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**Drosophilidae of Madeira, with the description of
Drosophila madeirensis n. sp.**

By M. MONCLÚS (1984)

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Introduction

When studying the *Drosophilids* of the Canary Islands (MONCLÚS, 1976) we found a new species, *D. guanche* in the laurisilva forest. In order to analyse the distribution of this new species, new collections were made on the Island of Madeira and on the Azores Islands where the laurisilva forest is also present. In this paper only the results of samples collected in Madeira will be given.

Previous publications with records on the *Drosophilids* of Madeira are: BECKER (1908), FREY (1936, 1944, 1948), DUDA (1940) and HACKMAN (1958 a, 1960 and 1969). Yet, not more than 9 species were quoted hither-to.

Our first collection was carried out in July of 1970. No *D. guanche* were caught but we found, also in the laurisilva forest, another very similar species which we called *Drosophila madeirensis*. This new species will be described in this paper. In September of 1977 and October 1978, V. M. CABRERA and A. MATILLA of the University of La Laguna (Canary Islands), made new *Drosophila* collections with the purpose of studying the allozyme polymorphism of *D. madeirensis* and of comparing it with that of the very close species *D. guanche* from the Canary Islands. The flies of these collections were generously sent to the author for taxonomic analysis. The data of that analysis were added to the data of our previous collections. We would like to thank Dr. CABRERA and Dr. MATILLA once more for their generous collaboration.

Material and methods

Collections were made only on the biggest island of the Archipelago: Madeira, with 741 km², situated in the Atlantic Ocean at 32° 38' lat. N. and 16° 54' long. W. (Greenwich). It is a volcanic island with high mountains (Pico Ruivo 1861 m) and deep gullies. The geographic relief of the island, the oceanic situation, the latitude, etc., provide a temperate climate with little thermal oscillations and frequent mist, causing humid areas with exuberant vegetation. In some parts of the island (from 600 to 800 m above sea level) some laurisilva forests are found. Especially on the Northern slopes between the Ribera del Inferno and the Joao Delgado, there is one of the ecologically least degraded areas of all the Macaronesic Islands. We collected in this area and in the gullies near-by and also in pine forests, orchards and domesticated areas.

The same trapping method as for the previous collections was used (MONCLÚS 1964) except that the traps were kept open. Some of the traps were placed on trees or shrubs at a height of about 1,5 m, others on the ground. Collections sites (Fig. 1) in domesticated habitats, in agricultural areas, in pine forests and in the laurisilva forests were chosen

The collection sites are:

1. Funchal, the capital of the island. At sea level. Domesticated habitat.
2. Cabo Girao, in the South coast on a cliff. At 550 m above sea level. Some pines, fruit trees and grazing land.
3. Curral das Freiras, inland, 690 m above sea level. Laurisilva forest.
4. Faja da Nogueira, inland, 750 m above sea level. Laurisilva forest.
5. Ribeiro Frio, inland, 800 m above sea level. Laurisilva forest.
6. Terreiro da Luta, inland, 870 m above sea level. Laurisilva forest.
7. Santo da Serra, inland, 670 m above sea level. Degraded forest with pines, some laurisilva and undergrowth.
8. Serra de Agua, inland, 700 m above sea level. Pine forest.
9. Achada de Cedro Gordo, inland, 750 m above sea level. Pine forest with undergrowth.

A total of 4118 specimens belonging to 19 species of the family Drosophilidae were captured; 16 of the genus *Drosophila* and the other 3 of the genus *Scaptomyza*.

One new species, *D. madeirensis*, belonging to the subgenus *Sophophora*, *obscura* group, was found. This species is described in this paper for the first time.

Table 1 shows the numbers and the percentage of each of the species collected at the various sites.



