

Taxonomic revision of the genus *Hadropus* Schoenherr (Coleoptera: Curculionidae) with comments on infraspecific variation

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ABSTRACT

Hadropus Schoenherr, 1826 is a monotypic genus of Naupactini (Curculionidae: Entiminae), ranging in Brazil and Paraguay. It is easily recognized by the nebulous pattern of the elytral vestiture, the presence of very short rostrum and humped elytra with strongly bisinuate anterior margin. The morphological characters of the rostrum, antennae, legs, elytra and female genitalia relate *Hadropus* to *Ericydeus* Pascoe. *Hadropus albiceris* (Germar) shows variation in body size, morphometrics of the pronotum and color of the scaly vestiture, that allows distinguishing two basic morphotypes. This paper includes descriptions of the genus and its single species, habitus photographs, line drawings of genitalia, and a map of distribution.

Keywords: Systematics, weevils, Naupactini, Entiminae, Brazil, Paraguay

INTRODUCTION

Hadropus is a monotypic genus of the subfamily Entiminae, tribe Naupactini, described by Schoenherr (1826) based on the species *H. nubiculosus*, a junior synonym of *H. albiceris* (Germar) according to Gemminger & Harold (1871). It is distributed in South America (Brazil and Paraguay), throughout the Chacoan and Parana subregions of the Neotropics, mainly on hills about 1000 meters high. The Chacoan subregion is characterized by xerophyllous forests and graminous steppes, and the Parana subregion, by the presence of subtropical forests (Morrone 2006).

The genus was included in keys by van Emden (1944) and Hustache (1947), in a couplet along with *Ericydeus* Pascoe, based on the short antennal scape not exceeding eyes and the transversal second tarsite. However, there is neither a complete generic redescription nor a detailed analysis of the infraspecific variation of its single species.

The main objectives of this contribution are to redescribe *Hadropus*, including characters of the male and female genitalia, to provide a detailed

description and illustration of the diagnostics characters of its species, to bring new data on geographic distribution, and to discuss its possible relationships with other Naupactini genera.

MATERIALS AND METHODS

This study was based upon the examination of about 200 specimens borrowed from the following institutions:

AMNH: American Museum of Natural History, New York, USA. Lee Herman.

DZUP: Departamento de Zoologia, Universidade Federal do Parana, Curitiba, PR, Brazil. Germano Rosado-Neto.

MNRJ: Museo Nacional de Río de Janeiro, RJ, Brazil. Miguel Monné.

MZSP: Museu de Zoologia da Universidade do São Paulo, SP, Brazil. Sergio Vanin.

NHRS: Naturhistoriska Riksmuseet, Stockholm, Sweden. Bert Vicklund.

USNM: National Museum Natural History, Smithsonian Institution, Washington D.C., USA. Richard Gordon.

Dissections were made according to standard entomological techniques. Photographs and drawings were done with a digital camera and a camera lucida attached to a stereoscopic microscope. Measurements were taken with an ocular micrometer. Measurements with their abbreviations are as follows: LB, length of body, measured along midline; LA, maximum length of antenna; LC, maximum length of club; WC, maximum width of club; LR, length of rostrum; WR, width of rostrum measured across apex (excluding scrobes); WF, width of frons between anterior margin of eyes; LP, maximum length of pronotum; WP, maximum width of pronotum; LE, maximum length of elytra; WE, maximum width of elytra.

