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# NOTES ON ALASKAN DROSOPHILIDAE (DIPTERA), WITH THE DESCRIPTION OF A NEW SPECIES

By MARSHALL R. WHEELER[1] AND LYNN H. THROCKMORTON[2]

During July and August, 1960, we had an opportunity to make *Drosophila* collections in Alaska, primarily to obtain cultures of *D. montana* for use in studies of evolutionary cytology. A number of other species were also attracted to the yeasted banana bait and several species of *Scaptomyza* and *Chymomyza* were collected by other means. There are so few reports of Alaskan Drosophilidae that these new collections have more than tripled the number of species recorded from the state. We have supplemented our data with the unpublished collection records of Dr. Dwight Miller of the University of Nebraska who worked in the Anchorage-Palmer and Fairbanks-College areas during the summer of 1957. The Alaskan records of Hackman (1955, 1959) for the genus *Scaptomyza* have also been included.

The principal localities from which Drosophilidae have been taken are shown on Fig. 1. The winding broken line within the state shows, very roughly, the approximate limit of the spruce-birch interior forests. The tundra region, mostly in the north and west, is not absolutely treeless, however, since there are small willows, alders, and occasionally cottonwoods, especially along rivers and stream banks. Collections at King Salmon and Bethel were marginal, the preponderant heath tundra interdigitating with the sparse stands of stunted spruce; several species of *Drosophila* were taken at these marginal locations, but the populations appeared to be quite small. Cape Thompson, the site of Project Chariot of the U. S. Atomic Energy Commission, and Nome are both well removed from forested areas, and we were unable to catch any *Drosophila* at either of these tundra areas (except for *Drosophila immigrans* in a store), although we did collect single specimens of *Scaptomyza* at each of them.

In view of the great size of the state and its considerable variety of habitats, the present report cannot be considered as more than preliminary. It seems clear, however, that the variety of species of Drosophilidae to be expected in such northern latitudes will in-

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evitably be much smaller than that of more moderate climatic regions. On the other hand Alaskan collections are of special interest in detecting additional examples of Holarctic species, particularly with regard to species previously considered to be limited to the Palaearctic region. Basden (1956) in his excellent summary of the species of Drosophilidae from the arctic regions (defined as that area north of the Arctic Circle) points out that the number of species of the family recorded as common to the Nearctic and Palaearctic regions is 22, but that nine of these, and probably more, are dubiously conspecific in both regions, and that many of the remainder are cosmopolitan species. The real paucity of the family in arctic areas is clearly demonstrated by Basden (*op. cit.*) and Basden and Harnden (1956); only 24 species out of well more than 1000 in the family were definitely recorded from north of the Arctic Circle (Lat. 66° 32′ N). It was further pointed out that not a single species was known from the arctic areas of Alaska, Canada or Greenland. Our collection of a specimen of *Scaptomyza* from Cape Thompson (*c.* Lat. 68° 10′ N), therefore, represents the first record of a Drosophilid from arctic North America.

Approximately one-third of that part of Alaska lying north of the Arctic Circle (Fig. 1) is forested. Since the only known attempt to collect Drosophilidae in the far north was in a tundra area, the apparent absence of the family in arctic Alaska is misleading. In fact, it seems safe to predict that in the forested areas north of Fairbanks collectors will find *Drosophila athabasca, montana, testacea* and *subquinaria,* one to several species of *Scaptomyza* and *Chymomyza,* and possibly occasional specimens of "domestic" species within buildings as well.

## Alaskan Species of Drosophilidae

1. *Drosophila* (*Drosophila*) *montana* Stone, Griffen and Patterson, 1941. Anchorage, Big Lake, Matanuska Valley, King Salmon, Bethel, Fairbanks, College. *D. montana* is found only in moist areas near streams and lakes where it is associated with cottonwood or alder. In California, Wyoming and Oregon the larvae were found in the decaying phloem tissue of cut or broken limbs and trunks of these trees.

