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A REVIEW OF THE GENUS *DROSOPHILA* FALLEN (DIPTERA: DROSOPHILIDAE) IN CHILE WITH THE DESCRIPTION OF *DROSOPHILA ATACAMENSIS SP. NOV.*[1]

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SUMMARY

A revised list of species of the genus *Drosophila* (Diptera: Drosophilidae) found in Chile is given and a new identification key is proposed. The genus in Chile includes 27 species belonging to 6 subgenera: *Chusqueophila* (1 species), *Dorsilopha* (1 species), *Drosophila* (19 species), *Hirtodrosophila* (1 species), *Phloridosa* (1 species) and *Sophophora* (4 species). One of the species of the subgenus *Drosophila* is new: *D. (Drosophila) atacamensis* Brncic and Wheeler *sp. nov.* and is described here (with figures). The species found in Chile belong to four categories: (a) **cosmopolitan** (8 species), (b) **subcosmopolitan** (4 species), (c) **widespread in the New World**) (3 species) and (d) **endemic** (12 species). The central region of the country contains the largest number of endemic species, followed by the North and South regions. No endemic species have been found in the Austral region (Aisen and Magallanes).

RESUMEN

Se entrega una lista actualizada de las especies del género *Drosophila* (Diptera, Drosophilidae) encontradas en Chile y se propone una nueva clave para la identificación. El género en Chile incluye 27 especies pertenecientes a 6 subgéneros: *Chusqueophila* (1 especie), *Dorsilopha* (1 especie), *Drosophila* (19 especies), *Hirtodrosophila* (1 especie), *Phloridosa* (1 especie) y *Sophophora* (4 especies). Una de las especies del subgénero *Drosophila* es nueva: *D. (Drosophila) atacamensis* Brncic y Wheeler sp. nov. y se da su descripción (con figuras). Las especies encontradas en Chile pertenecen a cuatro categorías: a) **cosmopolitas** (8 especies), b) **subcosmopolitas** (4 especies), c) **ampliamente extendidas en el nuevo mundo** (3 especies), y d) **endémicas** (12 especies). La región Central del país contiene el número más grande de especies endémicas seguido por las regiones Norte y Sur. En la región Austral (Aisén y Magallanes) no se han encontrado especies endémicas.

INTRODUCTION

Since 1957, when I published a monograph of the Chilean species of *Drosophilidae* (Brncic, 1957a) very few articles have appeared reporting new species in the country, and no serious attempts have been made to review the subject. So, I have prepared an abridged taxonomic overview including a new key to the identification of the species, updated according to the new criteria of classification and the increase of knowledge about the taxon.

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Of the 62 genera of the family (Wheeler, 1981 & 1986), only three have been recorded in Chile: *Leucophenga* (one species), *Scaptomyza* (7 species) and *Drosophila* (27 species). The genus *Leucophenga* is represented by the cosmopolitan species *L. maculosa Coquillett, 1895* and was found only in Juan Fernández (Robinson Crusoe) Islands (Brncic, 1957a & 1957b). No other localities for the species have been discovered since the first report. The genus *Scaptomyza* in Chile has been recently reviewed (Brncic, 1983b). So, in the present publication I will refer just to the larger and complex genus *Drosophila*, which has experienced many changes in the last years, especially due to the work of Wheeler (1981, 1986) on the Catalogue of the World's *Drosophilidae* and Val *et al.* (1981) and of Vilela (1983) on the Neotropical species. On comparing the species list proposed in Brncic

(1957a) to the one here refered to, the following major additions and corrections must be introduced:

1 . *New species added in Brncic (1962) and Wheeler et al. (1962): D. (Phloridosa) alei* Brncic, 1962; *D. (Drosophila) cardini* Sturtevant, 1919; *D. (Drosophila) flavopilosa* Frey, 1918 and *D. (Drosophila) nigricruria* Patterson and Mainland, 1943.
2 . *New species added in the present publication: D. (Drosophila) atacamensis* Brncic and Wheeler *sp. nov.* (here described); *D. (Drosophila) buzzatii* Patterson and Wheeler, 1942 (here reported for the fist time in Chile) and *D. (Sophophora) subobscura* Collin, 1936 (reported in Chile by Brncic and Budnik, 1980).
3 . *Nomenclatural changes: D. (Drosophila) hoeckeri* Brncic, 1957a synonym of *D. (Drosophila) nigricruria*, synonymyzed by Wasserman (1962b); *D. (Drosophila) osornina* Brncic, 1957a a synonym of *D. (Drosophila) huilliche* Brncic, 1957a, synonymyzed in the present publication.

The genus *Drosophila* Fallén

Fallén, 1823: 2,4. Type species: *Drosophila funebris* Fabricius, 1787: 345 (as *Musca funebris*), designated by Zetterdsted, 1847.

This is the largest genus of the Family *Drosophilidae*. Wheeler (1986b) lists 1576 species of *Drosophila*, more than 56 percent of the entire family which includes, according to the same author, 2776 known species clustered in 62 genera.

Sturtevant (1921) redefined the genus as follows: "Arista plumose, vibrissae and ocellars present; three orbitals present, lowermost proclinate, upper two reclinate, middle one smaller than the others (second one placed a trifle below the third in *D. alabamensis*); postverticals large; one or more humerals; one presutural; two notopleurals; two supra-alars; two post-alars; one to three sternopleurals; mesopleura bare; two dorsocentrals[3]; prescutellars usually absent (present in *D. sigmoides, D. florae* and species similar to each, represented by large hairs in *D. repleta* and other forms); two pairs of scutellars, posterior ones crossed; disc of scutellum bare; costa twice broken, reaches apex of fourth vein; two small bristles just before distal costal break; discal and second basal cells confluent; anal cell present, often incomplete; preapicals evident at least on third tibiae; acrostichal hairs in six or more rows in front of transverse suture, four or more between the anterior dorsocentral bristles" (Fig. 1).

Wheeler (*op. cit.*) divided the genus into 15 subgenera. Six of the subgenera are represented in Chile: *Chusqueophila* (1 species), *Dorsilopha* (1 species), *Drosophila* (19 species), *Hirtodrosophila* (1 species), *Phloridosa* (1 species) and *Sophophora* (4 species), making a total of 27 known species in Chile.

Subgenus *Chusqueophila* Brncic

Brncic 1957a: 101. Type species: *Drosophila appendiculata* Malloch, 1934: 441.

This is a monotypic subgenus established for *D. appendiculata* which, due to its distinct characteristics, is difficult to include in any other known subgenus of *Drosophila*: "Large yellowish species (five or more mm). On the posterior side of fourth vein there are some transverse spur veins (Fig. 5); both cross veins and spur veins strongly clouded. Prescutellar bristles absent. Eggs with four large filaments and enterely covered with minute protruding spines. Spermathecae not chitinized; ventral receptacle long with about 600 spires" (Brncic, 1957a).

D. appendiculata Malloch, 1934: 441 (holotype: Puntra, Chiloé (Chile) U.S. National Mus., Washington).

In addition to the original description (Malloch, 1934), we have redescribed the species (in Spanish) with drawings of the eggs, spermathecae, abdomen and male and female external genital apparatus (Brncic, 1957a). It is a well distributed species in the southern part of Chile from Temuco to Aisen (Coihaique), living in the plant associations growing along the borders of rivers and lakes, specially in parts where *Chusquea* sp. (Bambuseae) are abundant (Brncic, 1957a).

[3]*Note:* In a few species such as those of the *polychaeta* group and *D. atacamensis sp. nov.* (this publication) there are three pairs of dorsocentral bristles.

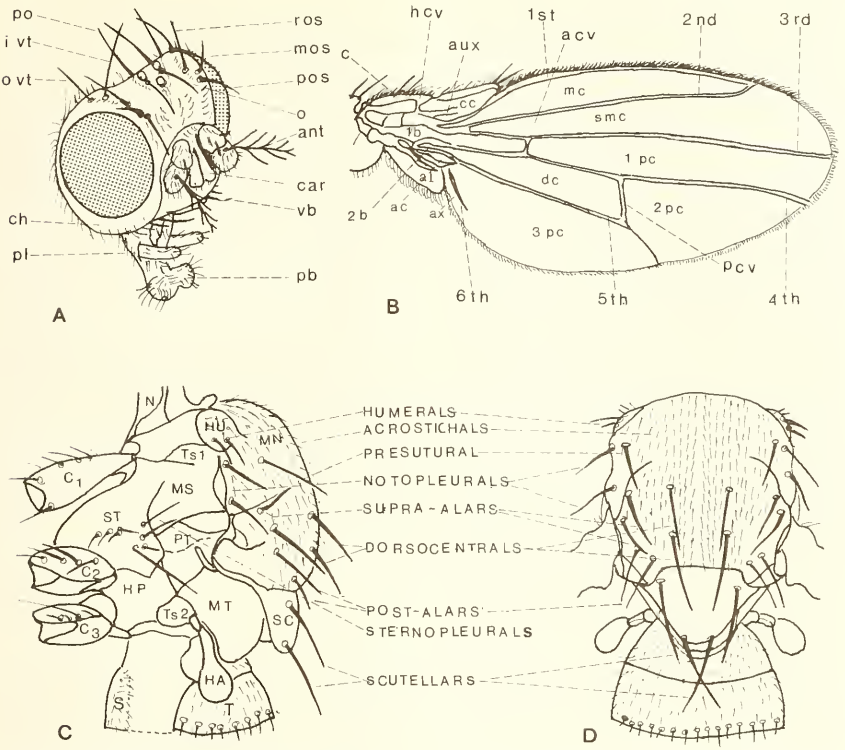

Figure 1. External morphology of adult *Drosophila*.

A) Head of *D. pavani*: *ant* = antenna; *car* = carina; *ch* = cheek; *i vt* = inner vertical bristle; *mos* = middle orbital bristle; *o* = ocellar bristle; *ovt* = outer vertical bristle; *pb* = proboscis; *pl* = maxillary palp; *po* = post ocellar bristle; *pos* = proclinate orbital bristle; *ros* = reclinate orbital bristle; *vb* = vibrissa (oral bristle).

