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ANASTREPHA (TRYPETYDAE, DIPTERA) FRUIT FLIES IN PUERTO RICO

By FRANCISCO SEÍN, JR., *Assistant Entomologist,*
Insular Experiment Station, Río Piedras, P. R.

Two species of fruit flies of the genus *Anastrepha* occur in the Island of Puerto Rico. In this region, they can be conveniently differentiated on the basis of the host selection, that is, the fruits in which the maggots are found, although in the case of two of the host fruits, both species may be found together. The two species can unquestionably be differentiated in the egg and adult stages. In the larval stage, the one character used to distinguish them seems to be constant. One is described as a distinct new species: *unipuncta.* The other, although differing greatly in host fruits from the species *fraterculus* as reported from some localities in South America, is here considered as a variety of that species: *mombinpraeoptans* because of its preference for the hog plum, (*Spondias mombin* L.). The lack of more data from South America does not seem to justify a greater differentiation at present.

What has previously been called the West Indian fruit fly, *Anastrepha fraterculus,* was described by Wiedemann (**10**) in 1830 from a Brazilian specimen and was first reported from Puerto Rico by Gundlach (**4**) in 1887 as *Acrotoxa fraterculus* and *Trypeta fraterculus* Wied., in synonymy as determined by Roeder. Up to recently it was considered the only species of *Anastrepha* on the Island.

In 1911, after the Puerto Rico Experiment Station at Mayagüez had introduced some of the selected East Indian varieties of mangoes it was noticed that some, especially the Cambodiana, were attacked by fruit flies, and in that same year, Tower (**9**) published an account of the life history of the insect under the name of *Anastrepha acidusa* Walker, as determined by W. R. Walton.

In 1912, Dr. Hooker (**5**) also of the Puerto Rico Station reported that a comparison made by Dr. L. O. Howard with the type of *A. acidusa* in the British Museum showed the fruit fly from Puerto Rico (it is not possible to tell which of the two) to be a different species, possibly undescribed. In the same report, however, it is added that

Prof. Bezzi identified specimens as *A. fraterculus* and that Mr. Knab was inclined also to consider them as belonging to that species.

In Dr. Wolcott's check list of the insects of Puerto Rico (**11**) published in 1923, *A. fraterculus* is the only species recorded, and *A. acidusa* is given as a synonym. The host plants of the two species are given as those of the single species recognized at the time.

In 1925, at a hearing (**7**) held in Washington, D. C., to consider prohibiting or restricting the entrance of citrus fruits from Puerto Rico into the United States due to the presence of *A. fraterculus,* Dr. C. L. Marlatt expressed the opinion that although *A. fraterculus* did not infest citrus fruits in Puerto Rico, *Anastrepha* larvae had been found on one occasion in citrus from the Isle of Pines and furthermore stated that:

"In our examination of citrus fruits from the West Indies and Mexico, Central America, etc., we find that these native fruit flies which occur throughout all that region do not attack citrus. It is not at all impossible that there may be a rare case of a maggot of these other fruit flies coming in citrus fruit. The insect may lay eggs under some abnormal conditions in citrus fruit and there is a possibility of course that infestation may result."

Since this hearing, the exportation of citrus fruits from Puerto Rico into the United States has continued uninterruptedly, the shipments being accompanied by permits issued by Inspectors of the Bureau of Plant Quarantine stationed on the Island. The permits are based on inspections made throughout the year in the groves and again in the packing houses before shipment. The inspections are most carefully conducted during the spring and summer and since 1931, with special care in the localities where infestations might be considered more likely to occur. As stated by Dr. G. G. Becker in the report on his trip of inspection to Puerto Rico, May 28 to June 13, 1931:

"A much greater fruit-fly risk is assumed in shipments of Cuban and Isle of Pines citrus than is assumed with Puerto Rican citrus because of the fact that fruit from the former Islands is given only a cursory examination on arrival."

In April, 1926, Mr. José Luciano of the Insular Quarantine Service found one fruit-fly larva in a native sweet orange (grown most likely in the western part of the Island) which was identified by Mr. C. T. Greene as *Anastrepha* sp. In the spring and summer of 1931 some infested grapefruit, sour oranges and one native sweet orange were found in the western part of the Island and a few infested Valencia oranges in two trees in a large commercial grove in the northern

part. In April 15, 1932, a few infested grapefruits and some sour oranges (very remarkably in the same grove and practically on the same date as the previous year), were again found in the west and a few infested sour oranges were also found in one locality in the south. Those infestations, as shown by careful surveys conducted by inspectors of the Bureau of Plant Quarantine and the Insular Quarantine Service in cooperation, have all been localized, of short duration and involving only an infinitesimal number of fruits compared with the total crop of the Island. Nothing can be added at present to the statements made by Dr. Marlatt to explain why those infestations take place. They do not occur when the flies are more abundant and neither do they seem to be caused simply by a lack or scarcity of their ordinary host fruits. They might possibly be due to a special activity of some of the flies in the spring and summer, or to a certain tendency of some individuals. Whatever the cause, and even though the host plants of the insect occur in the neighborhood of practically all the citrus groves in the Island without infestation taking place, the elimination of those host plants would eliminate the source of flies in the vicinity of the groves and therefore also the danger of infestation. Picking the fruit early would also reduce the danger since the infestations have been found in the spring and at the beginning of summer. The fly that has been reared from citrus fruits in Puerto Rico is *not* the one that breeds in mango, "jobo", and "ciruela" but another distinct species which breeds commonly in guava, rose apple, to some extent in tropical almond and less commonly in custard apple, star apple, zapodilla, beach plum and kunquat.