2. *D.* (*Drosophila*)*testacea* von Roser, 1840. Anchorage, Fairbanks, College. This Holarctic species is largely, if not entirely, fungivorous, but it is readily attracted to banana bait.

3. *D.* (*Drosophila*) *melanderi* Sturtevant, 1916. Anchorage. Our four specimens represent the first record of this fungivorous

species in Alaska; the nearest previous known locality was in Washington.

4 (*Drosophila*) *immigrans* Sturtevant, 1921. Nome. This cosmopolitan, "domestic" species was found by us around bananas, tomatoes and potatoes in a grocery store.

5. *D.* (*Drosophila*) *funebris* (Fabricius), 1787. Big Lake, Matanuska Valley, Palmer, College. Dr. Dwight Miller (personal communication) reports that this cosmopolitan species was sometimes found breeding in rotting potatoes in such numbers in the Matanuska Valley that the adults were considered a nuisance in homes.

6. *D.* (*Drosophila*) *subquinaria* Spencer, 1942. Anchorage, Big Lake, Kodiak, King Salmon, Bethel, Fairbanks. It has been shown elsewhere (Wheeler, 1960) that this fungivorous species is probably the same as the Palaearctic *transversa* Fallén, while the species in North America which has erroneously been called *transversa* was undescribed and has now been named *falleni*. Laboratory tests are now in progress which should settle the question of the identity of *subquinaria* and *transversa*.

7. *D.* (*Sophophora*) *athabasca* Sturtevant and Dobzhansky, 1936. Anchorage, Big Lake, King Salmon, Bethel, Fairbanks, College, Matanuska Valley, Dead Man's Lake; also from Chitina, Juneau, Ketchikan and Gravina Island (Dobzhansky and Epling 1944). This is by far the most common species in the forested areas of Alaska, and is one of the most widely distributed native species of *Drosophila* in North America (Miller, 1958). It is readily attracted to fermenting banana bait.

8. *D.* (*Sophophora*) *melanogaster* Meigen, 1830. Anchorage. We found this cosmopolitan species in a grocery store; Dr. Miller found a male in an apartment building. As with *D. immigrans* there is no evidence that this species has established itself in wild environments in Alaska .

9. *D.* (*Sophophora*) *populi* new species. Anchorage. This new species, represented by 37 individuals swept from a fallen cottonwood tree along Rabbit Creek, is described below.

10. *Scaptomyza* (*Hemiscaptomyza*) *terminalis* (Loew), 1863. Sitka, Anchorage, Kodiak. The type locality was Sitka and, according to Hackman (1955, 1959), the species has never been found elsewhere.

11. *S.* (*Hemiscaptomyza*) *trochanterata* Collin, 1953. Anchorage, Matanuska, Fairbanks. The species was first reported as Holarctic by Hackman (1959); it is widespread in the Palaearctic region.

12. *S.* (*Hemiscaptomyza*) *unipunctum* (Zetterstedt), 1847. Bethel, Fairbanks. This is the first record from North America; Hackman (1959) reported it from Kamchatka as well as other Palaearctic areas. Although our new records are based upon single males from each locality, the male genitalia agree quite well with that described for *unipunctum*.

13. *S.* (*Scaptomyza*) *teinoptera* Hackman, 1955. Sitka. Hackman (1955) first reported the presence of this Holarctic species in Alaska; there are no additional records for the Nearctic.

14. *S.* (*Scaptomyza*) *flaveola montana* Wheeler, 1949. Fairbanks, Sitka. We found a single male of *montana* near Fairbanks; although it was first described as a species, Hackman (1959) placed it as a subspecies of *flaveola* (Meigen) 1830. Coquillett (1900) recorded *flaveola* from Sitka; we have not seen his specimens but they were most likely also *montana* since the nominate form is not known to occur in the Nearctic.

15. *S.* (*Scaptomyza*) *nigrita* Wheeler, 1952. Fairbanks. The identification of this species, a new record for Alaska, is based on a single female, and females are not readily identifiable in this genus. The specimen agrees quite well, however, with the type material from California.

