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Objekttyp: **Article**

Zeitschrift: **Mitteilungen der Schweizerischen Entomologischen Gesellschaft = Bulletin de la Société Entomologique Suisse = Journal of the Swiss Entomological Society**

Band (Jahr): **77 (2004)**

Heft 1-2

PDF erstellt am: **18.09.2024**

Persistenter Link: https://doi.org/10.5169/seals-402859

MITTEILUNGEN DER SCHWEIZERISCHEN ENTOMOLOGISCHEN GESELLSCHAFT
BULLETIN DE LA SOCIÉTÉ ENTOMOLOGIQUE SUISSE
77, 69 – 79, 2004

On two Chilean species of *Drosophila* (Diptera, Drosophilidae)

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Two Neotropical species of *Drosophila* described from Chile and endemic to South America, namely *D. gasici* Brncic, 1957, belonging to the *mesophragmatica* group, and *D. huilliche* Brncic, 1957, a poorly known species belonging to the *guarani* group, are redescribed. Illustrations of the male terminalia are also provided. A proposal is made to tentatively include *Drosophila amplipennis* Malloch, 1934 in the *guarani* group as an aberrant member.

Keywords. *Drosophila gasici*; *Drosophila huilliche*; *Drosophila amplipennis*; *mesophragmatica* group; *guarani* group; male terminalia.

INTRODUCTION

As part of our goal to clarify the identities of some poorly known species of Neotropical Drosophilidae we recently had the opportunity to study many type specimens of four of them, which were described from Chile by Dr. Danko Brncic (Vilela & Bächli 2002). While that paper was already in press, we received, through the kindness of Dr. Ariel Camousseight, curator of the Museo Nacional de Historia Natural (Santiago, Chile) a second loan including type specimens of two additional species, also described from Chile by the same author. So, in the present paper we are presenting the illustrated redescriptions of *Drosophila gasici* Brncic, 1957, belonging to the mostly Andean *mesophragmatica* species group, and of *Drosophila huilliche* Brncic, 1957, which seems to be endemic to southern Andes, although included in the more widespread *guarani* species group.

MATERIAL AND METHODS

The analyzed male type specimens of *D. gasici* and *D. huilliche* are deposited in the Museo Nacional de Historia Natural (Santiago, Chile) (MNHN). They were sent to us as a loan in a box containing 15 pinned specimens, some of which belonging to the type series of 5 additional species not treated, for different reasons (see below), in the present paper. Unexpectedly, upon opening the box we realized that unfortunately two specimens, the "holotype" of *D. huilliche* [Tipo No. 4533] and one "paratype" of *Drosophila araucana* Brncic, 1957 [Tipo No. 4532], had fallen down from their cardboard points, somewhere during the airmail transport from Chile to Switzerland.

However, every specimen mounted to points had its cardboard triangle additionally fixed by means of two crossed pins and, fortunately, the box was firmly covered with an additional transparent paper beneath the lid. As some parts of the two specimens that had fallen down remained glued to the points, and the margin

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of the accidental breakage line of the wing seems to be unique for each case, patiently we were able to partially solve the puzzle and associate most of the pieces undoubtedly to each of the two labelled and partially empty pins.

After being identified, the thorax+abdomen of the "holotype" of *D. huilliche* were glued again to the point; its two wings, fortunately attached to each other, found on the bottom of the box were separately mounted in Canada balsam over two microslides, each attached through its cardboard end to the original pin.

The "paratype" of *D. araucana* was less damaged. The thorax, abdomen and wings (distal ends missing) did not separate from one another. So, they were glued again to the original pin.

One loose left wing was assumed to belong to the "holotype" of *Drosophila pavani* Brncic, 1957 [Tipo No. 4543], based on the same criteria stated above, and mounted in the same way it was done for those of *D. huilliche*. However, the following additional loose pieces could not be undoubtedly associated to any of the pinned specimens: one head, 4 dark brown legs and one yellowish leg. They are kept respectively in three microvials filled with glycerin and pinned by the stopper to an empty labelled pin. The head could belong to either one of the three headless specimens present in the loan box, types No. 4532, 4533 or 4569, respectively ♀ paralectotype of *D. araucana*, ♂ "holotype" of *D. huilliche*, paralectotype *D. kuscheli* Brncic, 1957 (abdomen missing, sex unknown).

Some of the 15 type specimens we received in that last loan from the MNHN (Santiago, Chile) were not used in the present study because they were either females ("holotype" of *D. pavani*) or belong to the four species (*Drosophila alei* Brncic, 1962, *D. aruacana*, *D. camaronensis* Brncic, 1957, and *D. kuscheli*) we had already redescribed in our previous paper on Brncic's material (Vilela & Bächli 2002). However, one female "paratype" of *D. huilliche* received in the first loan from the MNHN was also used for the redescription of this species, as stated under "material examined".

Label data attached to each type specimen are cited in full with a slash indicating a label change. Our own notes or interpretations are included in brackets.

For morphological terminology, measurements, indices, preparations of microscope slides as well as illustrations see Vilela & Bächli (2000). All figures in the same plate were drawn to the same scale and the photomicrographs were taken and enlarged to the same magnification.