B) Wing: 1^{st}, 2^{nd}, 3^{rd}, 4^{th}, 5^{th} and 6^{th} = longitudinal veins; *1b* and *2b* = 1^{st} and 2^{nd} basal cells; *1pc*, *2pc* and *3pc* = 1^{st}, 2^{nd} and 3^{rd} posterior cells; *ac* = anal cell; *acv* = anterior cross vein; *al* = alula; *aux* = auxiliary vein; *ax* = axillary cell; *c* = costa; *cc* = costal cell; *dc* = discal cell; *hcv* = humeral cross vein; *mc* = marginal cell; *pcv* = posterior cross vein; *smc* = submarginal cell.

C) and D): Thorax: C_1, C_2 and C_3 = coxae; *HA* = haltere; *HP* = hypopleura; *HU* = humerus; *MN* = mesonotum; *MS* = mesopleura; *MT* = metanotum; *N* = neck; *PT* = pteuropleura; *S* = sternite; *SC* = scutellum; *ST* = sternopleura; *T* = tergite; T_1 and T_2 = thoracic spiracles.

Reference material from Peulla, Chile (1955) and Centinela, Chile (1955) has been deposited by the present author at the Mus. Nac. Hist. Nat. (Santiago, Chile).

Subgenus *Dorsilopha* Sturtevant

Sturtevant, 1942: 28. Type species: *Drosophila buscki* Coquillett, 1901: 18.

This is a monotypic subgenus established by Sturtevant (1942) with the following characteristics: "Yellowish species; mesonotum longitudinally striped; preapicals not evident on second and third tibiae; larvae with dorsal processes; 4 egg filaments; Malpighian tubes fused; ventral receptacle not kinky; sternoindex about 0.3".

Drosophila busckii Coquillett, 1901: 18 (as *buskii*, error) (lectotype: U.S. Nat. Mus. Washington).

Syn: *D. rubrostriata* Becker, 1908: 155.
Syn: *D. pleurilineata* Villeneuve, 1911: 83.

A more recent description of the species was given by Patterson (1943) (with figures). *D. busckii* is recorded as cosmopolitan and synanthropic. The species is usually observed living and reproducing in a variety of substrates and is a conspicuous visitor of the fermenting banana baits utilized for collecting *Drosophila*. Sturtevant (1921) records the following as breeding sites for the fly: "bread and milk, moist bran, rotten pigeon eggs, stale formalinized chicken, sour milk, spinach leaves, flour paste, decayed onions, rotten fish, rotten potato, tomato and fungi". In addition many authors have found the species associated with flowers (Brncic, 1983). In Chile, Malloch (1934) first recorded the species in Casa Panque (Llanquihue). The present author has collected the species all over the country from Azapa (Arica) to Chiloé, always in domestic environments, in groceries, fruit markets and cellars, specially over rotten potatos and onions (Brncic, 1957a).

Reference specimens from La Florida (Santiago, Chile) have been deposited by the author at the Mus. Nac. Hist. Nat. (Santiago, Chile).

Subgenus *Drosophila* Fallén

Fallén, 1823: 4. Type-species: *Musca funebris* Fabricius, 1787: 345.

"Three or four egg-filaments (two in the *melanica* group), at least anterior ones tapering; ventral receptacle long, fine, usually kinky; testes long, spiral; posterior Malpighian tubes forming a closed loop around the gut, their distal ends sometimes merely apposed but usually fused and with a continuous lumen; dark posterior bands on abdomen usually narrowed or broken in mid-dorsal line; sternoindex usually 0.5 or more; cheeks often wide; puparium "horns" often more than 1/5 length of puparium" (Sturtevant, 1942).

This is the largest of all the subgenera, Wheeler (1986) recorded 786 species as belonging to the taxon and it was subdivided into many species-groups. In Chile the subgenus is represented by 19 species clustered in 8 species-groups: (a) *cardini* group (2 species), (b) *flavopilosa* group (1 species), (c) *funebris* group (1 species), (d) *guarani* group (2 species), (e) *immigrans* group (1 species), (f) *mesophragmatica* group (2 species), (g) *repleta* group (5 species) and (h) *virilis* group (1 species), plus 4 species of uncertain affinity.

a) *cardini* species-group (Sturtevant, 1942: 31).

The group is basically neotropical and only a few species extend into the Southern Nearctic region. Sturtevant (1942) defined the group as follow: "Reddish to yellowish brown, shining; larvae skip; posterior Malpighian tubes apposed but not with continuous lumen; cheeks narrow; sterno-index about 0.5; costal index about 3.9". In Chile the group is represented by *D. cardini* and *D. cardinoides*.

Drosophila cardini Sturtevant, 1916: 336 (holotype: Amer. Mus. Nat. Hist., New York).

In addition to the original description (Sturtevant, 1916) the species has been redescribed (with figures) by Patterson (1943) and by Stalker (1953). *D. cardini* is very difficult to distinguish from *D. cardinoides*, the other species found in Chile. The figures of the male external genitalia and palpus given by Stalker (1953) are very useful for identification (Fig. 3).

The species was originally recorded from West Indies and Mexico to Brazil and Perú. The present author (Brncic, 1962) collected the species earlier in Arica (Azapa and Camarones); since then it has been collected in low numbers in Antofagasta (La Chimba) and occasionally farther south, in "El Tabo" (Dec. 1959) and Valparaíso (Dec. 1966). It is a polyphagous species found in rotten fruits and also in flowers (Pipkin *et al.*, 1966).

Specimens from Arica (Chile) were deposited by the author at the Mus. Nac. Hist. Nat. (Santiago, Chile).

Drosophila cardinoides Dobzhansky and Pavan, 1943: 21 (holotype: Mus. Zool. Univ. S. Paulo, Brazil).

Dobzhansky and Pavan (1943) give a full description of the external and internal morphology of the species and also the characteristics of the eggs, the puparia and the metaphase chromosomes. Nevertheless, the drawings of Stalker (1953) and Heed and Russell (1971) of the external genital apparatus and palpus, are very useful for identification. It is a well distributed species from Mexico to Brazil and Chile, breeding in rotten fruits and also in flowers (Frota-Pessoa, 1952). In Chile it was found only in Arica (Brncic, 1957a).

Pinned specimens collected by the author (Arica) were deposited as reference material at the Mus. Nac. Hist. Nat. (Santiago, Chile).

b) *flavopilosa* species group (Wheeler, Takada and Brncic, 1962: 386).

A large group (at least 18 named species) of flower-breeding species from the neotropical region.

"With few exceptions the species are entirely or mostly all dull yellow; they are of small to medium size, have a rather high costal index, a single strong oral bristle, an arista formula of 3/2 (the number of dorsal and ventral branches, excluding the terminal fork, expressed as a fraction), and six acrostichal rows. Females have unusually strongly spined ovipositors, and most of them have apical caps on the spermathecae. The male genitalia are of characteristic structure: lower portion of genital arch usually with two long bristles; 'toe' strongly bent forwards, usually elongate and narrow, not covering clasper; anal plate oblong and fused with genital arch; primary clasper broad, its under margin basally convex. Penis slender and long, curved centrally and with a pair of apical lobes; hypandrium simple; anterior gonapophyses usually lacking or fused with hypandrium; posterior gonapophyses apparently absent; phallosomal index (Okada, 1953) more than 4.0" (Wheeler *et al.*, 1962). The only species of the group found in Chile is *D. flavopilosa*.

Drosophila flavopilosa Frey, 1918: 14 (holotype from Valparaíso: Zool. Mus. Helsinki, Finland).

Syn. *D. dentata* Duda, 1927: 20 (Not *dentata* Duda, 1924: 242).
Syn. *D. dentata* Duda. Malloch, 1934: 441.
Syn. *D. tendata* Wheeler, 1959: 183.

The species was first recorded in Valparaíso (Frey, 1918), Los Andes (Duda, 1927), Los Andes, Casa Pangue and Angol (Malloch, 1934), in Argentina (Buenos Aires) (Malloch, 1934) in Perú (Cuzco), Bolivia (La Paz) and Uruguay (Montevideo) (Duda, 1927).

Although in my monograph of Chilean species of Drosophilidae (Brncic, 1957a) I failed to include this species, it was later discovered to be present by the thousands all over the North-Central par of Chile, from Antofagasta to Valdivia, living and reproducing in the flowers of *Cestrum parqui* L'Her (Solanaceae). It was redescribed (with figures) by Wheeler, Takada and Brncic (1962). The distribution, general biology, genetics, cytogenetics and ecology of the species have been recently summarized (Brncic, 1983a).

Reference material from various localities of Chile have been deposited by the author at the Mus. Nac. Hist. Nat. (Santiago, Chile).

c) *funebris* species group (Surtevant, 1942: 31).

"Reddish brown species; sterno-index about 0.7; horn about 1/5 length of puparium, arista with 10 to 11 branches, male abdomen largely shining black" (Sturtevant, 1942). In Chile, the group is represented by the cosmopolitan and synanthropic species, *D. funebris*.

Drosophila funebris Fabricius, 1787: 345 (as *Musca funebris*) (Syntype: Zool. Mus. Copenhagen, Denmark).

Syn: *D. clarkii* Hutton, 1901: 91.
Syn.: *D. atkinsoni* (as *Leucophenga*) Miller, 1921: 302.
Syn: *D. dudai* Malloch, 1934: 440.

More recent descriptions (with figures) of the species have been given by Patterson (1943)

and Burla (1951). The cosmopolitan species *D. funebris* is the most widely distributed species of the genus and the one that extends its range farthest North (Iceland and Greenland) (Basden, 1956) and farthest South (Tierra del Fuego) (Brncic and Dobzhansky, 1957). Like the other cosmopolites, it occurs mostly in close association with man, but it is apparently the most cold-adapted of the synanthropic species, and it is rare or absent in the tropics. Malloch (1934) first recorded the existence of the species (as *D. dudai*) in Chile (Angol). We have collected the species all over the country from Coquimbo to Tierra del Fuego (Brncic, 1957a) and Juan Fernández Islands (Brncic, 1957b) over rotten fruits and vegetables, in groceries, fruit markets and cellars.

Reference specimens from several parts of Chile have been deposited by the author at the Mus. Nac. Hist. Nat. (Santiago) and the Mus. Inst. of Patagonia (Punta Arenas).

d) *guarani* species group (King, 1947: 143).