16. *S.* (*?Scaptomyza*) species undetermined. Cape Thompson. A single male was taken by sweeping near the Project Chariot site; it does not agree with any of the described species but it shows some similarities to *norica* Hackman from the Austrian Alps. It is especially remarkable in possessing five well-developed orbital bristles, two proclinate and three reclinate (*norica* has one proclinate and three reclinate). The humeral bristles are damaged, making the subgeneric reference uncertain but probable.

17. *Chymomyza aldrichi* Sturtevant, 1916. Anchorage, Big Lake, Matanuska Valley, Bethel, Fairbanks, College. This is a rather common and widespread species in Alaska; although it is usually found around freshly cut tree trunks, it comes to banana bait quite readily.

18. *C. caudatula* Oldenberg, 1914. Anchorage. This Holarctic species is widely distributed across North America. Our two specimens were found on a freshly cut tree trunk.

19. *C. coxata* Wheeler, 1952. Anchorage, Fairbanks. This is not only a new record for Alaska, but also a considerable extension of the known range, having been collected previously only in Colorado and Wyoming.

20. *C. wirthi* Wheeler, 1954. Anchorage. We found a single

male; the species was previously known only from Ontario and Virginia.

21. *Amiota* (*Amiota*) species undetermined. Anchorage. The single female specimen has not been identified; it runs to *alboguttata* Wahlberg in the available keys but it seems probable that several species are currently included under that name. Members of the genus are often quite annoying, flying near and resting on one's eyes and ears. We suspect that *Amiota* is not this rare in Alaska but the swarms of *Simulium* are sometimes so great that an occasional *Amiota* among them is apt to be overlooked. The use of repellents against attacks of mosquitoes and *Simulium* probably also reduces the opportunity for capturing *Amiota*.

*Other species.* Dr. Miller classified a specimen from College as *Drosophila putrida* Sturtevant, dark form; it was not possible to check this carefully, but since *putrida* was not taken by us during the summer of 1960 it seems probable that he was dealing with an aberrant individual of *testacea* which is rather common in the Fairbanks region. He also identified, but with considerable doubt, *Drosophila suboccidentalis* Spencer from College, Dead Man's Lake, and the Matanuska Valley. The few available specimens remaining from his Alaskan material have been re-examined and only *subquinaria* was present among them. However, *D. occidentalis* Spencer was present among flies taken by him at Rancheria River, Yukon Territory, so that it is quite probable that this species also occurs in Alaska.

There are, in addition, several Alaskan species which have sometimes been included in the Drosophilidae but which are currently placed in other, more restricted, families. *Aulacigaster leucopeza* (Meigen) of the Aulacigasteridae, which is apparently widespread in the forested areas, belongs in this category as does *Campichoeta* (= *Thryptocheta*) *micans* (Hendel) of the Diastatidae, which we found near Fairbanks.

**Drosophila (Sophophora) populi,** n. sp.

This new species is quite similar in size and general appearance to *D. athabasca,* but it may be separated from the latter readily by the wholly pale legs and pale lower pleura, the much brighter red eyes in life, the bristled, non-dentate ovipositor of the female, and the absence of sex combs on the male fore tarsi.

Thirty-seven specimens were collected along Rabbit Creek, south of Anchorage. Banana baits were placed in the vicinity of a recently felled cottonwood tree (*Populus* sp.); portions of the tree

were immersed in the stream and there was a faint, but definite, fermentation odor in the area. Both *D. populi* and *D. montana* were collected by sweeping among the branches and broken limbs of the tree, while very few were attracted to the bait. Of 82 *montana* taken at this locality, we estimate that fully 90% came from the tree, and an estimated 98% of the *populi* were obtained by sweeping among the branches. Most of the specimens were placed on a *Drosophila* culture medium but we were unable to secure a stock, all of the larvae dying in the food vials before pupation.

*Description.*—♂, ♀. Front dull black, the orbits and ocellar triangle gray; antennae blackish. Face black (♂) or dirty tan (♀), the carina forming a very low ridge bounded by rather deep foveae. Oral margin somewhat protruding, the clypeus narrow and black. Cheeks narrow, dark tan beneath the eye, black in the area of the oral bristles. Vibrissa single, rather short. Palpi dirty yellow, darker apically.