As we have recently (Vilela & Bächli 2002) redescribed one species (*D. camaronensis*) closely related to *D. gasici* and another (*D. araucana*) closely related to *D. huilliche*, the descriptions of their male terminalia, were mostly made in a comparative way.

In the original description of *D. gasici* it is stated "Tipos.– Material tipo [sic] utilizado en la presente descripción proveniente de Arica (Camarones)", and in that of *D. huilliche*: "Tipos. – Holotipo macho y hembra [sic] provenientes de Angachilla (Valdivia); paratipos de Peulla y Puerto Montt.". So, there was no designation of a single specimen which would then be considered a holotype; thus, all the specimens cited under the item "Tipos" in the original description are to be treated as syntypes, even though one has been labelled as "Holotipo". We have pointed out previously (Vilela & Bächli 2002: 197) that the designations of types of some of the species described by Brncic (1957) were not in conformity with the rules of the fourth edition of the International Code of Zoological Nemenclature (ICZN 1999). Quoting from the ICZN (1999: 79): "Art. 73.1. Holotypes. A holotype is the single specimen upon which a new nominal species-group taxon is based

in the original publication"; "Art. 73.1.3. The holotype of a new nominal species-group taxon can only be fixed in the original publication and by the original author". In his later publications (Brncic 1987, Brncic & Martínez 1990), the status of the types are cited just as they were labelled and, where appropriate, lectotypes and paralectotypes have not been desiganted. Considering that doubts on the identities of some of his species still remain, we have decided to formally designate lectotypes for the two species included in the present article, as we have done before (Vilela & Bächli 2002) while redescribing some Brncic's species described in the same paper (Brncic 1957).

In the item "distribution", whenever directly (from literature and/or labels) or indirectly (from search on maps) known, states or equivalents are cited in parentheses, following the respective countries.

Drosophila Fallén, 1823

Drosophila mesophragmatica species group

Drosophila gasici Brncic, 1957

(Figs 1, 2, 5A)

Drosophila gasici Brncic 1957: 92 (key, description, male terminalia, chromosomes, early stages), 1958: 10 (distribution), 13 (development time), 16 (reproductive isolation), 28 (chromosomes), 35 (paracentromeric inversions), 1970: 427 (chromosomal polymorphism, distribution), 428(geographic races), 1987: 54 (key); Koref-Santibañez & Neele 1961: 44–46 (mating behavior); Koref-Santibañez 1962: 84, 1963: 101–106 (mating behavior); Hunter 1964: 114 (abundance, distribution), 1966: 415, 1970: 124 (distribution); Hunter & Hunter 1964: 735 (distribution); Brncic & Koref-Santibañez 1965: 50–51 (chromosomes), 53 (mating behaviour); Wheeler 1970: 79.15 (Neotropical catalog), 1981: 41 (world catalog); Brncic et al. 1971: 4, 6, 7 (chromosomes), 8 (affiliation); Nair et al. 1971: 18–24 (isozymes), Throckmorton 1975: 228 (phylogeny); Val et al. 1981: 141 (distribution); Brncic & Martínez 1990: 4 (type material, distribution); Del Pino & Godoy-Herrera 1999: 393 (strains), 404 (larval behavior and morphology); Beltrami & Godoy-Herrera 2001: 102 (larval behavior).

Material examined (1 ♂). Male lectotype (here designated, dissected, MNHN) labelled: "Drosophila gasici Brncic det Brncic / Camarones Tarapacá 1.7.1965 [corrected to 55] col Brncic / HOLOTIPO [brick-colored label] [sic, labelled as such but not formally designated in the original description] / CHILE M.N.H.N. Tipo No 4535 / LECTOTYPE / Drosophila gasici Brncic 1957 Vilela & Bächli 2004".

Diagnosis. Generally brownish flies; tergites with dark, broad marginal bands which are medially interrupted; wing relatively short, crossveins and tips of veins faintly shadowed; aedeagus sharply pointed distally in lateral view, submedially bearing a pair of anteriorly directed, ventral spurs, which are abruptly pointed at the very end; paraphysis distally straight, somewhat rectangular-shaped and twice as long as wide.

Redescription. ♂. Head. Frons dark-brown, blackish along eye margins, in part yellow above face, microtrichose, frontal length 0.36 mm; frontal index = 0.75, top to bottom width ratio = 1.18. Frontal triangle dark brown, about 66 % of frontal length; ocellar triangle prominent, black, about 38 % of frontal length. Orbital plates apically diverging from eye margin, about 86 % of frontal length. Orbital setae black, or2 slightly behind and outside of or1, distance of or3 to or1 = 55 % of or3 to vtm, or1 / or3 ratio = 0.82, or2 / or1 ratio = 0.50, postocellar setae = 57 %, ocellar setae = 95 % of frontal length; vibrissal index = 0.62. Face pale yellowish. Carina

prominent but not noselike, narrow, slightly diverging downwards, dorsally sulcate. Cheek index about 4–5. Eye index = 1.10. Antennae brown, flagellomere 1 darker, length to width ratio = 1.25. Arista with 4 dorsal, 2 ventral and about 6 short inner branches, plus small terminal fork. Proboscis yellowish. Palpus brownish.