So much confusion exists as to what are the characters of *Anastrepha fraterculus* Wied., that it would seem desirable to describe what has been considered to be that species in Puerto Rico as new. But due to lack of sufficient reared material and data on the immature stages from a large number of localities throughout its wide range in the West Indies, Central and South America, for the present, the insect as found in Puerto Rico is here redescribed as a variety within the species *fraterculus*. Several such varieties may eventually be established and some may prove to be distinct species. The creation of varietal names will facilitate the study of the genus *Anastrepha* and particularly the species *fraterculus*. It may be useful also in connection with quarantine regulations. A long list of plants has been reported infested by *A. fraterculus*, but in some localities where *A. fraterculus* is reported to occur, some of those plants are not infested. Manifestedly, one locality should not be put under

quarantine regulations on the basis of the plants the insect attacks in another. The reason why some plants are infested in one locality and not in another may most readily be explained perhaps, by the existence of varieties within the species *fraterculus*. It is possible also that in some localities, plants reported infested by *A. fraterculus* may have been infested, as in Puerto Rico, by some other closely related species heretofore confused with it.

On this basis it would appear desirable to retain the common name of West Indian fruit fly, restricting it to the mango and jobo infesting variety: *mombinpræoptans,* which does not attack citrus in Puerto Rico. This variety is probably found in other West Indian islands besides Puerto Rico, and presumably also in tropical Central and South America. For the variety (if we may consider it as such) of *A. fraterculus* which attacks citrus and subtropical fruits in Brazil, Argentina and other South American countries, the common name of South American fruit fly as used by Essig (**2**) would be appropriate. Essig, when using that term in his book, was not considering varieties.

In describing the adult, the three bands on the wings (Fig. 60) are given names. The basal band extends from the base of the wing along the costal border to the end of the apical cell. The S-shaped band is clearly marked from the tip of the wing along the anterior margin to about the middle, thence bending over the radio-medial cross-vein it reaches the tip of the anal cell diffusing over it towards the base of the wing. The two arms of the inverted V-band rest on the posterior margin. Because there is no connection between them, the basal and the S-shaped bands stand out very clearly in figures 2 and 60. In figure 3 (*A. fraterculus* from Argentine), there being no connection between the S-band and the inverted V-band, the shape of the latter is quite striking. In describing wings such as shown in figures 2 and 3, the three bands immediately catch the eye. In figure 1, however, because of the connections, the three-banded effect is somewhat lost. Although *A. fraterculus* in Argentine is not discussed in detail in this paper, an illustration of the wing has been introduced for comparison.

In obtaining the eggs of the two species, it has been found convenient to take advantage of the fact that the females when kept for a time in cages without fruits in which to oviposit, seem to be in such a hurry when suitable fruits are made available, that they deposit the first eggs on the surface of the fruits as they run over them trailing the ovipositor. The normal shape and size of the eggs can be more easily observed in such than in eggs dissected out of

the flies or out of the fruits. In the variety *mombinpraeoptans* the tips of the eggs protruding out of the cuticle of the fruits makes the search for them a simple operation, but unless the spot where the females insert the ovipositor in fruits in cages is marked, it is quite difficult to locate those of *A. unipuncta,* which are deposited entirely under the cuticle.

WIEDEMANN'S DESCRIPTION OF **A. fraterculus**

"Flavus; alis dimidio basilari costae, plaga S formi, fascia dimidia lineaque apicis obliqua flavis. Yellow, wing with basal half of rib yellow, "S" formed mark, half a hyphen and line at apex.

"Length 2⅔ lines. From Brazil.

"This species is much similar to *D. parallelus,* only it is much smaller, the costal stripe and the band and the line, which correspond to the third stripe of that one, are different. Antennae medium length, bristle not plumose. Color very pale rust yellowish; face the same, frons somewhat deeper yellow. Entire back (thorax) of a pale yellow in between acorn-brown to 'Izabell yellow',—this perhaps lost of its purity through smears with arsenic solution. Abdomen fuller yellow, sides of thorax and legs leather-yellow. Abdomen incisions (posterior edge of segments whitish. Bristles and hair of head and body black. Base of wing from the costa to the third longitudinal vein deep yellow, in the radial cell lighter. From the inner hind margin, near the base of the wing, an oblique "S" mark runs over the middle cross-vein with its first bend reaching the costa, (whereby there is left a triangular hyaline space between it and the basal stripe), then with a sharp bending along the outer wing margin to below the end of the third longitudinal vein. From the hind edge of the wing there is a hyphen (band) spreading over the ordinary cross-vein and reaching to about the middle of the wing width; from the hind margin of the wing apex a tapering line extends obliquely and reaches over the end of the band, but in no way connected with the same. Band and line are slightly brown. In my collection."

Anastrepha fraterculus Wied., var. **mombinpraeoptans,** new variety.

