# FOUR NEW SPECIES OF DROSOPHILA, WITH NOTES ON THE FUNEBRIS GROUP

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Two of the species herein described, *Drosophila subfunebris*, n. sp., and *Drosophila macrospina*, n. sp., appear to be closely related to *Drosophila funebris* Fabricius, type species of the genus. *Drosophila funebris* has been used extensively in genetic studies by H. A. and N. W. Timofeeff-Ressovsky (1926), Spencer (1928), Romaschoff and Balkashina (1931) and others. Over one hundred mutant types have been recorded. In general the nature of these mutations, at least in their phenotypic expression, differs markedly from that of mutations found in other species of the genus, i. e., *melanogaster* Meig., *virilis* Sturt., *pseudoobscura*, *hydei* Sturt., *ananassae*, *simulans* Sturt. and *willistoni*.

N. W. Timofeeff-Ressovsky (1936) summarizes the qualitative differences in the mutability of *funebris*. Of 83 mutants in this species recorded by Spencer and Timofeeff-Ressovsky only 21.7% showed 100% expression in homozygous stocks. In contrast, of 107 mutants found by the same workers in other *Drosophila* species 67.3% gave 100% expression in homozygous stocks. Of 502 mutants in *melanogaster* 17.2% are dominants. Of 94 mutants in *funebris* 41.5% are dominants. Body and eye color mutants constitute about 3% of the total in *funebris* and about 25% of the total in *melanogaster*. In contrast approximately 35% of the mutants in *funebris* affect the wing veins as against 7% in *melanogaster*. H. A. Timofeeff-Ressovsky (1930) has reported a similar trend in X-ray induced mutants. Many of the genetic loci which mutate rather frequently in other *Drosophila* species appear to have a very low mutation rate in *funebris*. It does not seem valid, however, to conclude in the light of data collected that the total mutation rate of the species is markedly lower than that of others. The difference seems to be largely a qualitative rather than a quantitative one. Recent quantitative studies by Keller and Luers (1937) on mutation rate in *funebris* following different X-ray dosages substantiate this conclusion. In view of the peculiarities noted above the discovery of two species closely related to *funebris* should be of interest to geneticists as well as taxonomists.

*Drosophila funebris* is widely distributed throughout the temperate regions of the world. Sturtevant (1921) states of its breeding and feeding habits, "In nature it is not so frequently to be found about fruit as are many other species. I have found that stables are very favorable places to collect it, and it is almost certain to appear about animal matter that has been preserved in formalin and then allowed to become somewhat stale. It will breed freely in such material. It will breed in fleshy fungi, but is rarely found about them in the woods. It is, in fact, seldom to be found in the woods at all, though quite common about houses, barns, or grocery stores." We have found it feeding on bleeding trees, and breeding in walnut hulls. In experiments on preference of *Drosophila* species for different baits we find that *funebris* comes readily to traps containing fleshy fungi. Where such traps are exposed along with fermenting banana or other fruit traps the fungus traps collect relatively more *funebris*. In view of the almost constant associations with the habitations of man and its rarity in woods it would seem to be an introduced species in the United States. Its reactions to baits indicate that in its native habitat it is probably a fungus feeder. This species is very easy to culture in the laboratory. Once a culture on either cornmeal, molasses agar, banana agar, or various other media is started it can be kept going almost indefinitely by the occasional addition of a chunk of food. *Funebris* is best cultured at about 22 or 23 degrees Centigrade. The females, in contrast to those of many other species, continue to lay eggs in old cultures and the larvae can secure nourishment from old worked-over media, on which most species would starve. Probably the most important single factor in laboratory culture of this species is not to expose it to temperatures above 24 degrees Centigrade.

One of us has cultured *macrospina* for over two years and *subfunebris* for over a year. The breeding habits in laboratory culture are very similar to those of *funebris*. Both of the new species require that the adults be aged two or three days longer before they breed. *Funebris* starts to lay fertile eggs on the third day after emergence of the adults under optimum conditions. It can complete the life cycle in fourteen days; the other two species require about seventeen days, the difference coming in the aging period of the adults. Neither of the two new species are quite as easy to rear as *funebris*. Both seem to require a higher protein content in the diet.

*Macrospina* has the peculiar habit of falling into a "catyleptic fit" when the culture bottle is jarred; the flies remain motionless for a minute or so and then begin to move about normally. In *funebris* Spencer (unpublished) has found a mutant showing similar behavior, but more extreme, which arose in the laboratory in a strain after it had been inbred for years. *Subfunebris* walks about the culture bottle very deliberately, with a dainty, mincing gait, while *macrospina* is more active than either of the others.

