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DISTRIBUTION OF DIFFERENT SPECIES OF DROSOPHILA IN GREECE

by

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Abstract: *During a period of 3 years adult speciments of Drosophila were captured in different parts of Greece. Fourteen species were collected over the whole period. The total number of Drosophila species captured in Greece until now reaches twenty-one. In the Greek mainland (September collections) the dominant species is D. simulans, while in two Greek islands the dominant species is D. melanogaster. In the Greek mainland the ratio of D. melanogaster to D. simulans increases with the latitude.*

INTRODUCTION

Though some areas of Greece have been explored in regard to *Drosophila* fauna (Krimbas, 1963 and 1964; Tsacas, 1963) several parts of this country need to be extensively surveyed. Hence, in the course of trapping *D. melanogaster* and *D. simulans* with the purpose of analyzing their allozyme polymorphism (Triantaphyllidis et al. 1980; Triantaphyllidis et al. 1982), we made some interesting observations related to their proportion in different sympatric populations from the extreme Northern Greece to the extreme Southern Greece. Furthermore, the present investigation gives the different *Drosophila* species occurring in the same populations.

MATERIAL AND METHODS

Collection method: Wild *Drosophila* flies were trapped using fresh fruit traps. In the laboratory the flies were etherized. Males of *Droso-*

phila melanogaster and *Drosophila simulans* were classified as to species by examining the genitalia. Females were placed in individual culture bottles and classified by examination of their male progeny. The other flies were preserved in ethanol and identified later.

Fig. 1. Map of Greece showing the localities of Drosophila populations sampled 1. Doirane, 2. Thessaloniki, 3. Trikala, 4. Corfu, 5. Sparte, 6. Kalamata, 7. Crete and 8. Charitomene, Drama (see also Table 2).

Collection localities: Collections were made at eight different localities (Fig. 1). The characteristics of the sampling sites and environmental data, where they were found, are given in other two papers (Triantaphyllidis et al. 1980, Triantaphyllidis et al., 1982).

RESULTS

Fourteen *Drosophila* species were collected over the whole period (Tables 1 and 2). Eight species were always rare or absent, while the other six were common at some time or other. *D. melanogaster* and *D. simulans* were most abundant everywhere, and *D. subobscura* and *D. immigrans* followed. The abundance of *D. melanogaster, D. simulans* and *D. subobscura* follows seasonal pattern at the University Farm. *D. melanogaster* is the predominant species in June collections, while *D. simulans* is the most common species in September collections. This

TABLE I

Distribution of different species of Drosophila in Greece

Species	Sites: 1*	2	3	4	5	6	7
D. buscki	—	9♂: 6♀	40♂:23♀	—	—	2♀	—
D. buzzatii	—	—	—	—	11♂,♀	31♂:12♀	—
D. cameraria	—	—	6♂: 6♀	—	—	—	—
D. funebris	—	—	—	—	—	1♂	—
D. hydei	—	35♂:26♀	10♂: 5♀	—	—	4♂:9♀	—
D. immigrans	1♀	48♂:46♀	20♂:13♀	—	42♂,♀	10♂:11♀	—
D. lebanonensis	—	1♂	—	—	—	—	—
D. limbata	1♀	2♂:2♀	2♂	—	—	1♂:1♀	—
D. phalerata	—	2♂:2♀	8♂:2♀	—	—	2♂	—
D. repleta	—	1♀	—	16♂,♀	—	—	—
D. subobscura	—	295♂,♀	71♂:131♀	80♂,♀	75♂,♀	15♂:14♀	—
D. transversa	—	—	—	—	1♂	—	—

*For the sites see Fig. 1 and Table 2.

TABLE 2

Percentage of adult individuals of D. melanogaster and D. simulans

Locality	Collection period	melanogaster %	simulans %	Total
1. Doirane (Kilkis)	Sept. 1979	50	50	550
2. University Farm (Thessaloniki)	June 1979	93	7	400
	June 1980	89.5	10.5	150
	Sept. 1979	30	70	550
3. Drosseron (Trikala)	Octob. 1979	30	70	950
4. Benitses (Corfu)	Sept. 1978	60	40	350
5. Sparte	August 1979	10	90	345
6. Petalidion (Kalamata)	Sept. 1980	25	75	700
7. Tybakion (Crete)	Sept. 1980	87	13	245

pattern is in general agreement with the results reported by many workers (see Parsons 1975). *D. buscckii* is found primarily in the spring.