The adult: Maximum size, male 7 mm., female (Fig. 4) with ovipositor, 8 mm., ovipositor, 1.8 mm. Wing expanse, 14 to 15 mm.(1) Head yellow, face light lemon yellow, front a grayish yellow amber. Compound eyes metallic irridescent. An almost black bloch between the simple eyes. Antennae with slight reddish tinge, arista chestnut. Proboscis golden yellow, palpi with very slight reddish tinge. Thorax dorsally reddish brown (2) with dark chestnut or blackish pile (3);

(1) In Wiedemann's description the size is given as 2⅔ lines. In Pierce's manual it is 12 mm., exclusive of the ovipositor with a wing expanse slightly over 25 mm. In Argentina according to Rust (8) average sizes are for the male 7 to 8 mm., with a wing expanse of 15 to 16 mm., and for the female 10 to 11 mm., with the ovipositor, ovipositor 2 mm. and wing expanse 18 to 20 mm.

(2) According to Wiedemann: "the entire back (thorax) is of a pale yellow in between acorn-brown and Isabell-yellow, this perhaps lost of its purity through smears with arsenic solution."

median mesoscutal vitta sulphur yellow with whitish pile(3), linear from collar expanding posteriorly into a cuneiform shape not reaching scutellum (Fig. 37); scutellum and lateral mesoscutal vitta sulphur yellow with scanty blackish pile. Metanotum a reddish amber with or without two markings which may be light or dark, shaped as spots or larger blotches Side of thorax dull yellow, pleural vitta enamelled sulphur yellow. An almost black rounded spot behind the wing base(4). The usual bristles all black. Abdomen amber with blackish pile and black bristles, posterior edges of segments usually showing as three lighter transverse bands. Ovipositor reddish amber, darker than abdomen, dorsally with an almost black spot near the tip. Two rounded, almost black spots on the membrane at the base of the ovopositor(4).

Legs lighter yellow than body, tibiae and tarsi, slightly tinged with reddish.

Wings (Fig. 1) hyaline, iridescent, markings in the shape of three brownish orange bands overlaid in part with a smoky brown which in places is blackish. The borders of the bands darker in places. Occasional vacuoles or lightly pigmented areas in the bands. Basal band brownish orange from the base of the wing to apical cell. Apical cell darker. S-shaped band dark smoky from tip of wing along anterior margin to about the middle, thence dark brownish orange over the radiomedial cross-vein and lighter brownish orange over it into cell 1st M_2. On cell Cu_1 there are usually two dark spots, sometimes coalescing, one of which is on the tip of the anal cell(5). The basal and the S bands are connected at a point near the r-m cross-vein thus leaving a triangular or notch shaped hyaline area between them with its base on the anterior margin and the apex pointing towards the posterior margin of the wing. Inverted V band with its arms resting on the posterior margin, the vertex connecting with the S band, the connection usually strong(6), the vertex is brownish orange, the arms smoky. Very exceptionally (Fig. 55) the arms of the inverted V band may be disconnected as described by Wiedemann. In one specimen the S band was found to be cut in two at the middle, (Fig. 56). Figures 43 to 56 show some only of the more striking variations that occur in the *mombinpraeoptans* variety.

Described from 3,000 freshly killed specimens reared by the writer from the different fruits in which the insect breeds in Puerto Rico during the years 1927 to 1933 from many localities both in the costal plain and the higher elevations. Dried specimens in the collections of the Insular and Puerto Rico Experiment Stations and in the National Museum in Washington, D. C., some of them collected as far back as 1913 and identified as *A. fraterculus* have also been examined. Dried specimens are brownish with the vittae whitish.

Type.—A single female; (P. R. Ac. No. 44–33), March 20, 1933, Río Piedras, Puerto Rico; reared by F. Sein, Jr., from *Spondias mombin* L. In the U. S. National Museum, Washington, D. C.

Paratypes.—Four female specimens; (P. R. Ac. No. 44–33), March 20, 1933,

(3) In Wiedemann's description the bristles and hairs of head and body are black, but according to Loew (6) the pile on Wiedemann's type was light chestnut or yellowish. Dr. C. H. Curran has informed the writer that *fraterculus* has the abdomen wholly yellow haired and has yellow or brownish bristles.

(4) Not mentioned in former descriptions of *fraterculus*.

(5) According to Bezzi (1) this spot is not present in *fraterculus*. Greene (3) who states that the adults are easily differentiated on wing pattern illustrates the spot for *A. fraterculus* but not for *A. ludens* or *A. serpentina* and indistinct for *A. striata*.

(6) In Wiedemann's description the arms are "in no way connected". Loew states that in Wiedemann's type the connection was present though not very distinct.

Río Piedras, Puerto Rico, reared by F. Seín, Jr., from *Spondias mombin* L. In the British Museum, London, England, and at the Insular Experiment Station, Río Piedras, Puerto Rico.

Mounted wings from which the drawings of the variations in pattern and slides from which the drawings of the posterior spiracles and the hairs or rays were made deposited at the Insular Experiment Station.

The egg: Length, 1.4 mm.; Width, 0.4 mm.; Spindle shaped with one end prolonged into a neck which usually swells somewhat into an ovoid head at its extremity, the other end bluntly pointed, (Figs. 8, 9 and 10). Egg membrane white, opaque, smooth and glossy. The egg is inserted in the fruit up to the shoulder, the head and neck protruding outside of the cuticle (Figs. 6–8 and 10). The larva emerges through a slit near the pointed end.

Described from eggs dissected out of fruits, from mature eggs dissected out of the female flies and from eggs deposited on the surface of fruits in cages.