The taxonomic description of *Drosophila funebris* Fabricius from Sturtevant's monograph (1921) has been included for completeness and the other descriptions are modelled after this. Where possible quantitative characters are used. Recent collections by Dobzhansky, Sturtevant, and ourselves indicate that there are many undescribed species and sub-species of the genus even in regions previously collected. The taxonomy will best be worked out by concentrating on small sub-groups. In some of these one set of characters proves particularly valuable for taxonomic purposes, i. e., sex combs in the *affinis* group (Sturtevant and Dobzhansky, 1936). In the *funebris* group the plates of the male and female external genitalia differ markedly in the three species. It is extremely difficult to separate the specimens of *funebris* and *subfunebris* of either sex on other characters, but reference to the genital plates makes the classification easy. Furthermore, these plates can be observed in living flies under ether, without recourse to dissection.

Descriptions of *chagrinensis*, n. sp., and *magnafumosa*, n. sp., from single collected specimens have been included in this paper because they appear to be fungus feeders not closely related to any of the known sub-groups of the genus.

## TAXONOMIC DESCRIPTIONS

The following taxonomic description of *Drosophila funebris* Fabricius is taken from Sturtevant's (1921) "The North American Species of Drosophila," p. 84:

### **Drosophila funebris** Fabr.

(Figs. 1 and 2)

"*Male, female.* Arista with about six branches above and four below, antennae yellow, third joint brown. Front about one-half width of head, wider above; yellowish brown. Second orbital about one-half

third, which is about three-fourths first. Second oral bristle over one-half first. Carina broad, flat; face yellowish brown. Cheeks yellow; their greatest width about one-fourth greatest diameter of eyes. Eyes clothed with thick pile.

"Acrostichal hairs in six rows; no prescutellars. There are several enlarged hairs in front of the two pairs of dorsocentral bristles, and in the same rows with them. Mesonotum and scutellum slightly shining reddish brown. Pleura yellowish brown above, becoming yellow below. Legs yellow. Apical and preapical bristles on first and second tibiae, preapicals on third.

"Abdomen, in the male, shining black; basal segments with a narrow yellow posterior line, and brownish basally. In the female, the abdomen usually appears largely brown in pinned material. In life it can be seen to be yellowish brown, each segment having a posterior dark brown band.

"Wings clear, veins brown. Costal index about 3.9; fourth-vein index about 1.4; 5x index about 1.1; 4c index about 0.6.

"Length body 2.5 mm.; wing 2.5 mm."

**Drosophila subfunebris,** n. sp.

(Described from living material. Figs. 3 and 4)

*Male.* Arista with about six branches above and three below. Antennae brown, third joint slightly darker, clothed with short, white hairs. Second oral bristle more than half length of first. Second orbital almost one-half length of third which is two-thirds length of first. Carina high and prominent, especially below; face yellowish brown. Front more than one-third width of head, wider above, velvety brown. Cheeks shining yellowish brown, their greatest width about one-fifth greatest diameter of the eyes. Eyes with rather heavy black pile.

Acrostichal hairs in eight rows, no prescutellars. Several enlarged hairs in front of anterior dorsocentrals, and in the same rows with them. Mesonotum and scutellum brown. Former with darker median stripe. Mesonotum slightly pollinose laterally, scutellum slightly pollinose over entire surface of disc. Legs and pleurae brownish yellow.

Abdomen shining brownish black.

Wings clear, two bristles at distal costal break. Costal index about 3.2; fourth-vein index about 1.4; 5x index about 1.0; 4c index about 0.8.

Length body 3.0 mm.; wing 2.8 mm.

*Female.* Same as above except abdomen shining blackish brown, each segment darker posteriorly.

Length body 3.4 mm.; wing 3.0 mm.

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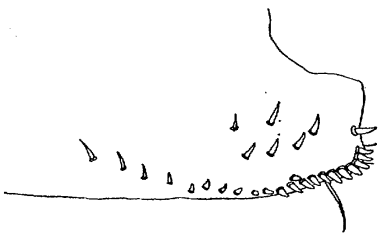
EXPLANATION OF FIGURES

Fig. 1. Ovipositor plate of female *D. funebris.*
Fig. 2. Male external genitalia of *D. funebris.*
Fig. 3. Ovipositor plate of female *D. subfunebris* n. sp.
Fig. 4. Male external genitalia of *D. subfunebris* n. sp.
Fig. 5. Ovipositor plate of female *D. macrospina* n. sp.
Fig. 6. Male external genitalia of *D. macrospina* n. sp.

A—anal plate. G—genital arch. C—clasper.