gasici

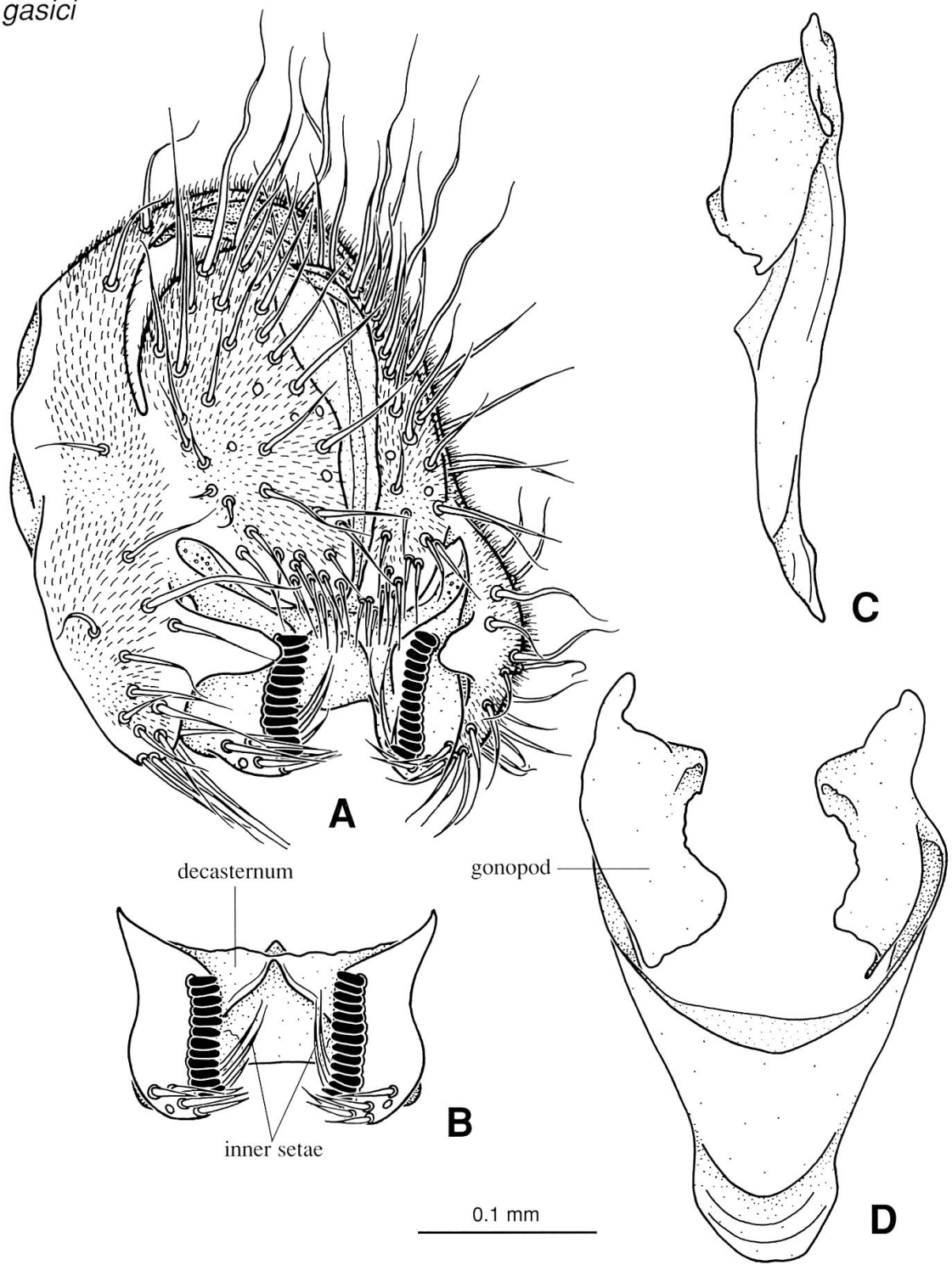

Fig. 1. *Drosophila gasici* Brncic, 1957, lectotype ♂. A, epandrium, cerci, surstyli and decasternum, oblique posterior view. B, surstyli and decasternum, posterior view. C, hypandrium and gonopods, right lateral view. D, idem, posterior view.

Thorax length 1.36 mm. Scutum dark brown, microtrichose, with 3 darker stripes, one in the midline, two along the line of the dorsocentral setae, 6–8 rows of acrostichal setulae. h index = 1.12. Transverse distance of dorsocentral setae 185 % of longitudinal distance; dc index = 0.67. Scutellum dark brown with paler margins, scutellar setae nearly equidistant; basal ones divergent; scut index = 1.00. Pleura dark brown, mid katepisternal seta about 65 % of the anterior one.

Wing hyaline, length 3.05 mm, length to width ratio = 2.12. Indices: C = 3.75, ac = 2.00, hb = 0.38, 4C = 0.64, 4v = 1.48, 5x = 1.22, M = 0.44, prox. x = 0.56.

