Alahiotis, S.N. and G.N. Goulielmos.
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F_1 males and females from crosses between
Drosophila mauritiana females and **D.melano-
gaster** or **D.simulans** males.

It is known that in crosses between the sibling species
Drosophila simulans and **D.mauritiana** (a species
originated from **D.simulans**; Tsacas et al. 1981)
fertile females and sterile males are yielded in the
F_1 generation, independently of what species is used
as female. Moreover, it is also known that in crosses
between the sibling species **D.melanogaster** and
D.mauritiana, sterile females or males (in respect with the melanogaster sex used) are yielded in the F_1
generation. In spite of this general consensus, we present now data showing that fertile males and females
can be obtained from some crosses between the sibling species pair mentioned above. Thus, in one out of
55 pair matings, where **mauritiana** was used as female and **melanogaster** as male, fertile F_1 males and
females appeared. The fertility of these individuals was tested by mating them and noticing if F_2 (or F_n)
progeny are yielded. These interspecific fertile hybrids have been named mame and are kept with success
in our laboratory as a stock for 10 generations so far. In the opposite cross (♀ **melanogaster** x **mauritiana**
♂), seven out of 43 pair matings were found to yield hybrid females (named mema) which are sterile when
crossed with **melanogaster** or **mauritiana** males. It must be noted that as **melanogaster** we used the
CyL^4/Pm stock, while in a previous effort using another **melanogaster** stock (homozygous for the malate
dehydrogenase fast form), we failed to get one successful mating (yielded offspring) out of 92 performed.

In another interspecific cross-type where **mauritiana** was used as female and **simulans** as male, two
out of 82 pair matings yielded fertile F_1 males and females. These interspecific fertile hybrids have been
named masi and are kept in our lab as a stock, like mame. In the case where **mauritiana** is used as male
and **simulans** as female, 63.41% (26/41) successful matings obtained. Each such successful pair mating
yielded females and males which are sterile when crossed with each other but fertile when crossed with
mauritiana (males) and **simulans** (males or females). When **mauritiana** females are crossed with the above
described interspecific hybrids (named sima), no progeny are produced. The same is also true in the cross
♀ **mauritiana** x mame ♂. In crosses ♀ mame x masi
♂ (and the reciprocal), some pair matings are
successful, yielding females and males which
possibly get genes from three different species
(**melanogaster**, **simulans**, **mauritiana**). In Table
1 we show all the above information described
and in Table 2 we give a brief summary of the
reproductive isolation status among the three
sibling species examined as it was found in our
lab (with the strains of the species we used).

It must be noted that the combination
melanogaster-simulans was tested and our findings
verify the previous consensus (see Table 2), that
is, sterile F_1 females or males are produced,
dependent on the **melanogaster** sex used.
However, in a mass cross (6 ♀ **melanogaster** x
simulans ♂ 6) a part of the sterile females
obtained as expected, 3 hybrid males were also

Table 1. Successful and unsuccessful pair-matings
between pairs of **D.melanogaster** (mel), **D.simulans**
(sim) and **D.mauritiana** (maur), as well as between
fertile interspecific hybrids* and their parents.

species pair	No. of matings successful	unsuccessful	total
♀ sim x maur ♂	26	15	41
♀ maur x mel ♂	1	54	55
♀ maur x sim ♂	2	80	82
♀ mel x maur ♂	7	36	43
♀ masi x sim ♂	15	27	42
♀ masi x maur ♂	16	1	17
♀ maur x masi ♂	0	49	49
♀ sim x masi ♂	1	3	4
♀ mame x mel ♂	13	0	13
♀ mame x maur ♂	1	7	8
♀ maur x mame ♂	0	38	38
♀ mel x mame ♂	8	0	8
♀ mema x mel ♂	0	14	14
♀ mema x maur ♂	0	28	28
♀ sima x sim ♂	7	3	10
♀ sima x maur ♂	3	3	6
♀ maur x sima ♂	0	16	16
♀ sim x sima ♂	9	0	9
♀ masi x mame ♂	5	18	23
♀ mame x masi ♂	7	25	32

*The name of the interspecific hybrids is com-
posed of two syllables. The first is from the ♀
and the seond from the ♂ species-parent name.

Table 2. Hybridization possibilities between
the 3 sibling species, **melanogaster, simulans,
mauritiana**, as it has been found in our lab.

parents	♀	♂
♀ mel x sim ♂	sterile	---
♀ sim x mel ♂	---	sterile
♀ mel x maur ♂	sterile	---
♀ maur x mel ♂	fertile	fertile
♀ sim x maur ♂	fertile*	fertile*
♀ maur x sim ♂	fertile	fertile

*but sterile when crossed with each other
(see text)

Table 3. Mating propensities in multiple choice experiments involving the interspecific fertile hybrids <u>masi</u> and its parental species, **mauritiana** and **simulans**.