The larva: Maximum length, 10 mm., width, 2 mm., at posterior end; cylindrical, tapering slightly towards cephalic end. When young, cream colored, usually turning later to a golden yellow. In addition to the head region, the body consists of 11 segments of about equal length; a ventral fusiform area on anterior portion of each of segments 2 or 3 to 11(7), (Fig. 16). Head, (Fig. 14), small, partly retractile, each side of the front bearing two broadly rounded somewhat flattened tubercles, the antennae(8) slightly larger; mouth hooks (Figs. 20–25), medium sized, first part rather slender, first and second parts black, second part shaped more frequently like the head of a hammer(9), third part with a dark brown infuscated area at base which fades to hyaline towards apices. Anterior spiracles small, yellowish, chitinized, with from 10 to 16 small rounded tubules(10) arranged in an irregular row, (Fig. 15). Posterior spiracles, (Figs. 17, 19 and 27), medium sized, each spiracle with three broad yellow entrances, each with a dark brown peritreme, entrances more frequently arranged so that the two above are parallel and the one below obliquely upturned(11), Figs. 17 and 19), but in some specimens all three entrances may converge, (Fig. 27). In some specimens the entrances may be described as short and thick, in others as longer and more slender. Hairs (rays) branched and well spaced as shown in (Fig. 17). Button large but indistinct. Above each spiracle two small tubercles in a transverse line and below, two small tubercles slightly wider apart and almost in a transverse line (12), (Fig. 26). The lower pair of tubercles is in some specimens located in a ridge, (Fig. 26, *a* and *b*), in others in two ridges (Fig. 26, *c* and *d*), and the innermost of the two tubercles is usually bifid (Fig. 26, *a* and *c*). Another pair of tubercles can usually be seen on the median line between the upper and the lower pair(13). Anal elevation large, rounded and with two prominent lobes.

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(7) According to Greene (3) in *A. fraterculus* the fusiform area occurs on segments 4 to 11.

(8) Greene illustrates a somewhat differently shaped antenna.

(9) Greene's illustration shows it shaped somewhat like a bottle.

(10) According to Greene *A. fraterculus* has from 15 to 17 tubules, *A. striata* and *A. serpentina* go as high as 17 and *C. capitata* as low as 10.

(11) According to Greene the second is the only arrangement that occurs in *fraterculus*.

(12) According to Greene there is one tubercule below each spiracle.

(13) Greene does not consider them as bifid; this condition was first pointed out to the writer by Mr. F. H. Benjamin.

(14) Not mentioned by Greene.

Described from 500 full grown larvae from the same sources as the adults.

The puparium: Maximum length, 5.7 mm., width, 2 to 2.4 mm., cylindrical, yellowish, later turning to mahogany; 11 distinct segments, (Figs. 32–35). Anterior spiracles like those of the larva but darker and somewhat shrunk. Posterior spiracles (Fig. 36) medium sized, dark reddish, located in a faintly depressed area somewhat oval in shape, a broad flattened projection extending down between the upper end of the spiracular plates([15]), each spiracle with three broad yellow entrances, each located on a well defined ridge; button small and indistinct. Anal plate large, dark and round.

Described from 500 specimens from the same source as the larva. Material from Panama (whence Greene drew his description) has also been examined.

Hosts: Hog plum, "jobo" *Spondias mombin* L.; "ciruela", *S. cirouella* Tussac and *S. purpurea* L., some mango varieties, *Mangifera indica* L., and rarely in "jobo de la India", *S. dulcis* Frost. Occasionally some may breed in guava, "guayaba", *Psidium guajava* L., and rose apple, "pomarrosa", *Jambos jambos* L.

Anastrepha unipuncta new species

The adults of this species can readily be differentiated from *A. fraterculus* Wied., var. *mombinpraeoptans* by the dark spot on the suture between the metathorax and the scutellum. The egg has no neck and is deposited entirely underneath the cuticle of the fruit. The larva has the hairs or rays in the posterior spiracles more numerous, closer together and somewhat less branched. No character has yet been found to distinguish the puparium. An occasional puparium may be formed inside the fruits in which the larvae have developed, a habit which has not been observed in *A. fraterculus* Wied., var. *mombinpraeoptans.*

The adult: Slightly darker than *A. fraterculus* Wied., var. *mombinpraeoptans* and similar in size; ovipositor very slightly longer and wider at the middle, (Fig. 42). Thorax (Fig. 5) dorsally a reddish amber or honey color the median mesoscutal vitta linear and faintly lighter than thorax; lateral and pleural vittae a dull greenish yellow. Pile on dorsal part of thorax all blackish (Fig. 38). A noticeable dark spot on the suture between the metathorax and the scutellum, (Figs. 5, 38 and 39) invariably present. Wing markings (Figs. 2 and 57–60), usually darker and more smoky and in some individuals different in pattern from *A. fraterculus* Wied., var. *mombinpraeoptans.* Basal band dark smoky. S shaped band dark smoky to near the r-m cross vein thence brownish yellow to cell Cu_1. In cell Cu_1 the two dark smoky spots frequently coalesce extending towards the base of the wing. When the basal and the S bands are not connected, the hyaline area between the two bands extends uninterruptedly towards the base of the wing, (Figs. 2 and 60). The connection between the S and the inverted V bands though strong in some individuals (Figs. 2 and 58) may be weak (Figs. 57 and 60) or lacking in others (Fig. 59). In many individuals

([15]) According to Greene the area is hexagonal and the flattened projection is not present, it being specific for *A. striata.*

there are two slightly lighter areas in the basal band on either side of the humeral cross vein. In dried or in specimens preserved in alcohol the spot on the dorsum is always visible.