Fig. 1. Madeira Island. Sites of collection

Table 1
Drosophilidae collected in Madeira

Species	Domestic		Semi-agricultural zone		Laurisilva forest								Laurisilva and pines				Total		
	Funchal		Cabo Girao		Curral das Freiras		Faja da Nogueira		Ribeiro Frio		Terreiro da Luta		Santo da Serra		Serra de Agua			Achada do Cerro Gordo	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		n	%
<i>D. lebanonensis</i>	6	5,04																	6
<i>D. busckii</i>	6	5,04					1	0,11											7
<i>D. melanogaster</i>	38	31,93	16	39,02	4	2,50	314	35,68	712	62,29	3	0,71	8	6,15	345	34,95	42	18,03	1438
<i>D. simulans</i>	10	8,40																	31
<i>D. ananassae</i>	31	26,05	8	19,51	55	34,37	163	18,52	272	23,80	404	95,06	46	35,38	632	64,03	164	70,39	1744
<i>D. subobscura</i>					8	5,00	140	15,91	30	2,62	6	1,41							184
<i>D. madeirensis</i>													8	6,15	1	0,10			8
<i>D. virilis</i>					20	12,50													21
<i>D. funebris</i>																			5
<i>D. repleta</i>	5	4,20			16	10,00	1	0,11											17
<i>D. bydei</i>																			23
<i>D. mercatorum</i>	23	19,33																	70
<i>D. buzzatii</i>			17	41,46	34	21,25	111	12,61	95	8,31	3	0,71	19	14,61					20
<i>D. immigrans</i>					16	10,00	149	16,93	34	2,97			13	10,00	9	0,91	20	8,58	267
<i>D. cameraria</i>													28	21,54			7	3,00	218
<i>D. andalusica</i>																			3
<i>S. pallida</i>					7	4,37							8	6,15					10
<i>S. apicalis</i>							1	0,11											11
<i>Scaptomyza s. str.</i>	119		41		160		880		1143		425		130		987		233		4118

Species collected in Madeira and their systematic positions

Description of the new species *D. madeirensis*

D. lebanonensis Wheeler, 1949

Records: Only Funchal, July 1970

No previous records in Madeira but from other Mediterranean areas and from the Canary Islands.

D. busckii Coquillet, 1901. Later description have been given by PATTERSON 1943 and BURLA 1951.

Records: Funchal, July 1970; Faja da Nogueira, September 1977.

Previous records: FREY (1936, 1944, 1948).

Cosmopolitan species. Synanthropous. Recorded from Canary Islands too.

D. simulans, Sturtevant, 1921. Other complete descriptions have been given by PATTERSON 1943 and BURLA 1951.

Records: It is common in the island and was captured on all the sites except in Cabo Girao. It is dominant in respect to *melanogaster* as in other Mediterranean areas.

No previous records from Madeira (probably included in some *ampelophila* or *melanogaster* records). Cosmopolitan and synanthropous. Recorded for Canary Islands too.

D. ananassae Doleschall, 1858. Later description by PATTERSON 1943.

Records: Funchal, July 1970.

No previous records for Madeira. Distributed in warm areas all over the world.

D. subobscura Collin, 1936. Later descriptions: POMINI 1940; BURLA 1951.

Records: In all the captures from July 1970, September 1977 and October 1978 (except from Funchal).

Previous records: BECKER (1908) and FREY (1936, 1944 and 1948) (records of *D. obscura* from Madeira probably refer to *D. subobscura*) HACKMAN (1960, 1969). Palearctic region, Canary Islands, Chile (BRNCIC et al. 1981) and Argentina (PREVOSTI et al. in press).

Table 2

Genus	Subgenus	Species group	Species	
<i>Drosophila</i>	<i>Pholadoris</i>	<i>victoria</i>	<i>D. lebanonensis</i> Wheeler, 1949	
		<i>busckii</i>	<i>D. busckii</i> Coq., 1901	
		<i>melanogaster</i>	<i>D. melanogaster</i> Meig., 1830	
	<i>Drosophila</i>	Not assigned		<i>D. simulans</i> Sturt., 1919
				<i>D. ananassae</i> Doll., 1858
			<i>obscura</i>	<i>D. subobscura</i> Collin, 1936
				<i>D. madeirensis</i> sp. n.
				<i>D. virilis</i> Sturt., 1921
				<i>D. funebris</i> Fabr., 1787
				<i>D. repleta</i> Woll., 1858
				<i>D. hydei</i> Sturt., 1921
				<i>D. mercatorum</i> Patt. and Wheeler, 1942
				<i>D. buzzatii</i> Patt. and Wheeler, 1942
	<i>D. immigrans</i> Sturt., 1921			
<i>Scaptomyza</i>	<i>Scaptomyza</i>	<i>fenestrarum</i>	<i>D. cameraria</i> Hal., 1833	
			<i>D. andalusiaca</i> Strobl., 1906	
			<i>S. s. str.</i>	
			<i>S. apicalis</i> Hardy, 1850	
	<i>Parascaptomyza</i>		<i>s. pallida</i> Zett., 1847	