Abdomen generally yellowish-brown, tergites 2–5 with broad, blackish marginal bands which are medially interrupted.

gasici

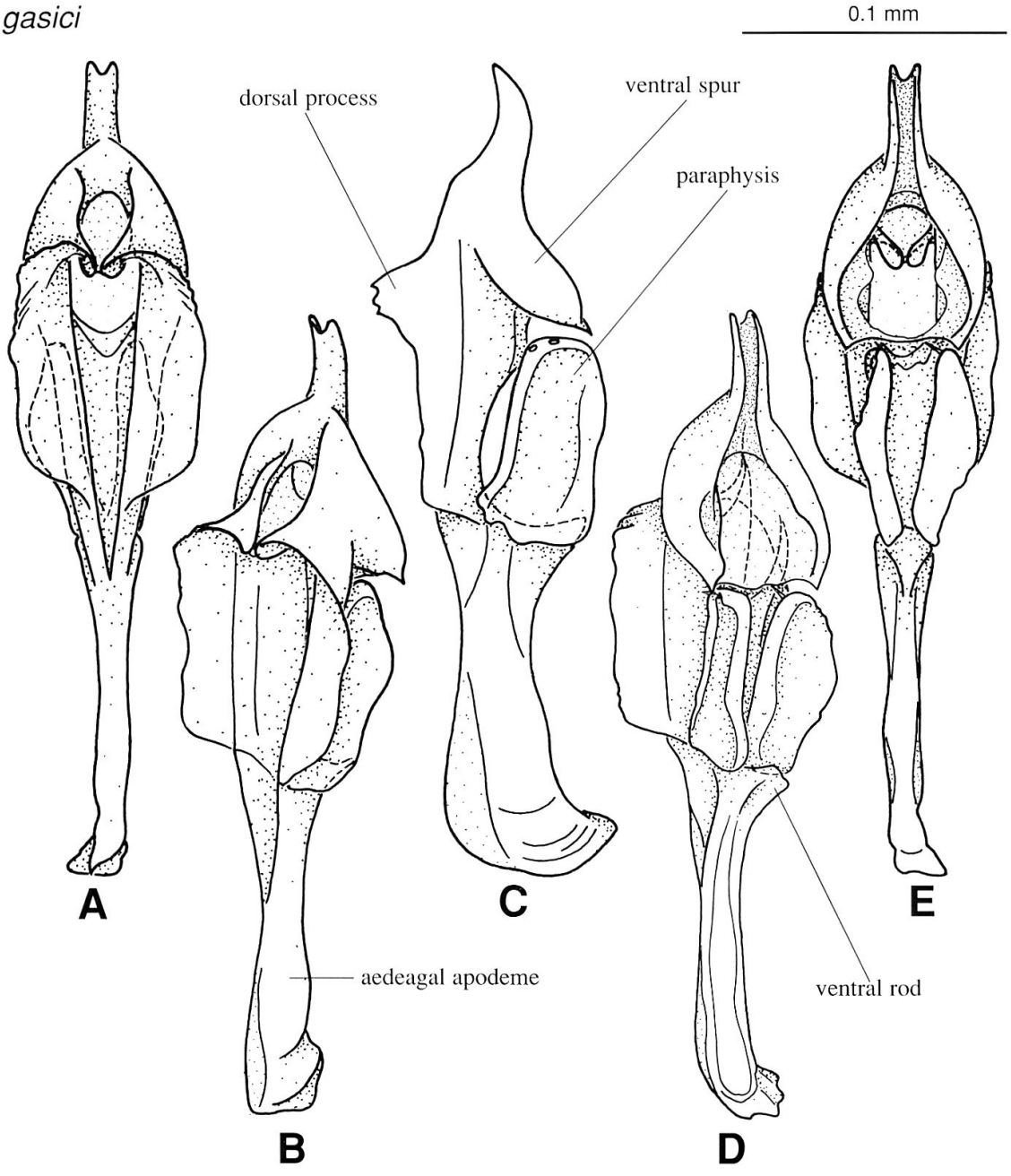

Fig. 2. *Drosophila gasici* Brncic, 1957, lectotype ♂. A–E, aedeagus+aedeagal apodeme, and paraphyses, several views from dorsal through ventral.

♂ *Terminalia* (Figs 1, 2, 5A). Epandrium mostly microtrichose with about 18 lower setae, and 3 upper setae; ventral lobe anteriorly microtrichose, dorsally finger-shaped and covering surstylus. Cercus mostly microtrichose, anteriorly fused to epandrium, ventromedially with a brush of dense, short setulae, without ventral lobe. Surstylus not microtrichose, bearing a straight row of 12–13 peglike prensisetae roundish at tip, about 5 outer long setae and ca. 4 long inner setae. Decasternum as in Fig. 1B. Hypandrium as long as epandrium, anteriorly narrower; dorsal arch absent; gonopod bare, connected to paraphysis by membranous tissue. Aedeagus fused to aedeagal apodeme, sharply pointed distally in lateral view (somewhat blunt in *D. camaronensis*), and slightly bifid at tip in dorsal view, submedially bearing a pair of anteriorly directed, ventral spurs, which are abruptly pointed at the very end (not so in *D. camaronensis*) and do not reach paraphysis (reach paraphysis in *D. camaronensis*), medially bearing a pair of dorsal processes directed outwards. Aedeagal apodeme shorter than aedeagus, laterally flattened, anteriorly expanded ventrad. Ventral rod not well defined, as wide as anterior margin of paraphysis. Paraphysis somewhat rectangle-shaped (not so in *D. camaronensis*) in lateral view, twice as long as wide (thrice as long as wide in *D. camaronensis*), distal margin straight, linked to distal margin of aedeagal apodeme by membranous tissue, not microtrichose, and bearing 2 setulae near dorsodistal margin.