This typically Neotropical group includes brownish species with middle orbital bristle minute; arista with more than 10 branches; anterior scutellars divergent; strongly clouded cross veins; one of the bristles at apex of first costal seccion longer than the other, eggs with four filaments (King, 1947, Patterson and Stone, 1952). In Chile, the group is represented by two endemic species: *D. araucana* and *D. huilliche*.

Drosophila araucana Brncic, 1957a: 82 (holotype from Puerto Montt at the Mus. Nac. Hist. Nat., Santiago, Chile).

The description with drawings of the abdomen, male external genitalia, wings and metaphase chromosomes is given in the original publication (Brncic, 1957a). It was first collected at Puerto Montt (1944) over fermenting banana baits. Since then it was collected, always in low numbers, from Santiago to Chiloe, both in wild and suburban environments, especially during late winter and spring. The breeding and feeding sites of the species are unknown.

Drosophila huilliche Brncic, 1957a: 85 (holotype from Angachilla (Valdivia) at Mus. Nac. Hist. Nat., Santiago, Chile).

Syn: *D. osornina* Brncic, 1957a: 97 (Synonymyzed by the present publication).

In my former monograph of Chilean species of *Drosophilidae* (Brncic, 1957a), a full description of the external characteristics of the imagines, eggs and figures of abdomen, external genital apparatus of male and wings was given. It is easily distinguishable from *D. araucana* by the bright colour of the thorax, but there is some variation. Recently I had the opportunity to analyse more specimens of the species collected in southern Chile and to compare them with the original type as well as with the only preserved specimen of *D. osornina* (the holotype). I reached the conclusion that the latter is undistinguishable from *D. huilliche*, consequently I propose the synonymy, retaining the name of the species that appears first in my monograph of 1957a.

D. huilliche is a typically endemic species of unknown feeding and breeding habits, living in the Chilean and Argentinean Lake regions of Patagonia. In Chile it was observed in small numbers in many places from Temuco to Chiloé. One individual was collected near "El Tabo" in the Central coast of the Country.

e) *immigrans* species group (Sturtevant, 1942: 32)

Syn: subgenus *Spinulophila* (Duda, 1927: 107) = *Acanthophila* (Duda 1927: 122)

According to Patterson and Stone (1952) most members of the group have been reported from the Oriental region, with *D. immigrans*, the only cosmopolitan, recorded in Chile. The general characteristics of the group, defined by Sturtevant (1942) are: "Dull yellowish; a row of short thick spines on first femur; costal index over 30; "horn" about half length of puparium".

Drosophila immigrans Sturtevant, 1921: 83 (holotype: Amer. Mus. Nat. Hist., New York).

Syn: *D. brouni* Hutton, 1901: 91 (name offi-

cially suppressed according to the International Code).

Syn: *D. cilifemur* Villeneuve, 1923: 28.

Syn: *D. flexipilosa* Pipkin, 1964: 238.

Redescribed with figures by Patterson (1943). It is easily recognized by the characteristic short thick spines on the first femur and the wing pattern. It is a polyphagous species, very abundant over overripe fruits and vegetables in urban and suburban zones in all parts of the world. In tropical regions it was found in flowers(Pipkin *et al.*, 1961). It was first recorded in Chile in Angol (Malloch, 1934). We have collected the fly in various localities from Arica to Punta Arenas (Brncic, 1957a & 1980) and in Juan Fernandez Islands (Brncic, 1957b).

Specimens collected by the author in Azapa (Arica), Paihuano (Coquimbo), Concepción, and Aconcagua (all localities in Chile) were deposited at the Mus. Nac. Hist. Nat. (Santiago) as reference material.

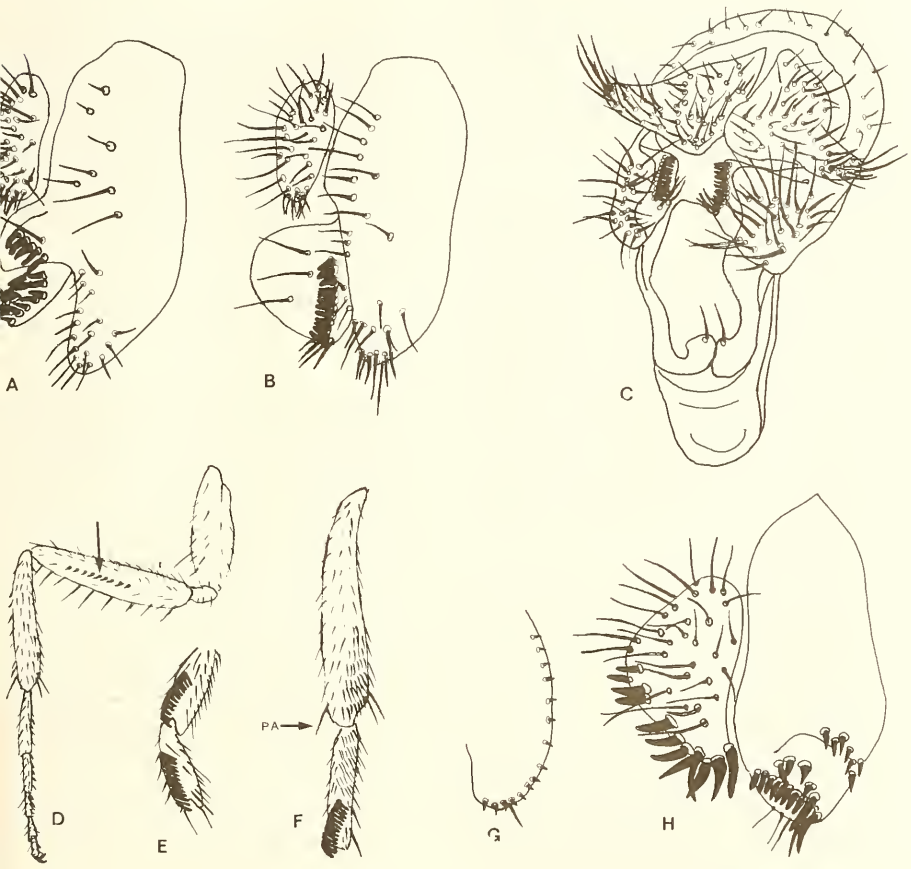

Figure 2. Lateral aspect of male genitalia of (A) *D. melanogaster* (B) *D. simulans*; (C) lateroblique aspect of male genitalia of *D. serenensis*; (D) *D. immigrans*, first femur showing row of small black spines; (E) and (F) male tarsal combs of *D. subobscura* and *D. melanogaster*; PA = preapical bristle; (G) ovipositor guide of *D. subobscura*; (H) *D. funebris* male genitalia.

f) *mesophragmatica* group (Brncic and Koref-Santibañez, 1957: 301).

"Brown species; arista with 7 to 9 branches; carina prominent and sulcate; 8 rows of acrostichal hairs; mesonotum pollinose with faint longitudinal stripes; abdominal tergites with transversal bands, interrupted in the middle-line and diffusely spread out toward the lateral angles; anterior Malpighian tubes free, posterior fused with a continuous lumen" The group includes 8 species of South American-Andean distribution in the Neotropics" (Brncic and Koref-Santibañez, 1957; Brncic *et al.*, 1971). In Chile two species of the group have been recorded: *D. gasici* and *D. pavani.*

Drosophila gasici Brncic, 1957a: 92 (holotype (Arica): Mus. Nac. Hist. Nat., Santiago, Chile).

This is a relatively rare species, but nevertheless well distributed from Colombia (Bogotá) to Northern Chile (Arica), Bolivia (La Paz) and Argentina (San Luis). In the original description (Brncic, 1957a), figures of the external genital apparatus of male, spermathecae and metaphase chromosomes are given. Brncic and Koref-Santibañez (1965), considering the external morphology of adults, the cytogenetic analysis and behavioral traits related to mating and sexual isolation, decided to include the species within the *mesophragmatica* group. In addition, Brncic *et al.* (1971) give an analysis of the evolutionary status of the species and its relationships with the other members of the group.

This is a polyphagous species found in rotten fruits both in domestic and wild environments, and is easy to breed under laboratory conditions on the usual *Drosophila* food media.

Drosophila pavani Brncic, 1957a: 88 (holotype, La Florida, Santiago: Mus. Nac. Hist. Nat., Santiago, Chile).

In addition to the original description (with figures) there are many publications dealing with the genetics, ecology, population dynamics and the evolutionary biology of the species and its relationships with the other members of the *mesophragmatica* group. Recent reviews can be found in Brncic *et al.* (1971) and Nair *et al.* (1971). *D. pavani* is very difficult to distinguish morphologically from its sibling species, *D. gaucha* (Jaeger and Salzano, 1953) widely distributed in Argentina, Bolivia, Uruguay and southern Brazil. But both species are easily distinguished by analysis of the salivary gland polytenic chromosomes of the larvae. *D. pavani* in Chile is a polyphagous species well distributed and abundant from Copiapo to Valdivia and abundant (in late winter and spring) in a variety of wild and synanthropic environment such as gardens and orchards.

g) *repleta* species group (Sturtevant, 1942: 31)

Redefined by Vilela (1983) as follows: "Grayish or brownish mesonotum, each hair and bristle arising from a black or dark brown spot, sometimes absent or fused to form more or less elaborate patterns; wings clear, 3rd and 4th longitudinal veins not convergent; costal index ranging from 1.9 to 3.9; testis with number of coils ranging from 3.5 to 51, ventral receptacle with number of coils ranging from 6 to 735; surstylus not micropubescent, usually without secondary teeth; gonopod with one to three sensila (absent in *D. inca*), usually linked to conch of hypandrium by membranous tissue".

The *repleta* group is the largest group of the subgenus *Drosophila*. In a recent review of the group, Vilela (1983) included 76 species. The group is endemic to the New World; nevertheless some species like *D. hydei* and *D. repleta* are cosmopolitan, and still others such as *D. mercatorum* and *D. buzzatii* are widespread in more than three of the biogeographic reams.

In Chile there are 5 species of the group: *D. buzzatii, D. hydei, D. mercatorum, D. nigricruria* and *D. repleta*. In my monograph of 1957 I included also *D. serenensis* as a possible member of the group, but Vilela (1983), studying the characteristics of the male genital apparatus, concluded that the latter species must be removed from the *repleta* species group.