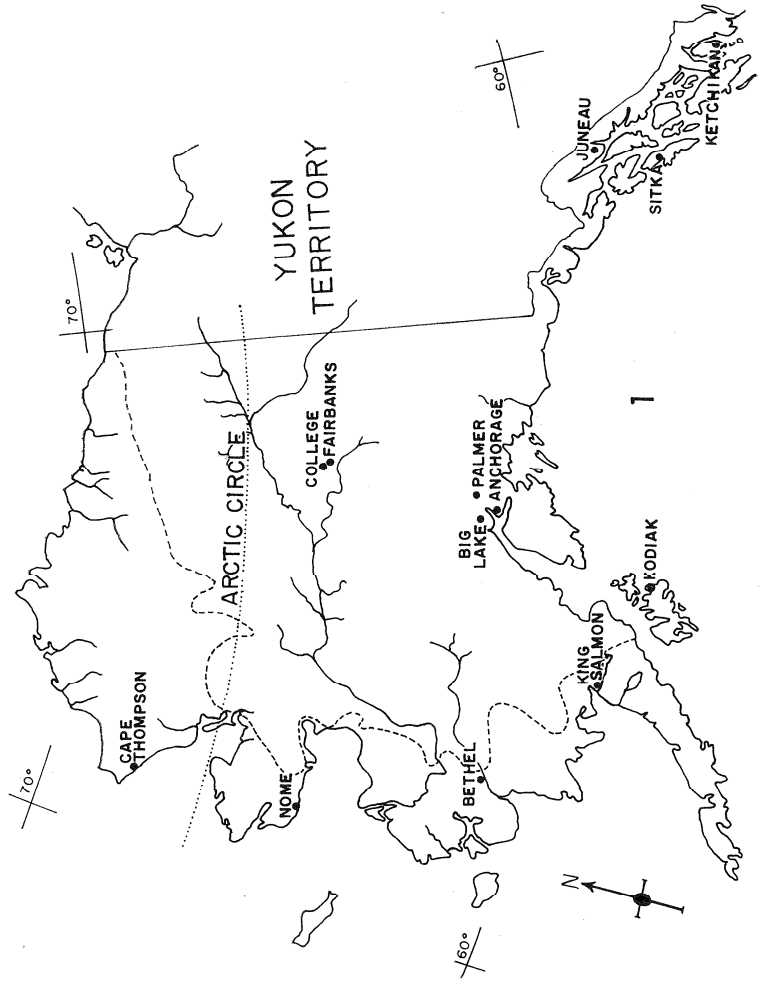
Proclinate orbital only a trifle shorter than posterior reclinate, the anterior reclinate thin, about 1/3 the length of proclinate and situated rather close to the latter. Ocellars, inner and outer verticals, and postverticals all well developed. Arista with 3 (rarely 4) dorsal and 2 ventral branches basal to the terminal fork, all branches rather short.

Mesonotum dull black with thin grayish pollinosity. Basal scutellars convergent to straight. Acrostichal hairs in about 8 rows, but quite irregular; often with a pair of enlarged prescutellar acrostichals but their size is not constant. No propleural bristle; anterior sternopleural 3/5 the length of posterior, the middle one small and thin. Pleura dark above becoming yellowish below on