Described from over 500 specimens reared from the different fruits in which the insect breeds collected in different localities in Puerto Rico including the lower and the higher elevations. Specimens in the collection of the Insular Experiment Station, P. R., reared from guava in 1913 and identified as *A. fraterculus* Wied., have also been studied.

Type.—A single female; (P. R. Ac. No. 45–33), March 20, 1933, Río Piedras, Puerto Rico; reared by F. Seín, Jr., from *Psidium guajava* L. In the U. S. National Museum, Washington, D. C.

Paratypes.—Four female specimens; (P. R. Ac. No. 45–33), March 20, 1933, Río Piedras, Puerto Rico, reared by F. Seín, Jr., from *Psidium guajava* L. In the British Museum, London, England, and at the Insular Experiment Station, Río Piedras, Puerto Rico.

Mounted wings from which the drawings of the variations in pattern, and slides from which the drawings of the posterior spiracles and the hairs or rays were made deposited at the Insular Experiment Station.

The egg: Length, 1 mm., width, 0.3 mm. Spindle shaped, both ends bluntly pointed and one with reticulations which may be indistinct in some cases, (Figs. 11–13). Egg membrane opaque, smooth and glossy. Egg inserted in the fruit just underneath the cuticle, the reticulated end nearest to the cuticle.

Described from mature eggs dissected out of the female flies and from eggs laid in and on fruits in cages in the laboratory.

The larva: Similar in size and color and other characters to that of *A. fraterculus* Wied., var. *mombinpraeoptans* except that the bunches of hairs (rays) in the posterior spiracles are more numerous, closer together and not so branched, (Fig. 18), entrances more frequently convergent; number of tubules in anterior spiracles from 9 to 17, the lowest numbers have been found in rose apple and citrus and the highest also in citrus.

Described from 200 full grown larvae from the same source as the adults.

The puparium: Similar to that of *A. fraterculus* Wied., var. *mombinpraeoptans*. An occasional one may be formed inside the fruits in which the larvae have developed, a habit *A. fraterculus* Wied., var. *mombinpraeoptans* has not been observed to have.

Described from over 200 specimens from the same source as the larva.

Hosts: Guava "guayaba", *Psidum guajava* L.; rose apple, "pomarrosa", *Jambos jambos* L.; tropical almond, "almendra" *Terminalia catappa* L.; kunquat, *Fortunella margarita* (Champ) Swingle; star apple, "caimito", *Chysophyllum cainito* L.; zapodilla, "níspero", *Sapota achras* Mill.; custard apple or bullock's heart, "corazón", *Anona reticulata* L.; and beach plum, "hicaco", *Chrysobalanus icaco* L., occasionally, in the spring and early summer sporadically a few may breed in grapefruit, *Citrus maxima* Merril; sour orange, "naranja agria", *C. aurantium* L.; native and Valencia oranges, "chinas", *C. sinensis* L.

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PLATE X

Fig. 1.—*Anastrepha fraterculus* Wied., var. *mombinpræoptans,* right wing, greatly magnified.

Fig. 2.—*Anastrepha unipuncta* n. sp. right wing, same magnification as fig. 1; notice that the bands are darker and that the basal and the S shaped band are disconnected.

Fig. 3.—*Anastrepha fraterculus* Wied., from Argentina, right wing, same magnification as figs. 1 and 2; notice that the wing is larger than the other two, that the S shaped band and the inverted V bands are more slender and that they are disconnected; in color the Argentinean is similar to the *mombinpraeoptans* variety and both are lighter than *A. unipuncta.*

Fig. 4.—*Anastrepha fraterculus* Wied., var. *mombinpraeoptans,* dorsal view of female adult greatly magnified; notice the three bright longitudinal sulphur yellow stripes on the thorax.

Fig. 5.—*Anstrepha unipuncta* n. sp., dorsal view of thorax, magnification about the same as in fig. 4; notice the dark spot on the suture between the metathorax and the scutellum not present in fig. 4 and that the longitudinal stripes are dull and indistinct.

Fig. 6.—*Anastrepha fraterculus* Wied., var., *mombinpraeoptans,* the end of the egg protruding out of the cuticle of a green fruit, greatly magnified.

Fig. 7.—Same, the end of the egg protruding out of a ripe fruit.

Fig. 8.—Section of a green hog plum, *Spondias mombin* L., to show the egg as it is inserted by the female. In other fruits the egg is inserted in the same manner.

PLATE XI

Fig. 9.—*Anastrepha fraterculus* Wied., var. *mombinpraeoptans,* longitudinal section of egg, greatly magnified.

Fig. 10.—Same lateral view of egg with fruit tissues adhering to it as it usually appears when dissected out of fruits, not so greatly enlarged as Fig. 9.

Fig. 11.—*Anastrepha unipuncta,* n. sp., lateral view of egg showing reticulations at one end, magnification slightly more than Fig. 10 and very much less than Fig. 9.

Fig. 12.—Same, showing slight difference in shape and size.

Fig. 13.—Same, showing some variation in shape and reticulations indistinct.

Fig. 14.—*A. fraterculus* Wied., var., *mombinpraeoptans,* lateral view of head of larva showing: Mth, mouth; Oh, oral hook; a, antenna, ASp, anterior spiracle, greatly magnified.

Fig. 15.—Same, anterior spiracle of mature larva, lateral view, greatly magnified.