Drosophila buzzatii Patterson and Wheeler, 1942: 97 (Lectotype, by C.R. Vilela: Amer. Mus. Nat. Hist., New York).

Syn: *D. tigrina* Buzzati-Traverso, 1943: 44.
Syn: *D. buzzattii* (sic) Spieth, 1952: 401.
Syn: *D. versicolor* Mather, 1955: 573.

Syn: *D. buzzati* (sic) Dobzhansky *et al.*, 1957: 116; Monclús, 1964: 152.

In addition to the original description (Patterson and Wheeler, 1942) later descriptions (with figures) were made by Burla (1951) and Vilela (1983) (with drawings of male genitalia). The species is widely distributed in South America, Central Europe, near East Asia, Africa, Canary Island, Madeira and Australia, associated with rotten fruits and stems of *Opuntia ficus indica*.

In Chile the species was first collected near Santiago (Vizcachas) in 1978, in rotten parts of *Opuntia*; since then, it has been caught in small numbers in many semi-arid regions of the North-Central part of the country. I have the impression that the species is expanding its distribution.

Ref. material from Vizcachas (Santiago, Chile) has been deposited at the Mus. Nac. Hist. Nat. (Santiago, Chile).

Drosophila hydei Sturtevant, 1921: 101 (holotype: Amer. Mus. Nat. Hist., New York).

Syn: *Drosophila hydei yucatanensis* Spencer, 1940: 159.

Syn: *Drosophila setosa* Dobzhansky and Pavan, 1943: 46.

Redescribed with figures by Patterson (1943); Vilela (1983) gives ilustrations of the male genitalia. This is a cosmopolitan and synanthropic species very common in gardens, orchards, and in cellars and fruit markets. Brncic (1957a) reports the species in Chile from Arica to Valdivia. In later collections the species has been found as far as Puerto Montt.

Some specimens from Santiago (Chile) were deposited by the author as reference material at the Mus. Nac. Hist. Nat. (Santiago, Chile).

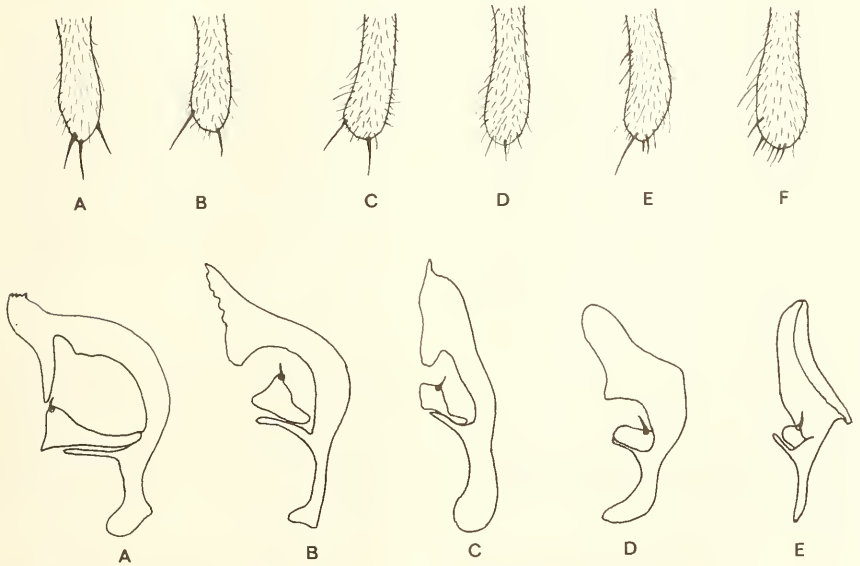

Figure 3. Upper row. Distal ends of the palpi of: (A) *D. melanogaster*; (B) *D. simulans*, (C) *D. cardini* male, (D) *D. cardinoides* male, (E) *D. cardini* female and (F) *D. cardinoides* female. Lower row. Lateral aspect of male aedeagus of: A) *D. hydei*, B) *D. mercatorum*, C) *D. nigricruria*, D) *D. buzzatii* and E) *D. repleta*.

Drosophila mercatorum Patterson and Wheeler, 1942: 93 (Syntype: Amer. Mus. Nat. Hist., New York).

Syn: *D. carinata* Grimshaw, 1901: 70 (Synonymyzed by Hardy, 1965: 204; name officially suppressed (I.C.Z.N. 1977).

Syn: *D. pararepleta* Dobzhansky and Pavan, 1943: 52 (see note).

Redescribed (with figures) by Patterson (1943). Vilela (1983) figured the male genitalia. Wide ranging in Neartic and Neotropical regions and in some places of Europe (Spain and Portugal), Canary and Madeira Islands, Australia, Samoa, Kenya, Zimbabwe and India (Ref. in Vilela, 1983). In Chile, Brncic (1957a) recorded the species in La Serena (Coquimbo) and later in low numbers in many places of the North-Central part of Chile. During the last 10 years it has not been caught in any of the routine collections.

Ref. material from La Serena (Chile) was deposited by the author in Mus. Nac. Hist. Nat. (Santiago, Chile).

Note: *pararepleta* was considered by Wharton (1944) as a subspecies of *mercatorum*. The Chilean populations of the species, according to the cytological studies of Wasserman (1962a) would correspond to *D. mercatorum pararepleta*.

Drosophila nigricruria Patterson and Mainland, 1943 (in Patterson, 1943: 136) (Type: not located; Vilela, 1983).

Syn: *D. nigrocruria* (*sic*) Hsu, 1949: 136.

Syn: *D. hoeckeri* Brncic, 1957a: 76 (Synonymyzed by Wasserman, 1962b: 101; holotype: Mus. Nac. Hist. Nat. Santiago, Chile).

Syn: *D.nigrucruria* (*sic*) Pavan, 1952: 11.

Syn: *D. nigricuria* (*sic*) Takada, 1963: 134; Pilares and Vasquez, 1977: 104.

In addition to the original description (Patterson, 1943), Brncic (1957a) redescribed the species as *D. hoeckeri* (*syn.*) in Spanish and, Vilela (1983) gives a complete study of the male genitalia.

This is a polyphagous species that is attracted by fermented fruit baits. It is well distributed from Mexico to Brasil and Chile. Brncic (1957a) collected the species for the first time at Azapa and Camarones (Arica). In the last decade the species has been collected in various localities of the North-Central part of Chile.

Some specimens from Arica (in addition to the holotype of *hoeckeri*, have been deposited as reference material at the Mus. Nac. Hist. Nat. (Santiago, Chile).

Drosophila repleta Wollaston, 1858: 117 (Lectotype: British Mus. Nat. Hist., London, England).

Syn: *D. punctulata* Loew, 1862: 232.

Syn: *D. adspersa* Mik, 1886: 328.

Syn: *D. nigropunctata* Wulp, 1892: 216.

Syn: *D. maculiventris* Wulp, 1897: 142.

Syn: *D. marmoria* Hutton, 1901: 91.

Syn: *D. prorepleta* Duda, 1925: 210.

Syn: *D. melanopalpa* Patterson and Wheeler, 1942: 77.

Syn: *D. australorepleta* Dobzhansky and Pavan, 1943: 50.

Syn: *D. betari* Dobzhansky and Pavan, 1943: 48.

Syn: *D. brunneipalpa* Dobzhansky and Pavan, 1943: 53.

Syn: *D. pumiliaris* Wheeler, 1981: 20.

Redescribed (with figures) by Patterson (1943) and Burla (1951). Vilela (1983) gives figures of the male genitalia. A cosmopolitan and sinanthropic species found in urban zones in fruit markets, gardens and orchards.Brncic (1957a) records the species in Chile from Arica to Santiago.

Reference material from Valparaíso (Chile) deposited by the author at the Mus. Nac. Hist. Nat. (Santiago, Chile).

h) *virilis* species group (Sturtevant, 1942: 30).

The general characteristics of the group according to sturtevant (1942) are: "Blackish species; anterior scutellars divergent; posterior cross-veins clouded; sterno-index 0.80 to 0.90". Patterson and Stone (1952) included 8 species in the group. The only species found in Chile is *D. virilis*.

Drosophila virilis Sturtevant, 1916: 330 holotype: Am. Mus. Nat. Hist., New York).

Redescribed by Patterson (1943). A full account of the biology, genetics, and evolution

of the species and its relatives is given by Patterson and Stone (1952). It is a polyphagous species found both in urban and wild environments; widespread in South Nearctic, Neotropical and North oriental regions, occasional in Europe and Hawaii. In Chile it was collected for the first time in Santiago (La Florida) and in Puerto Varas (Llanquihue) (Brncic, 1957a) and since then, in low numbers in other localities of central and southern parts of Chile. But according to our records it has not been observed in the last 10 years.

Some specimens from La Florida (Santiago) have been deposited by the author at the Mus. Nac. Hist. Nat. (Santiago, Chile).

i) *Species of uncertain affinity*

Within the subgenus *Drosophila* there are four species that, although they share most of the characteristics assigned by Sturtevant (1942) to the subgenus, are difficult to include in any of the established species groups. They are: *D. amplipennis, D. atacamensis, D. camaronensis* and *D. serenensis.*

Drosophila amplipennis Malloch, 1934: 442 (holotype: L. Correntoso, Arg., British Mus. Nat. Hist., London).

Malloch (1934) gives a full description of the species with some figures of wings and the male and female external genitalia. Brncic (1957a) redescribed the species in Spanish. This is a typically endemic species for the Lake Regions of Argentinean and Chilean Patagonia. Malloch recorded the species in Lake Correntoso (Arg.) and in Ancud (Chiloé) and the present author (Brncic, 1957a) found the species in several localities in South Chile (Angachilla, Valdivia, Llanquihue, Ensenada, Puerto Montt) but lately we observed the species further north and further south, from Salto del Laja to Coihaique. I have also occasionally collected the flies in places of the Central coast of Chile: El Tabo (Dec. 1959), Viña del Mar - Parque del Salitre (March 1958 and Feb. 1960). The species has been always collected in wild environments and its feeding and breeding sites are unknown.

Some specimens from various localities of Chile have been deposited by the author as reference material at the Mus. Nac. Hist. Nat. (Santiago, Chile).