Distribution. Venezuela (Lara), Colombia (Magdalena, Antioquia, Caldas, Santa Fé de Bogotá, D.C., Nariño), Ecuador, Bolivia (La Paz, Cochabamba), Chile (Arica), Argentina (San Luis).

Biology. A polyphagous species, collected in rotten fruits both in domestic and wild environments (Brncic 1987: 44).

Comments. The detailed analysis of the male terminalia of *D. gasici* confirms our previous suspicion (Vilela & Bächli 2002: 206), stated under "comments" in the redescription of *D. camaronensis*, that for the most cryptic species belonging to the *mesophragmatica* group the shape and the relative size of the paraphyses are apparently more diagnostic for species identification than is the aedeagus itself.

Drosophila guarani species group

Drosophila huilliche Brncic, 1957

(Figs 3, 4, 5B)

Drosophila huilliche Brncic 1957: 85 (description, male terminalia, early stages), 1987: 54 (key); Wheeler 1970: 79.16 (distribution), 1981: 42 (world catalog); Val et al. 1981: 148 (distribution); Brncic & Martínez 1990: 4 (type material, distribution).

Drosophila osornina Brncic 1957: 97 (description) (synonymyzed by Brncic 1987: 42); Wheeler 1970: 79.20 (distribution), 1981: 46 (world catalog).

Material examined. (1 ♂, 1 ♀). Male lectotype (here designated, dissected, MNHN) labelled: "Drosophila huilliche Brncic det Brncic / Angachilla Valdivia 5.2.1955 col Brncic / HOLOTIPO [sic] [brick-colored label] / CHILE M.N.H.N. Tipo No 4533 / LECTOTYPE / Drosophila huilliche Brncic – Vilela & Bächli det. 2003". Female paralectotype (not dissected, MNHN), two first labels as in lectotype, plus the additional ones: "PARATYPE [sic] [brick-colored label] / CHILE M.N.H.N. Tipo No 4534 / PARALECTOTYPE / Drosophila huilliche Brncic Vilela & Bächli det. 2004".

Diagnosis. Generally yellowish flies; 3 vibrissae, almost equal in length; abdomen with broad, dark marginal bands which are medially and laterally more or less extended to the base of the tergites; wing with shadowed main crossveins; median projetion of hypandrium's dorsal arch, conspicuously circular (Fig. 3D) in posterior view; aedeagus entirely membranous dorsally.

Redescription. ♂. Head is currently missing, but according to Brncic (1957), the general head color is yellow; antenna yellowish, flagellomere 1 darker, arista with 7–8 branches; frons brownish, slightly microtrichose; ocellar triangle blackish; or2/or1 ratio about 1/6; vi index about 1; carina prominent, triangular, not sulcate; cheeks about 1/6 eye length.

Thorax length 1.28 mm; scutum brown, shiny, transverse distance of dorsocentral setae 157 % of longitudinal distance; scutellum dark brown, laterally paler, scutellar setae almost equidistant, basal ones divergent; pleura yellowish, mid katepisternal seta about 47 % of the anterior one; halters and legs yellow, preapical setae on all tibiae, ventral apical seta on mid tibia.

Wing hyaline but diffusely shadowed along the costa, veins yellow, both crossveins brown and distinctly shadowed; length 3.22 mm, length to width ratio = 2.36. Indices: C = 4.13, ac = 2.00, hb = 0.44, 4C = 0.59, 4v = 1.56, 5x = 1.44, M = 0.48, prox. x = 0.48.

♂ *Terminalia* (Figs 3, 4, 5B). Epandrium dorsoposteriorly microtrichose with about 9 lower setae, and no upper setae; ventral lobe roundish, not microtrichose, not covering surstylus. Cercus anteriorly connected to epandrium by membranous tissue, partially microtrichose, without ventral lobe. Surstylus not microtrichose, bearing a straight row of 10–11 peglike prensisetae, roundish at tip (sharply pointed in *D. araucana*), about 10 outer setae and ca. 3–4 inner setae. Decasternum as in Fig. 3B. Hypandrium longer than epandrium; dorsal arch present, medially projected posterad, this median projection being conspicuosly circular (Fig. 3D) in posterior view (triangular in *D. araucana*); anterior margin rounded; gonopod fused to paraphysis, bearing one small seta near the median inner margin, and slightly microtrichose around the seta. Aedeagus fused to aedeagal apodeme, subproximally slightly bent dorsad (medially strongly bent dorsad in *D. araucana*) in lateral view; laterally bare (partially covered with tiny scales in *D. araucana*), blunt and slightly serrated at distal margin (pointed and serrated at dorsodistal margin in *D. araucana*); dorsally entirely membranous (as in *D. araucana*), being distally bifurcated and covered with tiny scales; ventrally membranous in its distal 3/4 (in its distal half in *D. araucana*). Aedeagal apodeme as long as aedeagus (longer than aedeagus in *D. araucana*), rod-shaped (dorsoventrally flattened in *D. araucana*). Ventral rod absent. Paraphysis linked to distal margin of aedeagal apodeme by membranous tissue, not microtrichose, and bearing 2 setulae near dorsodistal margin.

