"W. MCP 21644, 32, 30.6-46.0 mm SL, Brazil, Quaraí, rio Quaraí-Mirim on
409 road between Uruguaiiana and Quaraí, 30°15'21"S 56°30'23"W. MCP 35303, 3, 33.8-41.5 mm SL,
410 Brazil, Quaraí, arroio Garupá on road from Quaraí to Harmonia, about 33 km northeast of Quaraí,
411 30°09'45"S 56°14'08"W. MCP 40904, 23 + 4 c&s, 17.6-45.6 mm SL, Brazil, Quaraí, arroio
412 Quaraí-Mirim on road between Uruguaiiana and Quaraí, 30°18'S 56°19'W. UFRGS 7926, 1, 21.1
413 mm SL, Uruguay, Artigas, arroyo Yucutujá on ruta 3. **Rio Ibicuí drainage:** MCP 9630, 2, 23.4-
414 33.4 mm SL, Brazil, Dom Pedrito, rio Santa Maria at km 246 of highway BR-293, between Dom
415 Pedrito and Santana do Livramento, 30°59'S 54°42'W. MCP 23090, 1, 44.4 mm SL, Brazil, São
416 Francisco de Assis, arroio Sanga Funda about 15 km southeast from São Francisco de Assis,
417 29°39'02"S 55°00'06"W. MCP 27539, 4 + 2 c&s, 28.8-46.6 mm SL, Brazil, Jaguari, arroio do
418 Tigre on highway BR-453/Ijuçapirama, about 2.5 km northeast from BR-453, 29°28'18"S
419 54°40'19"W. MCP 27545, 1, 42.6 mm SL, creek affluent of rio Santana, near Jari, tributary to rio
420 Jaguari, Tupanciretã, Brazil, 29°13'56"S 54°21'23"W. MCP 27567, 1, 28.6 mm SL, Brazil, Jaguari,
421 creek affluent of rio Tunas on highway BR-453/Ijuçapirama, tributary to rio Jaguari, 29°26'27"S
422 54°35'35"W. MCP 27604, 7, 15.2-35.3 mm SL, Brazil, Jaguari, arroio Capivari on highway BR-
423 453/Jari, tributary to rio Jaguari, 29°21'10"S 54°28'32"W. MCP 27611, 15, 16.5-40.7 mm SL,
424 Brazil, São Francisco de Assis, arroio Carai-Passo on road from São Francisco de Assis to Manoel
425 Viana, 29°31'03"S 55°10'49"W. MCP 27625, 3, 29.8-37.0 mm SL, Brazil, Tupanciretã, rio Santana
426 near Jari, tributary to rio Jaguari, 29°14'33"S 54°16'47"W. MCP 41631, 5, 34.4-39.74 mm SL,
427 Brazil, São Francisco de Assis, rio Inhacunda at São Francisco de Assis going to Manoel Viana,
428 29°32'51"S 55°08'11"W. MCP 41632, 1, 32.7 mm SL, Brazil, São Francisco de Assis, rio
429 Inhacunda at São Francisco de Assis about 500 meters above pottery, 29°32'27"S 55°07'45"W.

430 MCP 41633, 5, 26.8-32.6 mm SL, Brazil, São Francisco de Assis, rio Inhacunda at São Francisco de
431 Assis on road to Manoel Viana, 29°32'51"S 55°08'11"W. MCP 41634, 6, 19.1-37.2 mm SL, Brazil,
432 São Francisco de Assis, creek affluent to rio Inhacunda at São Francisco de Assis about 300 meters
433 from pottery, 29°32'39"S 55°07'50"W. UFRGS 2576, 1, 34.5 mm SL, Brazil, Santa Maria, arroio
434 Taquara at km 10 on highway RS-453 between Santa Maria and Santiago. UFRGS 8332, 3, 36.8-
435 39.7 mm SL, Brazil, Bagé, rio Santa Maria on highway BR-293 between Bagé and Dom Pedrito,
436 31°08'S 54°22'W. UFRGS 8333, 1, 40.4 mm SL, Brazil, Bagé, arroio Santa Maria Chico affluent
437 of rio Santa Maria on highway BR-293, 31°04'S 54°29'W. **Rio Ijuí drainage:** MCP 9616, 1, 32.5
438 mm SL, Brazil, Panambi, riacho Raiz Mana at Condor on road from Palmeira das Missões to
439 Panambi, 28°13'S 53°29'W. MCP 16751, 1, 34.5 mm SL, Brazil, Jóia, creek affluent of rio
440 Ijuizinho near Jóia, on road from Eugênio de Castro to Jóia, 28°39'S 54°07'W. MCP 16770, 1, 28.7
441 mm SL, Brazil, Eugenio de Castro, creek affluent of rio Ijuizinho, 2 km from Eugenio de Castro on
442 road to Jóia, 28°33'S 54°07'W. MCP 34876, 1, 37.4 mm SL, Brazil, São Pedro do Butiá, arroio
443 Albino, 28°08'10"S 54°55'28"W. MCP 34968, 2 c&s, 19.3-34.9 mm SL, Brazil, Roque Gonzales,
444 arroio Portão, 28°06'21"S 54°58'33"W. MCP 35337, 4, 34.8-42.3 mm SL, Brazil, São Pedro do
445 Butiá, arroio Albino, 28°08'10"S 54°55'28"W. MCP 37035, 4, 37.2-39.0 mm SL, Brazil, São Pedro
446 do Butiá, arroio Albino, 28°08'10"S 54°55'28"W. MCP 37064, 3, 34.0-40.4 mm SL, Brazil, Roque
447 Gonzales, arroio Portão, 28°06'21"S 54°58'33"W. MCP 37232, 2 + 2 c&s 36.1-38.4 mm SL,
448 Brazil, São Pedro do Butiá, arroio Albino, 28°08'10"S 54°55'28"W. MCP 37270, 4, 23.1-33.6 mm
449 SL, Brazil, Dezesseis de Novembro, lageado Araçá, 28°12'23"S 54°56'58"W. UFRGS 4329, 3,
450 37.8-45.6 mm SL, Brazil, Panambi, rio Caxambu, at km 275 of highway BR-285, 28°19'S
451 53°39'W. From laguna dos Patos system. **São Gonçalo drainage:** MCP 25139, 15 + 2 c&s, 32.4-
452 46.4 mm SL, Brazil, Pinheiro Machado, arroio dos Pires on bridge of railroad at Passo dos Pires,
453 31°38'S 53°27'W.

454 **Diagnosis.** *Hisonotus charrua* differs from its congeners, except from *Hisonotus armatus*,
455 *Hisonotus* sp. “Ariranhas”, *Hisonotus laevior*, *Hisonotus* sp. “Camaquã”, and *Hisonotus taimensis*
456 by the color pattern of the caudal fin, which has a hyaline transverse band composed of clear spots
457 (a second posterior band in larger individuals) in a dark background vs. a different pattern from the
458 above described □hyaline areas not forming clearly defined transversal stripe in the middle portion
459 of caudal fin. *Hisonotus charrua* is distinguished from *Hisonotus armatus* and *Hisonotus* sp.
460 “Ariranhas” by having a narrow naked band, without odontodes on the anterior margin of snout vs.
461 snout completely covered by odontodes. *Hisonotus charrua* is distinguished from *Hisonotus*
462 *laevior*, *Hisonotus* sp. “Camaquã”, and *Hisonotus taimensis* by the number of median plates 23-25
463 vs. 25-28 plates, and by vertebral count 28-29 vs. 30-32 vertebrae.

464 **Description.** This species was recently described by Almirón et al. (2006) and will not be
465 redescribed here.

466 **Distribution and habitat.** *Hisonotus charrua* is widely distributed in the middle and lower
467 portions of the rio Uruguai basin from the northern rio Ijuí drainage in the Rio Grande do Sul state,
468 Brazil to the southern Río Negro drainage in the Uruguay. Besides the limits of the rio Uruguai
469 basin, this species is known from the coastal streams of Uruguay, and from a single locality in the
470 headwaters of São Gonçalo drainage in the laguna dos Patos system (Fig. 19). The new species is
471 synpatric with *H. ringueleti* along its distribution. In several streams tributaries to rio Ibicuí and Río
472 Negro drainage *H. charrua* is usually collected together with *H. nigricauda*. This species inhabits a
473 variety of habitats, usually small to medium size creeks with loose stones, and gravel bottom, with
474 medium to rapid-flowing water. Collected associated to marginal vegetation composed by grasses or
475 *Echinodorus* sp.

476 **Variation.** There are morphological differences between the specimens collected in the rio
477 Ijuí drainage (the northern distribution limit of the species) and the other drainages tributaries to the

478 rio Uruguai basin and Río de La Plata. The specimens from the rio Ijuí drainage possess a narrow
479 stripe devoid of odontodes in the anterior portion of the snout (Fig. 20), vs. a wider naked odontode-
480 free band in the specimens from the other tributaries (including the type-locality in the Río Negro
481 drainage—Fig. 21). However, that population is diagnosed by the same features as other *H. charrua*
482 populations, and no additional differences were found.

483

484 ***Hisonotus* sp. “Chapecó”, new species**

485 Figure 22, Table 6

486 *Hisonotus aky* non (Azpelicueta, Casciotta, Almirón, Körber, 2004).-Reis & Carvalho (2007:
487 84) [listed misidentified].

488

489 **Holotype.** MCP uncataloged, 33.4 mm SL, female, Brazil, Santa Catarina, Coronel de
490 Freitas, rio Chapecó at vila São Miguel on road from Coronel de Freitas to Quilombo, rio Uruguai
491 basin, 26°51'26”S 052°44'29”W, 23 Jan 2006, C. A. S. Lucena, V. Bertaco, E. Pereira J. P. Pereira.

492 **Paratypes.** MCP 40029, 22 + 3 c&s, 21.6-29.7 mm SL, collected with the holotype.

493 **Diagnosis.** *Hisonotus* sp. “Chapecó” differs from its congeners by the lower lateral plate
494 count 20-22 vs. 23-29 lateral plates (Tab. 3), and by the lower vertebral count 25-26, vs. 27-32
495 vertebrae. Additionally, it can be distinguished from all other congeners, except *Hisonotus aky* and
496 *Hisonotus* sp. “Canoas”, by having an infraorbital canal entering the infraorbital series via the
497 compound pterotic (Fig. 23A) vs. infraorbital canal entering the infraorbital series via the sphenotic
498 (Fig. 23B).

499 **Description.** Morphometrics and meristics in Table 6. Adult size small for members of this
500 genus (maximum size 33.4 mm in SL). Body stocky, without conspicuous keels. Caudal peduncle
501 round in cross section. Dorsal profile almost straight from snout to supraoccipital tip, convex bump

502 on internareal region. Almost straight from posterior parieto-supraoccipital tip to dorsal-fin origin,
503 except for posterodorsally inclined profile of nuchal region. Dorsal-fin base straight and
504 posteroventrally sloped, straight from posterior end of dorsal-fin base to posterior end of caudal
505 penduncle. Ventral profile straight from snout tip to anal-fin origin, concave at anal-fin base, and
506 straight from posterior end of anal-fin base to caudal-fin origin. Greatest body depth at dorsal-fin
507 origin. Least body depth at caudal peduncle. Posterior profile of caudal fin concave. Head and snout
508 broad, snout rounded in dorsal view, body progressively narrowing posterior to pectoral-fin
509 insertion. Snout region anterior of nares depressed, interorbital region slightly convex. Upper
510 margin of orbit not elevate. Eye dorsolaterally positioned. Iris operculum present.

511 Pectoral fin I,6. Pectoral-fin posterior margin gently curved when depressed tip extending
512 anterior to middle of pelvic fin. Posterior margin of pectoral-fin spine smooth in adults, juveniles
513 with feeble serrae along distal third of pectoral-fin spine. Pectoral-fin axillary slit present, slit
514 posteroventrally sloped below posterior margin of cleithral process. Pelvic fin i,5, tip of depressed
515 fin just reaching anal-fin origin in females, but extending far beyond that point in males. Dorsal fin
516 II,7. Dorsal-fin origin located posterior to vertical through pelvic-fin origin. Dorsal-fin spinelet
517 somewhat rounded in shape. Anal fin i,5. First anal-fin pterygiophore exposed anterior to anal fin.
518 Adipose fin absent. Caudal fin i,14,i.

519 Body almost entirely covered by plates except for region overlying opening of swim bladder
520 capsule, area between pectoral girdle and lower lip, region around anus, and area around base of
521 paired fins. Rostral plate with posterior notch articulation with mesethmoid. Rostral plate thickened,
522 completely covered by odontodes without anterior odontode-free band (Fig. 24). Region anterior to
523 nares completely covered by plates, prenasal plates anterior to nares not reduced in size. Three rows
524 of predorsal plates. Median series formed by 20–22 plates (Tab. 3). Lateral line incomplete, with
525 gap without pores along middle length of body, posterior portion of lateral line sometimes absent.

526 Median-plate series truncated, not reaching posterior end of caudal peduncle (Fig. 25). Lateral
527 abdominal plates large and forming regular series of three to five plates on each side. Median
528 abdominal series formed by one to three irregularly arranged series. Plates of pre-anal shield region
529 large (Fig. 26). Coracoid and cleithrum exposed and covered by odontodes, except for median
530 region of cleithrum between arrector fossae openings and medial region of coracoids.

531 Head without conspicuous crests, except for enlarged odontodes on parieto-supraoccipital tip,
532 forming raised tuft (Fig. 27). Head, fin-spines, and body plates covered with odontodes, these larger
533 on anterior surface of all fin spines, and on ventral margin of rostrum. Anteroventral margin of
534 compound pterotic with median-to-large size perforations. Infraorbital canal entering infraorbital
535 series via compound pterotic. Lips roundish and papillose, posterior margin of lower lip gently
536 fimbriate to smooth. Maxillary barbel present.

537 Premaxillary and dentary teeth slender proximally and flattened distally□bifid, major (medial)
538 cusp large and rounded, minor (lateral) cusp minute and pointed. Accessory patch of teeth absent on
539 dentary and premaxilla.

540 Hypurals 1-2 and 3-5 completely fused, without median notch on posterior margin of caudal-
541 fin. Total vertebrae 25-26 (2 c&s).

542 **Color in alcohol.** Ground color of dorsal and lateral surfaces carbon black. Dorsolateral
543 region of head with paired longitudinal stripes, beginning at tip of snout, passing through nares and
544 reaching anterior orbit margin. Parieto-supraoccipital tip lighter than surrounding areas.
545 Ventrolateral and ventral surfaces yellowish, with scattered chromatophores, most concentrated on
546 cheek, bases of paired fins, and caudal peduncle. Fins mostly unpigmented, except for dark
547 transverse bars, forming striped pattern. Middle portion of caudal fin with wide hyaline bar. Ground
548 color in life dark green.

549 **Sexual dimorphism.** Characterized by the urogenital papilla, positioned just behind anal
550 opening in males. Adult males also possess a developed fleshy flap along dorsal margin of first
551 thickened pelvic-fin ray, that is absent in females. Flap slightly wider basally and progressively
552 narrowing distally. Middle portion of first and second branched rays with a slightly developed
553 fleshy flap. Flaps absent in juvenile males and females. Males have a longer pelvic-fin unbranched
554 ray that extends beyond anal-fin origin, with pelvic-fin just reaching origin of anal fin in females.

555 **Distribution and habitat.** *Hisonotus* sp. “Chapecó” is known only for the type locality in rio
556 Chapecó, a tributary of the upper rio Uruguai basin (Fig. 13). Rio Chapecó, at the collection site of
557 the new species, is a wide and shallow river with a median to fast flow watercourse. The stream has
558 clear waters running over a rocky bottom. The species is collected in the aquatic submersed
559 vegetation.

560

561 *Hisonotus* sp. “Ariranhas”, new species

562 Figures 28-29, Table 7

563 *Hisonotus* sp. 8 in Reis & Carvalho (2007: 84) [listed].

564

565 **Holotype.** MCP uncataloged, 42.2 mm SL, female, Brazil, Santa Catarina, Xavantina, rio
566 Ariranhas on bridge of highway SC-466, rio Uruguai basin 27°04’17”S 052°20’34”W, 30 Apr
567 2007, T. P. Carvalho, A. R. Cardoso & C. A. Cramer.

568 **Paratypes.** All from Brazil, Santa Catarina, rio Uruguai basin: MCP 41354, 5 + 2 c&s 18.3-
569 40.8 mm SL, collected with the holotype. MCN 12741, 2, 37.4-37.6 mm SL, same type locality, 8
570 Jul 1996, W. R. Koch, M. Rosenau & K. M. Grosser. MCP 41351, 1, 19.8 mm SL, Xavantina, rio
571 Ariranhas about 800 meters northeast from urban area of Xavantina, 27°03’55”S 052°20’10”W, 30
572 Apr 2007, T. P. Carvalho, A. R. Cardoso & C. A. Cramer. MCN 12024, 1, 40.2 mm SL, Concórdia,

573 rio Rancho Grande on the highway SC-461, 27°20'22"S 051°57'50"W, 27 Jul 1995, R. C. Vieira,
574 R. R. Estevão & K. M. Grosser. MCN 12553, 1, 37.4 mm SL, Concórdia, rio Rancho Grande on
575 highway SC-461, 27°20'22"S 051°57'50"W, 25 Apr 1996, W. R. Koch, M. Rosenau & K. M.
576 Grosser.