From Table 2 it is evident that in September collections *D. melanogaster* was more frequent than *D. simulans* in the Greek islands, while *D. simulans* was always more frequent than *D. melanogaster* in the Greek mainland. Furthermore, a gradient of *D. melanogaster* and *D. simulans* frequencies was detected between the Greek Jugoslavian borders and the South Greek mainland. A similar shift was described in the United States and in Australia, but a different one in Brazillian populations (Parsons 1975).

DISCUSSION

Our results indicate (Tables 1, 2 and 3) that five other species should be added to the list of *Drosophila* species found in Greece (Krimbas, 1963 and 1964; Tsacas, 1963; Rocha Pité and Tsacas, 1979 a and b). The total number of *Drosophila* species captured in Greece until now reaches 21 (Table 3). Thus Greece, with 21 species of *Drosophila*, seems less prospected than many european countries (Rocha Pité and Tsacas, 1979a). The european countries are very unequally prospected for *Drosophila*, i.e. only 22 species are known from the european part of SSSR and 16 from Italy. Doubtlessly new records will allow the finding of other species in Greece.

In the University Farm, population analysis began in 1969. The previous studies (Triantaphyllidis 1971) in the same locality had shown the *D. melanogaster* species to be the dominant one all year around. After 10 years, it is clear (Table 2) that *D. melanogaster* suffered a sharp decline in June as well as in September collections. Similar changes in the relative frequencies of the two sibling species *D. melanogaster* and *D. simulans* have been reported to occur in Columbia (Hoenigsberg 1968), in Egypt (Tantawy et al, 1970), and in Japan (Watanabe and Kawanishi, 1976), where *melanogaster* was losing ground in competition with *simulans*. Several hypothesis may be considered to explain the decline of *D. melanogaster*. This may be due to the construction of new buildings, to partial elimination of native flora and to introduction of some new plant species by man in an area of 500 m from our collecting site.

TABLE 3

List of Drosophila species captured in Greece

Subgenus	Species group	Species	Distribution
Dorsilopha	—	*busckii* Coqnillett	Cosmopolitan
Drosophila s. str.	*funebris*	*funebris* Fallén	Cosmopolitan
	immigrans	*immigrans* Sturtevant	Cosmopolitan
	quinaria	*kuntzei* Duda	Europe
		**limbata* van Roser	Europe
		phalerata Meigen	Europe
		**transversa* Fallén	Palearctic
	repleta	**buzzatii* Patterson and Wheeler	Cosmopolitan
		**hydei* Sturtevant	Cosmopolitan
		repleta Wollaston	Cosmopolitan
	testacea	*testacea* von Roser	Holarctic
	not classified	*picta* Zetterstedt	Europe, localized
Lordiphora	——	*andalusiaca* Strobl	Europe
Scaptodrosophila	*victoria*	*lebanonensis* Wheeler	Europe, Israel, U.S.A.
		rufifrons Loew	Europe
Sophophora	*melanogaster*	*melanogaster* Meigen	Cosmopolitan
		simulans Sturtevant	Cosmopolitan
	obscura	*ambigua* Pomini	Europe
		obscura Fallén	Europe
		subobscura Collin	Europe, Circummediterranean
Notelassified	——	**cameraria* Haliday	Europe

* found in Greece for the first time.

It is worth noting that in the Southern Greek mainland localities (Fig. 1 and Table 2) as well as in Egyptians September collections (Tantawy et al 1970) *D. simulans* is the predominant species over *D. melanogaster*. The reverse situation is true for the island of Corfu and especially for the island of Crete, which is about in the middle of the distance between Greece and Egypt. We do not have at present to offer an explanation for this observation. At any way, this may be due to some local environmental parameters that exist in the two islands (i.e. *D. simulans* was the most frequent species on the Jugoslavian island of Brioni; see Kekić and Marinković, 1979).

TABLE 4

Simple correlation coefficient* between the relative abundance of *D. melanogaster* and different environmental means[a]

Latitude	AT	SUMMAX	WINM	ATMP	RAIN A	RAIN P
A +0.75	−0.89	−0.84	−0.84	−0.35	+0.27	+0.53
B −0.51	+0.44	−0.21	+0.48	+0.49	−0.50	−0.52

* All the correlations were not statistically significant at the 5% level of significance.

A: The localities are: Doirane (Sept. 1979). Univ. Farm (Sept 1979), Drosseron (Octob. 1979) and Petalidion (Sept. 1980).

B: The previous localities as well as the Tybacion (Seprt. collection).

a Data abbreviations and units are: AT, average annual temperature, degrees C; SUMMAX, mean summer maximum temperature (June, July, Aug.,); WINM, mean winter minimum temperature (Dec., Jan., Feb.); ATMP, mean temperature of the month preceding collection; RAIN A, average annual precipitation, in mm; RAIN P, mean precipitation of the month preceding collection.