♀. Head. Frons golden yellow, dull; frontal triangle slightly darker and subshiny, ocellar triangle prominent, brownish: orbital plates brownish, subshiny, diverging from eye margin; orbital setae dark brown, almost equidistant; or2 distinctly more close to the eye margin than or1 and or3; face brownish-yellow; carina prominent, slightly diverging downwards, dorsally flat, convex but not noselike; occiput predominantly yellowish; antennae yellowish; flagellomere 1 slightly brownish, length to width ratio = 1.50; arista with 4 dorsal, 2 ventral and about 7 small inner branches, plus terminal fork; proboscis brownish-yellow; palpi yellowish, with 2 dark apical and a few pale yellowish setae.

Scutum brownish-yellow, shiny, slightly darker towards scutellum, 8 rows of acrostichal setulae; transverse distance of dorsocentral setae 181 % of longitudinal distance; scutellum dark brown, laterally paler, pleura yellowish, mid katepisternal seta about 60 % of the anterior one.

Abdomen predominantly yellowish, tergites 2–5 each with a narrow, brown marginal band which is medially more or less interrupted and laterally not reaching the ventral margin.

Measurements: Frontal length 0.41 mm; frontal index = 0.75, top to bottom width ratio = 1.25, frontal triangle about 58 % of frontal length; ocellar triangle about 37 % of frontal length; orbital plates about 75 % of frontal length; distance of or3 to or1 = 55 % of or3 to vtm, or1 / or3 ratio = 0.75, or2 / or1 ratio = 0.40, post-ocellar setae = 71 %, ocellar setae = 92 % of frontal length; vibrissal index = 0.93;