Drosophila atacamensis Brncic and Wheeler *sp. nov.* (Fig. 4).

Holotype and paratypes: From Paposo (Antofagasta) Coll. by M. Elgueta (10/X/1983), Mus. Nac. Hist. Nat. (Santiago, Chile).

Type locality: Paposo, Chile.

External characters of imagines (In living individuals).

Head (♂, ♀). Arista with only 2 dorsal and one ventral branches in addition to terminal fork. Antennae pale brown; second joint with two prominent bristles; third joint darker and with fine dark pilosity. Front golden yellow. Triangle and orbits blackish. Middle orbital bristle about 2/3 the anterior proclinate and 1/2 the posterior reclinate. Only one prominent oral bristle; second oral fine and about a half of the first. Carina prominent and sulcate. Face pale yellow, cheeks pale yellow, their greatest width about 1/3.5 greatest diameter of eyes. Eyes very dark red, almost sepia, with abundant whitish pilosity. Proboscis and maxillary palps pale yellow.

Thorax (♂, ♀). Acrostichal hairs in 6 irregular row. Three pairs of dorsocentral bristles, the anterior ones just before the suture and slightly divergent; the distance between the anterior and the middle pair greater than between the middle and the posterior. Anterior scutellar bristles slightly convergent. One strong humeral. Sterno-index about 0.6. Mesonotum bright brown without stripes or marks. Scutellum brown, finely pollinose. Pleura blackish. Legs pale yellow. Apical bristles on first and second tibiae, preapicals on all three.

Abdomen (♂, ♀). Dull brown, without bands or marks.

Wings (♂, ♀). Transparent; veins pale brown; bristles black. Costal index about 2.3.; 4th vein index about 2.0; 5x index about 1.4.; 4c index about 1.1. Two well-developed bristles of equal size at apex of first costal section. Third costal section with heavy bristles on its basal 1/4. Halteres yellow.

Body length (♂, ♀). About 2.5 mm.

Puparia. Orange-brown. Each anterior spira-

cle with about 8 branches; horn-index about 11.

Relationship. Species of uncertain affinity. Some characteristics suggest a possible relationships with the unusually polymorphic neotropical *nannoptera* group of the subgenus *Drosophila* established by Ward and Heed (1970).

Distribution and types. 6 males and 4 females emerged from a group of *Drosophilidae* pupae found in rotten parts of *Copiapoa cinerea* Phil. (Cactaceae) and were brought to the laboratory on 10/X/1983 from Paposo (25°S/70° 28'W) in the Atacama desert (Chile) by Mr. Mario Elgueta, entomologist of the Chilean Museum of Natural History. *Holotype* male and 3 *paratypes* were deposited in the Mus. Nac. Hist. Nat. (Santiago, Chile).

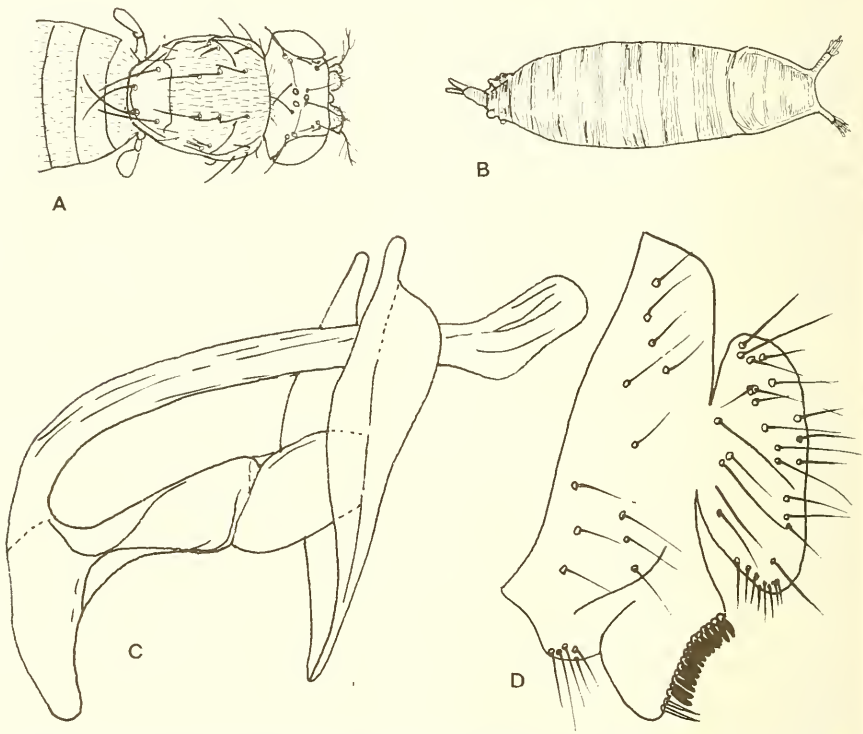

Figure 4. *D. atacamensis* sp.n. A) Diagramatic sketches of head and thorax, B) puparium, C) lateral sketch of male hypandrium and aedeagus, D) lateral aspect of the male external genitalia.

Drosophila camaronensis Brncic, 1957a: 95 (holotype: Camarones (Chile) Mus. Nac. Hist. Nat., Santiago, Chile).

The original publication (Brncic, 1957a) describes the external and some internal characteristics of imagines, puparium, eggs and chromosomes with some figures. It was collected for the first time over fermented banana baits at Camarones (Arica, Chile). It was later caught in other localities of Arica (Azapa).

It is a polyphagous species living in wild environments and is easy to breed on the usual *Drosophila* food medium.

The characteristics of this fly fit very well with those of the other species belonging to the subgenus *Drosophila*, but it is difficult to include it in any of the known species groups.

Drosophila serenensis Brncic, 1957a (holotype: La Serena, Coquimbo, Mus. Nac. Hist. Nat., Santiago, Chile).

In addition to the original description, with figures of the male external genitalia, ovipositor, spermatheca, and metaphase chromosomes, Vilela (1983) described and illustrated the male copulatory apparatus. The species was originally described as a member of the *repleta* species group, due to some external characteristics such as grayish mesonotum and bristles arising from black spots. But Vilela (1983) removed the species from the group because of the configuration of the male genitalia, which is quite different from the rest of the *repleta* species group (Fig. 2).

Very well distributed in all North-Central parts of Chile from Copiapó to Chillán (Brncic, 1957a). Vilela *et al.* (1980) records the species in various high and dry areas of the Occidental part of Chaco and East Slopes of the Andes mountains in Argentina.

The ecology of the fly is unknown, but the adults are polyphagous and are attracted by fermenting fruit baits. *D. serenensis* can be manteined under laboratory conditions on the usual *Drosophila* food medium.

Subgenus *Hirtodrosophila* Duda

Duda, 1924: 203. Type species: *Drosophila longecrinita* Duda, 1924: 204.
Syn: *Dasydrosophila* Duda, 1925: 152 (Improper subtitution for *Hirtodrosophila*).

This is a large subgenus that according to Wheeler (1986) includes 123 species, most of them from South Asia, Africa, Australia, Pacific Islands and the American Tropic. Sturtevant (1942) summarized the characteristics of the taxon as follows: "Third antennal segment large, covered with unusually long hairs; carina narrow, short, practically absent on lower part of face; arista usually with one branch bellow in addition to terminal fork; sterno-index 0.5 or less; so far as known all are fungus-feeders".

The only known Chilean species of *Hirtodrosophila* is *D. kuscheli*, endemic to the Juan Fernández Islands.

Drosophila kuscheli Brncic, 1957b: 394 (holotype not localized, probably lost; paratypes: Mus. Nac. Hist. Nat., Santiago, Chile).

The original description is given in Brncic (1957b), although it was reproduced in the monograph "Las especies chilenas de Drosophilidae" (Brncic, 1957a) erroneously as a "new species". In both references the external characteristics of the imagines (with figures), the relationship with other species and the distribution are reported. Until now, the species was recorded only from Juan Fernández Islands (Robinson Crusoe), Plazoleta del Yunque, Miradero de Selkirk, Cerro Alto. The feeding and breeding sites of the species are unknown.

Subgenus *Phloridosa* Sturtevant

Sturtevant, 1942: 28. Type species: *Drosophila floricola* Sturtevant, 1942: 42.

This is a typically Neotropical subgenus that includes 7 known species (Wheeler, 1986) with the following distinctive traits: "Shining black or brown species; bristles and branches of arista short; sterno-index 0.3 or less; anterior Malpighian tubes absent; posterior Malpighian tubes fused to form a loop around the gut; testes long, spirally coiled; eggs without filaments or remains of follicle cells; flower-feeding species" (Sturtevant, 1942). In Chile only one species of the subgenus is known: *D. alei*.

Drosophila alei Brncic, 1962: 4 (holotype: (Arica) Mus. Nac. Hist. Nat., Santiago, Chile).

The original description (Brncic, 1962) includes the external and internal characters of imagines, eggs and puparium, and ilustrations of the male external genital apparatus and metaphase chromosome. The actual distribution includes Arica (Chile) and the Southern Peruvian Coast (Pilares and Vásquez, 1977).

As all other members of the subgenus, *D. alei* is an exclusive flower-breeding species.