RESULTS

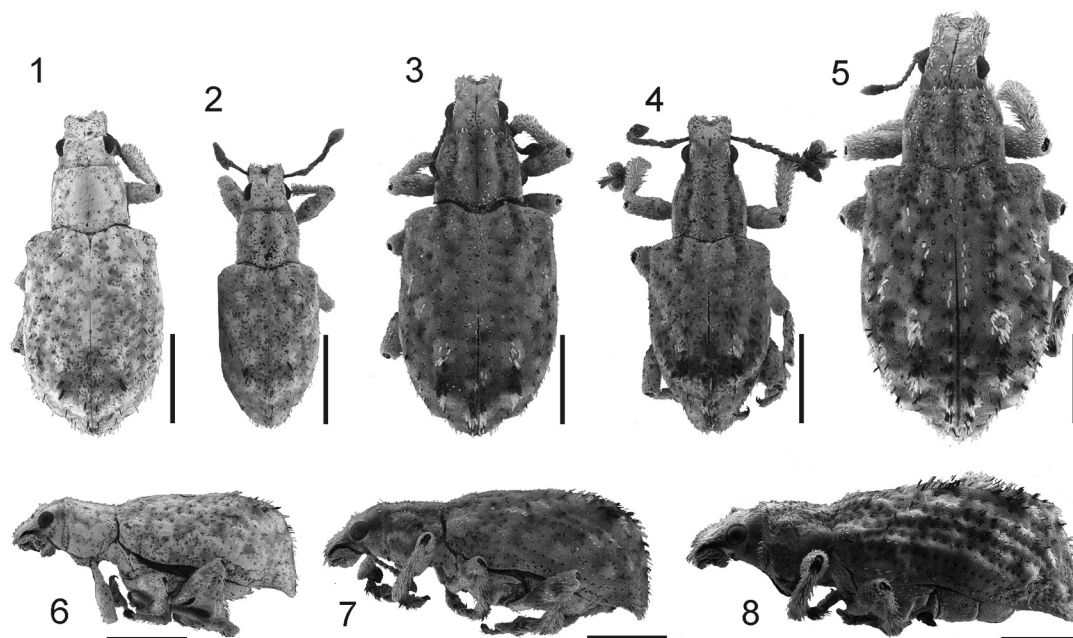
Hadropus Schoenherr (Figs 1-16)

Hadropus Schoenherr 1826:111; Dalla Torre et al. 1936:6 (catalogue); van Emden 1944:511 (in key); Hustache 1947:6 (in key); Blackwelder 1947:792 (checklist); Wibmer & O'Brien 1986:52 (checklist); Alonso-Zarazaga & Lyal 1999:164 (catalogue).

Type species.— *Hadropus nubiculosus* Schoenherr 1826:111 (= *Cyphus albiceris* Germar 1824), by original designation.

Diagnosis.— Species medium sized (6-9 mm long), vestiture dense, composed of whitish and green scales forming irregular nebulous pattern, and scatter, suberect, short scales-like setae, more dense on elytral declivity, mainly on intervals 1 and 3 (Figs 5, 8). Rostrum very short with distinct narrow epistome. Antennae short with scape reaching anterior half of eyes. Pronotum truncate-conical, strongly bisinuate at base. Elytra humped (Figs 6-8), with strongly bisinuate base and prominent humeri (Figs 1-5). Outer bevels broad, setose. Spermatheca large, with reduced nodulus and strongly developed ramus.