D. madeirensis n. sp.

This species belongs to the subgenus *Sophophora*, *obscura* group. It is a species very similar to *D. guanche* (MONCLÚS 1976) from Canary Islands, both living in the last vestiges of laurisilva forests. The description of the adults is based on a ♂ and a ♀ caught in Ribeiro Frio in July 1970. The description of eggs and pupae corresponds to 20 eggs and 20 pupae. The number of teeth of the clasper and the tarsal combs has been determined from 20 adults taken from laboratory stocks. The genitalia, the internal structures and the chromosomes are described by means of individuals reared in the laboratory.

The sites of capture and the frequencies of the species are given in Table 1.

The male and female holotypes and two paratypes of each sex have been deposited at the Museu de Zoologia de Barcelona, Spain.

Two paratypes of each sex have been deposited in Cátedra de Atrópodos de la Facultad de Ciencias de la Universidad de Madrid, Spain.

Stocks of this species are kept in the Department of Genetics of the University of Barcelona.

Head ♂ and ♀: Arista with 3 branches above and 2 below in addition to terminal fork. Antenna pale brown, 3rd joint perceptibly darker. Front pale brown and about half as broad as head width. Ocellar triangle darker than the front. Periorbites pale. Second or lower reclinate orbital bristle shorter than half the length of the third (proclinate), first longer than the third. Ocellar bristles long and divergent. Post-verticals long and convergent. Face and cheek pale yellowish brown. Carina not very prominent. Vibrissa long and the second oral not differentiated. Palpus with one prominent bristle. Clypeus pale brown. Eyes red orange with short piles.

Thorax ♂ and ♀: Mesonotum pale brown with two submedian darker stripes and two incomplete lateral stripes. The intensity of colour and the stripes are variable. Sometimes only one central stripe is present. Scutellum dark brown. Thoracic pleura greyish. Acrostichal hairs in 8 rows between the dorsocentrals; no prescutelars. Anterior dorsocentrals about half of the posterior. Anterior scutelars convergent.

Legs ♂: Yellowish; preapicals on all three tibiae, apicals on first and second. On the first and second fore tarsal joints of the first leg, a large black sex comb (Fig. 2, 1). Upper comb with 17–21 teeth and lower comb with 15–18 teeth.

Legs ♀: The same as males but without sex combs.

Wings ♂ and ♀: Clouded towards tip and along the costal vein (Fig. 2, 7) specially in the aged specimens. Costal index about 3,02; 4th vein index about 1,86; 5x index about 1,25; 4c index about 0,89. ♂ wing length about 2,68 mm; ♀ wing length about 3,06 mm.