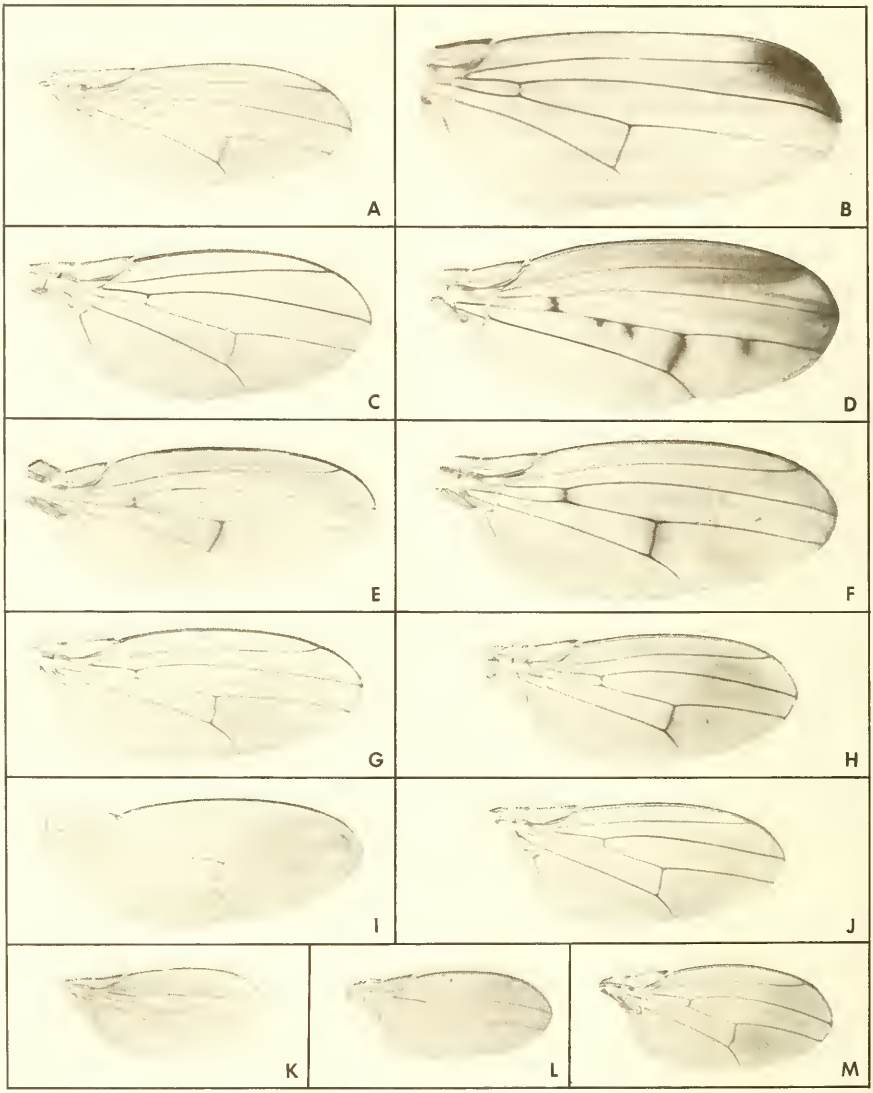

Figure 5. Wings of the followings species: A) *D. immigrans*, B) *D. amplipennis*, C) *D. funebris*, D) *D. appendiculata*, E) *D. huilliche*, F) *D. araucana*, G) *D. gasici*, H) *D. pavani*, I) *D. flavopilosa*, J) *D. hydei*, K) *D. melanogaster*, L) *D. atacamensis*, M) *D. buzzatii*.

The adults can be found in large numbers inside the large tubular corolla of florypondium (*Datura sp.*). It was also found occasionally in *Ipomoea* flowers.

Subgenus *Sophophora* Sturtevant

Sturtevant, 1939: 139. Type species: *Drosophila melanogaster* Meigen, 1830: 25.

This is the second subgenus of *Drosophila* with respect to number of species; Wheeler (1986) includes 265 members in this widely distributed subgenus. Sturtevant (1942) gives the following definition of the subgenus: "Eggs with 2 blunt filaments; ventral receptacle not kinky; posterior Malpighian tubes free at their distal ends; sterno-index 0.6 or less; anterior spiracle and its stalk not over 1/5 length of puparium; second to fifth abdominal tergites with posterior dark bands that are never broken or narrowed in mid-dorsal line; cheeks always relatively narrow".

In Chile 4 species belonging to two species groups have been found: 1) *melanogaster* species group (*D. ananassae, D. melanogaster, D. simulans*) and 2) *obscura* species group (*D. subobscura*).

a) *melanogaster* species group (Sturtevant, 1942: 29).

The group was redefined by Bock and Wheeler (1972) as follows: "yellowish or dull dusky species, abdomen of male shiny black distally in many species; ventral receptacle long and coiled; testes spiral, creamish to yellow (orange in *elegans*); no opaque areas on tergites; larvae do not skip; sex-combs present in all except two species of the *suzukii* subgroup; periphallic organ with well-developed genital arch including toe, bearing large bristles but without microtrichia; anal plate with large bristles, in several subgroups with differentiated lower bristles or teeth, in *nipponica* subgroup with a single large black ventromedial tooth; one or two pairs of setigerous claspers present; structures of phallic organs of very variable size and shape, but anterior and posterior parameres present in almost all species".

Drosophila ananassae Doleschall, 1858: 128 (Types not located).

Syn: *D. imparata* Walker, 1859: 126.
Syn: *D. similis* Lamb, 1914: 347 (Syntype: Zool. Mus. U. Cambridge, England).
Syn: *D. caribea* Sturtevant, 1916: 335 (Holotype: Amer. Mus. Nat. Hist., New York).
Syn: *D. errans* Malloch, 1933: 21.

Redescribed (with figures) in Patterson (1943). The male genital apparatus was studied in detail by Hsu (1949) and Wheeler and Takada (1964).

D. ananassae has been recorded from all six biogeographic realms, but it is typically circumtropical and is absent from colder areas. In Chile it is very occasional and was found only twice in the city market of Santiago over rotten imported banana and pineapples, and one specimen was collected in Arica. Most probably, in Chile the species is passively transported from outside but does not constitute a permanent population.

Specimens from Arica and Santiago were deposited by the author at the Mus. Nac. Hist. Nat. (Santiago, Chile).

Drosophila melanogaster Meigen, 1830: 85 (Lectotype: Mus. Nat. Hist., Paris, Fr.).

Syn: *D. fasciata* Meigen, 1830: 84.
Syn: *D. nigriventris* Macquart, 1843: 412.
Syn: *D. approximata* Zetterstedt, 1847: 2557.
Syn: *D. ampelophila* Loew, 1862: 23.
Syn: *D. uvarum* Rondani, 1875: 86.
Syn: *D. pilosula* Becker, 1908: 156.
Syn: *D. emulata* Ray-Chaudhuri and Mukherjee, 1941: 216.

The species has been redescribed with details and figures by Patterson (1943), Burla (1951) and Bock and Wheeler (1972). It is difficult to separate the females of the species from the females of the "sibling" species *D. simulans*, but the males are easily identified by the external genital apparatus.

This is the most cosmopolitan and synanthropic species of the genus and it is a conspicous visitor of houses, fruit markets, cellars, groceries, gardens and orchards. In Chile it is distributed from Arica to Punta Arenas (Brncic, 1957a & 1980) and Juan Fernández Islands (1957b).

Reference specimens have been deposited by the author at the Mus. Nac. Hist. Nat. (Santiago, Chile).

Drosophila simulans Sturtevant, 1919: 153 (Holotype: Amer. Mus. Nat. Hist., New York).

In addition to the original description (Sturtevant, 1919) the species has been redescribed with many ilustrations by Patterson (1943), Burla (1951) and Bock and Wheeler (1972). The figures of the male copulatory apparatus are very useful for distinguishing the species from *D. melanogaster*. It is a cosmopolitan, polyphagous and synanthropic species that together with *D. melanogaster* is found through a wide range of climatic conditions, but, at least in Chile, *D. simulans* seems to be a more warm adapted species than *D. melanogaster* that prefers the colder zones. *D. simulans* is present in large numbers all over the country, but has been not collected in Aisén and Magallanes (Brncic, 1957a & 1980).

Specimens of *D. simulans* from various localities of Chile have been deposited by the author at the Mus. Nac. Hist. Nat. (Santiago, Chile).

b) *obscura* species group (Sturtevant, 1942: 29).

"Dark species; no opaque areas on tergites; larvae do not skip; sex-combs present; preapicals on first tibia unusually long; sternoindex about 0.6; anterior scutellars convergent; second oral small; middle orbital large; north temperature zone" (Sturtevant, 1942). The group is fundamentally holoarctic but during recent years the North American species *D. pseudoobscura* has been found in Colombia and the European species *D. subobscura* has been found in Chile and in southern Argentina.

Drosophila subobscura Collin, 1936 (In Gordon, 1936: 60) (Syntype: Univ. Mus. Oxford, England).

There are more complete descriptions with figures of this species by Pomini (1940) and Burla (1951). Widespread in Europe, near East, North Africa, Canary Islands and Madeira (Monclús, 1984). In the Americas the species was found for the first time in Chile in Puerto Montt in Feb. 1978 (Brncic and Budnik, 1980); since then it has been expanding from La Serena to Punta Arenas. Prevosti *et al.* (1983) reported the species in Bariloche (Arg.), and recently it has been collected at Mar del Plata (Arg.) (personal communication of Prof. Mónica M. López). Beckenbach (1984) reported that *D. subobscura*, together with another European species of the group, *D. ambigua*, has recently been collected on the West Coast of North America.

Since 1978, *D. subobscura* constituted the most abundant species collected over fermenting fruit baits during late winter and spring in the South-Central part of Chile. In the latter zone the species feeds and reproduces on rotten fruits in gardens and orchards, but it was also found in wild environments far apart from human activities.

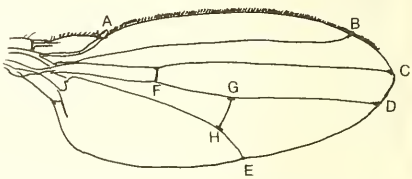

Figure 6. Measurements of the wing-vein indices: costal index = AB/BC; 4th vein index = DG/FG; 4c index = BC/FG; 5x index = EH/GH.