577 **Diagnosis.** *Hisonotus* sp. "Ariranhas" differs from its congeners, except *Hisonotus* sp.
578 "Canoas" by having wider light stripes on dorsolateral surface of head, from snout tip to posterior
579 end of compound pterotic, vs. narrow light stripes on dorsal surface of head extended from snout tip
580 to posterior end of compound pterotic, or no longitudinal stripes in that region. *Hisonotus* sp.
581 "Ariranhas" differs from *Hisonotus* sp. "Canoas" by having the snout completely covered with
582 odontodes, without an odontode-free band vs. anterior portion of snout with an odontode-free band □
583 by the life color pattern pale yellow to brown (Fig. 29), vs. light greenish □ and by the coloration of
584 the caudal fin which is composed by a dark ground crossed by vertical hyaline bar, vs. caudal fin
585 with several dark bars in a hyaline ground.

586 **Description.** Morphometrics and meristics in Table 7. Adult size moderate for members of
587 this genus (large adult reaching 42 mm in SL). Body somewhat robust, moderately elongate,
588 without conspicuous keels. Caudal peduncle round in cross section. Dorsal body profile convex
589 from snout tip to nuchal plate, straight and posterodorsally inclined over nuchal plate to dorsal-fin
590 origin. Straight and posteroventrally sloped at dorsal-fin base, straight from that point to caudal fin.
591 Ventral profile of body almost straight from snout tip to anal-fin origin, except for somewhat
592 concave margin from snout to posterior border of opercle. Straight and posterodorsally inclined at
593 anal-fin base, straight from that point to caudal-fin origin. Greatest body depth at dorsal-fin origin.
594 Least body depth at posterior end of caudal peduncle. Profile of posterior caudal fin margin
595 pronounced concave. Head and snout somewhat broad, snout rounded to slightly pointed in dorsal
596 view, body progressively narrowing caudally from pectoral-fin insertions. Snout region anterior to

597 nares depressed, interorbital region convex. Upper margin of orbit somewhat elevate. Eye
598 dorsolaterally positioned. Iris operculum present.

599 Pectoral fin I,6. Pectoral-fin posterior margin almost straight, when depressed, its tip reaching
600 middle of pelvic fin. Posterior margin of pectoral-fin spine smooth in adults, juveniles with
601 posterior half of spine serrate. Pectoral-fin axillary slit present, located below ventral margin of
602 cleithral process. Pelvic fin i,5. Tip of depressed fin not reaching anal-fin origin in females, but
603 surpassing that point in males. Dorsal II,7. Dorsal-fin origin located posterior to vertical through
604 pelvic-fin origin. Dorsal-fin spinelet somewhat rounded in shape. Anal fin i,5. First anal-fin
605 pterygiophore exposed anterior to anal fin. Adipose fin absent. Caudal fin i,14,i.

606 Body almost entirely covered by plates except for region overlying opening of swim bladder
607 capsule, area between pectoral girdle and lower lip, region around anus, and base of paired fins.
608 Rostral plate with posterior notch articulation with mesethmoid. Rostral plate thickened, anterior
609 margin completely covered by odontodes, without odontode-free band. Prenasal plates anterior to
610 nares reduced, a small unplated area positioned laterally between infraorbitals and prenasal plates.
611 Three rows of predorsal plates. Median series formed by 23–24 plates (Tab. 3). Lateral line
612 incomplete, with gap without pores along middle length of body. Median series not truncated,
613 reaching posterior end of caudal peduncle (Fig. 30). Abdominal plates composed by three rows,
614 lateral abdominal plates slightly larger, forming regular series of about four to five plates in each
615 side. Median abdominal series formed by one plate series. Pre-anal shield region formed by plates
616 of small size, irregularly arranged (Fig. 31). Coracoid and cleithrum exposed and covered by
617 odontodes, except for median region of cleithrum between arrector fossae openings and medial
618 region of coracoids.

619 Head without conspicuous crests. Odontodes on parieto-supraoccipital tip slightly larger than
620 those of surrounding areas, forming a slightly pronounced crest. Head, fin-spines, and body plates

621 covered with odontodes, these larger on anterior surface of all fin spines, and on ventral and dorsal
622 margin of rostrum. Anteroventral margin of compound pterotic with median-to-large size
623 perforations. Infraorbital canal entering infraorbital series via sphenotic. Lips roundish and
624 papillose, posterior margin of lower lip fimbriate. Maxillary barbel present.

625 Premaxillary and dentary teeth slender proximally and flattened distally□bifid, major (medial)
626 cusp round□minor (lateral) cusp minute pointed. Accessory patch of teeth absent on dentary and
627 premaxilla.

628 Hypurals 1-2 and 3-5 not completely fused, slight median notch on posterior portion of caudal
629 skeleton. Total vertebrae 29 (1 c&s).

630 **Color in alcohol.** Ground color of dorsal and lateral surfaces dark gray to light brown. Dorsal
631 and lateral portions of head darker than body. Light rounded spots over dorsal surface of head
632 between nares and orbits. Pair of longitudinal light stripes starting at snout tip and bifurcating
633 posterior to orbit. One branch reaching posterior end of parieto-supraoccipital and another branch,
634 not continuous, reaching posterior parieto-supraoccipital tip. Stripes wider than pupil diameter.
635 Ventrolateral region of head mostly yellowish, except for scattered dark marks, variable in shape.
636 Dorsolateral surface of body with three paired light longitudinal stripes. One pair more dorsally,
637 beginning at predorsal plate just after parieto-supraoccipital tip and reaching posterior end of caudal
638 peduncle. Two paired stripes more laterally located. Stripes beginning at posterior end of compound
639 pterotic, joining below dorsal-fin region and from that point, continuous as single stripe, reaching
640 posterior end of caudal peduncle. Sometimes presenting longitudinal stripe, at ventrolateral region,
641 from opercle to vertical trough end of anal-fin base. Ventral surface of body pale yellow with
642 scattered chromatophores. Grouped chromatophores forming dark blotches on cheeks, on bases of
643 pectoral fin, and on caudal peduncle. Unbranched rays of pectoral, pelvic, dorsal, anal, and caudal
644 fins mostly unpigmented, except for dark transverse bars. Branched rays of pectoral, pelvic, dorsal,

645 and anal fins mostly hyaline except for transverse dark bars. Caudal-fin branched rays mostly dark
646 pigmented, except for hyaline posterior portion of upper rays, and for transversal hyaline bar,
647 composed by rounded light spots crossing middle portion of caudal fin. Ground color in life
648 yellowish.

649 **Sexual dimorphism.** Characterized by the presence of an urogenital papilla, positioned just
650 behind the anal opening in males. Adult males also possess a fleshy flap along the dorsal margin of
651 the first thickened pelvic-fin ray. Flap is absent in juveniles males and females. Males show a
652 longer pelvic-fin unbranched ray that surpasses anal-fin origin, falling short of this point in females.

653 **Distribution and habitat.** *Hisonotus* sp. “Ariranhas” is only known from two tributaries of
654 the right margin of the rio Uruguai, rio Ariranhas and rio Rancho Grande, in the upper rio Uruguai
655 basin (Fig. 13). This species inhabits median to fast flowing watercourses of clear water, with
656 stones and sand on the bottom, and are found in aquatic, partially submersed, vegetation islands
657 composed by grasses (Fig. 32). Recent collection efforts in rio Rancho Grande failed to capture
658 additional individuals of this species. After the flooding of the reservoir of the Itá dam (a power
659 plant downstream the mouth of rio Rancho Grande into the rio Uruguai) in the year of 2000, a large
660 portion of the rio Rancho Grande was flooded. The changes in the environment from a rapid
661 running river to a lentic habitat apparently are the cause of the species disappearance.

662

663 ***Hisonotus* sp. “Passo Fundo”, new species**

664 Figure 33, Table 8

665 *Hisonotus* sp. Câmara & Hahn (2002) [listed].

666 *Hisonotus* sp. 7. Reis & Carvalho (2007: 84) [listed].

667

668 **Holotype.** MCP uncataloged, 42.8 mm SL, female, Brazil, Rio Grande do Sul, Coxilha,
669 arroio Caraguatá on secondary road to highway BR-153 between Passo Fundo and Ipiranga,
670 28°07'55"S 052°20'56"W, 29 Apr 2007, T. P. Carvalho, A. R. Cardoso & C. A. Cramer.

671 **Paratypes.** All from Brazil, Rio Grande do Sul, rio Uruguai basin, rio Passo Fundo drainage,
672 MCP 41352, 10, 23.7-47.1 mm SL, collected with the holotype. MCP 31765, 2, 18.2-38.6 mm SL,
673 Passo Fundo, rio Passo fundo on highway BR-285, 28°14'55"S 052°18'39"W, 3 Jan 2003, W.
674 Bruschi Jr. & J. P. Silva. MCP 31779, 9 + 3 c&s, 30.7-43.9 mm SL, Passo Fundo, rio Passo Fundo,
675 downstream of Corsam dam, 28°15'15"S 052°18'52"W, 3 Jan 2003 W. Bruschi Jr. & J. P. Silva.

676 **Diagnosis.** *Hisonotus* sp. "Passo Fundo" differs from its congeners by the arrangement of
677 abdominal plates, which are composed by greatly enlarged lateral abdominal plates, which contact
678 each other at the belly midline, without a median abdominal series (Fig. 34). All other species of
679 *Hisonotus*, with the exception of *Hisonotus* sp. "Canoas", possess a median series between the
680 lateral abdominal plate or a naked area between them. This feature is polymorphic in *H.* "Canoas",
681 some individuals having enlarged lateral abdominal plates, contacting at the midline. *Hisonotus* sp.
682 "Passo Fundo" is distinguished from *Hisonotus* sp. "Canoas" by the color pattern, having narrow
683 light stripes on head extended from the snout tip to the posterior end of the compound pterotic, vs.
684 wider light stripes on head extended from the snout tip to posterior end of the compound pterotic □
685 by the caudal-fin color pattern which is almost completely dark, vs. color pattern composed by
686 vertical dark stripes, and by the infraorbital canal entering infraorbital series via sphenotic, vs.
687 infraorbital canal entering infraorbital series via compound pterotic.

688 **Description.** Morphometrics and meristics in Table 8. Adult size moderate to large for
689 members of this genus (larger individual surpassing 47 mm in SL). Body robust, somewhat
690 elongate, without conspicuous keels. Caudal peduncle round in cross section. Dorsal profile slightly
691 concave from tip of snout to nares, convex from that point to parieto-supraoccipital tip. Straight and

692 posterodorsally inclined from posterior end of parieto-supraoccipital to dorsal-fin
693 base straight and posteroventrally sloped, almost straight from posterior end of dorsal-fin base to
694 caudal-fin origin. Ventral profile almost straight from snout tip to anal-fin origin. Concave at anal
695 fin base, straight from that point to origin of caudal fin. Greatest body depth at dorsal-fin origin.
696 Least body depth just posterior to middle of caudal peduncle. Posterior profile of caudal-fin margin
697 concave Head and snout broad, snout rounded in dorsal view, body progressively narrowing
698 posterior of pectoral-fin insertion. Snout region anterior of nares slightly depressed □ interorbital
699 region straight to slightly convex. Upper margin of orbit not elevated. Eye dorsolaterally positioned.
700 Iris operculum present.

701 Pectoral fin I,6. Pectoral-fin posterior margin almost straight, when depressed tip extending
702 beyond middle of pelvic fin. Posterior margin of pectoral-fin spine smooth. Pectoral-fin axillary slit
703 apparently absent. Pelvic fin i,5. Tip of depressed fin not reaching anal-fin origin in females, but
704 extending just to that point in males. Dorsal II,7. Dorsal-fin origin located slightly posterior of
705 vertical through pelvic-fin origin. Dorsal-fin spinelet laterally extended. Anal fin i,5. First anal-fin
706 pterygiophore exposed anterior to anal fin. Adipose fin absent. Caudal fin i,14,i.

707 Body almost entirely covered by plates except for region overlying opening of swim bladder
708 capsule, area between pectoral girdle and lower lip, region around anus, and base of paired fins.
709 Rostral plate with posterior notch articulation with mesethmoid. Rostral plate thickened, with
710 odontode-free area between dorsad and ventrad series of odontodes. Area devoided of odontodes
711 narrow at medial portion and wider at lateral portions (Fig. 35). Prenasal plates present not reduced.
712 Three rows of predorsal plates. Median series formed by 22–24 plates (Tab. 3). Lateral line
713 incomplete, with gap without pores along middle length of body. Median plate series truncated, not
714 reaching posterior end of caudal peduncle (Fig. 36). Abdominal plates composed by enlarged lateral
715 abdominal plate series, each other at midportion of the belly. Lateral abdominal plates forming

716 regular series of three to five plates, two to four of them contacting at midline. Pre-anal shield
717 region formed by large size plates (Fig. 34). Coracoid and cleithrum exposed and covered by
718 odontodes, except for median region of cleithrum between arrector fossae openings and medial
719 region of coracoids.

720 Head without conspicuous crests. Odontodes on parieto-supraoccipital tip slightly larger than
721 those of surrounding areas, mostly in smaller specimens. Head, fin-spines, and body plates covered
722 with odontodes, these larger on anterior surface of all fin spines, and on ventral margin of rostrum,
723 slightly enlarged in dorsal margin. Anteroventral margin of compound pterotic with median-to-large
724 size perforations. Infraorbital canal entering infraorbital series via sphenotic. Lips roundish and
725 papillose, posterior margin of lower lip fimbriate. Maxillary barbel present.

726 Premaxillary and dentary teeth slender proximally and flattened distally□bifid, major (medial)
727 cusp round□minor (lateral) cusp minute pointed. Accessory patch of teeth absent on dentary and
728 premaxilla.

729 Hypurals 1-2 and 3-5 almost completely fused, with median notch on anterior portion caudal-
730 fin skeleton. Total vertebrae 28 (2 c&s).

731 **Color in alcohol.** Ground color of dorsal and lateral surfaces dark gray to almost black.
732 Dorsal and lateral portions of head darker than body, except for yellowish area in ventrolateral
733 region of head contrasting with dark rounded blotches, and lighter spots on parieto-supraoccipital
734 forming Y shaped mark. Region anterior to nares lighter than surrounding areas, forming narrow
735 paired longitudinal light stripes from snout tip to posterior end of parieto-supraoccipital, bifurcating
736 and becoming inconspicuous from that point, and completely disappearing at vertical bellow dorsal-
737 fin origin. Ventral surface of body pale yellow, with scattered chromatophores grouped on base of
738 pectoral fin, forming dark blotches. Unbranched rays of pectoral, pelvic, dorsal, and anal fins
739 mostly unpigmented, except for dark transverse bars, forming striped pattern. Branched rays of

740 these fins mostly hyaline except for unconvincing dark transverse bars. Caudal fin mostly dark gray
741 pigmented, except for hyaline transverse bands on posterior portion of upper rays. Unbranched rays
742 of caudal fin with alternating transverse light and dark bars. In life, ground color of dorsum and
743 flanks dark green (Fig. 37).

744 **Sexual dimorphism.** Characterized by the urogenital papilla, positioned just behind the anal
745 opening in males. Adult males also possess a developed fleshy flap along the dorsal margin of first
746 thickened pelvic-fin ray, that is absent in females. Flap slightly wider basally and progressively
747 narrowing distally. Presence of fleshy flap on first and second branched rays of pelvic fin, in the
748 medial portion of these rays. In juvenile males, flaps smaller or absent. Males have a longer pelvic
749 fin that extends up to anal-fin origin, with pelvic fin falling short of that point in females.

750 **Distribution and habitat.** *Hisonotus* sp. “Passo Fundo” is known only from the headwaters
751 of the rio Passo Fundo drainage, a tributary to the upper rio Uruguai basin (Fig. 13). Arroio
752 Caraguatá at the type-locality is a small watercourse with slow to median flow of clear to brown
753 waters running over stones, vegetal litter, and sand bottom (Fig. 38). The species inhabits marginal
754 submerged vegetation composed mainly by grasses. See Câmara & Hahn (2002) for detailed
755 description of arroio Caraguatá, and its fish fauna. Recent collection efforts failed to capture this
756 species in the headwaters of rio Passo Fundo, near the city of Passo Fundo. The construction of a
757 dam (Barragem da Fazenda da Brigada) and the pollution caused by sewer rejects from the urban
758 area of Passo Fundo seems to be the cause of the disappearance of this species in that region.

759

760 ***Hisonotus* sp. “Canoas”, new species**

761

Figure 39, Table 9

762

763 **Holotype.** MCP uncataloged, 43.0 mm SL, female, Brazil, Santa Catarina, Rio Rufino, rio
764 Rufino on highway SC-427 at city of rio Rufino, 27°51'36"S 049°46'55"W, 01 May 2007, T. P.
765 Carvalho, A. R. Cardoso & C. A. Cramer.

766 **Paratypes.** All from Brazil, Santa Catarina, rio Uruguai basin, rio Canoas drainage, MCP
767 41459, 20 + 3 c&s, 16.0-45.1 mm SL, collected with the holotype. MCP 22369, 1, 33,5 mm SL,
768 Bom Retiro, creek tributary to rio João Paulo on road of Fazenda Jair Philippe, 27°45'36"S
769 049°36'19"W, 21 Dec 1998, R. E. Reis, A. R. Cardoso, P. A. Buckup & F. Melo

770 **Diagnosis.** *Hisonotus* sp. "Canoas" differs from its congeners, with the exception of
771 *Hisonotus* sp. "Ariranhas", by the color pattern: wider light stripes on dorsal surface of head
772 extending from snout tip to posterior end of compound pterotic, vs. narrow light stripes extending
773 from snout tip to posterior end of compound pterotic, or absence of longitudinal stripes in that
774 region. *Hisonotus* sp. "Canoas" differs from *Hisonotus* sp. "Ariranhas" by having the anterior
775 portion of the snout with an odontode-free band (Fig. 40) vs. anterior portion of the snout
776 completely covered by odontodes □ by the life coloration of the body which is brilliant green (Fig.
777 41), vs. a pale yellow to brown ground color pattern □ and by the color pattern of the caudal fin
778 which is composed by vertical dark bars, vs. caudal fin with a dark background crossed by a vertical
779 light bar composed by hyaline dots. Additionally it can be distinguished from other congeners,
780 except *Hisonotus aky* and *Hisonotus* sp. "Chapecó", by having an infraorbital canal entering the
781 infraorbital series via the compound pterotic, vs. infraorbital canal entering the infraorbital series
782 via the sphenotic.