Fig. 16.—Same, lateral view of mature larva showing, VFa, ventral fusiform area, and 1 to 11, number of segments, greatly magnified.

Fig. 17.—Same, posterior spiracles of mature larva showing the hairs or rays well spaced and branched and the two entrances above parallel with the lower one obliquely upturned, greatly magnified.

Fig. 18.—*Anastrepha unipuncta,* n. sp. posterior spiracles of the female showing the hairs or rays more abundant, closer together and less branched than in Fig. 17, greatly magnified, entrances convergent.

Fig. 19.—*Anastrepha fraterculus* Wied., var., *mombinpraeoptans,* posterior spiracles of one third grown larva showing the two spiracular plates closer together than in the full grown larva in Fig. 17, but the hairs or rays about the same, greatly magnified.

Fig. 20.—Same, mouth hooks of the full grown larva, lateral view showing the three parts, greatly magnified.

Figs. 21–25.—Same, mouth hooks of full grown larva, first and second parts of different individuals showing variations in the shape, greatly magnified.

Fig. 26.—Same, posterior end of full grown larva showing the tubercles: a and b, in profile, located in one ridge; c and d, in profile, located in two ridges; a and c, in profile, with inner tubercles bifid, greatly magnified.

Fig. 27.—Same, posterior spiracles of the mature larva showing the entrances convergent, hairs or rays not shown, greatly magnified.

Figs. 28–31.—*Anastrepha unipuncta* n. sp., posterior spiracles of the mature larva showing the two upper entrances horizontal and the lower one obliquely upturned, hairs or rays not shown, greatly magnified.

PLATE XII

Fig. 32.—*Anastrepha fraterculus* Wied., var., *mombinpraeoptans,* lateral view of puparium showing: PSp, posterior spiracles; An, anus; Sp, lateral spiracle; P, vertical cleavage line; O, horizontal cleavage line; ASp, anterior spiracle; 1 to 11, number of segments, greatly magnified.

Fig. 33.—Same, lateral view of opened puparium after the emergence of the fly, ASp, anterior spiracle, greatly magnified.

Fig. 34.—Same, dorsal view of puparium showing: Asp, anterior spiracle; Mth, mouth; PSp, posterior spiracle, greatly magnified.

Fig. 35.—Same, ventral view of puparium showing AnP, the anal plate, greatly magnified.

Fig. 36.—Same, posterior spiracles of the puparium showing the broad flattened projection extending down between the upper end of the spiracular plates, greatly magnified.

Fig. 37.—Same, dorsal view of thorax showing the distribution of the dark colored pile, the whitish pile on the median mesoscutal vitta not showing, greatly magnified.

Fig. 38.—*Anastrepha unipuncta,* n. sp., dorsal view of thorax showing the distribution of the dark colored pile and the spot on the suture between the metathorax and the scutellum, greatly magnified.

Fig. 39.—Same, a variation in the shape of the spot between the metathorax and the scutellum, greatly magnified.

Fig. 40.—*Anastrepha fraterculus* Wied., var. *mombinpraeoptans,* external genitalia of the male showing the claspers, greatly magnified. The external genitalia of *A. unipuncta* show identical characters.

Fig. 41.—Same, lateral view of the ovipositor, greatly magnified.

Fig. 42.—*Anastrepha unipuncta,* n. sp., lateral view of the ovipositor, same magnification as Fig. 41; notice the difference in shape and size, Fig. 42 being wider at the middle and slightly longer than Fig. 41.

PLATE XIII

Figs. 43 to 51.—*Anastrepha fraterculus* Wied., var. *mombinpraeoptans,* right wing of individuals showing variations in pattern, somewhat diagrammatic, greatly magnified.

Fig. 43.—Showing the connection between the S and the inverted V bands very weak.

Fig. 44.—The S band widening downwards and the inverted V band widening at the apex to make a wide connection.

Fig. 45.—The S and the inverted V bands connected at two points.

Fig. 46.—A wide connection between the S and the inverted V bands and the two arms of the inverted V band connected along the posterior margin of the wing.

Fig. 47.—Same, but the connection between the two bands still greater.

Fig. 48.—Same, but the arms of the inverted V band disconnected along the posterior margin of the wing.

Fig. 49.—The S and the inverted V bands connected at two points and the arms of the inverted V band connected along the posterior margin of the wing.

Fig. 50.—Same, but the arms of the inverted V band not connected along the posterior margin of the wing.

Fig. 51.—Same, the S and the inverted V bands almost connected near the tip of the wing in a striking manner.

PLATE XIV

Figs. 52 to 56.—*Anastrepha fraterculus* Wied., var. *mombinpraeoptans,* right wing of individuals showing variations in pattern, greatly magnified, somewhat diagrammatic.

Fig. 52.—A very wide connection between the S and the inverted V bands and a striking curve of the outer arm of the inverted V band.

Fig. 53 and 54.—Breaking up of the S and the inverted V bands by vacuoles.

Fig. 55.—The two arms of the inverted V band disconnected somewhat as described for *A. fraterculus* by Wiedemann in Brazil.

Fig. 56.—The two halves of the S band disconnected, a most unusual condition.

Figs. 57–60.—*Anastrepha unipuncta* n. sp., right wing of individuals showing variations in pattern, greatly magnified, somewhat diagrammatic.

Figs. 57 & 58.—A pattern similar to that of *A. fraterculus* Wied., var., *mombinpraeoptans,* (Fig. 1) differing from it only in being darker.