KEY TO CHILEAN SPECIES OF *DROSOPHILA*

1. — Arista with only one ventral branch in addition to terminal fork 2
   — Arista with two or more ventral branches in addition to terminal fork 3
2. — Arista with 4-5 dorsal branches; eyes red; two pairs of dorsocentral bristles ..... *D. kuscheli*
   — Arista with only two dorsal branches; eyes very dark red (sepia); three pairs of dorsocentral bristles ..... *D. atacamensis* sp. nov.
3. — Two pair of dorsocentral bristles; preapical bristles evident only on third tibia; mesonotum yellow with distinct black longitudinal stripes, the middle one bifid posteriorly; pleura with 2 or 3 brown stripes; abdomen yellow, each segment with an apical black band interrupted in the middorsal line and attenuated or interrupted at each lateral margin ..... *D. buschii*

— Two pairs of dorsocentral bristles; preapical bristles on second and third tibiae; mesonotum and pleura not as above 4

4. — Mesonotum brown or gray, almost all bristles arising from a black or brown spot, these spots sometimes fused 5
— Mesonotum not spotted 10

5. — Abdomen entirely grayish black, without bands or marks; male genitalia with cerci having lateral finger-shaped protuberances covered with abundant hairs (Fig. 2-C) ..... *D. serenensis*
— Abdomen yellow or grayish yellow, each segment with a dark band interrupted medianly and reaching the anterior margin at the angle of the tergite forming dark areas that could be solid, interrupted or leaving light zones near lateral margin 6

6. — Coxae of first legs black or very dark brown, much darker than tibiae and tarsi 7
— Coxae of first legs not darkened, about same color as remainder of leg 8

7. — Arista with about 7 branches, antennae dark brown; second oral bristle about 1/5 length of first. Posterior crossvein slightly clouded. Lateral areas of abdominal tergites with light grayish areas near lateral margin, especially evident on first three segments ..... *D. nigricruria*
— Arista with about 8 branches, antennae tannish brown, third joint darker; second oral bristle about 1/2 length of first. Posterior cross-vein not clouded. Lateral areas of abdominal tergites yellow, shading into brown along lateral margin; apical dark bands not widened to form a triangle in the posterior corner of lateral areas ..... *D. repleta*

8. — Dark brown or blackish species; all lateral areas of abdominal segments almost completely covered by expansions of the apical bands, solid color, without interruptions of light areas. Costal index over 3.4. Eyes very dark red ..... *D. hydei*
— Grayish yellow species; some or all lateral areas of abdominal segments separated from the more median portions of the apical band near the angle of the tergite, lateral areas not completely covered with dark markings. Costal index less than 3.0. Eyes cherry-red or vermilion 9

9. — Color pattern of the bands in lateral areas of abdominal segments faint, faded and diffuse ..... *D. mercatorum*
— Dark brown bands in the lateral areas of abdominal segments more nitid and enclosing small, irregular yellow basal areas wich are often missing on posterior segments ..... *D. buzzatii*

10. — Costal index less than 2.5; males with tarsal combs; eggs with two filaments 11
— Costal index more than 2.5; males without tarsal combs; eggs with four filaments or two very short filaments or without filaments 14

11. — Small black species (2-2.2 mm), abdominal segments without bands; first leg of male with two tarsal combs, the upper one with 10 to 15 teeth, lower with 9 to 13 teeth (Fig. 2-E) ..... *D. subobscura*
— Small yellow-brown species (2-2.2 mm) 12

12. — Costal index less than 1.5; abdomen brownish yellow in both sexes, each segment with an indistinct brownish margin. Male tarsal comb small and pale ..... *D. ananassae*
— Costal index about 2.2; abdomen brownish yellow, each segment with a black margin not interrupted in the mid-dorsal line, last three segments in male entirely black. Male sex comb of 9-12 black teeth on front matatarsus (Fig. 2-F) 13

13. — Cheek width about 1/6 greatest diameter of eye; maxiliary palps most often with 3 stouter bristles on their outer end (Fig. 3-A). Male genital arch with small hook-shaped process (Fig. 2-A) ..... *D. melanogaster*
— Cheek width less than 1/6 greatest diameter of eye; maxiliary palps most often with 2 stouter bristles on their outer end (Fig. 3-B). Male genital arch with large hood-shaped process (Fig. 2-B) ..... *D. simulans*

14. — A row of about 10 small stout bristles on the inner side of the apical part of each front femur (Fig. 2-D); costal index about 4.4; wings clouded at apex of 1st, 2nd and 3rd longitudinal veins and on posterior cross-vein ..... *D. immigrans*
— Inner side of the femur without a row of stout bristles 15

15. — Small flies (2-2.5 mm); wings clear; eggs without or with two very short filaments, found exclusively in flowers 16
— Medium-size (3.0-3.5 mm) to large flies (4-5 mm); eggs with 4 large filaments 17

16. — Shining brownish black species; acrostichal hairs in 8 irregular rows; costal index about 2.5 to 2.6. The adults are found inside the large flowers of *Datura sp.*, ocassionaly in *Hibiscus* flowers *D. alei*
— Yellow species. Acrostichal hairs in 6 rows; costal index about 5.0; females with strong spined ovipositors. All developmental stages of the fly are found inside the flowers of *Cestrum parqui* ..... *D. flavopilosa*

17. — Anterior scutellar bristles convergent 18
— Anterior scutellar bristles divergent 20

18. — Arista with about 11 branches; mesonotum reddish-brown without marks or stripes, acrostichal hairs in 8 rows; abdomen dark-brown (blackish) with a yellow band at least on the first four tergites along the anterior margin, broadest in the middle line; male anal plate with 10-11 heavy spines slightly bent upward (Fig. 2-H) ..... *D. funebris*
— Arista with about 8 branches; acrostichal hairs in 6 rows; thorax shining reddish-brown; abdomen reddish-yellow with distinct black bands on posterior margin of each segment, interrupted in the middle line. The two bristles at apex of first costal section unequal in lengh 19

19. — Cross-veins slightly clouded; at level of anterior cross-vein, L2 is closer to L3 than to the costa; palpi in both sexes roughly club-shaped, with one or more well differentiated bristles on the anterolateral edge (Figs. 3-C, E) ..... *D. cardini*

— Cross-veins dark but not clouded; at level of anterior cross-vein, L2 is closer to the costa than to L3. Palpi of both sexes very broad and rouded, and with hairs or weakly differentiated bristles on both medio-ventral and lateral surfaces; in the males the palpi lacking any well differentied bristle (Figs. 3-D, F) ..... *D. cardinoides*

20. — Wings clear, cross-veins not clouded or only slightly clouded 21
— Wings darker than usual, cross-veins strongly clouded, if not, with distinct dark marks or darker areas 24

21. — Mesonotum with light longitudinal stripes between dorsocentral bristles; carina strongly sulcate 22
— Mesonotum without longitudinal stripes; carina not sulcate or only slightly sulcate 23

22. — Mesonotum brown pollinose, slightly striped longitudinally. Legs yellowish ..... *D. pavani*
— Mesonotum dark brown with the following marks: a thin light stripe in the middle line, a light stripe between the middle line and the dorsocentral bristles from the anterior margin of the mesonotum to the lebel of anterior dorsocentrals, a light mark outside the dorsocentrals and before the suture, one or two diffuse light marks behind the suture ..... *D. gasici*

23. — Dark dull-brown species; arista with 7 branches; acrostichal bristles in 6 rows, costal index about 2.8 ..... *D. virilis*
— Yellowish species; arista with 9-10 branches; acrostichal bristles in 8 rows; costal index about 3.5 ..... *D. camaronensis*

24. — Brown species, cross-veins strongly clouded; middle orbital minute, less than 1/5 other two; the two bristles at apex of first costal section of unequal length; two prominent oral bristles, carina not sulcate 25
— Not entirely as above 26

25. — Arista with about 10 branches; eye wine-red; mesonotum dark brown pollinose, with light longitudinal stripes, sometimes diffuse ..... *D. araucana*
— Arista with about 7-8 branches; eye large and bright-red; mesonotum bright dark-brown, without bands, scutellum blackish .... *D. huilliche*

26. — Large brownish yellow species (4-5 mm); wings darker along the costa to over the second vein; several short spur veins on the posterior side of fourth vein, one or two in the discal cell and one in the first posterior cell; the spur veins and both cross-veins clouded ..... *D. appendiculata*
— Large species (about 4 mm). Wings without spur veins, but with a large dark brown mark on the costa, extending from a short distance proximal to apex of second vein to third vein ..... *D. amplipennis*

SOME REMARKS OF THE *DROSOPHILA* FAUNA IN CHILE

Val *et al.* (1981) list 417 species of the genus *Drosophila* in the Neotropical Region, clustered in 8 subgenera plus 44 unplaced species. Only 27 species have been found in Chile belonging to 6 of the subgenera. This number could be considered rather low, compared to other neotropical areas of about the same size. The low number could be attributed to several factors. First, the scantiness of local entomologists interested in field collection, identification and description of species. Wheeler (1981) has established a direct relationship between the increase of the number of known species of drosophilids in the last 50 years in each zoogeographical region and the growing interest of research groups in *Drosophila* systematics. A second factor is that in Chile remain many areas poorly or not surveyed at all regarding the *Drosophila* fauna. The insular part of the Aisén and Magallanes regions and some parts of the Chilean Altiplano are among these areas. A third factor is that most collections have been made over fermented fruit baits, especially banana. This method has been employed because it allows the collection of great numbers of flies. This is useful for population genetics studies, but the system is rather selective since there are many species that are seldom attracted by banana baits like the fungus and flower breeding species, among other ecologically specialized forms. Quite possibly an exhaustive and systematic survey of all the possible breeding sites for *Drosophila* in the country would increase our list of species. Finally, the fourth reason for the low number of species in Chile, could be the general tendency, observed in many taxa, of a reduction in the number of species as a function of the distance from the tropics. An analysis of the patterns of distribution of the genera shows clearly that the larger number of species are found in the tropical regions of the neotropics (Val *et al.*, 1981). This tendency can be observed also in Chile. As shown in Table 1, the North and Central regions contain many more species than the South region and the Austral zone, where only a few cosmopolitan or subcosmopolitan synanthropic species have been found.