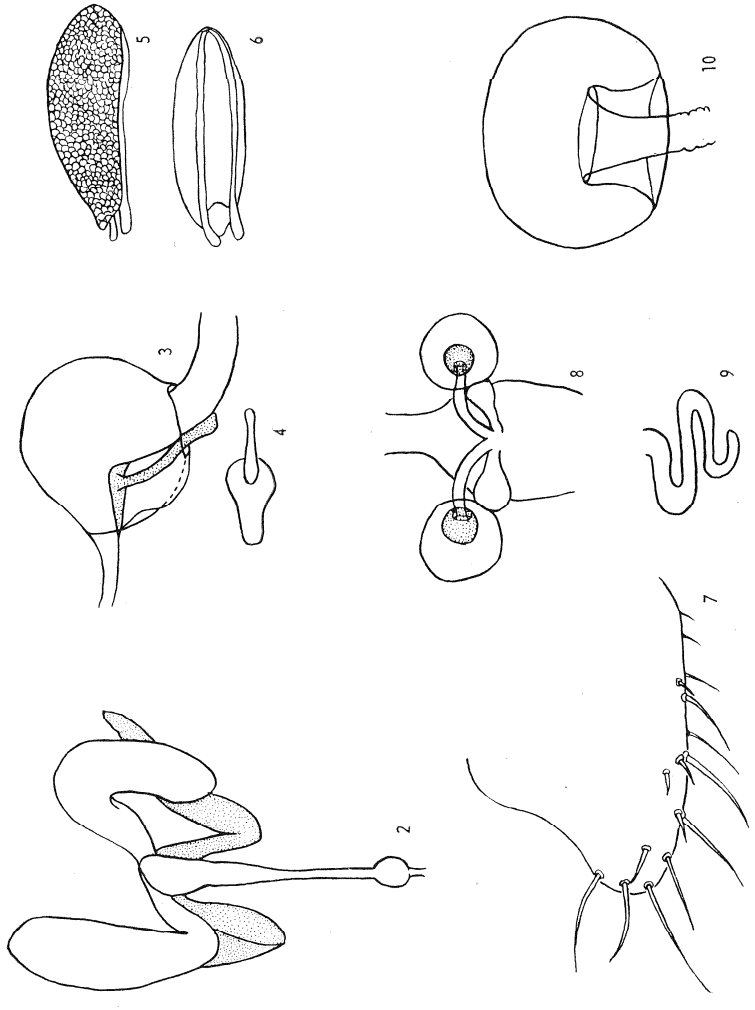
## Explanation of Plates I and II

Fig. 1, Map showing principal localities in Alaska where collections of Drosophilidae have been made. Figs. 2–10, *Drosophila populi,* new species. Fig. 2, Male reproductive system, showing testes (stippled) and paragonia. Fig. 3, Sperm pump, lateral view; the ventral ejaculatory apodeme (stippled) is strongly pigmented black. Fig. 4, Ejaculatory apodeme, ventral view. Fig. 5, Egg, lateral view, showing strongly sculptured surface. Fig. 6, Egg, ventral view, showing filaments continued along ventral surface as heavy ridges. Fig. 7, Ovipositor, lateral view. Fig. 8, Female reproductive organs, dorsal view, showing spermathecae and parovaria. Fig. 9, Female ventral receptacle, shown after clearing in phenol. Fig. 10, Spermatheca, inner sclerotized capsule.

WHEELER AND THROCKMORTON PLATE I



WHEELER AND THROCKMORTON PLATE II



sternopleura. Legs, including fore coxae, all pale yellowish, without unusual bristling. Abdomen wholly black with thin pollinosity. Wings hyaline; costal index about 2.4; third costal section with the short black bristles on the basal 1/4 to 2/5.

Upper anal plate of female with a pair of unusually long bristles; ovipositor (Fig. 7) with a series of slender bristles, not dentate. The male external genitalia and copulatory structures are described in detail by Dr. Takada in the following article.

One male and one female were sacrificed for dissection. Malpighian tubules with short stalks, less than 1/4 their total lengths; posterior pair with their tips apposed but lacking a continuous lumen. Testes (Fig. 2) appearing red through the body wall, but showing an orange-brown pigmentation when dissected free; one paragonium directed anteriorly, the other posteriorly. Inner capsule of spermatheca (Fig. 10) dark and relatively small; ventral receptacle (Fig. 9) forming a short serpentine sac. Male sperm pump (Fig. 3) without diverticula, the ejaculatory apodeme black.

Eggs (Fig. 5, 6) with two short filaments which are clearly continued along the surface as heavy white ridges; egg surface strongly sculptured. Posterior spiracles of larva rather short, parallel, pale with brownish tips. Puparium not seen.