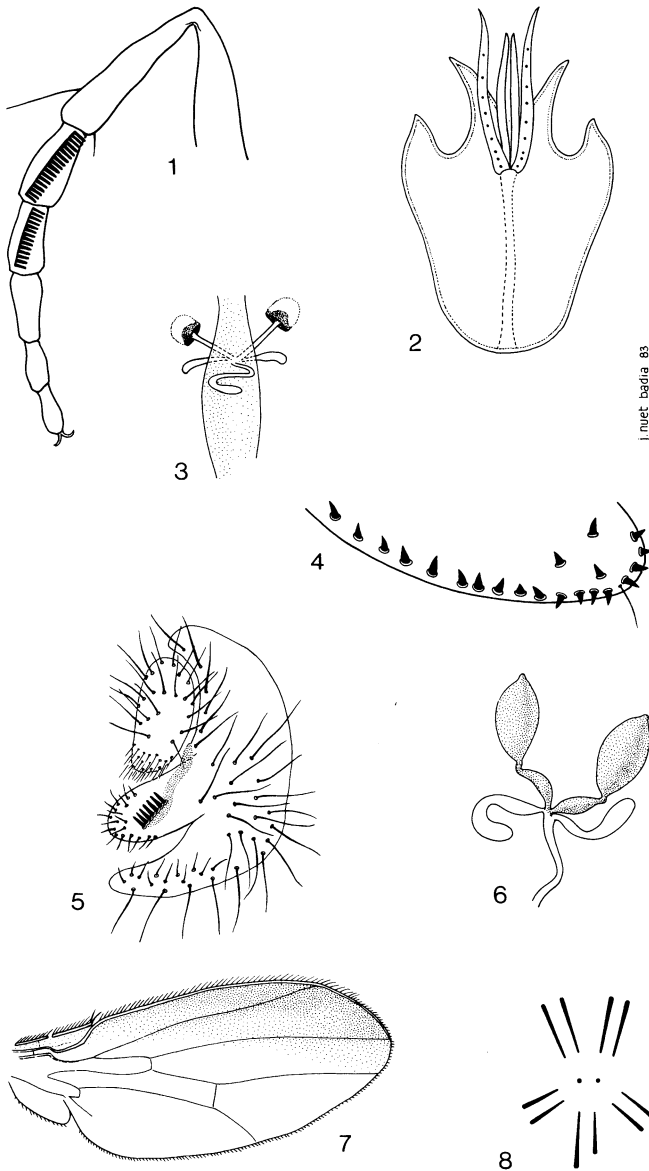
Abdomen ♂ and ♀: Abdominal tergites dark brown, uniform, not interrupted.

♂ Periphallalic organs: Genital arch pale yellow. Middle and lower portion with about 14 long and some short hairs; upper portion with about 20 long hairs. Heel roundish, toe curved forwards pointed tip. Primary clasper dark brown lying on the center of the secondary clasper with 6–8 primary black teeth equal in length. Secondary clasper with about 10 small but stout setae. Anal plate oval, not attached to the genital arch, with about 22 long bristles and apically narrowing, with dense short setae (Fig. 2, 5).

♂ Phallic organs: Pale brownish yellow. Aedeagus long. Apodema longer than the aedeagus. Anterior paramere lanceolate, pointed at tip and with a row of about 9 sensilla. Ventral fragma semielliptical (Fig. 2, 2).

♀ Egg-guides: Lobe pale yellowish, rounded at tip with about 18 black marginal and three or four discal black teeth (Fig. 2, 4).

Internal structures: Malpighian tubes with posterior branches ending free. Testis orange, ellongate elliptical, apically slightly pointed, not coiled (Fig. 2, 6). Ventral receptacle short (1 coil) (Fig. 2, 3). Spermatheca small, hemispherical.



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Fig. 2. D. madeirensis. 1: Male fore leg; 2: Phallic organs; 3: Female reproductive organs; 4: Egg guide; 5: Periphallic organs; 6: Male reproductive organs; 7: Wing; 8: metaphase plate

Eggs: Elliptical, white, with two long filaments which are about 0,9 of the egg length.

Larvae: Cylindrical, white.

Pupae: Yellowish-brown. Anterior spiracles with eleven branches. Posterior spiracles divergent.

Chromosomes: The metaphases of larval neuroblasts show : five pairs of rods and one pair of dots (Fig. 2, 8). (PAPACEIT, M., pers. comm.).

Distribution: Collected in Madeira Island only in the *laurisiva* forest. It seems to be endemic to the Madeira Island.

Some of the differences between *D. madeirensis* and *D. guanche* are: a lower number of teeth in the tarsal combs and the clouded wings in the aged individuals of *D. madeirensis*; also the stripes on the thorax, but this character is variable. Hybridisation tests are in course. Until now only one test gave hybrids. These showed some morphological differences compared with the parent species. Details on these differences and the data on the isolation between both species will be published after completing the experiments.

D. virilis Sturtevant, 1921. Later description: PATTERSON 1943.

Records: Santo da Serra, July 1970.

No previous records in Madeira. Captured also in the Canary Islands. This species seems to become cosmopolitan.