783 **Description.** Morphometrics and meristics in Table 9. Adult size moderate to large for
784 members of this genus (larger specimen surpassing 45 mm in SL). Body robust anteriorly,
785 somewhat slender posteriorly, without conspicuous keels. Caudal peduncle round in cross section.
786 Dorsal profile almost straight from tip of snout to parieto-supraoccipital, except for convex bump

787 over nares, straight to slightly convex from that point to dorsal-fin origin. Dorsal-fin base straight
788 and posteroventrally sloped, slightly convex from posterior end of dorsal-fin base to caudal-fin
789 origin. Ventral profile almost straight from snout tip to anal-fin origin. Concave at anal fin base and
790 straight from that point to caudal-fin origin. Greatest body depth at dorsal-fin origin. Least body
791 depth just posterior to middle of caudal peduncle. Posterior profile of caudal-fin margin concave.
792 Head and snout broad, snout rounded, somewhat square, in dorsal view, body progressively
793 narrowing posterior of pectoral-fin insertion. Snout region anterior of nares slightly depressed
794 interorbital region straight to slightly convex. Upper margin of orbit not elevated. Eye dorsolaterally
795 positioned. Iris operculum present.

796 Pectoral fin I,6. Pectoral-fin posterior margin somewhat convex, when depressed tip
797 extending beyond middle of pelvic fin. Posterior margin of pectoral-fin spine smooth in adults,
798 juveniles with half of spine length serrate. Pectoral-fin axillary slit present, located below ventral
799 margin of cleithral process. Pelvic fin i,5. Tip of depressed fin not reaching anal-fin origin in
800 females, but surpassing that point in males. Dorsal fin II,7. Dorsal-fin origin located posterior to
801 vertical through pelvic-fin origin. Dorsal-fin spinelet not laterally extended, somewhat rounded.
802 Anal fin i,5. First anal-fin pterygiophore exposed anterior to anal fin. Adipose fin absent. Caudal fin
803 i,14,i.

804 Body almost entirely covered by plates except for region overlying opening of swim bladder
805 capsule, area between pectoral girdle and lower lip, region around anus, and bases of paired fins.
806 Rostral plate with posterior notch articulation with mesethmoid. Rostral plate thickened, with
807 narrow odontode-free band between dorsad and ventrad series. Area devoided of odontodes
808 narrower at medial portion, wider laterally (Fig. 40). Prenasal plates present not reduced, without
809 unplated area anterior to nares. Three rows of predorsal plates. Median series formed by 22–23
810 plates (Tab. 3). Lateral line incomplete, with gap without pores along middle length of body.

811 Median plate series truncated, not reaching posterior end of caudal peduncle. Arrangement of
812 abdominal plates variable. Composed of three rows, lateral abdominal plates slightly larger and
813 forming regular series of about two or three plates. Median abdominal series formed by a single
814 series (Fig. 42 A), or abdominal region plated only by enlarged abdominal plates of the lateral series
815 which contacts at belly midline portion. Lateral abdominal plates relative larger, forming regular
816 series of two to three plates, contacting each other at midline, (Fig. 42 B). Median abdominal series
817 composed by one, triangular in shape, plate located posteriorly, pre-anal shield region formed by
818 large size plates. Coracoid and cleithrum exposed, covered by odontodes, except for median region
819 of cleithrum between arrector fossae openings and medial region of coracoids.

820 Head without conspicuous crests. Odontodes on parieto-supraoccipital tip slightly larger than
821 those of surrounding areas, mostly in smaller specimens. Head, fin-spines, and body plates covered
822 with odontodes, these larger on anterior surface of all fin spines, and on ventral margin of rostrum.
823 Anterior and ventral margins of compound pterotic with median-to-large size perforations.
824 Infraorbital canal enters infraorbital series via compound pterotic. Lips roundish and papillose,
825 posterior margin of lower lip fimbriate. Maxillary barbel present.

826 Premaxillary and dentary teeth slender proximally and flattened distally□bifid, major (medial)
827 cusp round□minor (lateral) cusp minute pointed. Accessory patch of teeth absent on dentary and
828 premaxilla.

829 Hypurals 1-2 and 3-5 completely fused. Total vertebrae 28 (2 c&s).

830 **Color in alcohol.** Ground color of dorsal and lateral surfaces light to dark gray. Dorsal and
831 lateral portions of head darker than body. Light rounded spots over dorsal surface of head between
832 nares and orbits. Pair of longitudinal light stripes starting at snout tip, passing through nares, and
833 bifurcating posterior to orbit. One branch reaching posterior end of parieto-supraoccipital and other
834 branch, not continuous, reaching V-shaped mark at parieto-supraoccipital tip. Stripes wider than

835 pupil diameter. Ventrolateral region of head yellowish, covered with scattered dark spots.
836 Dorsolateral surface of body with two light longitudinal stripes, from posterior end of compound
837 pterotic to vertical through dorsal-fin base. Dorsum, between posterior end of dorsal fin and caudal
838 fin, with three to four light saddles. Ventral surface of body pale yellow, with scattered
839 chromatophores, these grouped on base of pectoral fin, forming dark blotch. Unbranched rays of
840 pectoral, pelvic, dorsal, anal, and caudal fins mostly unpigmented, except for dark transverse bands,
841 forming a barred pattern. Branched rays of these fins mostly hyaline except for dark transverse bars.
842 Caudal fin mostly unpigmented, except for transverse dark bars, some individuals with square-lined
843 pattern or presenting wide hyaline transverse area in middle of caudal fin. In life, ground color of
844 dorsum and flanks shiny light green (Fig. 41).

845 **Sexual dimorphism.** Characterized by the urogenital papilla, positioned just behind anal
846 opening in males. Adult males also possess a developed fleshy flap along the dorsal margin of first
847 thickened pelvic-fin ray, which is absent in females. Flap slightly wider basally and progressively
848 narrowing distally. Presence of a fleshy flap at the medial portion of first and second branched rays
849 of pelvic fin. In juvenile males, flaps smaller or absent. Males have a longer pelvic fin that
850 surpasses anal-fin origin, with pelvic fin falling short of anal-fin origin in females.

851 **Distribution and habitat.** *Hisonotus* sp. “Canoas” is known only from two tributaries of rio
852 Canoas drainage in the upper rio Uruguai basin (Fig. 13). This species inhabits median flow
853 watercourses, with clear waters of sand and rocky bottom and is found associated with marginal
854 vegetation composed mainly of grasses (Fig. 43). *Hisonotus* sp. “Canoas” is found at high altitudes,
855 about 850 m above the sea level, and is the species of *Hisonotus* occurring in the most elevated
856 portions of the rio Uruguai basin.

857

858 **Key to the species of *Hisonotus* from laguna dos Patos system and rio Uruguai basin.**

859

860 **1a.** Dorsal and ventral series of odontodes along anterior margin of the snout separated by an
861 odontode-free band.....2

862 **1b.** Absence of an odontode-free band, anterior margin of snout completely covered by odontodes
86315

864 **2a.** Presence of a tuft of conspicuously enlarged odontodes on the parieto-supraoccipital tip in
865 adults.....3

866 **2b.** Absence of a tuft of enlarged odontodes on the parieto-supraoccipital tip in adults, odontodes on
867 parieto-supraoccipital tip with same size of surrounding ones, sometimes larger in juveniles.....4

868 **3a.** Shorter pectoral-fin spine (22.0-25.6% of SL), just reaching the vertical through dorsal-fin
869 origin□general color pattern in life dark green, in alcohol grayish
870*Hisonotus* sp. “Prata” (rio da Prata drainage□laguna dos Patos system).

871 **3b.** Longer pectoral-fin spine (24.7 -29.0% in SL), far surpassing the vertical through dorsal-fin
872 origin□general color pattern in life yellowish, in alcohol brownish
873*Hisonotus* sp. “Carreiro” (rio Carreiro drainage□laguna dos Patos system).

874 **4a.** Three predorsal plate series□22-25 plates in lateral series□and 27-29 vertebrae5

875 **4b.** Three or four predorsal plate series (modally four)□25-29 plates in lateral series□and 30-32
876 vertebrae13

877 **5a.** Posterior portion of pectoral-fin spine serrate in specimens smaller than 35 mm SL
878*Hisonotus ringueleti* (middle Uruguai basin)

879 **5b.** Posterior portion of pectoral-fin spine smooth in specimens larger than 25 mm SL6

880 **6a.** Caudal-fin pigmentation mostly dark without hyaline areas, except for posterior portion of upper
881 caudal-fin rays7

882 **6b.** Caudal fin presenting hyaline areas in different patterns in the middle portion10

883	7a. Median series of abdominal plates present	8
884	7b. Median series of abdominal plates absent.....	9
885	8a. Median series of abdominal plates composed by several small plates, irregularly arranged	
886	.....<i>Hisonotus nigricauda</i> (lower and middle rio Uruguai basin, and lower portions of laguna	
887	dos Patos system)	
888	8b. Median series of abdominal plates composed by one or two rows of plates, forming a regular	
889	series <i>Hisonotus</i> sp. “Passo Novo” (upper rio Jacuí basin □ laguna dos Patos system)	
890	9a. Lateral series of abdominal plates contacting each other at midline	
891	.....<i>Hisonotus</i> sp. “Passo Fundo” (rio Passo Fundo drainage □ rio Uruguai basin)	
892	9b. Lateral series of abdominal plates not contacting at midline, leaving a naked area between them	
893	..... <i>Hisonotus</i> sp. “Felício” (arroyo Felício □ rio Jacuí basin)	
894	10a. Trunk median plate series truncated, not reaching the posterior end of caudal peduncle □	
895	infraorbital canal entering infraorbital series via compound pterotic	11
896	10b. Trunk median plate series not truncated, reaching the posterior end of caudal peduncle,	
897	infraorbital canal entering infraorbital series via sphenotic	12
898	11a. Dorsal surface of head with rounded light marks, a wide light longitudinal stripe	
899	..... <i>Hisonotus</i> sp. “Canoas” (rio Canoas drainage, upper rio Uruguai basin)	
900	11b. Dorsal surface of head without ligh marks, a narrow ligh longitudinal stripe	
901	.....<i>Hisonotus aky</i> (Yabotí-Guazú and Forquilha drainages □ rio Uruguai basin)	
902	12a. Median portion of caudal fin with a vertical hyaline bar composed by round dots	
903	..... <i>Hisonotus charrua</i>	
904	(lower and middle rio Uruguai basin, and upper rio Piratini drainage in laguna dos Patos system)	

905	12b. Median portion of caudal fin with somewhat triangular hyaline areas forming an hour-glass	
906	like mark	<i>Hisonotus</i> sp. "Sinos" (rio Jacuí
907	basin)	
908	13a. Caudal peduncle slightly square in cross section □odontode-free band of snout wide □rostral	
909	plate thin without the posterior notch articulation with the mesethmoid	
910	.....	<i>Hisonotus</i> sp. "Camaquã" (rio Camaquã drainage)
911	13b. Caudal peduncle round in cross section □odontode-free band of snout narrow □rostral plate thick	
912	with a posterior notch articulation with the mesethmoid	14
913	14a. Body relatively slender, low body depth at dorsal-fin origin (13.3-16.3% in SL)	
914	.....	<i>Hisonotus taimensis</i> (lower portions of laguna Mirim)
915	14b. Body relatively robust, high body depth at dorsal-fin origin (16.2-20.8 % in SL)	
916	.....	<i>Hisonotus laevior</i> (laguna dos Patos system)
917	15a. Lateral plate series 20-21 □vertebral count 25-26	<i>Hisonotus</i> sp. "Chapecó"
918	(rio Chapecó drainage □rio Uruguai basin)	
919	15b. Lateral plate series 22-25 □vertebral count 27-29	16
920	16a. Median portion of caudal fin with a vertical hyaline bar composed by round dots.....	17
921	16b. Caudal-fin mostly dark, without hyaline bar on median portion.....	18
922	17a. Dorsolateral surface of head with wide light stripes, dorsal region of head with a light V-	
923	shaped mark	<i>Hisonotus</i> sp. "Ariranhas" (rio Rancho Grande and Ariranhas drainages, upper
924	rio Uruguai basin)	
925	17b. Dorsolateral surface of head without ligh stripes, dorsal region of head with dark marks	
926	contrasting with somewhat reticular light areas.....	<i>Hisonotus armatus</i> (laguna dos Patos system)
927	18a. Posterior portion of lateral line present, median abdominal series composed by a single row of	
928	plates.....	<i>Hisonotus aff. leucofrenatus</i> (Coastal plan of eastern laguna dos Patos system)

929 **18b.** Posterior portion of lateral line absent, median abdominal series composed by several rows of
930 small plates, irregularly arranged*Hisonotus nigricauda* (lower and middle
931 Uruguai basin, and lower portions of laguna dos Patos system)

932

933

934

Discussion

935

936 The diversity of *Hisonotus* in the rio Uruguai basin is immense. As a comparison, the upper
937 rio Paraná drainage has five species (Britski & Garavello, 2003), and just two species, apparently
938 are found in southeastern coastal drainages of Brazil. Eight species are herein reported, but many
939 portions of the upper rio Uruguai basin are poorly sampled, and the number of *Hisonotus* species
940 can be underestimated.

941 Lucena & Kullander (1992) described five general distributional patterns of the fish fauna in
942 the rio Uruguai and neighboring drainages. The distribution of species of *Hisonotus* can be included
943 in three of these patterns: *Hisonotus* sp. “Ariranhas”, *Hisonotus* sp. “Chapecó”, *Hisonotus* sp.
944 “Passo Fundo”, and *Hisonotus* sp. “Canoas” fit in the pattern (1) with species endemic from the
945 upper rio Uruguai. *Hisonotus aky* is likely to be part of the pattern (2) of species endemic within the
946 Uruguai. *Hisonotus nigricauda* and *Hisonotus charrua* share the pattern (5), of species restricted to
947 the coast of Uruguay and Rio Grande do Sul plus the Uruguai drainage. The exception is *Hisonotus*
948 *ringueleti* that do not fit in any pattern proposed by Lucena and Kullander (1992). That species is
949 widespread in the middle rio Uruguai, suggesting it as an endemic component for that portion of
950 basin.

951 Studying in more detail the diversity of *Hisonotus* in the rio Uruguai, two distributional
952 patterns are observed: (1) species restricted to the upper rio Uruguai basin found in one or two

953 drainages tributaries to rio Uruguai, allopatric in distribution, and occurring in separated
954 headwaters (2) widespread species occurring in the middle and lower Uruguai, courses inhabiting
955 several drainages, most sympatric to one another. A single species, *Hisonotus aky*, is shared between
956 upper and middle rio Uruguai courses. The distribution of that species is somewhat awkward being
957 only found in the rio Forquilha drainage (upper rio Uruguai/Brazil) and Río Yabotí-Guazu drainage
958 (middle rio Uruguai/Argentina) nowhere between these localities or downstream the latter. Rio
959 Forquilha apparently has a peculiar fish fauna as previously observed by Lucena & Kullander
960 (1992), which reported a different fauna of the cichlid genus *Crenicichla*. According to them, local
961 conditions of that drainage do not offer any clue to the presence of an endemic *Crenicichla* fauna,
962 no fall or other apparent barriers are present in the rio Forquilha. In the same manner, Rican &
963 Kullander (2006) studying the diversity of *Australoheros* cichlids, found a species inhabiting rio
964 Forquilha (*Australoheros* sp. “Forquilha”) and a similar but not conspecific (*Australoheros* cf.
965 “Forquilha) inhabiting tributaries of middle portion of the Uruguay basin in Misiones/Argentina.
966 However, no conspicuous differences were found suggesting the split between *Hisonotus aky* from
967 Yabotí-Guazú and the specimens from rio Forquilha into different taxa. Moreover, the ichthyofauna
968 of some portions of upper rio Uruguai basin are still unknown, and perhaps that distributional gap,
969 could be due to the presence of poorly sampled areas.

970 Several authors suggested the upper rio Uruguai as an endemic area (Winberger et al., 1998
971 Aquino et al., 2001 Miquelarena & Lopez, 2004). The presence of a putative clade of *Hisonotus*
972 (see *Hisonotus aky* remarks in this chapter) inhabiting the upper portions of that basin reinforces
973 that endemism. These species share the derived presence of an infraorbital canal entering
974 infraorbital series via compound pterotic. That feature was discussed by myself (Carvalho, in press)
975 and seems to be a convergence between some species of *Corumbataia* and this putative clade of
976 *Hisonotus*, since these genera are not closely related (Gauger & Buckup, 2005).

977 The great diversity in the upper rio Uruguai, compared to the lower portions can be
978 explained by its accidented relief. The upper portions of the rio Uruguai basin differ from the
979 neighbouring Paraná/Paraguay system mainly by its geomorphic immaturity, indicated by the
980 sloped river profile and the prevalence of rocky substrata and strong currents (Di Persia & Neiff,
981 1986). Rapids and waterfalls are dispersal barriers for most of *Hisonotus* species, and is likely the
982 cause for allopatric speciation during the process of drainage evolution. A similar aspect is found
983 in the headwaters of the rio Jacuí basin (Chapter 2) which possesses several endemic and
984 restrictedly distributed species.