In order to examine if there is any relation between the proportion of both sibling species and different environmental parameters we calculate the simple correlation coefficients between different environmental means and the relative abundance of *D. melanogaster* (Table 4). The relative proportion of *D. melanogaster* to *D. simulans*, locality to locality, had a high but not significant negative correlation with mean annual temperature, mean summer maximum and mean winter minimum temperature for the mainland populations. Therefore, temperature is an important factor to the relative success of the *D. melanogaster*/*D. simulans* complex in Greek mainland populations.

An interesting ecological observation has been made during the course of this investigation. In Kalamata area (Southern Greece) and in Charitomene Drama (North Greece) *Drosophila* larvae (see Fig. 1) were observed in overripe figs (*Ficus carica*). A lot of them were transfered to the Laboratory, placed in individual vials and after some days there were *D. melanogaster* and *D. simulans* flies in the vials. Thus, our field work indicates that the larvae of both sibling species are sympatric in ripe figs. It can be noticed that in Californian fig orchards, *D. melanogaster* widely uses the edible fig *Ficus carica* as breeding site (Phaff and Miller, 1961). In tropical Africa both *D. melanogaster* and *D. simulans* were shown to use commonly wild native figs as larval breeding sites. The former has been reared from seven species of *Ficus* (*eriobotryoides, exasperata, kamerunensis, macrosperma, mucuso, ovata* and *sur*), whereas the latter has been reared from *exasperata* only together with *melanogaster* (Lachaise et al., in press; Lachaise and Tsacas, in press). Both *Drosophila* have opportunistic african population ovipositing on the syconial wall of figs in the early post-floral successional stage. This latter is the only period of the fig decay suitable to most species of *Drosophila* in contrast to the early floral stages of the immature fig and to the late post-floral stages of matured figs. Furthermore, in the mediterranean area tunisian populations of *D. melanogaster* and *D. simulans* were shown to share simultaneously the same decaying fruits of *Opuntia ficus-indica* as larval breeding sites (Rouault, 1979). Then, it appears that the larvae of both species coexist in figs in different parts of the world and are known also to exploit simultaneously other fruits.

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ΠΕΡΙΛΗΨΗ

Η ΚΑΤΑΝΟΜΗ ΔΙΑΦΟΡΩΝ ΕΙΔΩΝ DROSOPHILA ΣΤΗΝ ΕΛΛΑΔΑ

ὑπὸ

ΚΩΝΣΤΑΝΤΙΝΟΥ Δ. ΤΡΙΑΝΤΑΦΥΛΛΙΔΗ καὶ ΛΕΩΝΙΔΑ ΤΣΑΚΑ

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'Από τὸ 1978 μέχρι τὸ 1980 ἔγινε δειγματοληψία ἐνήλικων ἀτόμων *Drosophila* ἀπὸ ὀκτὼ διαφορετικὲς περιοχὲς τῆς 'Ελλάδας. Στὶς περιοχὲς αὐτὲς διαπιστώθηκε ἡ ὕπαρξη 14 εἰδῶν *Drosophila*. Πέντε ἀπὸ τὰ εἴδη αὐτὰ ἀναφέρονται γιὰ πρώτη φορὰ στὸν 'Ελληνικὸ χῶρο. Μὲ τὰ εἴδη αὐτὰ ὁ συνολικὸς ἀριθμὸς εἰδῶν *Drosophila* στὴν 'Ελληνικὴ πανίδα φθάνει τὰ 21. Στὴν ἠπειρωτικὴ 'Ελλάδα (δειγματοληψίες Σεπτεμβρίου) τὸ ἐπικρατέστερο εἶδος εἶναι ἡ *D. simulans*, ἐνῶ ἀντίθετα στὴν Κρήτη καὶ τὴν Κέρκυρα τὸ ἐπικρατέστερο εἶδος εἶναι ἡ *D. melanogaster*. Στὴν ἠπειρωτικὴ 'Ελλάδα ὁ λόγος τῶν ἀτόμων *D. melanogaster*/*D. simulans* αὐξάνει μὲ τὸ γεωγραφικὸ πλάτος τῆς τοποθεσίας συλλογῆς τῶν ἀτόμων. Στὴν ἐργασία δίνονται ἐπίσης στοιχεῖα σχετικὰ μὲ τὴν οἰκολογία τῶν ἀδελφικῶν εἰδῶν *D. melanogaster* καὶ *D. simulans*. Τέλος οἱ παρατηρήσεις μας συζητοῦνται σὲ σχέση μὲ δεδομένα ἀπὸ τὴ βιβλιογραφία.