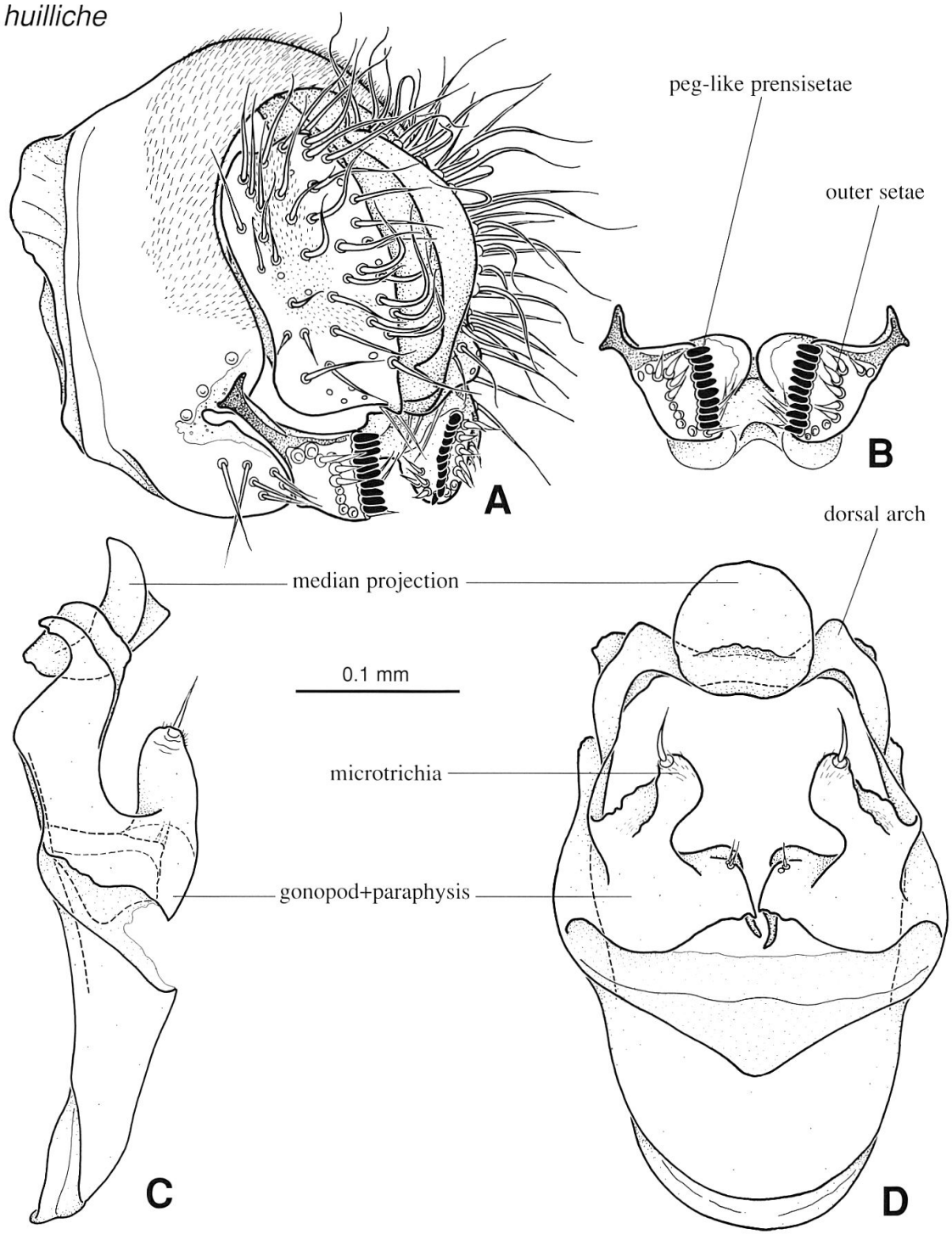

Fig. 3. *Drosophila huilliche* Brncic, 1957, lectotype ♂. A, epandrium, cerci, surstyli, and decasternum, oblique posterior view. B, surstyli and decasternum, posterior view. C, hypandrium and gonopods+paraphyses, left lateral view. D, idem, posterior view.

huilliche

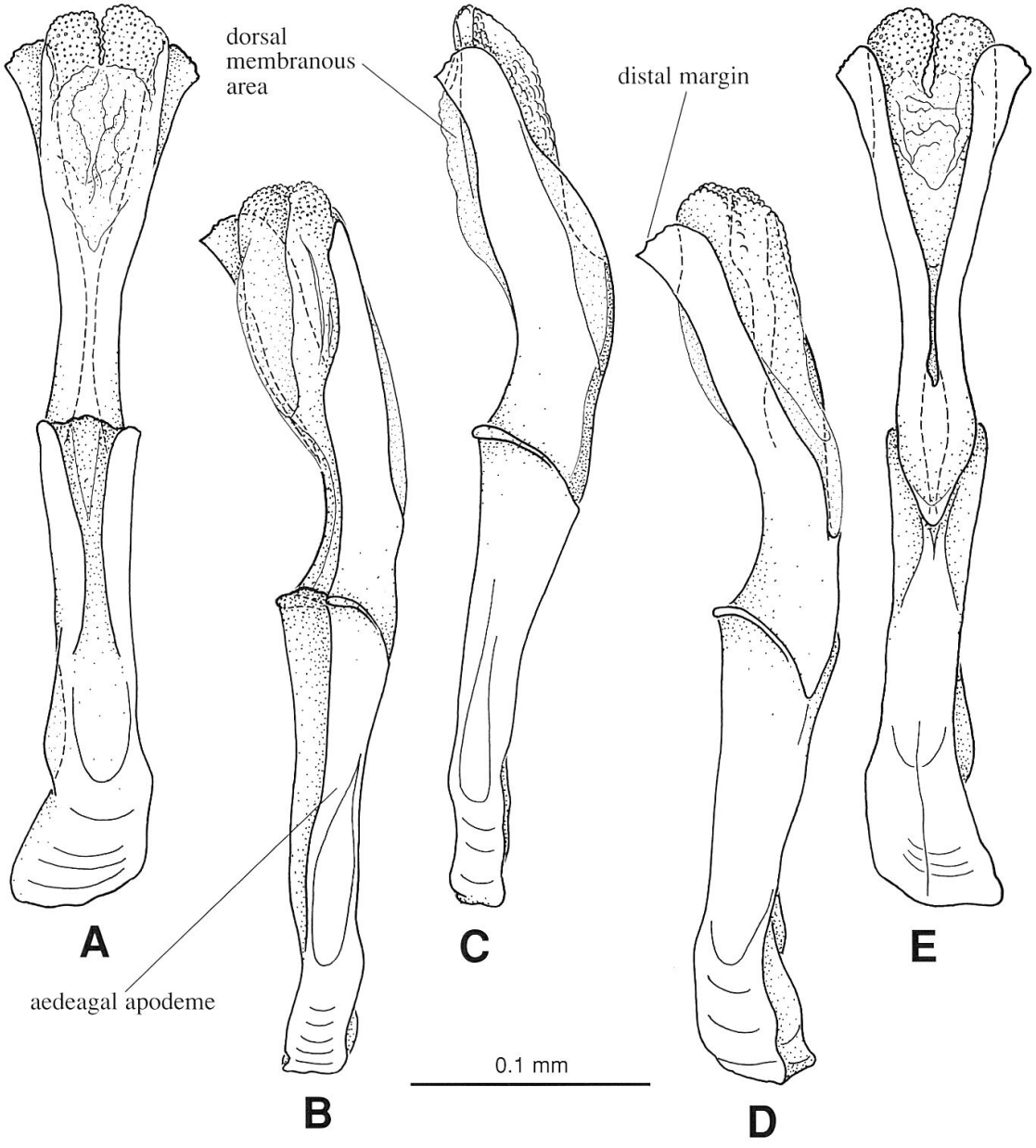

Fig. 4. *Drosophila huilliche* Brncic, 1957, lectotype ♂. A–E, aedeagus+aedeagal apodeme, several views from dorsal through ventral.

cheek index about 5–6; eye index = 1.12; thorax length 1.61 mm; h index = 0.89, transverse distance of dorsocentral setae 180 % of longitudinal distance; scut index = 0.97, sterno index = 0.66, mid katepisternal seta about 60 % of the anterior one; wing length 3.85 mm. Indices: 4v = 1.67, 5x = 1.30, M = 0.43, prox. x = 0.57.