Fig. 59.—The S and the inverted V bands entirely disconnnected, a condition seldom if ever occurring in *A. fraterculus* Wied., var. *mombinpraeoptans.*

Fig. 60.—The basal and the S bands entirely disconnected, a condition not observed in *A. fraterculus* Wied., var., *mombinpraeoptans.*

PLATE X.

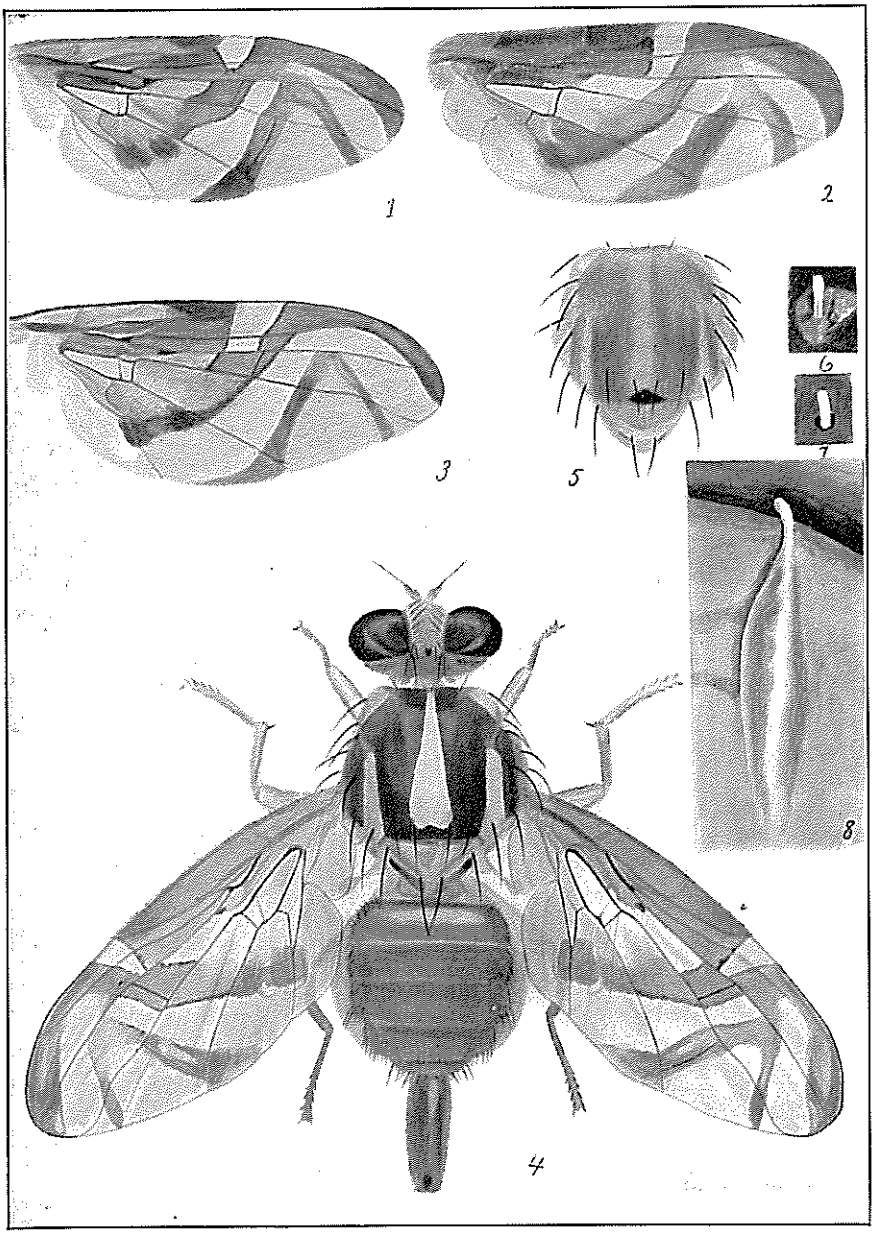

PLATE XI.