Redescription.— Species medium sized (female 7-9 mm long; male 6.25-7.10 mm long). Integument strongly sclerotized, densely covered with whitish or tan and green scales, forming irregular nebulous pattern on elytra (Figs 1-5); scales appressed, subcircular and striate; scales-like setae scattered, short, suberect, denser and grouped in tufts on apical third of elytral intervals 1 and 3 (Figs 5, 8). *Rostrum* (Figs 1-5) very short (LR/WR:0.73-0.83), with subparallel sides (WF/WR:1.00-1.12) and dorsum strongly depressed; apex v-shaped, with narrow and well delimited epistome, covered with small, scattered, subcircular scales; median groove linear, narrow, exceeding hind margin of eyes; scrobes not visible from dorsum, strongly curved downwards, almost reaching ventral surface; gular angle about 120° (Fig. 7). *Mouthparts.* Mandibles covered with creamy disperse scales and coarse yellowish setae on external face; prementum subpentagonal, external surface strongly concave, without setae. Eyes moderately convex; preocular impression absent; postocular constriction slight. Frons and vertex flat. *Antennae* (Fig. 9) short (LB/LA:2.8-3.8), setose; scape almost reaching half of eyes, about half length of funicle; funicular article 2, 1.5-1.9x longer than article 1, articles 3 to 7 slightly longer than wide; club acuminate oval (LC/WC:2.05-2.41). *Pronotum* (Figs 1, 3, 5) moderately transverse (WP/LP:1.10-1.23), truncate-conical, with one dorsal and two lateral longitudinal depressions, separated by a pair of distinct longitudinal elevations; anterior margin slightly curved onwards; flanks slightly curved and divergent; hind margin strongly bisinuate, with posterior angles projected backwards. *Scutellum* subtriangular, distinct, densely covered with cream scales. *Elytra* oval, short (LE/WE:1.31-1.56); base strongly bisinuate; humeri strongly prominent, without tooth (Figs 1-5); apex entire (not bifid), subacute; apical declivity strong (at almost right angle), humped (Figs 6-8), with distinct subapical callus (Figs 3-5); punctures of striae small, with one oval scale on bottom; intervals wavy (with undulating depressions) (Fig. 8); interval 1 and 3 strongly elevated near declivity. Metathoracic wings present. *Legs* short; fore coxae contiguous, slightly closer to anterior margin than to posterior margin of prosternum; tibiae without denticles on inner face;



Figs 1-8. Habitus of *Hadropus albiceris*, showing intraspecific variation. 1-5, dorsal views; 6-8, lateral views. 1, 3, 5-8, females; 2, 4, males. Scale: 2 mm.

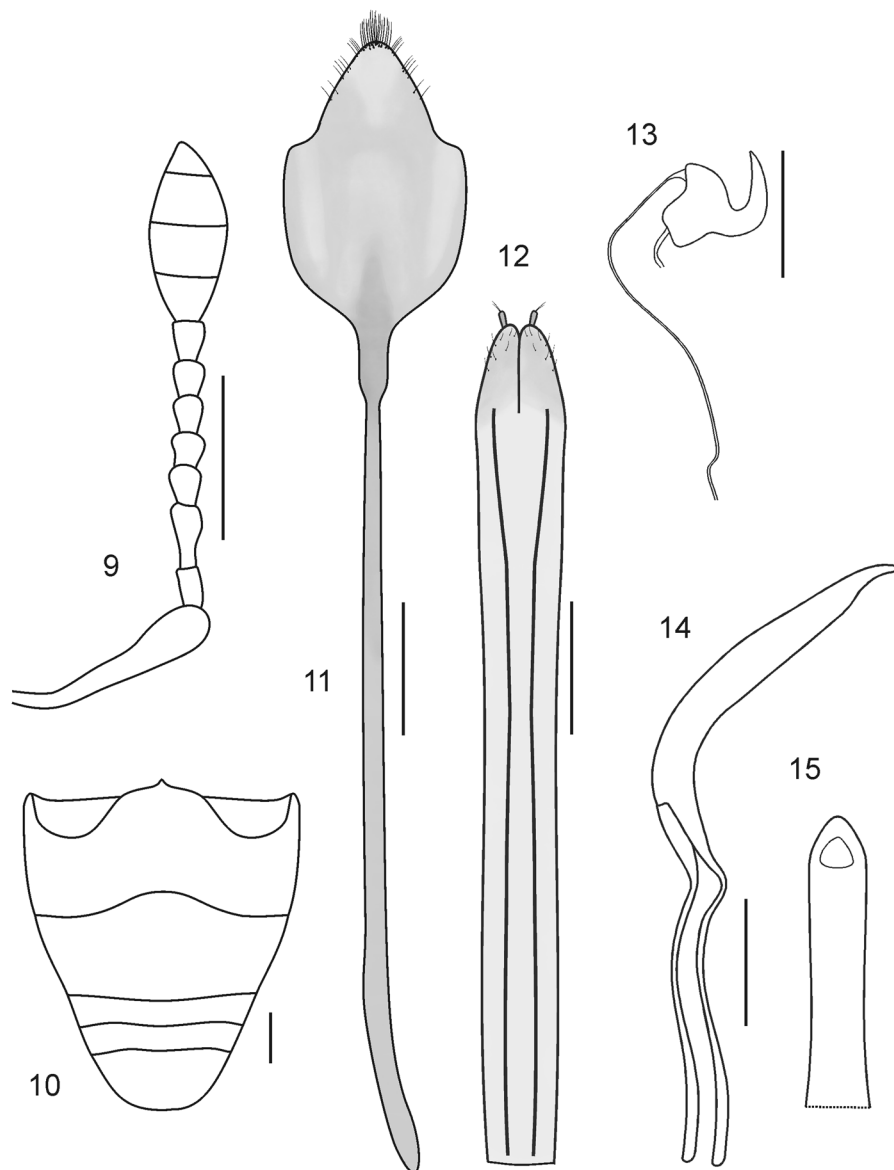
pro and mesotibiae with small mucro and metatibiae without mucro; outer bevels broad, densely covered with setae-like scales; apical comb almost 2x longer than dorsal comb; tarsite 2 transversal. *Abdomen* (Fig. 10) with intercoxal portion 1.5x broader than cavities of hind coxae; ventrite 2 about twice longer than ventrites 3+4.