*Relationship.*—The affinities of this new species are uncertain but a relationship with the subgenus *Sophophora* seems most likely. There are only two egg filaments as in *Sophophora,* but they are not constructed as in that subgenus. The male genitalia, both internal and external, are rather similar to those seen in members of the *obscura* species group of *Sophophora,* but some features are unique. The bristled ovipositor of the female is, strangely, most like that found in the genus *Chymomyza.* For the present we are assigning *populi* to the subgenus *Sophophora,* but we cannot place it in any of the established species groups.

*Types.*—*Holotype* male and 8 *paratypes,* collected July 22–24 and Aug. 4, 1960, from the above described locality near Anchorage, Alaska. Two paratypes are being placed in the collection of the U. S. National Museum, Washington, D. C.; all other types are in the *Drosophila Type and Reference Collection* of the Genetics Foundation, The University of Texas, Austin.

## Acknowledgments

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# THE MALE GENITALIA OF *DROSOPHILA POPULI* WHEELER AND THROCKMORTON (DIPTERA; DROSOPHILIDAE)

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The species *Drosophila populi* was described by Wheeler and Throckmorton earlier in this publication. The male genitalia show a number of unusual features which should be described as a supplement to their description.

The author wishes to express his sincerest appreciation to Professor Wilson S. Stone, University of Texas, for providing the opportunity to work in the Genetics Foundation, and is especially indebted to Professor Marshall R. Wheeler, University of Texas, for his constructive criticisms and for furnishing the material for the present study. I wish to thank Mrs. Linda Kuich for her assistance in the preparation of the figures.

*External genital apparatus.*—Genital arch (Fig. 1) dark brown, broad and convex below, the undermargin sclerotized, the heel triangular. Lower portion of arch with about 10 bristles, the upper portion with about 38 hairs. Primary clasper (Fig. 1) dark brown, with a prominent thumb-like process and with 10–11 long primary brownish black teeth; inner surface of clasper with usually two fine bristles and about six short but stout bristles. Bridge (Fig. 2) connecting the clasper (decasternum of Okada, 1954) brown, elongate, and proximally with triangular lateral pieces; median piece rodlike, orange brown.

## Explanation of Plate

Figs. 1–4, Male genitalia of *Drosophila populi.* Fig 1, External genital apparatus. Fig. 2, Bridge (decasternum) connecting the claspers. Fig. 3, Male copulatory organs, ventral aspect (left side) and dorsal aspect (right side). Fig. 4, Male copulatory organs, lateral aspect.

Abbreviations: *ap,* anal plate; *ga,* genital arch; *c,* clasper; *h,* heel; *pt,* primary teeth; *ag,* anterior gonapophysis; *pg,* posterior gonapophysis; *hy,* hypandrium; *n,* median notch of hypandrium; *sb,* submedian spine of hypandrium; *p,* penis; *sa,* sensilla of anterior gonapophysis; *b,* basal apodeme of penis.