985 The endemism of the lower portions (middle and lower courses) is less apparent. The
986 species *Hisonotus nigricauda* and *Hisonotus charrua* are widely distributed in these lower portions,
987 but are also present in other hydrographic systems. Only *Hisonotus ringueleti* is endemic for that
988 region. Aquino et al. (2001) considered that species pertaining to the upper rio Uruguai basin, which
989 differs from the definition of the rio Uruguai portions used here. Miquelarena & Lopez (2004)
990 erroneously cited *H. ringueleti* from the upper rio Uruguai. Miquelarena & Lopez (2004)
991 delimitation of rio Uruguai courses follow the same used here, which subdivides the upper course
992 (sensu Aquino et al., 2001) into middle and upper rio Uruguai. *Hisonotus ringueleti* and *H.*
993 *nigricauda* distributions are impressively complementary (Fig. 8 and Fig. 3, respectively). These
994 species are never collected together but are sympatric with *H. charrua* throughout.

995 A phylogetic review of *Hisonotus*, and more sampling efforts in the upper rio Uruguai basin
996 should provide refined evidences for discussion of history of the genus in these areas.

997

998

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999

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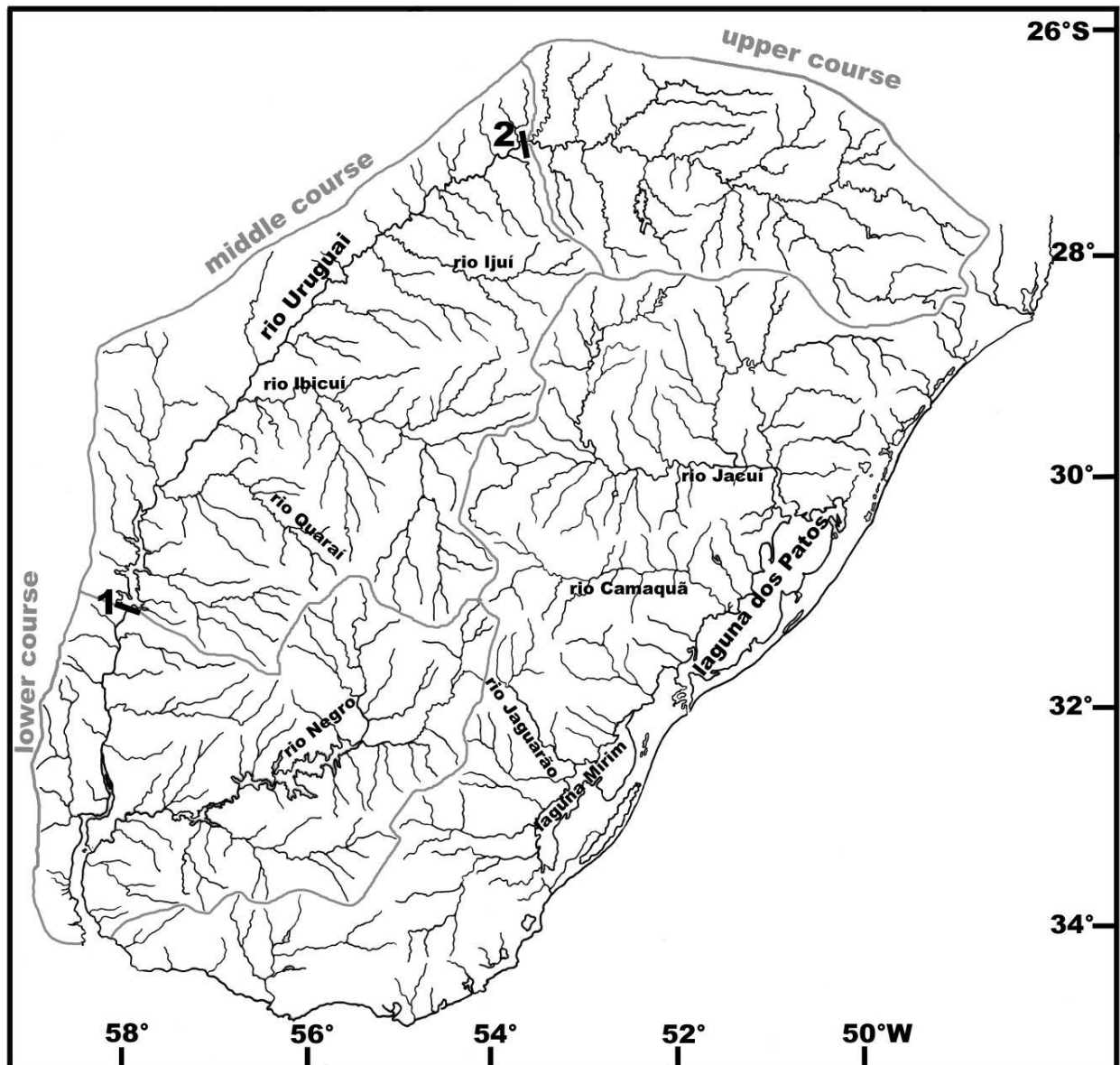
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1080

Figure Legends

1081



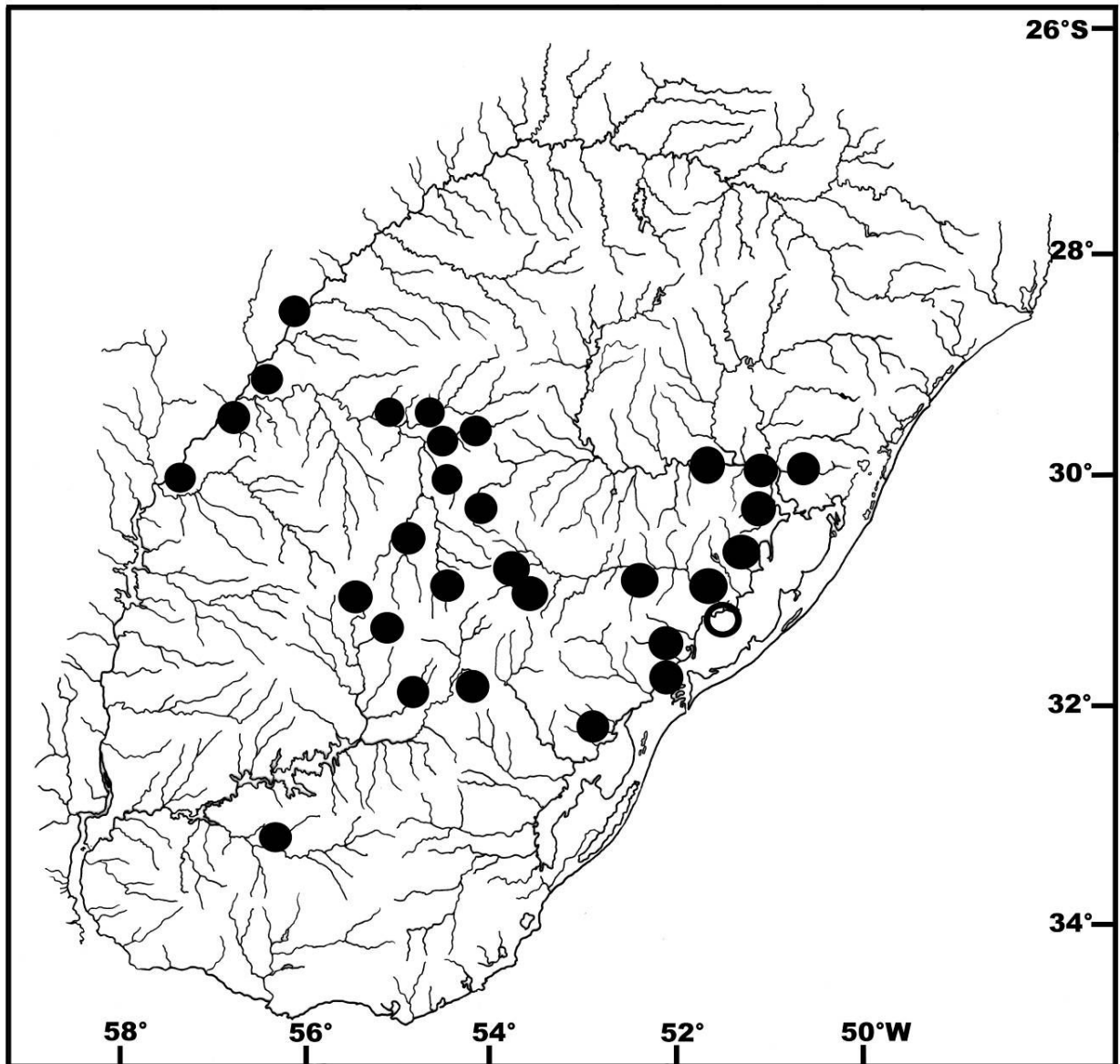
1082
 1083 Figure 1. Drainage map of rio Uruguai basin (circulate areas) and the neighboring laguna dos Patos
 1084 system. Numbers 1-2 represent the divides between lower, middle, and upper courses. 1-Salto
 1085 Grande□2-Saltos do Yucumã.



1086

1087 Figure 2. *Hisonotus nigricauda*, MCP 26865, female, 37.9 mm SL. Arroio do Salso on highway

1088 BR-158, affluent to rio Ibicuí da Armada.



1089

1090 Figure 3. Drainage map of rio Uruguai basin and laguna dos Patos system showing distribution of
1091 *Hisonotus nigricauda*. Open symbol designate the probable type locality—some symbols represent
1092 more than one collecting locality.



1093

1094 Figure 4. Paratype of *Hisonotus ringueleti*, ILPLA 883, female, 35.5 mm SL. Creek at km 18 of
1095 route joining Santana do Livramento, Brazil and Rivera Uruguay, rio Quaraí drainage, Rivera,
1096 Uruguay.



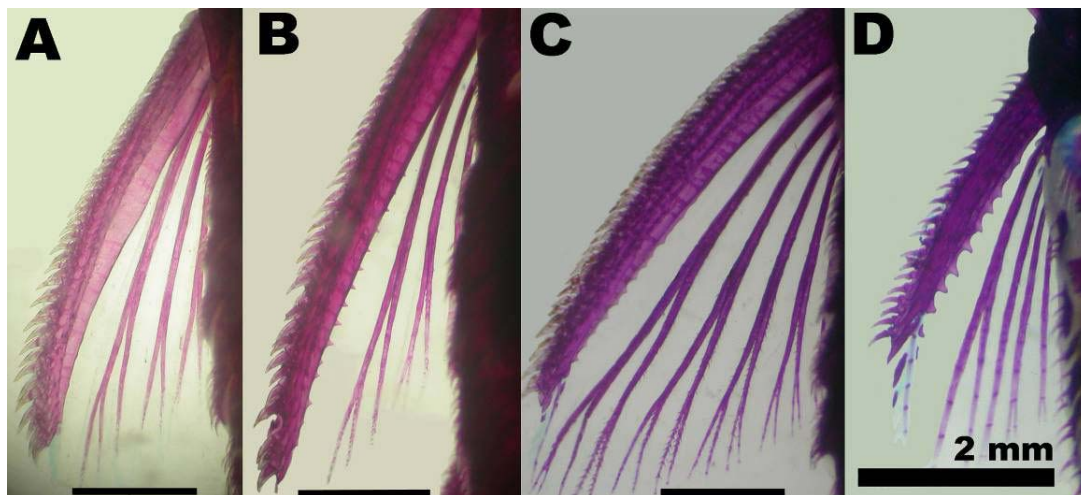
1097

1098 Figure 5. *Hisonotus ringueleti*, MCP 11215, female, 37.0 mm SL. Arroio Quaraí-Mirim on road

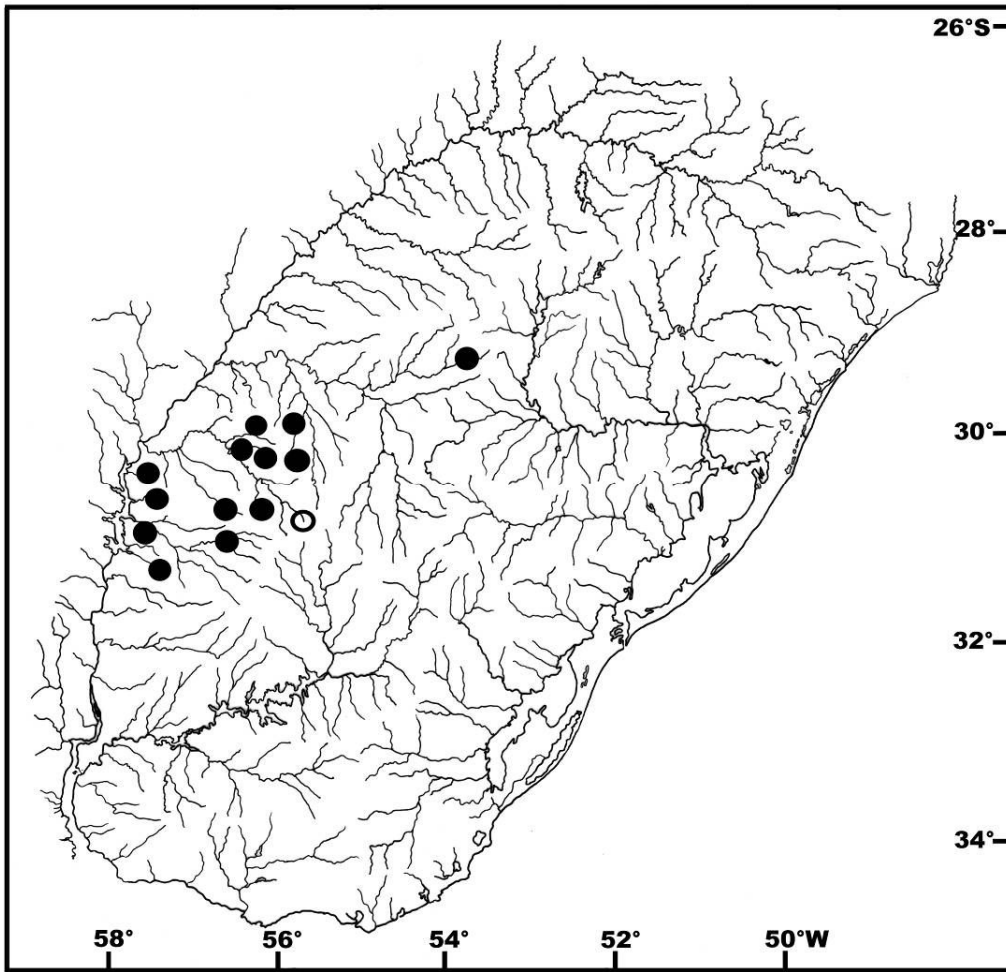
1099 between Quaraí and Alegrete, Quaraí, Brazil.



1100
 1101 Figure 6. Young specimens of *Hisonotus ringueleti*. A- ILPLA 883, paratype, 23.9 mm SL. Creek at
 1102 km 18 of route joining Santana do Livramento, Brazil and Rivera Uruguay, rio Quaraí drainage,
 1103 Rivera, Uruguay. B - MHNG 2662, paratype of *Hisonotus candombe*, 26.3 mm SL. Arroyo
 1104 Palomas, Río Arapey Grande drainage, Salto, Uruguay.



1105
 1106 Figure 7. Left pectoral-fin spine in dorsal view. A - *Hisonotus ringueleti*, MCP 11215, 38.1 mm SL.
 1107 B - *Hisonotus ringueleti*, MCP 11215, 31.2 mm SL. C - *Hisonotus* sp. “Camaquã”, UFRGS 8966,
 1108 36.6 mm SL. D – *Hisonotus* sp. “Camaquã”, UFRGS 8966, 22.5 mm SL. Scale bar 2mm.



1109
 1110 Figure 8. Drainage map of rio Uruguai basin and laguna dos Patos system showing distribution of
 1111 *Hisonotus ringueleti*. Open symbol designate the type locality □ some symbols represent more than
 1112 one collecting locality.



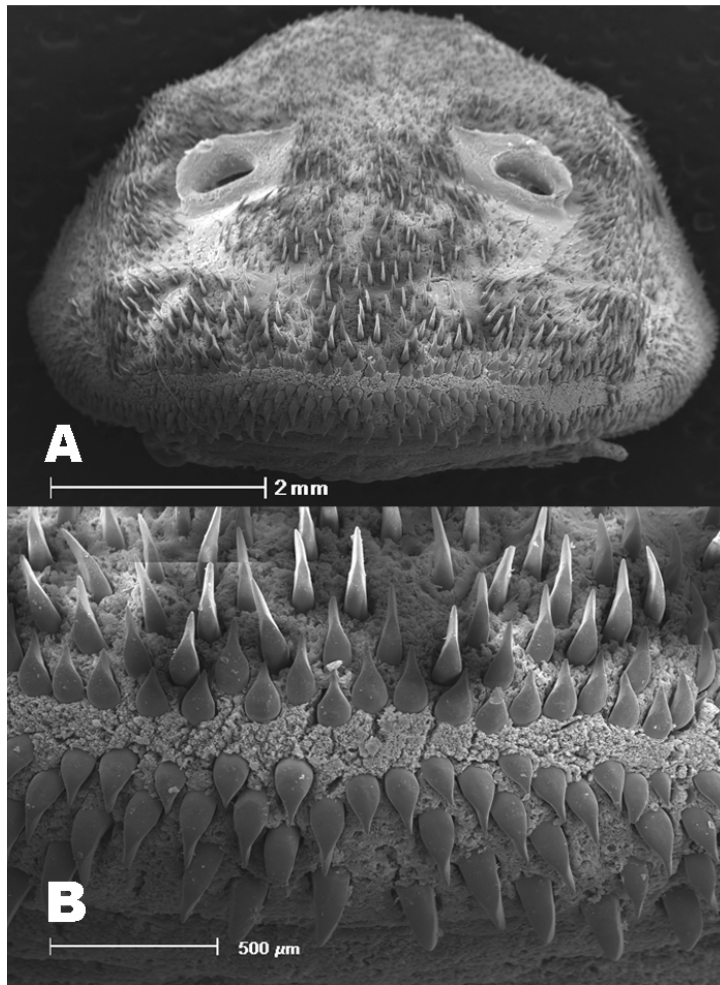
1113
1114 Figure 9. Holotype of *Epactionotus aky*, AI 124, female, 29.2 mm SL. Arroyo Garibaldi tributary to
1115 arroyo Yabotí Guazu, Misiones, Argentina.