Female terminalia. Sternite VIII (Fig. 11) subrhomboidal, slightly sclerotized, 2- 2.5x as long as apodeme, apex bearing long setae. Ovipositor (Fig. 12) slender, long (about as long as abdomen), slightly curved on lateral view; coxites slightly sclerotized with short setae; baculi subparallel; styli well developed, directed backwards. Spermathecae (Fig. 13) large, somewhat subglobose, lacking nodulus, with well developed ramus and moderately long cornu; spermathecal duct fine, moderately sclerotized, as long as ovipositor.

Male genitalia. Aedeagus (Figs 14-15) slightly longer than abdomen; tube slightly longer than apodemes (1.3x), moderately curved in lateral view, with ventrally curved and subacute apex and small ostium.

Sexual dimorphism

Males (Figs 2, 4) more slender and smaller than females; antennae slightly longer; pronotum less transversal and longer in relation to elytral disc (values of LE/LP: 2.65-2.80, smaller than in females LE/LP: 2.76-3.06); elytra more elongate than in females.



Figs 9-15. *Hadropus albicaris*. 9, right antenna; 10, ventrites 1-5; 11, female sternite VIII; 12, ovipositor, ventral view; 13, spermathecae with spermathecal duct; 14, aedeagus, lateral view; 15, aedeagus, terminal portion of tube, ventral view. Scales: 0.5 mm.



Fig. 16. Map of Brazil and Paraguay (South America), showing the geographical distribution of *Hadropus albiceris*.

Geographic distribution

Hadropus is distributed in southeastern Brazil (Espírito Santo, Goiás, Mato Grosso do Sul, Minas Gerais, Paraná, Rio de Janeiro, São Paulo and Santa Catarina) and Paraguay (Fig. 16). This area corresponds to the Atlantic, Cerrado and Paranaense provinces of the Neotropics (Cabrera & Willink 1973) and to the Brazilian Atlantic Forest, Cerrado and Parana provinces according to the biogeographic scheme of Morrone (2002, 2006). The Cerrado (south-central Brazil, states of Minas Gerais, Mato Grosso, Goiás, São

Paulo, Parana, Maranhao, and Piaui, northern Paraguay and Bolivia) represents one of the largest savanna+forest complexes in the world, with open forests having low trees (8–12 m), shrubs, a stratum of herbs rich in Poaceae and Fabaceae and gallery forests along the rivers. The Atlantic province includes the oriental slopes of the coastal hills of Brazil, characterized by a pluvial forest of trees of 30–40 meters of high, with a lower stratum rich in palms, lianas and epiphytes. The Paranaense Forest is a subtropical forests ranging in north-eastern Argentina, eastern Paraguay and south-eastern

Brazil (Morrone 2000). In these biogeographic provinces, *Hadropus* is mainly distributed on hilly areas of about 1000 meters high.