In 1970 I proposed a classification of the Chilean species of *Drosophila* according to their distribution and ecology in three main groups: A) *Widespread species*, which includes the cosmopolitan forms and those which are

Table I
CLASSIFICATION OF CHILEAN SPECIES OF *DROSOPHILA*

Species Categories	*North region* (North border to Copiapó)	*Central region* (Copiapó to Bío-Bío)*	*South region* (Bío-Bío to Chiloé)	*Austral region* (Aisén and Magallanes)
COSMOPOLITAN				
ananassae	+	+		
buscckii	+	+	+	
immigrans	+	+	+	+
funebris		+	+	+
hydei	+	+	+	
melanogaster	+	+	+	+
repleta	+	+	+	
simulans	+	+	+	
SUBCOSMOPOLITAN				
buzzatii		+		
mercatorum		+		
subobscura		+	+	+
virilis		+		
WIDESPREAD (In the New World)				
cardini	+			
cardinoides	+			
nigricruria	+	+		
ENDEMIC				
alei	+			
amplipennis		+	+	
appendiculata			+	
araucana		+	+	
atacamensis	+			
camaronensis	+			
flavopilosa	+	+	+	
gasici	+			
huilliche		+	+	
kuscheli		+		
pavani		+	+	
serenensis		+		

*Includes Juan Fernández Isl.

amply distributed in the New World; B) *Endemic and ecologically restricted species*, which includes the highly specialized forms and C) *Endemic and ecologically versatile* species, which includes certain localized species that are nevertheless abundant in several environments. Table 1 is a somewhat modified version of such a classification. Following the criteria of David and Tsacas (1980) the widespread species have been subdivided into cosmopolitan, subcosmopolitan and widespread groups. All endemic forms were clustered in only one category. The inclusion of many species in a particular category could be considered rather arbitrary but seems to be useful because it reflects certain general properties of the taxa.

The cosmopolitan, subcosmopolitan and most widespread species are closely associated with human made environments, houses, groceries, fruit markets, gardens, orchards and garbage dumps. All species are attracted to fermented-fruits baits and can be easily bred under laboratory conditions. Nevertheless, in Chile *D. immigrans* and *D. simulans* were also found in wild habitats. By definition, cosmopolitan species are those found in almost all countries or at least in the six classical

zoogeographic realms: paleartic, nearctic, neotropical, ethiopian (or afrotropical), oriental and australian (Patterson and Stone, 1952; David and Tsacas, 1980). But, strictly speaking, none of the 8 cosmopolitan species of *Drosophila* (Table 1) have truly worldwide distribution. *D. ananassae*, probably a native of the Oriental region, has expanded to the tropical zones of the six continental realms. It has became a circumtropical species, but it is cold sensitive and absent in temperate or cold climates. In Chile it seems to be an occasional foreign visitor that has not been able to establish permanent population. In contrast, *D. buscki* and *D. funebris* are cold-adapted species that are extremely rare or absent in the tropics. In Chile *D. funebris* is until now the only species found in Tierra del Fuego (Brncic 1957a & 1980). With regard to *D. melanogaster*, the better known synanthropic species, there still exist places in the world which in spite of a large human population do not harbour the species (David and Tsacas, 1980). *D. simulans* is found in practically the same places and seems to utilize almost the same ecological resources as does *D. melanogaster*, but is more warm adapted and has a low ethanol tolerance which prevents the utilization of alcoholic resources in wine cellars (Parsons and Stanley, 1981). *D. hydei* and *D. repleta* are considered true cosmopolitans, breeding in decaying fruits and other vegetal materials. Nevertheless there are many human populated places, such as the austral part of Chile, in which the two species have never been observed. *D. immigrans* is a polyphagous domestic species that in Chile has also been found in wild environments; together with *D. melanogaster* it is the only species that was found in the four regions represented in Table 1, nevertheless it is more abundant in cold and temperate zones or seasons of the year.

With regard to the subcosmopolitan group, I have included only four species: *D. buzzatii*, *D. mercatorum*, *D. subobscura* and *D. virilis*. The criteria to cluster all them in this category is that they are distributed at least in 3 or 4 biogeographic realms. In spite of the many ecological differences exhibited by these four species, they have certain characteristics in common, such as the colonizing ability through human passive transportation, the capacity to became more or less domesticated and their tolerance to environmental stress such as cold or desiccation (David and Tsacas, 1980). The invasive tendency of the subcosmopolitan species seems to depend on different strategies that determine peculiar patterns of expansion of the populations. *D. virilis* probably originated in the oriental region, and the neotropical species *D. mercatorum*, now well distributed in many places of the world, was found frequently all over the central part of Chile from 1954 to about 1970, but during the last 10 years has not been collected anymore. In contrast, in 1978 appeared suddenly *D. buzzatii* and *D. subobscura*. *D. buzzatii* is remarkable by its narrow ecological niche since its breeds almost exclusively on rotten cladodes of *Opuntia ficus indica*. *Opuntia* is native to the neotropical region, but has been introduced in many other zones such as Australia, Atlantic Islands, North Africa and the mediterranean European countries, and in practically all those places *D. buzzatii* has developed flourishing populations, so reaching a subcosmopolitan status. The reasons why *D. buzzatii* has been not observed before 1978 in Chile, where *Opuntia* is massively cultured, remains a mystery. Particularly interesting is the situation represented by the European *D. subobscura*. Since the first time that the species was collected in Chile in 1978 at Puerto Montt (Brncic and Budnik, 1980), it has expanded very rapidly and has become now the most abundant species in many zones from La Serena to Punta Arenas. *D. subobscura* is a typically polyphagous species found in rotten fruits and other vegetable parts, but it could utilize also native resources and has become well integrated to the Chilean entomofauna.

In the group of widespread species in the New World three species are included: *D. cardini*, *D. cardinoides* and *D. nigricruria*. The three species share many ecological characteristics of the subcosmopolitan forms, but their distributions are more restricted. They are well distributed from México to Brasil and Chile. These three species were recorded formerly from Arica in the Northern region, but *D. nigricruria* has expanded southward, and now it is possible to collect individuals belonging to it in small numbers in Santiago.

The endemic species represent obviously

the most typically Chilean group and are also the most frequent (44,4%). Many of the species are not exclusive to Chile, and extend their distributional area to neighboring regions of similar ecological characteristics in Argentina, Bolivia and Perú. Some of the species like *D. gasici* are even found as far as Bogotá (Colombia), Cochabamba (Bolivia) and San Luis (Argentina), and other species such as *D. flavopilosa* extended its distribution to the southern Atlantic coast of South America. These two species could be placed in the group of widespread species but, due to their abundance and ecological characteristics, I prefer to consider them within the Chilean endemic group.

From the biogeographic and ecological point of view, within the Chilean endemic species there are ecologically highly specialized forms and their distribution and abundance depends on the abundance and distribution of the resource that they exploit, in some cases a single plant host. Examples of these species are *D. flavopilosa* that lives exclusively in the flowers of *Cestrum parqui* L'Her. (Solanaceae); *D. alei*, found only in the large tubular corollas of *Datura arbustiva; D. appendiculata*, closely associated with *Chusquea* sp. (Bambuseae), and *D. atacamensis* which until now has been found breeding only in rotten parts of *Copiapoa cinerea* (Cactaceae). In contrast to these monophagous forms, within the endemic Chilean species there are others that are polyphagous and can be found both in wild habitats or coexisting with the cosmopolitan and widespread species in human made environments, feeding and ovipositing in rotten fruit and vegetables. To this category of ecologically versatile species belong *D. araucana, D. amplipennis, D. camaronensis, D. gasici, D. pavani* and *D. serenensis*, but each one of these species has a characteristic pattern of distribution (Table 1) according to the environmental and climatic conditions of each region of Chile. With respec to *D. huilliche*, found in the Lake regions of the Patagonia and *D. kuscheli* found only in Juan Fernández Islands, we know too litle to make any generalization about their ecology and population dynamics. An overwiew of the biology and genetics of some of the Chilean endemic forms can be found in Brncic (1970, 1983b).

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APPENDIX

In the species descriptions and Key I have followed the traditional nomenclature used in *Drosophila* systematics. This terminology is essentially the same employed by most field dipterists, who give special importance to diagnostic characters like color pattern, wing venation traits, bristle numbers and sizes, etc. This treatment is somewhat different to that employed by the insect morphologists.

A full discussion of the most commonly used characters in *Drosophila* systematics are given by Sturtevant (1942), Patterson (1943), and Wheeler (1981). Most of these traits are indicated in Figure 1.

In the head are particularly important the following characteristics: Shape and hairiness of third antennal segment (the lenght of the hairs); the branches of arista (the total number or branches, including the terminal fork as two, but in certain cases it is also important to distinguish between branches above and below the axis); structure of front (the size, shape and distinctness of the orbital lines and ocellar triangle); orbital bristles (there are two reclinate and one proclinate. The anterior reclinate, called the middle orbital, is the shortest one and its relative size respecting the anterior is of importance in classification); oral bristles (the relative length of the bristle just behind the anterior oral bristle or vibrissa); carina (it can be narrow, broad, nose-like, sulcate); cheeks ("the greatest width of cheek" represents the distance from the lower rear corner of the head to the margin of the eye).

In the thorax are many important characters: The color and pattern (pollinose areas, spots, longitudinal stripes); acrostichal hairs (the number of rows is to be taken just to the anterior dorsocentral bristles); acrostichal bristles (in some species there are differenciated bristles just in front of the suture-*presuturals* - or in front of the scutellum - *prescutellars*); dorsocentral bristles (there are normally two pairs, but in the *polychaeta* group and in the Chilean species *D. atacamensis* there exist three pairs); anterior scutellar bristles (they can be convergent or divergent); sternopleural bristles (the relative lengths of the anterior and posterior bristles). Legs: Preapical tibial bristles (in most subgenera they are evident on all three tibiae, but are small or absent on the first and second tibiae in *Dorsilopha* and most *Hirtodrosophila* species); tarsal ornaments of male (the classical "sex combs" present on the basal tarsal segments of many species of *Sophophora*). Abdomen: In addition to the color pattern, there are in many species posterior dark areas (bands) on the abdominal tergites that represent important taxonomic traits. In some species the bands are interrupted or narrowed in the mid-dorsal region, in other species the bands are uniform in width or are broader in the median line; in still other species, the bands are broken or expanded toward the margin of the tergites to form a characteristic pattern.

In the wings the background color and the color of the veins are important. In many species the tips of some veins and the cross-veins are clouded; in others like *D. appendiculata* and *D. amplipennis* there are large well-defined dark areas on the blade of the wing. Other taxonomic wing traits are: bristles of costa (the point at which the heavy short bristles disappear between the ends of the 2nd and 3rd longitudinal veins); the relative size of the two bristles at the tip of the first section of the costa. Wing-vein indices: In most descriptions four indices are used: costal index (length of second section of costa / length of third section); fourth vein index (length of distal-section of fourth vein/length of third section); 4c index (length of third section of costa/ length of third section of fourth); 5x index (length of distal section of fifth vein/length of posterior cross-vein) (Fig. 6).

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