1116

1117 Figure 10. *Hisonotus aky*, MCP 41474, female, 33.7 mm SL. Rio Forquilha at Espriado bathing

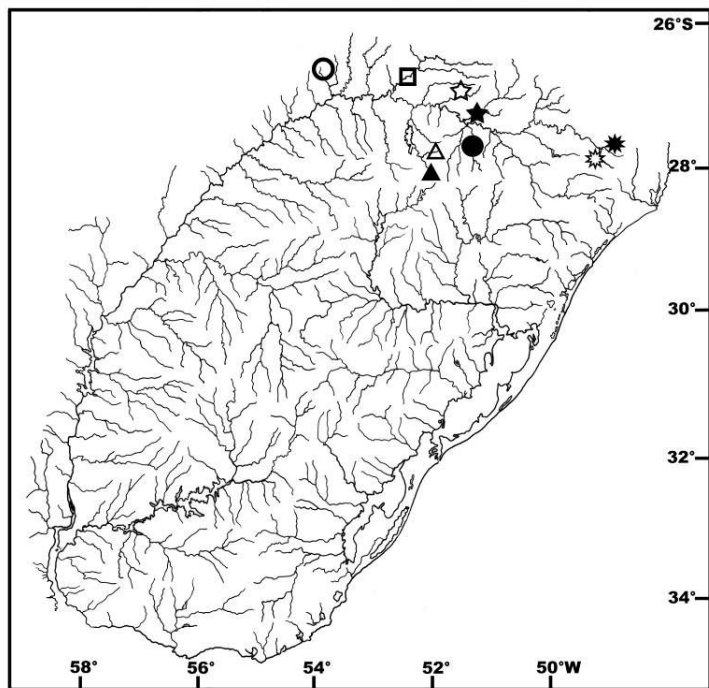
1118 spot on secondary road from Maximiliano de Almeida to Paim Filho, Paim Filho, Brazil



1119
 1120 Figure 11. Scanning electron micrograph of snout anterior rostral margin of *Hisonotus aky*, MCP
 1121 41474, 34.7 mm SL. A-anterior view of rostrum □ B-magnification of medial portion.



1122
 1123 Figure 12. Live specimen of *Hisonotus aky*, MCP 41474, SL unrecorded. Rio Forquilha at
 1124 Espriado bathing spot on secondary road from Maximiliano de Almeida to Paim Filho, Paim Filho,
 1125 Brazil.



1126

1127 Figure 13. Drainage map showing distribution of *Hisonotus* species in the upper rio Uruguai basin.

1128 Some symbols represent more than one collecting locality. Open symbols represent type locality.

1129 *Hisonotus aky* (circles) □ *Hisonotus* sp. “Chapecó” (square) □ *Hisonotus* sp. “Passo Fundo” (triangles) □

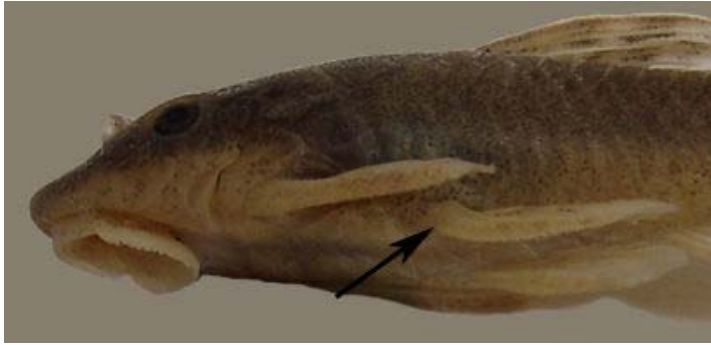
1130 *Hisonotus* sp. “Ariranhas” (star) □ and *Hisonotus* sp. “Canoas” (asterisk).



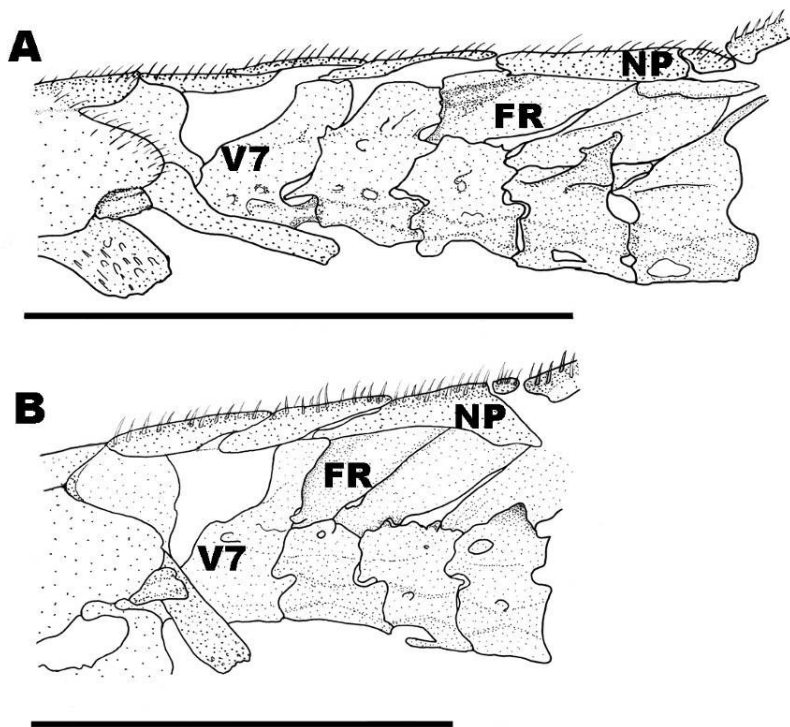
1131

1132 Figure 14. Collecting site of *Hisonotus aky*. Rio Forquilha at Espriado bathing spot on secondary

1133 road from Maximiliano de Almeida to Paim Filho, Paim Filho, Brazil.



1134
 1135 Figure 15. Paratype of *Hisonot*
 1136
 1137 *us akya*, AI 125, male, 34.5 mm SL. Anterior portion of body in ventrolateral view. Arrow indicates
 1138 the developed fleshy flap on pelvic-fin spine of adult male.



1139
 1140 Figure 16. Anterior portion of axial skeleton in lateral view. A- *Epactionotus bilineatus*, MCP
 1141 29293, 36.5 mm SL, neural spine of seventh vertebra not contacting nuchal plate dorsally, and first
 1142 proximal radial of dorsal fin contacting eighth vertebra. B- *Hisonotus akya*, MCP 41474, 37.2 mm
 1143 SL, neural spine of seventh vertebra contacting nuchal plate, and first proximal radial of dorsal fin

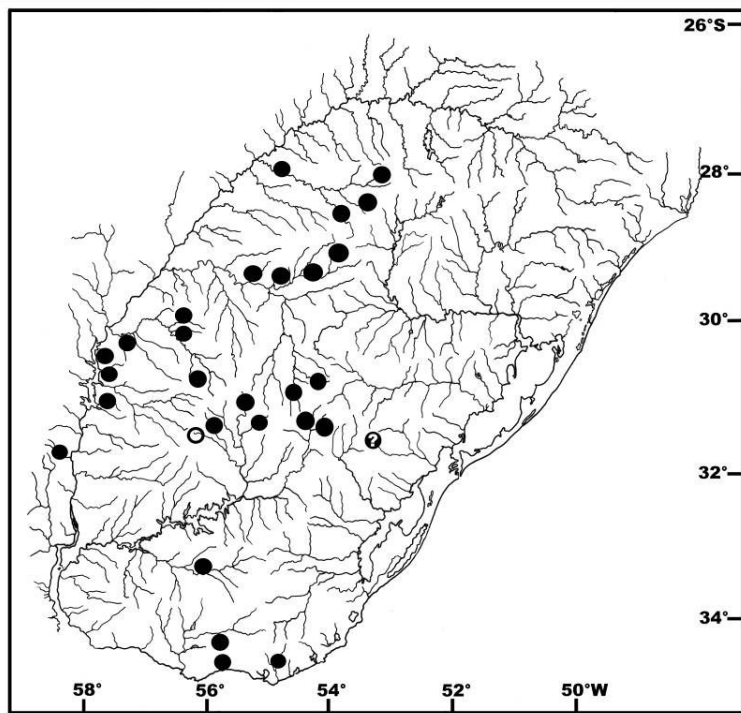
1144 contacting the seventh vertebra. FR = first proximal radial □ NP = nuchal plate □ V = vertebra. Scale
1145 bar is 5 mm.



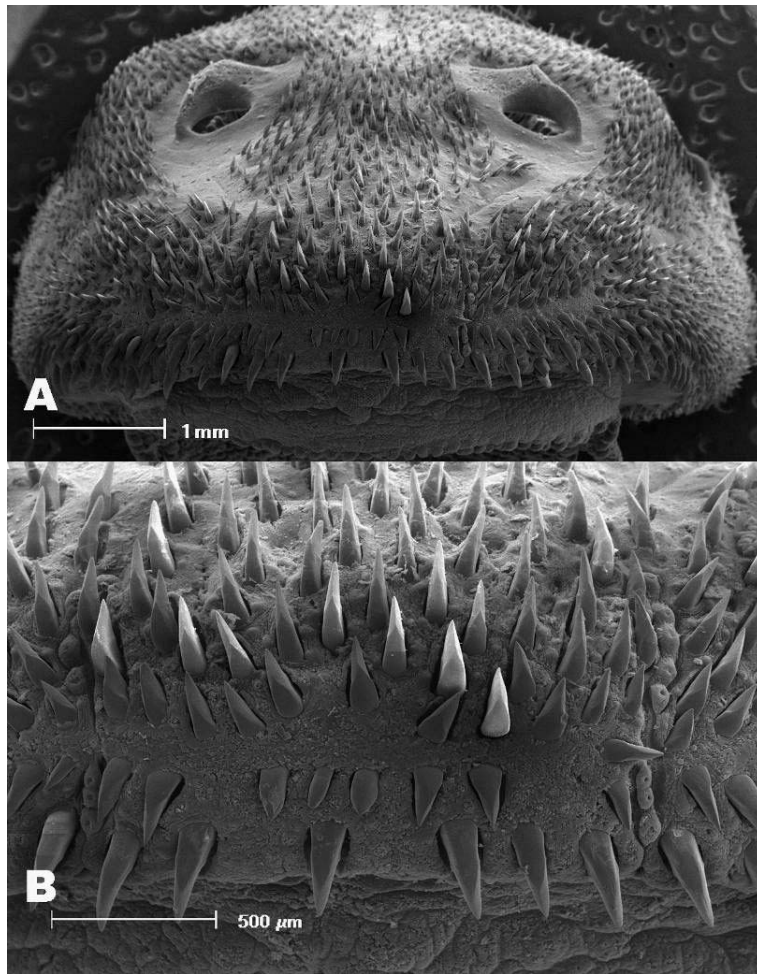
1146
1147 Figure 17. Holotype of *Hisonotus charrua*, ZVC-P 5639, 49.2 mm SL. Cañada de los Peña,
1148 Tacuarembó, Uruguay.



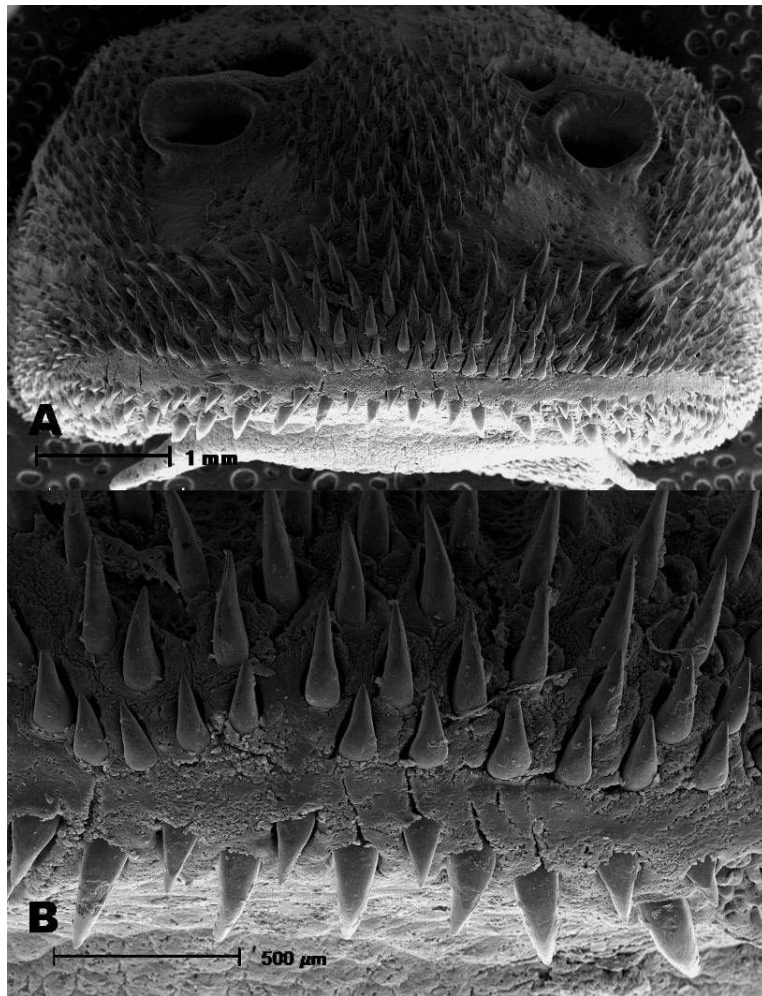
1149
1150 Figure 18. *Hisonotus charrua* MCP 35303, female 35.8 mm SL. Arroio Garupá on road from
1151 Quaraí to Harmonia, about 33 km northeast of Quaraí, Quaraí, Brazil.



1152
1153 Figure 19. Drainage map showing distribution of *Hisonotus charrua* in the rio Uruguai basin,
1154 coastal streams of Uruguay, and laguna dos Patos system. Some symbols represent more than one
1155 collecting locality. Open symbol represent type locality.



1156
1157 Figure 20. Scanning electron micrograph of the snout anterior rostral margin of *Hisonotus charrua*
1158 from rio Ijuí drainage, MCP 35337, 38.2 mm SL. A-anterior view of rostrum □ B-magnification of
1159 medial portion.



1160

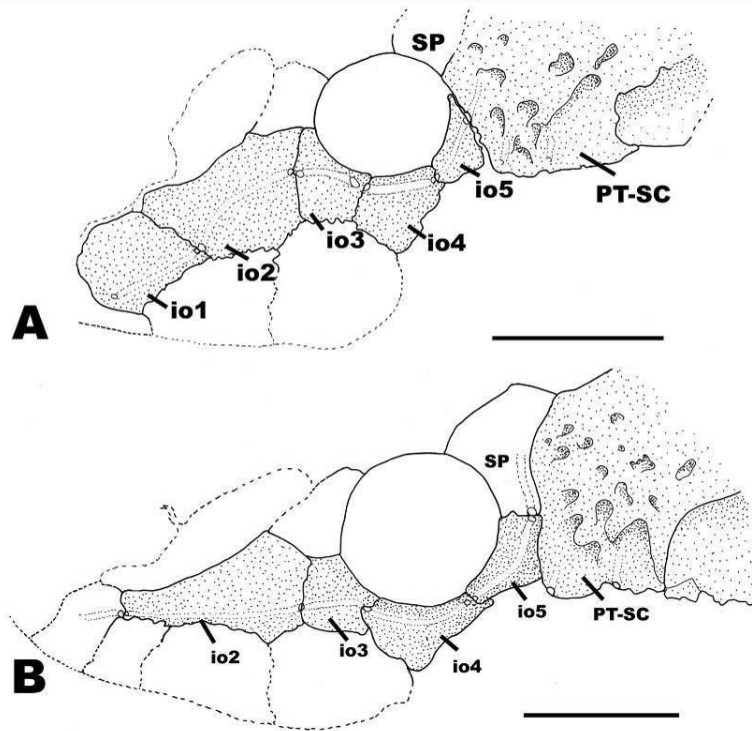
1161 Figure 21. Scanning electron micrograph of the snout anterior rostral margin of *Hisonotus charrua*,

1162 MCP 40256, 36.0 mm SL. A-anterior view of rostrum □B-magnification of medial portion.

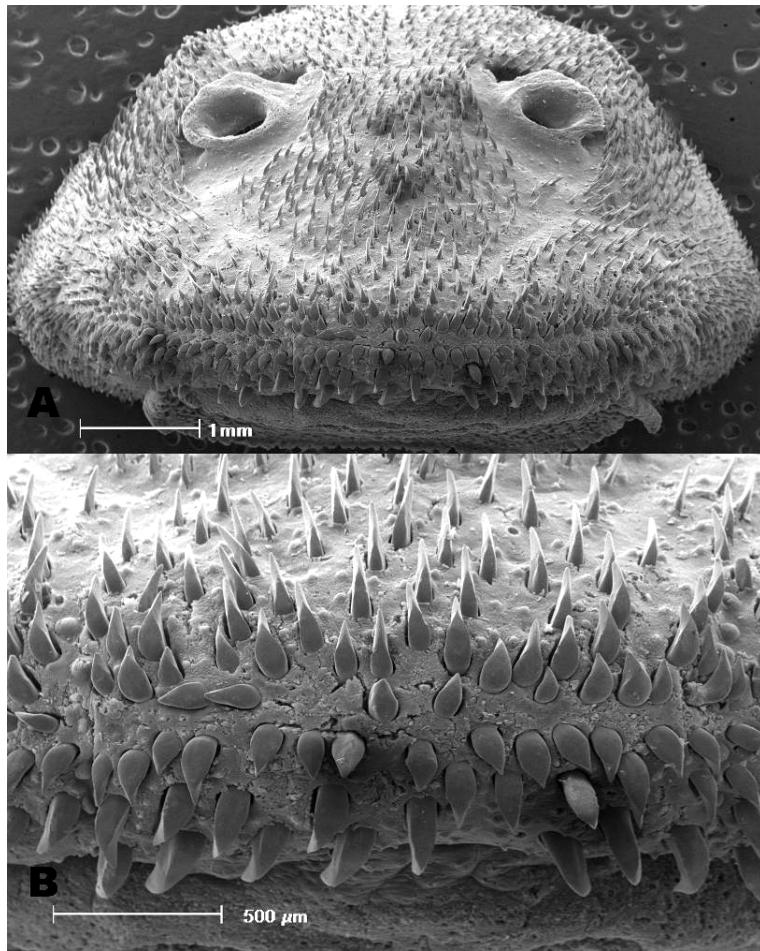


1163

1164 Figure 22. Holotype of *Hisonotus* sp. "Chapecó", MCP uncataloged, female, 33.4 mm SL. Rio
1165 Chapecó at vila São Miguel on the road from Coronel de Freitas to Quilombo, Coronel de Freitas,
1166 Brazil.