Remarks and comparative notes

In a preliminary phylogenetic analysis of the tribe Naupactini (del R o & Lanteri 2010), *Hadropus* was recovered as the sister taxa of a group formed by *Ericydeus* Pascoe and *Neoericydeus* Hustache. This relationship is mainly supported by the characters of the setose antennae; the truncate conical pronotum, with three longitudinal impressions, and the posterior angles projected backwards; the base of the pronotum and the elytra strongly bisinuate; and the subglobose espermatheca. *Hadropus* shares more characters with *Ericydeus* than with *Neoericydeus*, such as the short antennae, with scape no exceeding half of eyes, the stout rostrum, the strongly gibbous elytra, the short and robust legs without denticles, bearing small mucro on front and middle tibiae, and the broad corbels of the hind tibiae (Lanteri 1995). The characters of the female genitalia (sternite VIII, ovipositor and spermatheca) are similar in the two genera, although in *Hadropus* the spermatheca has a much strongly developed ramus and it lacks the nodulus, resembling that of the unrelated genus *Enoplopactus* Heller (Lanteri 1990a). The main differences between *Hadropus* and *Ericydeus* are in the sculpture of the integument, the vestiture and the color pattern. *Hadropus* shows larger, striate, appressed and not iridescent scales, and it lacks the typical maculae of the species of *Ericydeus* and *Neoericydeus*, although it shows some darker areas on the middle and hind femora and the elytral declivity (Figs 3-4). Moreover, in *Hadropus* the dorsal comb of the hind tibiae is much shorter than the apical comb, the subapical elytral callus is present (Figs 3, 5) and the ventrite 2 is much longer than the ventrites 3+4 (Fig. 10).

In the body shape, the sculpture of the integument and the vestiture *Hadropus* is similar to *Cyrtomon* Schoenherr, especially the Brazilian species *Cyrtomon gibber* (Pallas) which inhabits similar environment as *H. albiceris*. Both species show similar color pattern (vestiture whitish or tan mix with pale green), irregularly wavy elytral

intervals and uneven intervals usually elevated (especially interval 3). As a matter of fact, when Schoenherr (1826) described *Hadropus*, he remarked that the new genus is near *Cyphus* (= *Cyrtomon*), but with shorter antennae and club, eyes less prominent and straight tibiae. However, other generic characters, mainly those of the male and female genitalia, are very different in both genera (Lanteri 1990b; Lanteri & del R o 2008), and for this reason *Hadropus* and *Cyrtomon* are not so closely related in the phylogenetic analysis (del R o & Lanteri 2010).

Hadropus albiceris (Germar) (Figs 1-16)

Cyphus albiceris Germar 1824: 432.

Hadropus albiceris: Boheman 1833 in Schoenherr: 631.

Hadropus nubiculosus Schoenherr 1826: 111 (syn. by Gemminger & Harold 1871:2227)

"*Neoericydeus fascicularis* Hustache 1938:94 (syn. by Kuschel 1955: 278 as *Hadropus*).

Hadropus albinus Rosenschold 1840 in Schoenherr: 154; (syn. by Kuschel 1955: 278)

Redescription. Species medium sized (female 7-9 mm long; male 6.25-7.10 mm long). Integument densely covered with mix whitish and pale green scales (Figs. 1-2) or tan and olive-green scales (Figs. 3-5), and scatter setae-like scales. Head and pronotum mostly whitish or tan, except three longitudinal greenish stripes, along midline and sides of the pronotum, located on its impressed lateral areas and extended on middle of frons and behind eyes; elytra with nebulose pattern and usually with a darker V-shaped area of setae-like scales near declivity; legs mostly pale, except middle and hind femora, having pair of greenish maculae on external surface; venter whitish or tan.