Cross A x B	♀AxA♂	♀AxB♂	♀BxA♂	♀BxB♂	No. of chambers*	Sexual Isolation Index ± S.E.
sim x <u>masi</u>	25	22	13	27	6	0.195 ± 0.105
maur x <u>masi</u>	5	14	15	37	8	0.183 ± 0.116

* in each chamber existed 12 virgin females and 12 males from each stock.

noticed. They electrophorized for the alcohol dehydrogenase and exhibited an intermediate (between **melanogaster** and **simulans**) electrophoretic pattern.

The situation where **mauritiana** females do not give offsprings with <u>masi</u> or <u>mame</u> males, was further investigated in an attempt to see if this situation is due to pre- or post-mating isolation mechanism. Thus, performing multiple choice experiments (see for methodology Kilias & Alahiotis 1982), the mating propensities of our interspecific hybrids with their parental species were determined. As it is shown in Table 3, **mauritiana** females copulate with <u>masi</u> males, a fact which demonstrates that the absolute reproductive isolation observed between them is not due to premating mechanisms. Furthermore the same table shows that no significant sexual isolation toward homogametic mating has been developed. Taking into consideration the **melanogaster**-<u>mame</u> combination, we observed in preliminary experiments, that all the four possible mating types can be obtained, while this is not true in the case of **mauritiana**-<u>mame</u> combination where **mauritiana** females do not seem to copulate with <u>mame</u> males.

The situation described here regarding the reproductive isolation status between three sibling species in the **D.melanogaster** subgroup differs with that which it was so far known. These differences may be based on the genetic composition of our strains used (e.g. CyL^4/Pm for **D.melanogaster**; **D.simulans** was captured recently from a Greek natural population) or on some evolutionary changes of **D.mauritiana** under the laboratory conditions where lately is maintained.

The implication of these hybrids to the study of the speciation mechanisms is obvious and can be proved important in understanding the evolution of interspecific reproductive isolation. The elucidation of the detailed genetic organization of these hybrids (the status of which was also verified by electrophoretic and cytogenetic criteria) will contribute greatly to the approach of the above purpose.

References: Kilias, G. & S.N. Alahiotis 1982, Evolution 36:121-131; Tsacas et al. 1981, in: The Genetics and Biology of Drosophila, Ashburner, Carson & Thompson (eds.), Acd. London, Vol 3a:197-259.

Albers, K.B.M. and R. Bijlsma. University of Groningen, Haren, Netherlands. Selection for increase in tolerance with respect to xenobiotics in **Drosophila melanogaster**.

It is well known that **D.melanogaster** can readily become tolerant for a wide range of toxic chemicals when present in its environment. To obtain insight in the process of developing tolerance, two different populations of **D.melanogaster** were subjected to selection on five xenobiotics. Selection was performed by rearing the flies in cages on food supplemented with the xenobiotics. During the experiment the concentrations were increased regularly in 7-8 steps and the initial concentrations and the concentrations after 17 months (the moment the tolerance levels were determined) of the different chemicals are given: (1) phenobarbital (sodium salt): 250 → 1300 ppm; (2) rotenon (a commercial anti-flea powder containing 0.9% rotenon was used): 6 → 24 ppm; (3) malathion (a commercial preparation containing 50% malathion was used): 0.15 → 0.65 ppm; (4) carbaryl (also a commercial preparation containing 50% carbaryl was used): 6 → 28 ppm; (5) DDT: 15 → 65 ppm. The first chemical is used as a drug; the other four are or have been used as insecticides.

For the experiments two different sets of each six population cages were established. The Bogota populations were initiated with 36 independent lines isolated from the Bogota base population as described by Bijlsma (1980). The 50 x 50 populations were initiated with 40 lines from the second reisolation from the original 50 x 50 base population as described by Bijlsma & Van Delden (1977). All cages of each set were provided with standard food (for description of the food see Bijlsma 1980) for the first weeks to get them well established. Thereafter one cage of each set was kept on this food (control) while the others were supplied with standard food supplemented with one of the five toxic compounds. To standardize the selection pressures somewhat, the initial concentrations were chosen in such a way that the larval viability was approximately 40-60%; as a results the density in the cages was kept well over a thousand individuals. When the concentrations were increased during the experimental period, it was also ensured that the population density stayed above this level.