1167
1168 Figure 23. Skull of *Hisonotus* in dorsolateral view showing infraorbital canal. A- *Hisonotus*
1169 sp. "Chapecó", MCP 40029, 28.0 mm SL. B- *Hisonotus ringueleti*, MCP 11215, 37.2 mm SL. Scale
1170 bar is 2 mm.

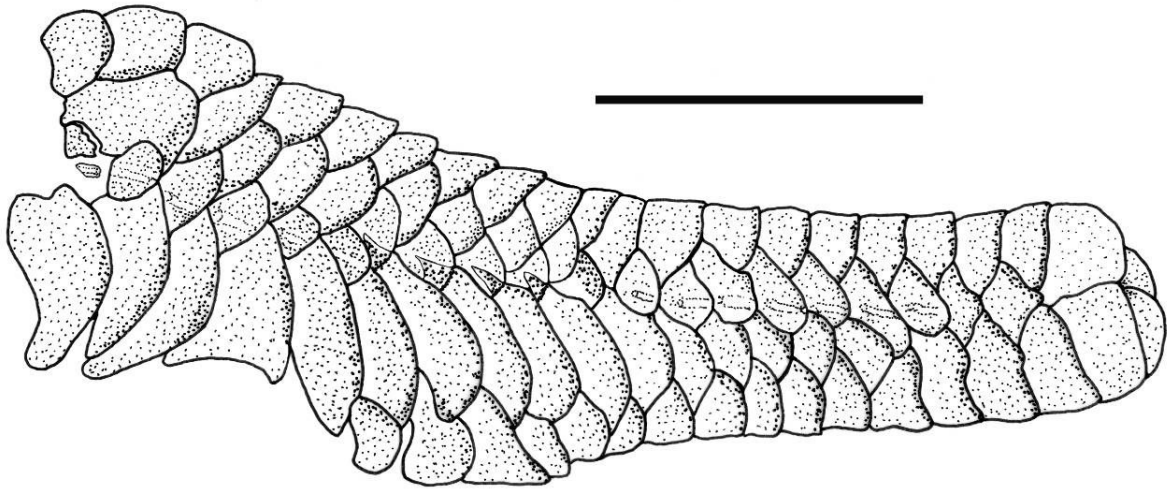


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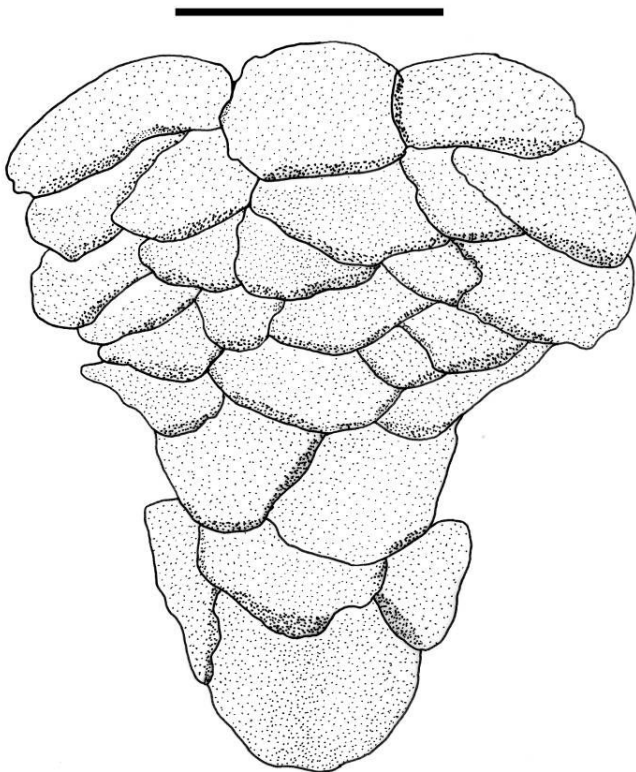
1172 Figure 24. Scanning electron micrograph of snout anterior rostral margin of *Hisonotus* sp.

1173 “Chapecó”, MCP 40029, 29.7 mm SL. A-anterior view of rostrum □ B-magnification of medial

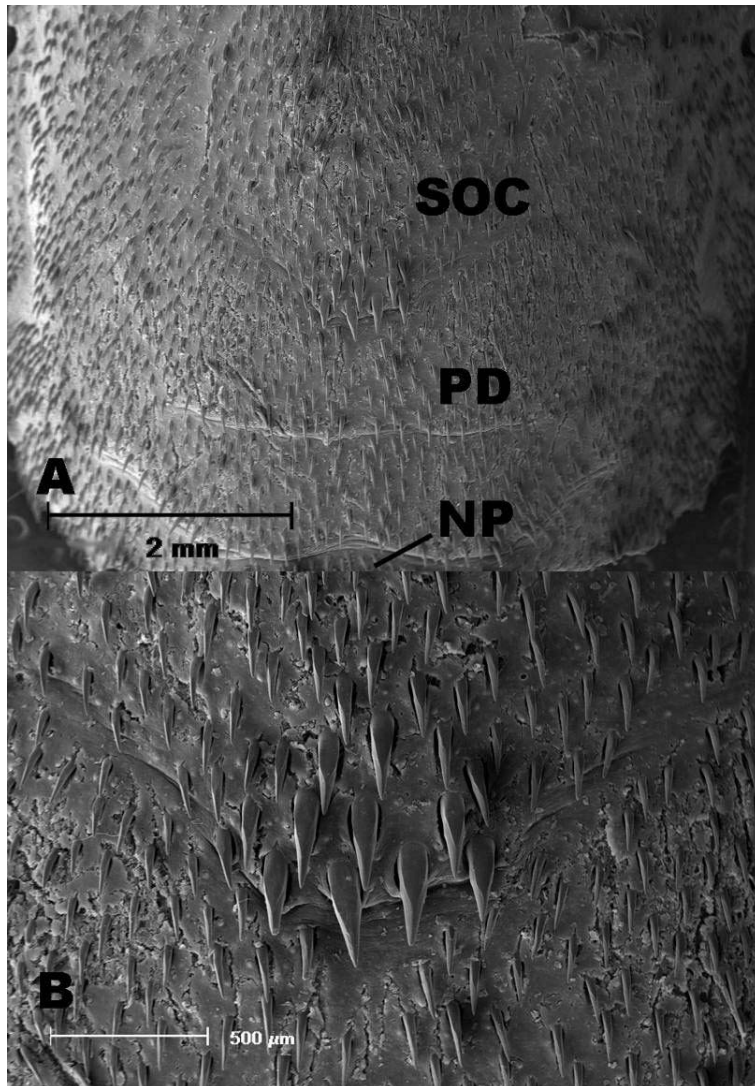
1174 portion.



1175
1176 Figure 25. Trunk lateral plates of *Hisonotus* sp. "Chapecó", lateral view of left side, MCP 40029,
1177 female, 23.3 mm SL. Scale bar is 4 mm.



1178
1179 Figure 26. Arrangement of abdominal plates, *Hisonotus* sp. "Chapecó", MCP 40029, 28.0 mm SL.
1180 Anterior portion toward top. Scale bar is 2 mm.



1181
 1182 Figure 27. Scanning electron micrograph of predorsal region of *Hisonotus* sp. “Chapecó”, showing
 1183 raised tuft of odontodes in posterior tip of parieto-supraoccipital. MCP 40029, 29.7 mm SL. A-
 1184 dorsal view of predorsal region. B-magnification of raised odontodes. SOC – Parieto-supraoccipital
 1185 PD - paired predorsal plates □ NP - nuchal plate.



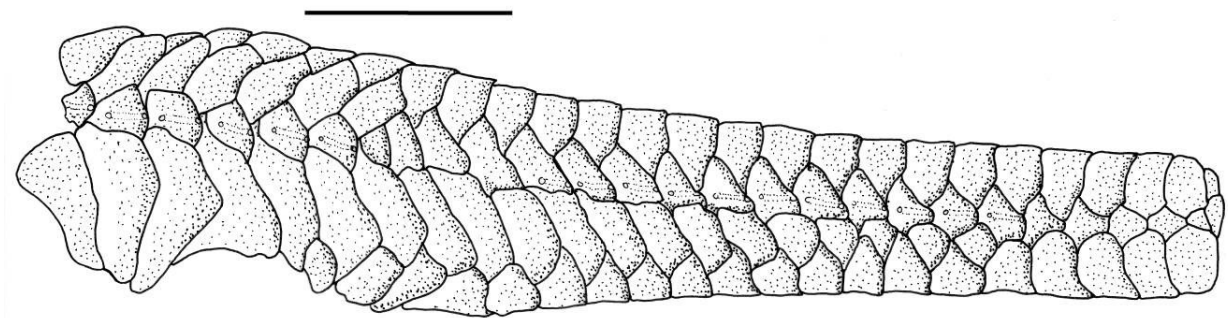
1186

1187 Figure 28. Holotype of *Hisonotus* sp. “Ariranhas”, MCP uncataloged, female, 42.2 mm SL. Rio

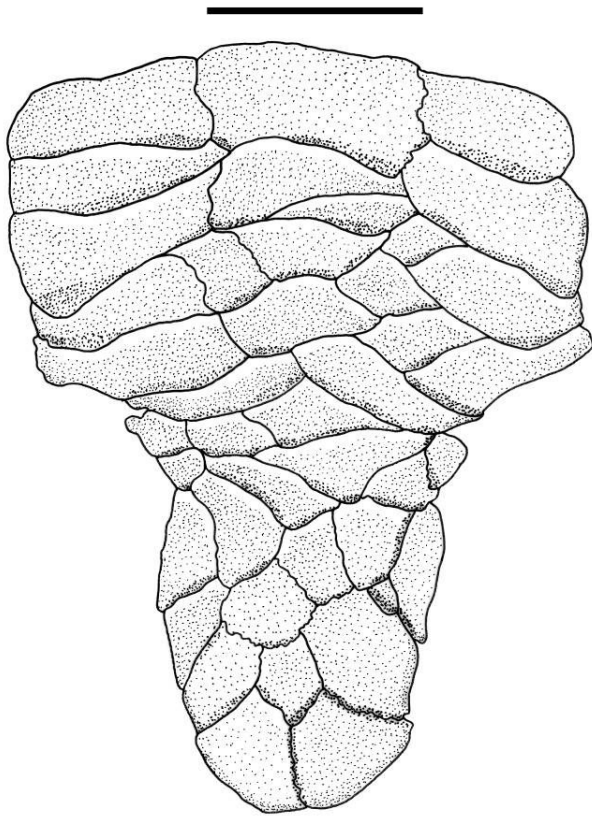
1188 Ariranhas on bridge of highway SC-466, Xavantina, Brazil.



1189
1190 Figure 29. Live specimen of *Hisonotus* sp. "Ariranhas", MCP 41354, SL unrecorded. Rio Ariranhas
1191 on bridge of highway SC-466, Xavantina, Brazil.



1192
1193 Figure 30. Trunk lateral plates of *Hisonotus* sp. "Ariranhas", lateral view of left side, MCP 41354,
1194 40.8 mm SL. Scale bar 4 mm.



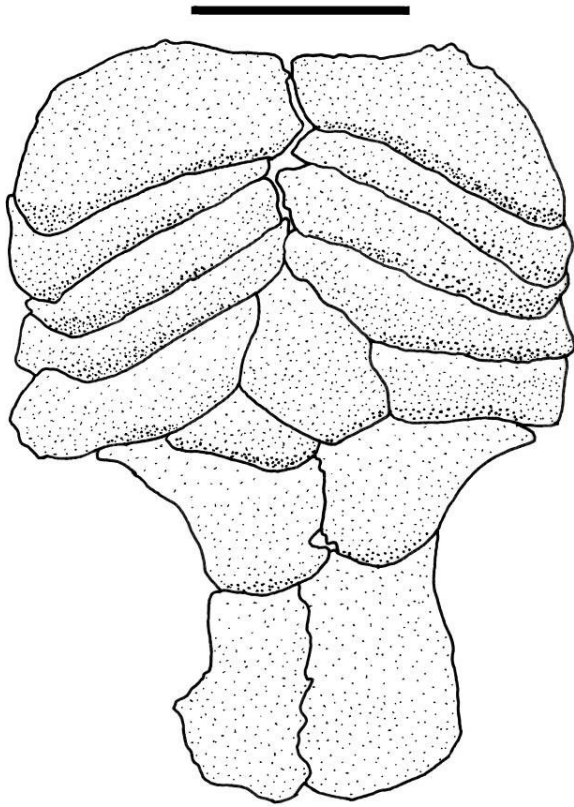
1195
1196 Figure 31. Arrangement of abdominal plates, *Hisonotus* sp. "Ariranhas", MCP 41354, 40.8 mm SL.
1197 Anterior portion toward top. Scale bar 2 mm.



1198
1199 Figure 32. Type locality of *Hisonotus* sp. "Ariranhas". Rio Ariranhas on bridge of highway SC-466,
1200 Xavantina, Brazil.



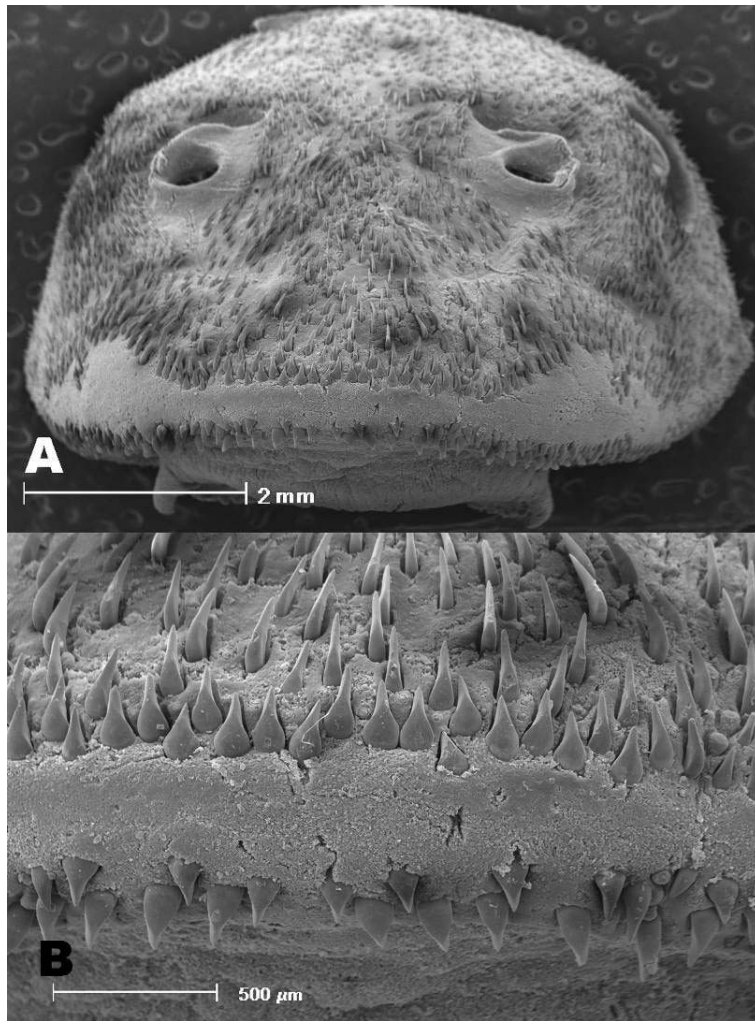
1201
1202 Figure 33. Holotype of *Hisonotus* sp. "Passo Fundo", MCP uncatalog, female, 42.8 mm SL. Arroio
1203 Caraguatá on secondary road to highway BR-153 between Passo Fundo and Ipiranga, Coxilha,
1204 Brazil.