Scales appressed, subcircular, striate, and not iridescent, covering whole body, except the antennae, that are clothed with fine decumbent white setae and verticillate setae at distal end of each funicular article. Seta-like scales short, decumbent, scattered and somewhat indistinct on head and pronotum; moderately long and suberect towards apical third of elytral, on intervals 1, 3, 5,

6 and 7, and denser and grouped in tufts of pale and dark setae on elevated areas of intervals 1 and 3, near elytral declivity (Figs 3, 5); punctures of elytral striae with one round scale on bottom; venter and femora covered with sparse semi-decumbent seta-like scales; tibiae and tarsi, covered with long, suberect, dense setae.

Rostrum (LR/WR:0.73-0.83; WF/WR:1.00-1.12). *Pronotum* (WP/LP:1.10-1.23). *Elytra* (LE/WE:1.31-1.56; LE/LP: 2.65- 3.06). Other morphological features of females and males as those described for the genus.

Type material studied

Type of *Hadropus nubiculosus* Schoenherr, male, from Brazil (NHRS).

Type of *Hadropus albinus* Rosenschold, Brazil, Minas Gerais, almost destroyed, only elytra available (NHRS).

Other material studied

BRAZIL. No loc. (5 MZSP, 1 USNM). *Espirito Santo*: Linhares, Parque Soontana, III-1953, Almeida col. (1 MNRJ). *Goiás*: Corumbá, Fazenda Monjolinho, 14-VI-1942, F. Lane (2 MZSP). *Mato Grosso do Sul*: Maracajú, II-1937, J. Lane col. (1 MZSP). *Minas Gerais*: Serra do Caraça, 24-II-3-III-1972, Exp. MZUSP (1 MZSP), 27-XI-5-XII-1972, Exp. MZUSP (1 MZSP), III-1963, Werner, Martins & Silva col. (1 MZSP); Viçosa, III-1931, Hambleton col. (1 USNM); Vila Monte Verde, V-1957, J. Halik (2 MZSP), 6-XII-1957, J. Halik (4 MZSP), 13-XI-1965, J. Halik (1 DZUP, 6 MZSP), 14-XI-1965, J. Halik (12 MZSP), 15-XI-1965, J. Halik (27 MZSP), XII-1965, J. Halik (3 MZSP), III-1966, J. Halik (1 MZSP), 12-19-III-1966, J. Halik (5 MZSP), 14-III-1966, J. Halik (1 MZSP), 16-21-XI-1966, J. Halik (11 MZSP), 12-IV-1967, J. Halik (3 MZSP), 22-II-1969, J. Halik (2 MZSP), 23-III-1969, J. Halik (1 MZSP), 26-V-1969, J. Halik (2 MZSP), 28-XI-1969, J. Halik (2 MZSP), XI-1969, J. Halik (6 MZSP), I-II-1970, J. Halik (3 MZSP), 10-III-1970, J. Halik (1 MZSP), 3-XI-1970, J. Halik (1 MZSP), XI-1970, J. Halik (1 MZSP), 2-XII-1970, J. Halik (2 MZSP), 21-22-XII-1971, J. Halik (3 MZSP) 6-I-1972, J. Halik (1 MZSP), 9-III-