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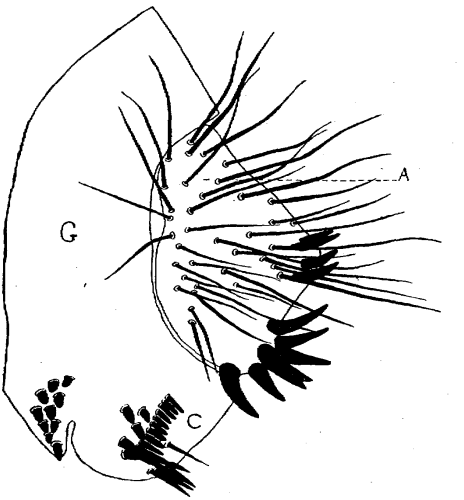


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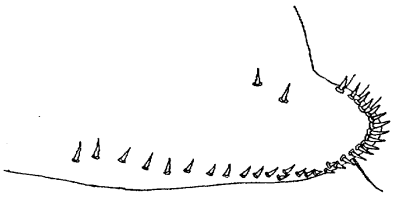

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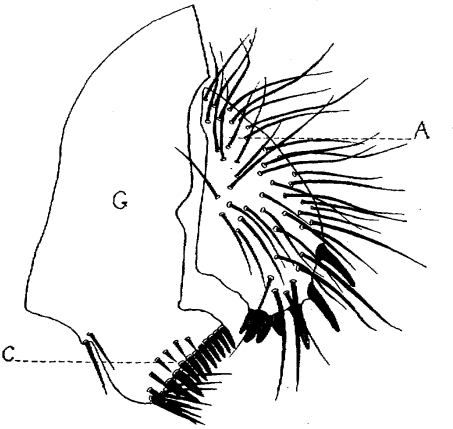


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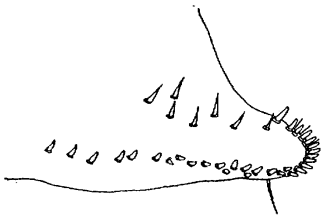

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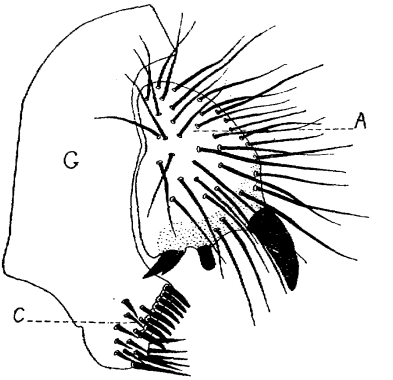


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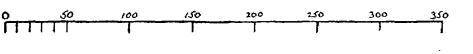
Scale in $\mu$



*Subfunebris* is approximately the same size as *funebris*. Our measurements of body and wing length on species described by Sturtevant run consistantly higher than his.

Sturtevant's description of *funebris* mentions it as having six rather than eight acrostichal rows. This is doubtless a typographical error.

*Type* and *gonotypes* from descendants of fertilized female collected at Pasadena, California, May 5, 1937 (W. P. Spencer).

Other collection records: Pasadena, California, November 19, 21, 28, 1936 (W. P. Spencer); Camp Rincon, San Gabriel Mountains, California, April 24, 1937 (W. P. Spencer).

The name *subfunebris* refers to the close relationship of this species with *funebris*.

*Drosophila subfunebris* differs from *Drosophila funebris* in the following characteristics: Thorax less grayish, shinier. Carina narrower, particularly above. Eyes lighter in color, pile shorter. Thoracic bristles longer and heavier. Legs and pleurae darker. Abdominal banding in female less distinct; dark posterior bands on each segment not interrupted mid-dorsally, or if interrupted, less distinctly so. Structure of external genitalia different in both sexes (see plate). Postero-dorsal angle of ovipositor plate in female not darkened. Walks with a more deliberate, mincing gait.

**Drosophila macrospina,** n. sp.

(Described from living material. Figs. 5 and 6)

*Male.* Arista with about five branches above and three below. Antennae yellowish brown, third joint darker, clothed with fine white hairs. Front over one-third width of head, wider above; dark brown. Second orbital less than one-half length of third which is three-quarters length of first. Second oral bristle three-quarters length of first. Carina high and narrow, particularly above, face dull brown, sometimes slightly yellowish. Cheeks shining yellowish brown, their greatest width about one-seventh greatest diameter of the eyes. Eyes pilose.

Acrostichal hairs in eight rows; no prescutellar bristles. Thoracic hairs in dorsocentral rows slightly more regular than acrostichal hairs median to them. Mesonotum dark brown, sometimes almost black; slightly pollinose, especially laterally. Scutellum pollinose, blackish brown. Pleurae and legs yellowish brown.

Abdomen shining brownish black.

Wings clear, two bristles at distal costal break. Costal index about 3.4; fourth-vein index about 1.4; 5x index about 1.4; 4c index about 0.8.

Length body 2.7 mm.; wing 2.5 mm.

*Female.* Same as above except abdomen shining dark brown, each segment with a paler anterior band.