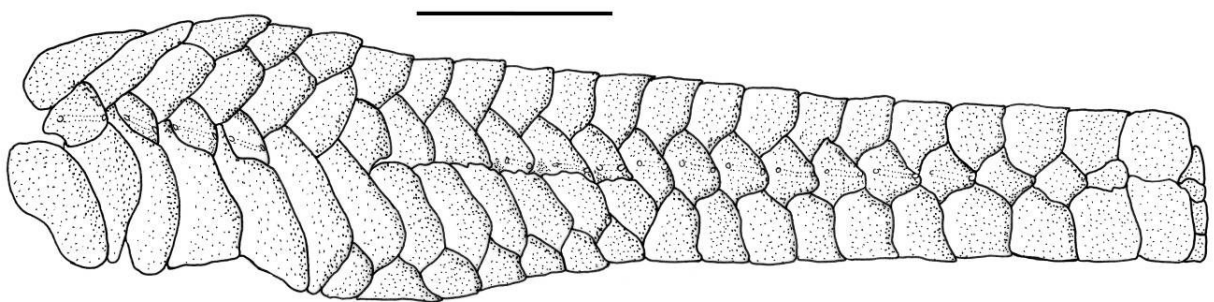
1205

1206 Figure 34. Arrangement of abdominal plates, *Hisonotus* sp. "Passo Fundo", MCP 31779, 37.8 mm

1207 SL. Anterior portion toward top. Scale bar 2 mm.



1208
 1209 Figure 35. Scanning electron micrograph of snout anterior rostral margin of *Hisonotus* sp. "Passo
 1210 Fundo", MCP 41352, 40.9 mm SL. A-anterior view of rostrum □B-magnification of medial portion.



1211
 1212 Figure 36. Trunk lateral plates of *Hisonotus* sp. "Passo Fundo", lateral view of left side, MCP
 1213 31779, 41.3 mm SL. Scale bar 4 mm.



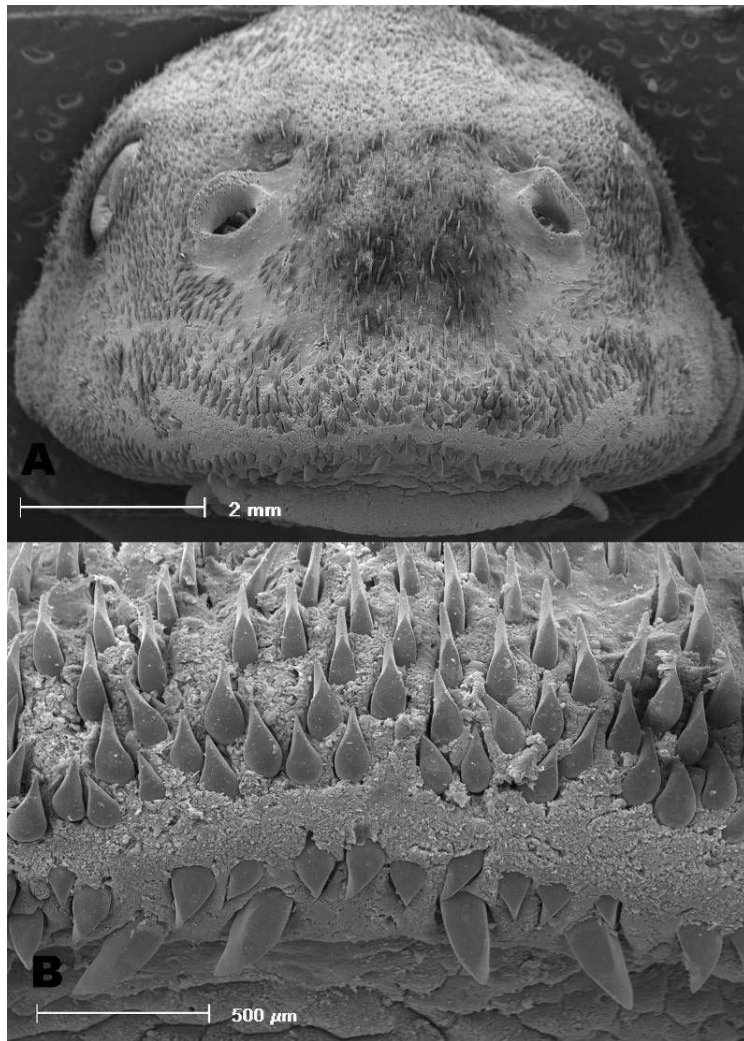
1214
1215 Figure 37. Live specimen of *Hisonotus* sp. “Passo Fundo”, MCP 41352, SL unrecorded. Arroio
1216 Caraguatá on secondary road to highway BR-153 between Passo Fundo and Ipiranga, Coxilha,
1217 Brazil.



1218
1219 Figure 38. Type locality of *Hisonotus* sp. “Passo Fundo”, arroio Caraguatá on secondary road to
1220 highway BR-153 between Passo Fundo and Ipiranga, Coxilha, Brazil.



1221
1222 Figure 39. Holotype of *Hisonotus* sp. “Canoas”, MCP uncataloged, female, 43.0 mm SL. Rio
1223 Rufino on highway SC-427 at city of rio Rufino, Rio Rufino, Brazil.



1224

1225 Figure 40. Scanning electron micrograph of snout anterior rostral margin of *Hisonotus* sp.

1226 “Canoas”, MCP 41459, 41.4 mm SL. A-anterior view of rostrum □ B-magnification of medial

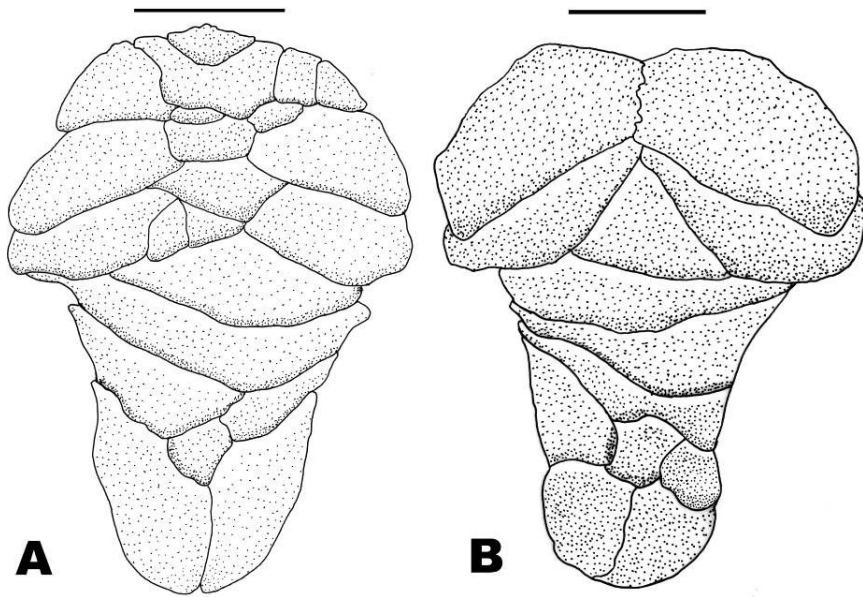
1227 portion.



1228

1229 Figure 41. Live specimen of *Hisonotus* sp. “Canoas”, MCP 41459, SL unrecorded. Rio Rufino on

1230 highway SC-427 at city of Rio Rufino, Rio Rufino, Brazil.



1231

1232 Figure 42. Arrangement of abdominal plates, *Hisonotus* sp. "Canoas". A- MCP 41459, 37.9 mm SL.

1233 B – MCP 41459, 39.4 mm SL. Anterior portion toward top. Scale bar 2 mm.



1234

1235 Figure 43. Type locality of *Hisonotus* sp. "Canoas". Rio Rufino on highway SC-427 at city of rio

1236 Rufino, Rio Rufino, Brazil.

Table 1. Morphometrics and meristics of *Hisonotus nigricauda*. SD = Standard deviation. n = number of specimens.

	Syntypes					laguna dos Patos					rio Uruguai				
	n	Low	High	Mean	SD	n	Low	High	Mean	SD	n	Low	High	Mean	SD
Standard length (mm)	9	24.8	31.8	27.6		60	25.06	39.24	32.37		60	24.1	38.5	30.1	-
Percents of Standard Length															
Head length	9	33.2	39.1	36.6	1.77	60	34.1	40.8	36.0	1.16	60	34.0	38.9	36.4	1.10
Predorsal length	9	44.5	49.6	47.6	1.57	60	44.9	48.8	46.8	0.86	60	44.6	51.0	47.5	1.24
Dorsal-fin spine length	8	22.6	26.5	24.4	1.21	59	23.7	28.7	26.3	1.25	59	22.7	28.7	25.4	1.12
Anal-fin unbranched ray length	8	16.3	19.0	17.9	1.00	58	16.3	21.4	18.7	1.10	60	15.9	20.4	17.8	0.90
Pectoral-fin spine length	9	23.2	27.7	25.6	1.33	60	22.4	31.2	26.7	1.62	60	23.8	30.4	27.1	1.22
Pelvic-fin unbranched ray length	9	14.6	18.7	16.3	1.23	60	14.3	22.1	16.8	1.95	59	12.9	19.7	15.9	1.60
Cleithral width	9	23.7	25.8	24.8	0.74	60	23.4	27.3	25.2	0.77	60	23.4	27.7	25.1	0.94
Thoracic length	9	16.2	19.7	18.3	1.11	60	15.8	19.4	17.7	0.88	60	15.8	19.3	17.7	0.82
Abdominal length	9	18.0	20.6	19.2	1.00	60	18.3	21.6	19.7	0.71	60	18.1	21.5	19.7	0.87
Body depth at dorsal fin origin	9	18.2	20.3	18.8	0.66	60	17.7	21.6	19.2	0.89	60	17.3	21.9	19.1	0.99
Caudal-peduncle length	9	28.6	33.1	31.2	1.56	60	29.9	34.6	31.9	1.10	60	28.0	35.1	31.0	1.55
Caudal-peduncle depth	9	9.8	10.6	10.2	0.23	60	10.0	12.2	11.0	0.43	60	9.4	11.3	10.3	0.51
Percents of Head Length															
Snout Length	9	44.6	47.2	45.8	0.79	60	40.0	49.8	47.2	1.44	60	44.7	50.6	47.4	1.30
Orbital diameter	9	18.3	20.7	19.6	0.76	60	16.1	20.2	18.2	0.99	60	15.3	20.1	17.7	0.95
Interorbital width	9	35.9	41.9	39.2	1.75	60	38.3	47.6	43.4	1.79	60	37.4	48.5	42.2	2.29
Head depth	9	43.8	51.2	47.5	2.73	60	41.0	56.6	49.4	2.93	60	44.5	53.4	48.6	2.07
Suborbital depth	9	13.5	16.4	15.0	0.98	60	14.4	20.4	17.4	1.34	60	14.3	19.3	16.3	1.08
Mandibular ramus	9	6.1	9.3	7.5	0.97	59	6.6	9.5	8.1	0.78	60	5.8	9.7	7.5	0.85
Meristics															
Left premaxillary teeth	7	10	14	12.1	1.35	56	11	19	14.4	1.61	55	10	17	13.6	1.59
Right premaxillary teeth	7	11	15	12.7	1.50	52	11	19	14.4	1.66	59	10	17	13.3	1.54
Left dentary teeth	9	10	12	11.4	0.88	56	10	16	12.8	1.50	60	10	15	11.9	1.45
Right dentary teeth	6	10	11	10.7	0.52	54	11	16	12.6	1.40	56	10	15	11.9	1.36
Left lateral scutes	9	23	24	23.3	0.50	60	22	24	23.0	0.64	60	22	24	23.3	0.65
Right lateral scutes	9	23	24	23.3	0.50	60	22	24	23.1	0.57	60	22	24	23.3	0.63

Table 2. Morphometrics and meristics of *Hisonotus ringueleti*. SD = Standard deviation, n = number of specimens, H = holotype.

	<i>H. ringueleti</i> types					<i>H. candombe</i> types					<i>H. ringueleti</i> non-types						
	H	n	Low	High	Mean	SD	H	n	Low	High	Mean	SD	n	Low	High	Mean	SD
Standard length (mm)	35.4	30	27.0	35.5	30.4		28.7	7	23.6	29.2	26.4		30	28.4	43.5	34.5	
Percents of Standard Length																	
Head length	34.6	30	34.2	38.9	36.2	1.17	35.6	7	35.6	38.9	37.7	1.23	30	32.7	37.2	35.3	1.31
Predorsal length	46.3	30	43.9	50.7	47.1	1.53	45.2	7	45.2	48.2	47.2	1.12	30	43.5	48.0	45.8	1.13
Dorsal-fin spine length	26.1	30	24.6	30.6	26.6	1.33	25.6	7	24.0	28.5	26.1	1.42	28	23.2	29.0	26.2	1.46
Anal-fin unbranched ray length	18.8	30	17.2	22.0	19.3	1.04	16.4	7	16.4	20.1	18.0	1.30	30	15.9	20.7	18.3	1.12
Pectoral-fin spine length	25.9	30	24.8	28.9	26.7	0.97	24.4	7	24.4	27.0	25.7	1.13	30	23.8	28.7	26.1	1.14
Pelvic-fin unbranched ray length	13.7	30	13.7	20.8	16.9	1.99	15.7	7	14.5	17.8	16.3	1.33	29	12.9	20.1	16.0	2.10
Cleithral width	23.2	30	21.8	24.6	23.2	0.74	22.8	7	22.8	24.3	23.5	0.57	30	22.0	24.5	23.1	0.56
Thoracic length	15.3	30	14.5	17.9	16.0	0.88	16.8	7	16.3	17.1	16.8	0.24	30	16.1	19.0	17.5	0.78
Abdominal length	19.2	30	17.1	20.7	19.1	0.92	18.6	7	18.3	20.9	19.5	0.84	30	17.9	21.3	19.5	0.99
Body depth at dorsal-fin origin	18.9	30	17.2	21.6	19.8	0.92	20.1	7	18.8	21.0	19.9	0.78	30	18.1	22.2	20.0	0.88
Caudal-peduncle length	31.8	30	28.7	35.4	32.0	1.62	34.4	7	28.4	34.4	31.2	2.15	30	29.5	35.0	32.2	1.42
Caudal-peduncle depth	14.0	30	12.5	14.9	13.5	0.68	13.6	7	13.4	14.9	14.1	0.53	30	12.1	15.2	13.6	0.85
Percents of Head Length																	
Snout Length	47.5	30	44.9	49.2	46.9	1.10	48.1	7	46.9	49.8	48.1	1.01	30	45.7	50.5	47.9	1.29
Orbital diameter	18.6	30	17.7	20.7	19.4	0.78	17.0	7	17.0	19.4	18.5	0.91	30	17.3	20.8	18.9	0.88
Interorbital width	40.4	30	35.3	43.7	40.4	1.83	39.4	7	37.3	41.5	38.5	1.47	30	36.5	45.6	40.8	1.91
Head depth	52.5	30	47.0	55.9	51.3	2.12	50.8	7	46.8	50.8	49.7	1.38	30	48.0	56.8	52.5	2.33
Suborbital depth	16.7	30	14.4	18.4	16.6	1.02	18.6	7	15.1	18.6	17.0	1.13	30	15.7	19.4	17.5	0.89
Mandibular ramus	8.7	30	6.1	9.3	8.1	0.70	9.0	7	7.1	9.5	8.6	0.87	30	7.3	9.7	8.4	0.70
Meristics																	
Left premaxillary teeth	14	30	11	15	13.4	1.28	13	6	12	14	13.0	0.89	28	10	18	14.3	1.78
Right premaxillary teeth	14	30	11	17	13.8	1.47	15	6	11	15	13.5	1.64	28	12	20	14.5	1.75
Left dentary teeth	14	30	10	15	12.6	1.30	12	6	10	12	11.2	0.98	29	10	16	12.7	1.37
Right dentary teeth	12	27	10	15	12.4	1.39	-	6	10	13	11.2	1.47	29	10	15	12.7	1.32
Left lateral scutes	24	30	22	24	23.2	0.63	24	7	23	24	23.6	0.53	30	22	24	23.5	0.57
Right lateral scutes	23	30	22	24	23.3	0.66	24	7	23	24	23.4	0.53	30	22	24	23.5	0.63

1239 **Table 3.** Frequency distribution for left and right lateral plate counts of species of *Hisonotus* in the
 1240 rio Uruguai basin. N = number of specimens.