1972, J. Halik (1 DZUP, 2 MZSP). *Río de Janeiro*: Río de Janeiro, Corcovado (1 RJ), 4-I-1956, Zajclw col. (1 MNRJ), IV-1958, Alvarenga & Seabra col. (3 DZUP), XII-1958, Alvarenga col. (1 MZSP), II-1959, Alvarenga col. (2 MZSP), IV-1960, Alvarenga col. (1 MZSP), III-1961, Alvarenga col. (1 MZSP), X-1962, Alvarenga col. (1 MZSP), III-1981, Alvarenga col. (1 DZUP); Petropolis, 5-7-III-1962, Bechiné col. (23 DZUP). *Paraná*: Curitiba, II-1945, Ciaretiano col. (1 AMNH). *Santa Catarina*: Rio Negrinho, I-1925, Maller col. (2 MNRJ); Rio Vermelho, (1 DZUP), III-1960, Dirings col. (2 MZSP); Timbó, II-1935, Pohl col. (1 MZSP), XII-1956, Dirings col. (1 MZSP). *São Paulo*: no loc. (1 RJ); Barbiellipe (2 AMNH); Campos de Jordão, 1944, F. Lane (1 MZSP); I-1948, Alvarenga col. (3 MZSP); Cantareira, XI-1920, Schmedel col. (3 MZSP), II-1962, J. Halik col. (1 MZSP); Cocaia, 1935 (1 MZSP); Diadema, 25-II-1961, Reichardt & Werner (1 MZSP); Embu, 1974, F. Lane col. (2 MZSP); Guarulhos, 19-XII-1957, J. Halik col. (2 MZSP); Horto Forestal, 1-III-1962, J. Halik col. (1 MZSP); I. S. Sebastiao, 1977 (1 MZSP); Interlagos, 4-III-1961, Reichardt & Werner col. (1 MZSP); Jabaguara, 29-II-1920, Maller col. (1 MNRJ); Morumbi, Nick col. (AMNH); Osasco, 5-IV-1938 (1 MZSP); San Bernardo, Represa do Rio Grande, XII-1951, Dirings col. (5 MZSP); I-1952, Dirings col. (1 MZSP), 5-I-1952, Pohl col. (1 MZSP); Santana, III-1967, J. Halik col. (1 MZSP); São Pablo, 29-II-1920 Maller col. (1 RJ); Serra do Cantareira, 24-III-2008, Silva col. (1 MZSP).

Geographic distribution

Hadropus albiceris was cited only for Brazil and Paraguay. Based on the material studied we add several new locality and states records from Brazil (Fig. 16). Regarding to Paraguay, we were not able to study material from this country.

Remarks

Germer (1824) described the species *Cyphus albiceris* from Brazil, later transferred to *Hadropus* by Boheman (1833). Schoenherr (1826) described the species *H. nubiculosus* in a combined description with the genus *Hadropus*. This species

was considered as a variety of *H. albiceris* by Boheman 1833 (in Schoenherr 1833: 631) and synonymized with it by Gemminger & Harold in 1871.

Hustache (1938) described the species *Neoericydeus fascicularis*, from Paraguay (Alto Parana, Hohenau) and Rosenschold (1840) described *Hadropus albinus*; both species synonymized by Kuschel in 1955 with *H. albiceris*.

The relatively extensive synonymic history of this species is related to its intraspecific variation mainly present in vestiture and body size.

Intraspecific variation

The variation of *H. albiceris* is mainly related to size, morphometrics and sculpture of pronotum and elytra, and color pattern of the vestiture. According to these characters there are two main morphotypes: A) Specimens small, having whitish- pale green scaly vestiture (Fig. 1-2, 6), pronotum with slight longitudinal impressions and sides slightly divergent towards base, and elytral intervals scarcely undose. B) Specimens usually larger and more robust, having tan and olive-green scaly vestiture, pronotum with strong longitudinal impressions and sides distinctly divergent towards base (more conical and with wider base), and elytral intervals strongly undose (Figs. 3-5, 7-8). The first morphotype occurs in the Brazilian states of Goiás, Mato Grosso do Sul, Minas Gerais (Serra do Caraça) and Rio de Janeiro; and the second morphotype was found in Minas Gerais (Vila Monte Verde), São Paulo and Santa Catarina states (Fig. 16). Morphotypes A and B coexist in the state of Minas Gerais, and there are also some specimens with intermediate characters in São Paulo state.

The scaly vestiture becomes darker in eastern direction towards the Atlantic coast or Atlantic Forest, and there is an increase of body size in southern direction. The largest and more sculptured specimens (with strongest impressions in pronotum and elytra) are those of Santa Catarina (Figs 5, 8).

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