Distribution. Chile (San Antonio, BioBío, Cautín, Valdivia, Llanquihue, Chiloé).

Biology. Unknown.

Comments. Regarding the structure of the male terminalia, particularly the aedeagus, *D. huilliche* is more closely related to *D. araucana* than it is to any of the remaining species ascribed to the *guarani* group. The dorsal region of the aedeagus

in both species is conspicuously completely membranous, being distally bifurcated and covered with tiny scales.

It should be pointed out that *Drosophila amplipennis* Malloch, 1934, a species endemic to the Chilean and Argentinian lakes region and as yet not assigned to any group, has conspicuous and quite unique wings, but all main sclerites (epandrium, hypandrium and aedeagus+aedeagal apodeme) of its terminalia are remarkably similar to those found in *D. araucana* and *D. huilliche* and suggest a closer relationship (for a comparison of their terminalia, refer to Vilela & Bächli 1990: 264 and Vilela & Bächli 2002: 203). So, we are proposing to include *D. amplipennis* tentatively in the *guarani* group, as an aberrant member.

ZUSAMMENFASSUNG

Die folgenden zwei aus Chile beschriebenen, endemischen, neotropischen *Drosophila*-Arten werden neu beschrieben und deren männliche Terminalia illustriert: *D. gasici* Brncic, 1957 (*mesophragmatica*-Gruppe) und *D. huilliche* Brncic, 1957 (*guarani*-Gruppe).

ACKNOWLEDGMENTS

We are indebted to K. Hutter, P. Brauchli and D. Röthlisberger for helping with digital image processing and to Dr. A. Camousseight (MNHN) for kindly loaning the specimens included in the present study.

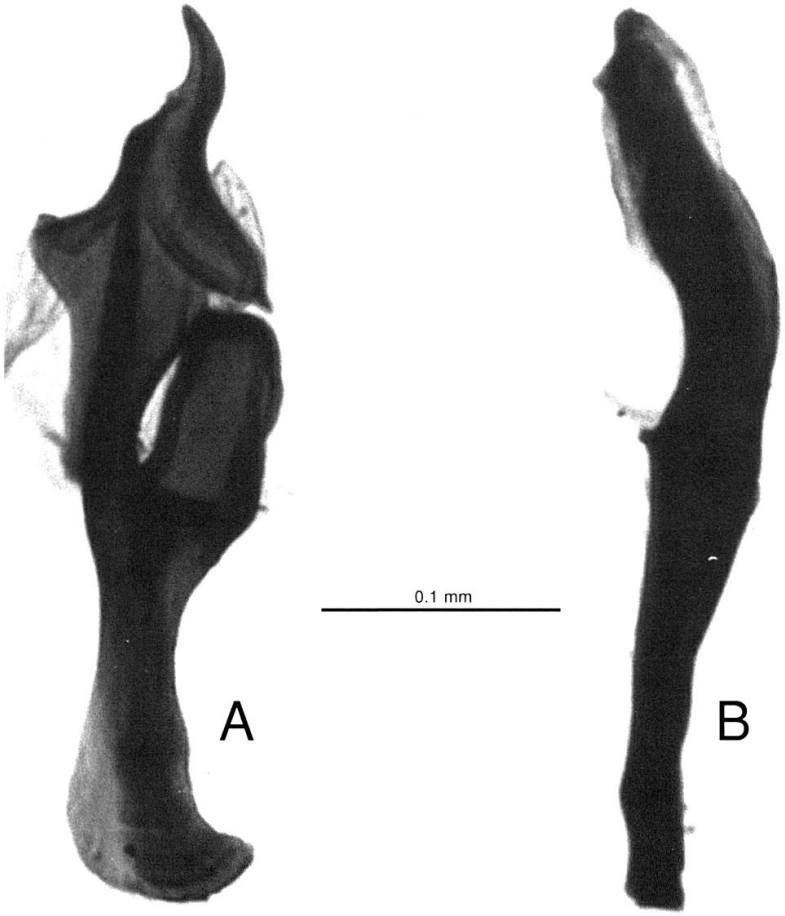

Fig. 5. A, aedeagus+aedeagal apodeme, and paraphysis of *Drosophila gasici* Brncic, 1957, lectotype ♂, left lateral view. B, aedeagus+aedeagal apodeme of *Drosophila huilliche* Brncic, 1947, lectotype ♂, left lateral view.

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