Species	Left Lateral Plates					N	Mean	
	20	21	22	23	24			
<i>Nigricauda</i>			7	31	22	60	23.3	
<i>Ringueleti</i>			4	34	29	67	23.4	
<i>Aky</i>			7	19	2	28	22.8	
<i>Charrua</i>				27	36	40	103	24.1
“Passo Fundo”			5	12	3	20	22.9	
“Ariranhas”				4	5	9	23.6	
“Canoas”			8	10		18	22.6	
“Chapecó”	5	13	2			20	20.9	

Species	Right Lateral Plates					N	Mean	
	20	21	22	23	24			
<i>Nigricauda</i>			6	33	21	60	23.3	
<i>Ringueleti</i>			5	30	32	67	23.4	
<i>Aky</i>			11	14	3	28	22.7	
<i>Charrua</i>				21	42	40	103	24.1
“Passo Fundo”			3	14	3	20	23.0	
“Ariranhas”				4	5	9	23.6	
“Canoas”			8	10		18	22.6	
“Chapecó”	8	11	1			20	20.7	

1241 **Table 4.** Morphometrics and meristics of *Hisonotus aky*. SD = Standard deviation, n = number of
 1242 specimens, H = holotype.

	types						non-types					
	H	n	Low	High	Mean	SD	n	Low	High	Mean	SD	
Standard length (mm)	29.2	8	25.0	34.5	28.6		20	28.8	39.7	32.06		
Percents of Standard Length												
Head length	35.6	8	34.9	38.7	36.7	1.43	20	33.3	36.3	34.8	0.81	
Predorsal length	46.4	8	45.6	48.3	47.1	1.36	20	42.8	47.7	46.2	1.06	
Dorsal-fin spine length	24.5	7	24.3	26.5	25.5	1.00	20	20.7	26.4	23.6	1.48	
Anal-fin unbranched ray length	17.5	8	17.0	20.8	18.1	1.22	19	15.1	18.4	16.4	0.91	
Pectoral-fin spine length	24.0	8	23.7	27.9	25.5	1.44	20	21.4	26.7	24.3	1.30	
Pelvic-fin unbranched ray length	16.7	8	15.6	21.2	17.9	2.02	20	14.9	21.6	17.5	2.10	
Cleithral width	23.5	8	23.5	26.0	24.8	0.90	20	23.6	25.6	24.4	0.62	
Thoracic length	17.3	8	16.2	18.0	17.2	0.57	20	13.1	18.2	16.1	1.11	
Abdominal length	19.7	8	17.5	21.8	19.3	1.24	20	18.8	22.6	20.7	0.86	
Body depth at dorsal-fin origin	20.2	8	19.7	23.8	20.8	1.29	20	18.5	22.0	20.6	0.70	
Caudal-peduncle length	33.6	8	32.3	34.5	33.5	0.68	20	31.3	36.0	33.5	1.25	
Caudal-peduncle depth	12.3	8	12.3	14.3	13.0	0.65	20	11.3	13.2	11.9	0.48	
Percents of Head Length												
Snout Length	48.6	8	48.4	51.2	49.3	0.96	20	48.5	53.8	51.2	1.55	
Orbital diameter	17.4	8	16.3	18.4	17.4	0.71	20	15.4	17.9	16.7	0.75	
Interorbital width	37.7	8	37.6	43.2	39.6	2.13	20	38.5	43.0	40.5	1.34	
Head depth	55.5	8	48.4	58.3	52.4	3.65	20	51.2	56.9	53.4	1.40	
Suborbital depth	20.3	8	16.7	22.9	19.9	2.16	20	21.1	24.3	22.4	0.80	
Mandibular ramus	7.8	8	6.5	10.1	8.3	1.48	20	7.9	10.7	9.2	0.74	
Meristics												
Left premaxillary teeth	17	8	11	17	14,1	1,89	20	10	14	12.4	5.33	
Right premaxillary teeth	16	8	12	16	14,3	1,75	20	11	14	12.6	3.85	
Left dentary teeth	13	8	11	16	12,9	1,96	20	10	15	11.9	5.04	
Right dentary teeth	12	8	11	15	12,6	1,51	20	11	15	12.4	4.95	
Left lateral scutes	23	8	22	23	22,9	0,35	20	22	24	22.8	0.62	
Right lateral scutes	23	8	22	24	23,1	0,64	20	22	24	22.6	0.60	

Table 5. Morphometrics and meristics of *Hisonotus charrua*. SD = Standard deviation. n = number of specimens. H = holotype.

	<i>H. charrua</i> types				<i>H. charrua</i> Uruguai basin				<i>H. charrua</i> Laguna dos Patos							
	H	n	Low	High	Mean	SD	n	Low	High	Mean	SD	n	Low	High	Mean	SD
Standard length (mm)	49.2	6	37.1	49.2	42.8	-	103	22.49	50.53	35.48	-	10	33.8	45.6	37.5	-
Percents of Standard Length																
Head length	33.0	6	33.0	36.4	34.6	1.33	103	32.3	39.4	35.4	1.44	10	32.0	34.8	33.8	1.04
Predorsal length	45.9	6	44.8	48.5	46.7	1.28	103	44.2	49.6	47.3	1.20	10	43.6	47.1	46.1	1.22
Dorsal-fin spine length	23.7	6	21.3	25.7	23.5	1.59	103	20.0	29.1	24.1	1.87	10	22.7	26.3	24.8	0.99
Anal-fin unbranched ray length	16.4	6	14.7	18.7	16.7	1.49	102	13.5	19.6	16.8	1.23	10	16.2	19.3	17.6	0.88
Pectoral-fin spine length	25.5	6	23.9	27.5	25.7	1.35	103	21.4	31.0	25.5	1.75	10	24.2	27.9	25.7	1.29
Pelvic-fin unbranched ray length	14.9	6	14.4	20.1	17.3	2.57	103	12.2	23.9	16.5	2.07	10	15.7	21.0	18.9	1.57
Cleithral width	22.8	6	22.8	24.8	24.0	0.78	103	21.8	25.7	23.9	0.88	10	23.0	25.2	24.1	0.68
Thoracic length	16.0	6	15.8	17.3	16.5	0.58	103	14.8	20.0	16.6	0.89	10	15.8	17.9	17.0	0.76
Abdominal length	19.7	6	19.0	20.9	19.8	0.65	103	16.1	22.1	20.0	1.01	10	18.8	20.6	19.8	0.63
Body depth at dorsal-fin origin	19.2	6	19.2	20.9	20.3	0.59	103	16.0	21.6	19.2	1.13	10	19.6	22.0	20.6	0.77
Caudal-peduncle length	33.3	6	31.9	33.8	33.0	0.79	103	28.7	36.4	32.7	1.40	10	32.1	34.9	33.4	0.89
Caudal-peduncle depth	11.5	6	11.5	12.2	12.0	0.26	103	9.6	13.4	11.8	0.82	10	11.6	13.0	12.2	0.50
Percents of Head Length																
Snout Length	48.2	6	47.4	49.8	48.3	0.83	103	43.4	52.4	49.2	1.34	10	45.7	51.4	48.5	1.76
Orbital diameter	15.5	6	14.8	18.0	16.1	1.12	103	13.4	18.7	16.3	1.09	10	14.9	17.8	16.6	0.75
Interorbital width	44.8	6	42.6	45.2	44.0	1.19	103	35.7	47.6	40.7	2.41	10	40.8	47.1	43.9	1.94
Head depth	53.6	6	53.0	55.0	53.9	0.70	103	42.2	54.6	49.2	3.12	10	51.0	58.9	53.3	2.48
Suborbital depth	17.8	6	16.8	19.4	18.1	0.98	103	14.9	21.9	18.2	1.65	10	17.5	22.1	20.4	1.42
Mandibular ramus	7.8	6	7.2	8.7	8.0	0.53	103	6.5	9.8	8.0	0.71	10	7.5	9.7	8.6	0.75
Meristics																
Left premaxillary teeth	18	5	13	19	17.0	2.35	101	12	20	15.7	1.95	10	14	18	16.5	1.43
Right premaxillary teeth	19	6	14	19	17.3	1.86	101	12	21	15.9	1.87	10	16	20	17.4	1.51
Left dentary teeth	12	6	12	18	15.0	2.19	102	11	19	14.3	1.72	10	14	19	15.7	1.70
Right dentary teeth	15	6	14	17	15.3	1.03	100	11	19	14.4	1.92	10	14	19	16.0	1.56
Left lateral scutes	25	6	24	25	24.2	0.41	103	23	25	24.1	0.76	10	23	25	24.0	0.67
Right lateral scutes	25	6	23	25	24.0	0.63	103	23	25	24.1	0.76	10	23	25	24.0	0.82

1244 **TABLE 6.** Morphometrics and meristics of *Hisonotus* sp. “Chapecó”. SD = Standard deviation, n =
 1245 number of specimens, H = holotype.

	types					
	H	n	Low	High	Mean	SD
Standard length (mm)	33.4	20	22.6	33.4	26.8	-
Percents of Standard Length						
Head length	37.2	20	36.3	41.1	38.4	1.15
Predorsal Length	50.4	20	47.5	52.6	50.1	1.24
Dorsal-fin spine length	21.9	20	21.9	27.0	24.8	1.20
Anal-fin unbranched ray length	13.1	20	13.1	19.3	16.9	1.29
Pectoral-fin spine length	22.5	20	22.5	29.5	27.4	1.65
Pelvic-fin unbranched ray length	16.6	20	15.9	21.5	18.8	1.67
Cleithral width	28.4	20	27.6	30.5	29.1	0.9
Thoracic length	18.8	20	16.0	19.3	17.8	0.87
Abdominal length	21.4	20	19.2	21.9	20.5	0.78
Body depth at dorsal-fin origin	21.7	20	19.9	23.7	22.3	0.78
Caudal-peduncle length	29.3	20	28.4	32.4	30.6	1.19
Caudal-peduncle depth	13.9	20	12.9	15.8	14.2	0.67
Percents of Head Length						
Snout Length	51.3	20	48.6	53.8	51.3	1.33
Orbital diameter	15.2	20	15.1	17.5	16.1	0.76
Interorbital width	36.8	20	36.4	40.5	37.9	1.01
Head depth	55.7	20	51.1	57.9	54.8	1.97
Suborbital depth	22.0	20	21.4	27.2	22.9	1.29
Mandibular ramus	7.3	20	6.6	9.2	8.2	0.68
Meristics						
Left premaxillary teeth	10	14	9	13	11.1	1.14
Right premaxillary teeth	10	16	9	14	11.3	1.44
Left dentary teeth	11	19	9	13	10.8	1.03
Rigth dentary teeth	-	17	9	12	10.6	1.09
Left lateral scutes	21	20	20	22	20.9	0.59
Rigth lateral scutes	20	20	20	22	20.7	0.59

1246 **TABLE 7.** Morphometrics and meristics of *Hisonotus* sp. “Ariranhas”. SD = Standard deviation, n =
 1247 number of specimens, H = holotype.

	types					
	H	n	Low	High	Mean	SD
Standard length (mm)	42.2	9	28.3	42.2	36.0	-
Percents of Standard Length						
Head length	35.0	9	32.9	37.5	34.8	1.28
Predorsal length	46.8	9	44.5	48.5	46.0	1.18
Dorsal-fin spine length	21.3	9	21.3	25.1	23.8	1.30
Anal-fin unbranched ray length	16.8	8	14.5	18.0	16.7	1.11
Pectoral-fin spine length	22.6	9	20.8	27.0	23.7	1.67
Pelvic-fin unbranched ray length	17.8	9	14.2	20.4	18.0	1.76
Cleithral width	23.3	9	22.2	24.1	23.1	0.54
Thoracic length	16.7	9	15.1	16.8	16.1	0.60
Abdominal length	20.6	9	19.2	21.2	20.4	0.61
Body depth at dorsal-fin origin	18.9	9	17.6	20.2	18.9	0.87
Caudal-peduncle length	32.9	9	31.9	35.9	33.2	1.51
Caudal-peduncle depth	10.1	9	9.8	11.8	10.6	0.59
Percents of Head Length						
Snout Length	48.6	9	46.8	48.8	47.8	0.67
Orbital diameter	15.1	9	15.1	16.5	15.9	0.38
Interorbital width	38.7	9	36.1	42.7	39.5	2.13
Head depth	50.2	9	46.2	52.8	49.5	2.48
Suborbital depth	18.1	9	17.3	20.0	18.9	0.88
Mandibular ramus	7.2	9	7.1	8.4	7.7	0.51
Meristics						
Left premaxillary teeth	12	9	11	15	12.8	1.79
Right premaxillary teeth	13	9	10	16	12.9	2.09
Left dentary teeth	14	9	10	15	12.7	1.80
Rigth dentary teeth	13	9	10	15	12.7	1.50
Left lateral scutes	23	9	23	24	23.6	0.53
Rigth lateral scutes	23	9	23	24	23.6	0.53

1248 **Table 8.** Morphometrics and meristics of *Hisonotus* “Passo Fundo”. SD = Standard deviation, n =
 1249 number of specimens, H = holotype.

	types					
	H	n	Low	High	Mean	SD
Standard length (mm)		20	30.7	47.1	38.6	
Percents of Standard Length						
Head length	32.1	20	29.6	35.5	32.3	1.30
Predorsal Length	45.7	20	41.2	46.7	44.2	1.44
Dorsal-fin spine length	21.6	20	19.4	24.4	21.5	1.31
Anal-fin unbranched ray length	15.7	19	13.4	19.1	16.2	1.33
Pectoral-fin spine length	22.6	19	20.4	26.0	22.7	1.47
Pelvic-fin unbranched ray length	12.2	20	12.2	19.9	15.7	2.44
Cleithral width	22.3	20	20.5	23.3	22.0	0.76
Thoracic length	15.4	20	14.6	17.1	16.1	0.83
Abdominal length	18.1	20	17.9	20.6	19.1	0.64
Body depth at dorsal-fin origin	20.0	20	17.8	21.1	19.3	1.01
Caudal-peduncle length	38.8	20	33.3	39.1	36.8	1.50
Caudal-peduncle length	11.2	20	10.3	12.6	11.4	0.67
Percents of Head Length						
Snout Length	53.0	20	46.4	53.0	49.9	1.48
Orbital diameter	15.6	20	13.9	16.8	15.3	0.84
Interorbital width	41.6	20	39.4	44.9	42.1	1.51
Head depth	55.5	20	49.8	56.2	53.0	2.19
Suborbital depth	22.0	20	19.3	23.6	21.8	1.16
Mandibular ramus	7.9	20	6.2	8.5	7.6	0.76
Meristics						
Left premaxillary teeth	20	20	13	21	17.4	2.52
Right premaxillary teeth	20	19	14	22	17.4	2.52
Left dentary teeth	18	20	12	19	16.1	1.86
Rigth dentary teeth	16	20	12	19	15.6	1.70
Left lateral scutes	23	20	22	24	22.9	0.64
Rigth lateral scutes	23	20	22	24	23.0	0.56

1250 **Table 9.** Morphometrics and meristics of *Hisonotus* sp. “Canoas”. SD = Standard deviation, n =
 1251 number of specimens, H = holotype.

	types					
	H	n	Low	High	Mean	SD
Standard length (mm)		18	27.1	45.1	36.3	
Percents of Standard Length						
Head length	33.3	18	31.8	37.6	33.7	1.67
Predorsal Length	44.9	18	41.9	46.8	44.3	1.32
Dorsal-fin spine length	22.3	18	21.7	25.3	23.6	1.12
Anal-fin unbranched ray length	16.8	18	15.8	19.8	17.8	1.14
Pectoral-fin spine length	23.8	18	21.0	25.1	23.6	1.03
Pelvic-fin unbranched ray length	14.3	18	13.1	20.1	17.1	2.05
Cleithral width	23.7	18	22.9	25.2	23.8	0.70
Thoracic length	16.0	18	14.3	16.3	15.6	0.57
Abdominal length	20.9	18	18.2	21.6	20.2	0.91
Body depth at dorsal-fin origin	20.1	18	19.7	21.9	20.7	0.64
Caudal-peduncle length	35.1	18	33.5	38.7	35.8	1.41
Caudal-peduncle depth	11.0	18	10.4	12.8	11.6	0.56
Percents of Head Length						
Snout Length	48.0	18	46.1	49.5	48.1	1.00
Orbital diameter	15.2	18	14.9	18.0	16.7	0.86
Interorbital width	41.3	18	35.9	44.9	41.2	3.08
Head depth	56.2	18	51.0	59.5	55.7	2.70
Suborbital depth	22.5	18	18.0	24.3	22.3	1.52
Mandibular ramus	8.25	18	7.1	9.2	8.4	0.72
Meristics						
Left premaxillary teeth	14	18	11	14	12.2	1.10
Right premaxillary teeth	14	18	10	14	11.9	1.13
Left dentary teeth	13	18	8	14	10.7	1.87
Rigth dentary teeth	13	18	9	13	11.2	1.44
Left lateral scutes	23	18	22	23	22.6	0.51
Rigth lateral scutes	22	18	22	23	22.6	0.51

Conclusões Gerais

Na bacia do rio Uruguai e no sistema da laguna dos Patos distribuem-se 18 espécies de *Hisonotus*, sendo a região aonde o gênero é mais diverso. Destas, 17 são encontradas apenas nessa região o que indica um alto grau de endemismo para as bacias hidrográficas. Doze espécies estão presentes no sistema da laguna dos Patos: *Hisonotus laevior*, sinônimo sênior de *H. leptochilus*, *H. nigricauda*, *H. taimensis*, *H. armatus*, *H. charrua*, *H. aff. leucofrenatus*, *H. sp.* “Prata”, *H. sp.* “Carreiro”, *H. sp.* “Camaquã”, *H. sp.* “Sinos”, *H. sp.* “Felício” e *H. sp.* “Passo Novo”. As regiões de cabeceira do sistema da laguna dos Patos apresentam um alto grau de endemismo ao passo que as porções mais baixas têm espécies mais amplamente distribuídas. Já a bacia do rio Uruguai apresenta um menor número de espécies, oito ao total. *Hisonotus nigricauda*, *H. ringueleti* sinônimo sênior de *H. candombe*, *H. aky*, *H. charrua*, *H. sp.* “Passo Fundo”, *H. sp.* “Chapecó”, *H. sp.* “Ariranhas” e *H. sp.* “Canoas” compõem as espécies do gênero na drenagem do rio Uruguai. Assim como ocorre na laguna dos Patos, as porções mais elevadas da bacia apresentam um alto grau de endemismo comparado com as regiões mais baixas. Apenas duas espécies são compartilhadas entre estas duas regiões hidrográficas estudadas (*H. nigricauda* e *H. charrua*), ambas espécies habitando regiões de baixas altitudes. Esse estudo permitiu verificar a alta diversidade, anteriormente desconhecida para a região, do gênero bem como os endemismos encontrados nas bacias.