D. funebris Fabricius, 1787. Later descriptions: PATTERSON 1943 and BURLA 1951.

Records: Curral das Freiras and Serra de Agua, July 1970 and September 1977.

No previous records in Madeira. Captured in the Canary Islands. Cosmopolitan and synanthropic.

D. repleta Wollaston, 1858. Later descriptions: PATTERSON 1943 and BURLA 1951.

Records: Funchal, July 1970.

Previous records: BECKER (1908), DUDA (1940), FREY (1936, 1949) and HACKMAN (1960).

Recorded from the Canary Islands. Cosmopolitan and synanthropic.

D. hydei Sturtevant, 1921. Other descriptions by PATTERSON 1943 and BURLA 1951.

Records: Curral das Freiras and Faja da Nogueira, July 1970 and October 1978.

No previous records in Madeira. Cosmopolitan and synanthropic.

D. buzzatii Patterson and Wheeler, 1942 (= *tigrina* Buzzati, 1943).

Later description: BURLA 1951.

Records: Santo da Serra, Curral das Freiras and Cabo Girao, July 1970.

No previous records. Captured in the Canary Islands. It is an American species probably introduced with *Opuntia*.

D. mercatorum Patterson and Wheeler, 1942.

Records: only in Funchal, July 1970.

No previous records in Madeira. Captured in the Canary Islands.

Becoming cosmopolitan.

D. immigrans Sturtevant, 1921. Later descriptions: PATTERSON, 1943 and BURLA, 1951.

Records: Santo da Serra, Curral das Freiras, Terreiro da Luta, Ribeiro Frio, Serra de Agua, Achada do Cedro Gordo and Faja de Nogueira. July 1970, September 1977 and October 1978.

Previous records: HACKMAN (1960), quotes this species for the Atlantic Islands.

Cosmopolitan.

D. cameraria Haliday, 1833 (= *pallida* Zett., 1847). Descriptions by DUDA, 1935 and BURLA 1951.

Records: Santo da Serra, Ribeiro Frio, Achada do Cedro Gordo and Faja de Nogueira. July 1970, September 1977 and October 1978.

Previous records: FREY (1944). Recorded in the Canary Islands. Common species in the Mediterranean forests.

D. andalusiaca Strobl., 1906 (= *forcipata* Collin, 1952)

Records: Terreiro da Luta. July 1970.

Previous records: FREY (1949), HACKMAN (1960 and 1969). Recorded in the Canary Islands. West Palearctic species.

Scaptomyza pallida Zett., 1847.

Records: Santo da Serra, Terreiro da Luta, July 1970.

Previous records: HACKMAN (1960). Cosmopolitan.

S. apicalis Hardy, 1850 (according to HACKMAN = *S. flaveola* Meig and ? *S. flava* Fall.).

Records: Curral das Freiras and Terreiro da Luta, July 1970.

Previous records: BECKER (1908), DUDA (1940), FREY (1948), HACKMAN (1960, 1969). Europe and Siberia.

Discussion

The collections described here were carried out in July 1970, September 1977 and October 1978. No important differences among the three samples were found, probably because of the small seasonal variation in the climatic conditions of Madeira and for this reason the data have been pooled.

In total 19 species were found. Among these species, 10 are cosmopolitan or subcosmopolitan: *D. busckii*, *melanogaster*, *simulans*, *ananassae*, *hydei*, *repleta*, *buzzatii*, *immigrans*, *funnebris* and *S. pallida*.

Two species, *D. mercatorum* and *virilis* seem to be species in expansion and becoming cosmopolitan. *D. virilis* was never found in collections made in Eastern Spain before 1964 (MONCLÚS 1964). In 1968 this species was collected in Prat de Llobregat, in 1960 in Navarrete and the Canary Islands. In 1975 in Elche, in 1977 in Valencia, etc. Since then, the frequency of the collection of this species has been increasing. *D. mercatorum* was recorded for the first time in Europe in Barcelona, Spain (PREVOSTI 1953) and is now present in a number of collections although always in low frequencies.