Length body 3.3 mm.; wing 2.8 mm.

*Type* and *gonotypes* from stock received from the University of Texas laboratory. This stock was collected at Austin, Texas, in 1935.

Other collection records: Lake Taneycomo, Ozark Mountains, Missouri, June 27, 1937 (W. P. Spencer); North Chagrin Reservation, Cleveland, Ohio, August 25, 1938 (J. V. Neel); Smoky Mountains National Park, Tennessee, July 11, 1938 (W. P. Spencer-H. D. Stalker); Grosse Pointe Shores, Michigan, July 6, 1935 (H. D. Stalker). Both the Ohio and Texas collections were made from fungus, the Michigan, Missouri, and Tennessee collections from fermenting banana.

The name *macrospina* refers to the conspicuous black spine on the anal plate of the male.

*Drosophila macrospina* differs from *Drosophila funebris* in the following characteristics: Smaller, squattier fly. Thorax darker, especially on sides. Carina narrower below. Hairs on third antennal joint slightly longer. Eyes larger, with shorter pile; cheeks narrower. Eye color lighter; front, legs, and pleurae darker. Female with more distinct abdominal banding. Structure of external genitalia different in both sexes (see plate). Ovipositor plate in female darkened both postero-dorsally and antero-ventrally, not just postero-dorsally as in *funebris*. Subject to "catyleptic fits" when container is disturbed.

*Drosophila macrospina* differs from *Drosophila subfunebris* in the following characteristics: Smaller, squattier fly, more size difference between the male and female. Thorax darker in color, thoracic pattern less distinct. Female with more distinct abdominal banding. Cheek narrower; eyes larger, with thinner pile and a lighter color. Carina narrower below; hairs on third antennal joint slightly shorter. Front darker. Structure of external genitalia different in both sexes (see plate). Ovipositor plate darker. Subject to "catyleptic fits" when the container is disturbed. Does not walk deliberately, with a mincing gait.

The eggs of all three of the above species have four filaments.

### **Drosophila chagrinensis,** n. sp.

(Described from pinned material)

*Female.* Arista with six branches above, and one below. Antennae brown, third joint darker, almost black, clothed with long yellow hairs. Carina low and narrow, confined to upper part of face; face yellowish brown. Front over one-third width of head, wider above, brown, lighter

anteriorly; orbits shining brown. Second orbital less than one-half length of other two. Only one prominent oral bristle. Cheeks light brown, their greatest width one-fourth greatest diameter of eyes. Eyes with thin, sparse pile.

Acrostichal hairs in six rows, no prescutellars. Mesonotum and scutellum brown, slightly shining. Mesonotum somewhat pollinose laterally, scutellum slightly pollinose over whole surface of disc. Mesonotum with two light stripes along dorso-central rows, two dark stripes just inside dorsocentral rows, and light area between these inner stripes. Anterior scutellar bristles divergent. Pleurae dark brown, legs yellowish brown.

Abdomen shining brownish-yellow, each segment with a dark brown posterior band.

Wings clear, with single bristle at the distal costal break. Costal index about 2.5; fourth-vein index about 1.6; 5x index about 1.5; 4c index about 0.9.

Length body 2.8 mm.; wing 2.6 mm.

*Type* and only specimen taken from fleshy fungus in North Chagrin Reservation, Cleveland, Ohio, July 27, 1937 (H. D. Stalker).

The name *chagrinensis* refers to the type locality.

**Drosophila magnafumosa,** n. sp.

(Described from pinned material)

*Male.* Arista with five branches above and one below. Antennae brownish yellow, third joint darker. Carina fairly prominent, face yellow. Second orbital one-third size of other two. Only one prominent oral bristle. Front over one-third width of head, wider above, velvety yellowish brown; orbits shining. Cheeks dull brownish yellow, their greatest width one-fourth the greatest diameter of the eyes. Eyes with blond pile.

Acrostichal hairs in six rows, no prescutellars. Anterior dorsocentrals very close to posterior dorsocentrals. Bristles on sides of thorax long. Mesonotum and scutellum brownish yellow, somewhat shining, slightly pollinose laterally. Mesonotum with median dark stripe. Anterior scutellars divergent. Pleurae brown, legs brownish yellow.

Abdomen yellowish brown, somewhat shining. Each segment with a posterior black band, widely interrupted mid-dorsally.

Wings clear, only one bristle at distal costal break. Costal index about 3.0; fourth-vein index about 1.5; 5x index about 1.7; 4c index about 0.9.

Length body 2.8 mm.; wing 3.0 mm.

*Type* and only specimen taken from fleshy fungus in Smoky Mountains National Park, Tennessee, at an elevation of 4,000 ft., July 11, 1938 (W. P. Spencer).

The name *magnafumosa* refers to the type locality.

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