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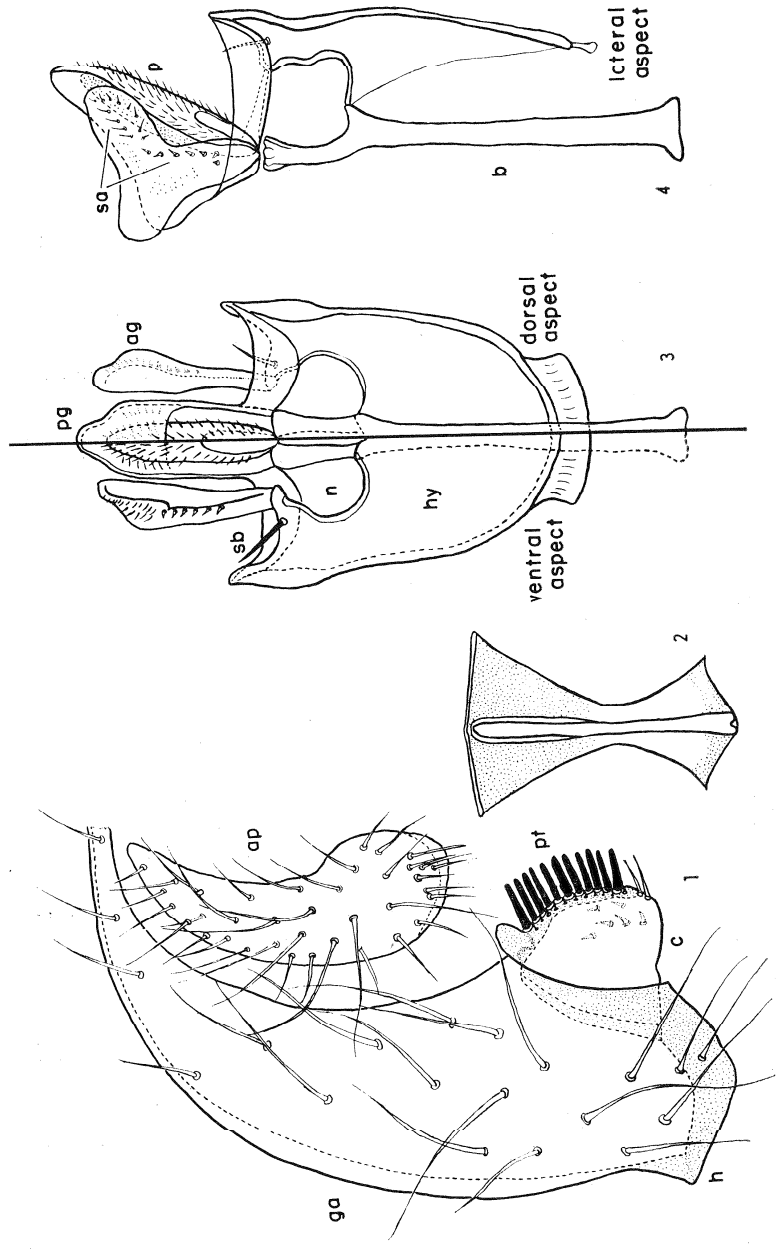
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*Copulatory organs.*—Penis (Fig. 4) pale brown, oblong, with numerous hairy structures. Anterior gonapophyses (Fig. 3) yellowish brown, curved ventrally, rounded apically, the outer surface of the upper portion with about 20 stout hairs and medially with a row of about seven spines. Posterior gonapophyses as long as the anterior ones, the fused upper portion of the inner surface with many hairy structures, separated from the penis, and surrounding the dorsal surface of the latter.

Hypandrium brown and quadrate, nearly as long as broad, the median notch deep and broad. Phallosomal index (Okada 1953; a ratio between the length of the penis and its apodeme) about 0.5.

*Discussion.*—The morphological differences described by Wheeler and Throckmorton in this same issue of the Bulletin and the present study show that *Drosophila populi* is distinct from all the other known species of the genus, and that it is probably related to the subgenus *Sophophora.* To discuss the relationships of species on the basis of only a few organs can be dangerous, but it is allowable when one is dealing with the male genitalia which is composed of several morphologically distinct elements. Similar conclusions were reached by others who have studied male genitalia, for example: Salles (1947), Malogolowkin (1948, 1952, 1953), Nater (1953), Burla (1956), Spassky (1957) and also Hsu (1949) from his study of the external genital apparatus. Extensive comparative studies of the copulatory organs have also been done by Okada (1953, 1954, 1955, 1956).

Although the present species has a relatively small phallosomal index, separated anal plate, distinct anterior gonapophyses with sensilla, and some features of the bridge connecting the claspers, each of which is characteristic of the *obscura* group of *Sophophora,* it does not agree with any of the known species of this group, having clearly fused upper portion of the posterior gonapophyses, penis with hairy structures, deep median notch of the hypandrium and thick anterior gonapophyses. Thus the present species should be placed near the *obscura* species group of the subgenus *Sophophora,* genus *Drosophila.*

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