Five species, *D. subobscura*, *cameraria*, *lebanonensis*, *andalusiaca* and *S. apicalis* are usual components of the drosophilid fauna in the Mediterranean subregion. The commonest of these species is *D. subobscura*, which is also most common in the entire West of the Palearctic region except in the coldest areas of the North. Its natural distribution ranges from North Africa to the South of the Scandinavian countries and from the Atlantic Ocean (the more Western records correspond to the Macaronesian Islands) to the Caucasus and Northern Iran at least. Recently (BRNCIC et al. 1981), this species has been introduced in Chile and last year we were able to capture *D. subobscura* in Argentina. It is now becoming the most common species in large areas of these countries. The second most common of the Mediterranean species in Madeira is *D. cameraria*, which is generally frequent in Mediterranean forests, especially in the West. *D. lebanonensis* is another of the Mediterranean species of Madeira. In Spain, the highest records of this species correspond to cellar samples where it is almost always present (MONCLÚS and PREVOSTI 1978–1979). This observations fits well with the high ethanol tolerance of *D. lebanonensis* which is even higher than that of *D. melanogaster* (DAVID et al. 1979). *D. andalusiaca* and *S. apicalis* collected with low frequencies in Madeira, are palearctic species often found in the Mediterranean subregion and also present on the Canary Islands.

The only endemic species found is *D. madeirensis* sp. n. Like its closely related species *D. guanche* from the Canary Islands it is associated with the laurisilva forest, an endemic relic of the Tertiary.

STURTEVANT (1946) posed a taxonomic problem about the type of *D. repleta* from Madeira deposited in the British Museum. He believes that this specimen is probably *D. buzzatii*. The presence of this species in our samples reinforces STURTEVANT's suspicion. We quoted four species of the *repleta* group in Madeira: *D. repleta*, *buzzatii*, *hydei* and *mercatorum*; the same four species which appear also in the Iberian Peninsula.

The drosophilid fauna of Madeira seems to be a very impoverished Mediterranean fauna. Only five autochthonous Mediterranean species, *D. subobscura*, *lebanonensis*, *cameraria*, *andalusiaca* and *S. apicalis* are present on this island.

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Summary

A total of 4118 specimens belonging to 19 different species of the family Drosophilidae were captured in domesticated habitats, in agricultural areas, in pine forest and in the laurisilva forest of Madeira. Only nine of these species were previously quoted for Madeira.

Among the 18 species completely identified, ten are cosmopolitan or subcosmopolitan (*D. busckii*, *melanogaster*, *simulans*, *ananassae*, *hydei*, *repleta*, *buzzatii*, *immigrans*, *funebri* and *S. pallida*). Two species (*D. mercatorum* and *virilis*) seem to be in process of becoming cosmopolitan. Five species (*D. lebanonensis*, *subobscura*, *cameraria*, *andalusiaca* and *S. apicalis*) are typical components of the drosophilid fauna in the Mediterranean subregion. One endemic and new species, *D. madeirensis*, was found in the laurisilva forest. The description of this new species is given.

Zusammenfassung

Die Drosophilafauna Madeiras – Mit einer Neubeschreibung der Art Drosophila madeirensis n. sp.

Es wurden in Wohngebieten, in Ackerbaugebieten, in Pinus-Wäldern und in Lorbeer-Wäldern der Insel Madeira insgesamt 4118 Individuen gefangen, die 19 verschiedenen *Drosophila*-Arten zugeordnet werden konnten. Unter den 18 eindeutig bestimmten Arten finden sich 10 kosmopolitische Arten (*D. busckii*, *D. melanogaster*, *D. simulans*, *D. ananassae*, *D. hydei*, *D. repleta*, *D. buzzatii*, *D. immigrans*, *D. funebri* und *S. pallida*). Zwei Arten (*D. mercatorum* und *D. virilis*) scheinen im Begriff zu sein, kosmopolitische Arten zu werden. Nur 5 Arten (*D. lebanonensis*, *D. subobscura*, *D. cameraria*, *D. andalusiaca* und *S. apicalis*) sind typische Vertreter der mediterranen *Drosophila*-Fauna. Eine Art, *D. madeirensis*, ist neu und in Madeira endemisch. Sie wurde nur in den Lorbeer-Wäldern gefunden. Diese neue Art ist hier erstmalig beschrieben.

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