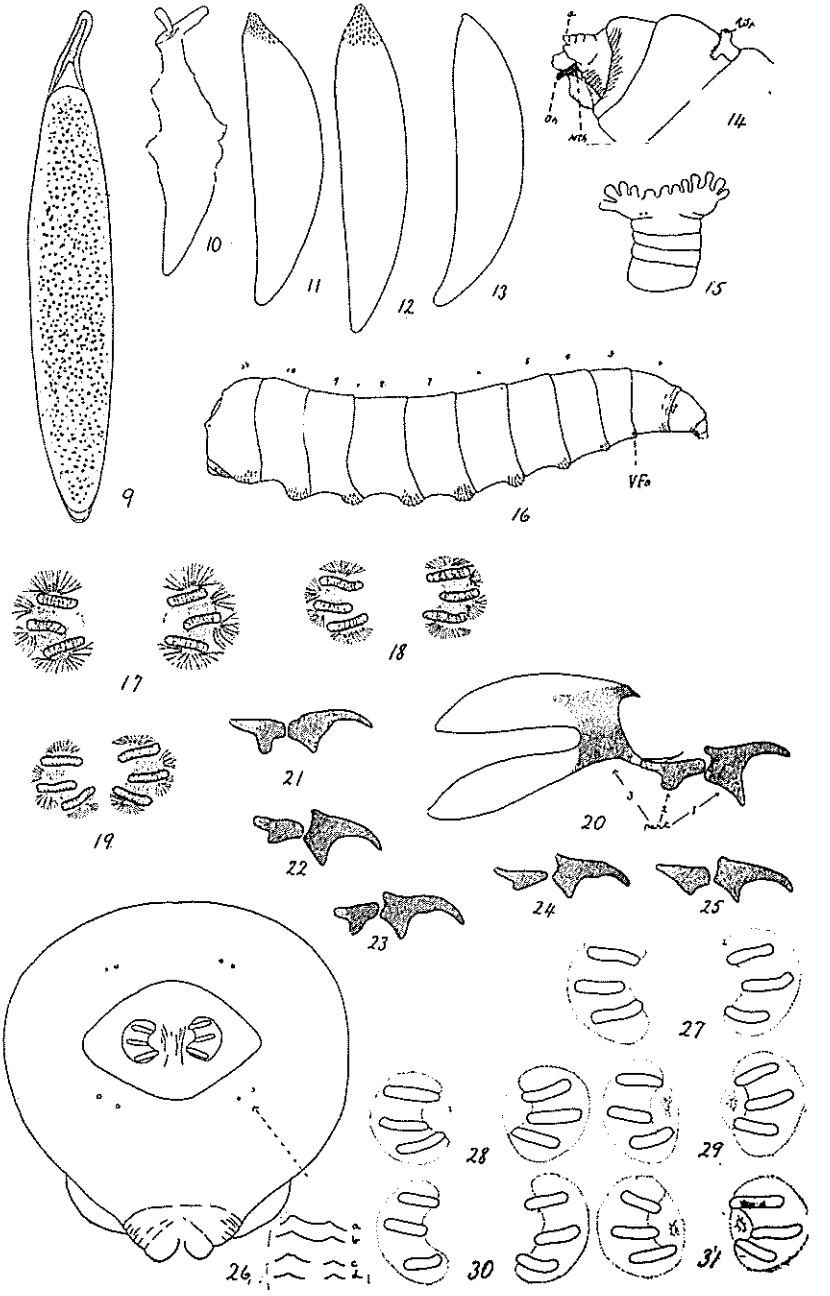

PLATE XII.

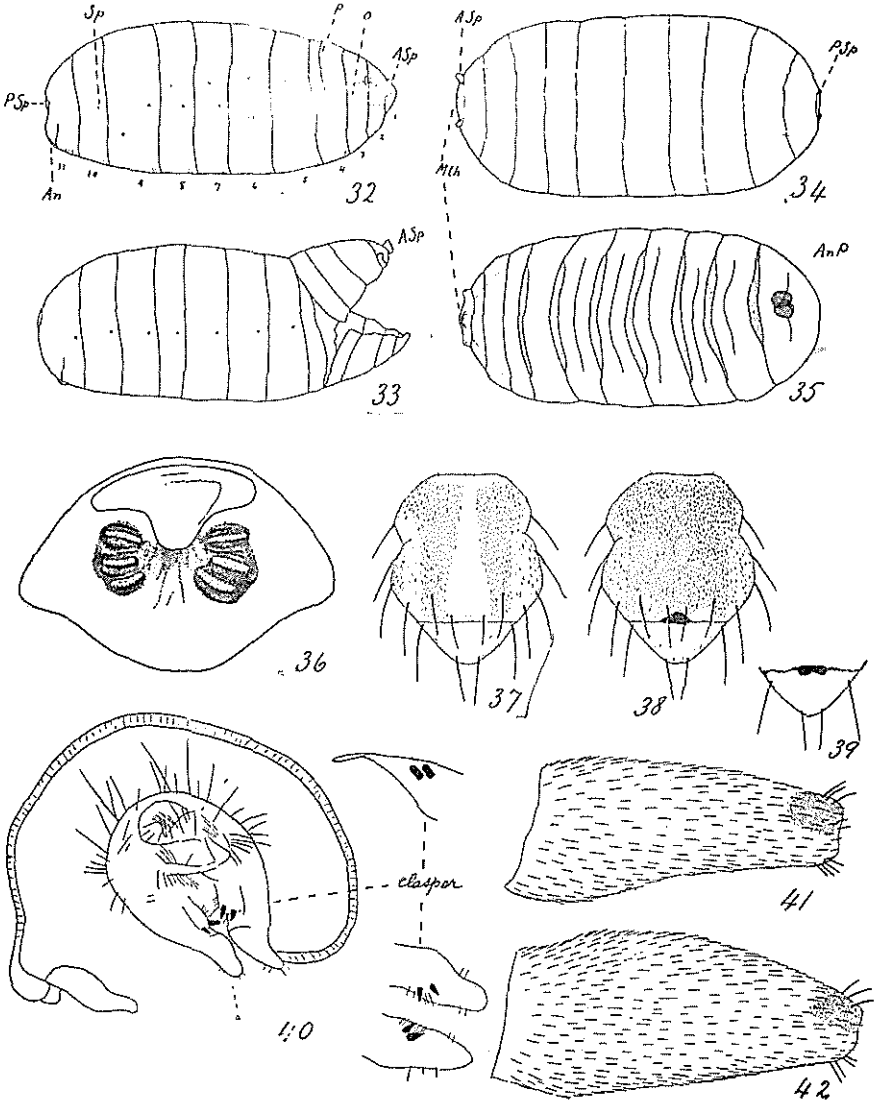
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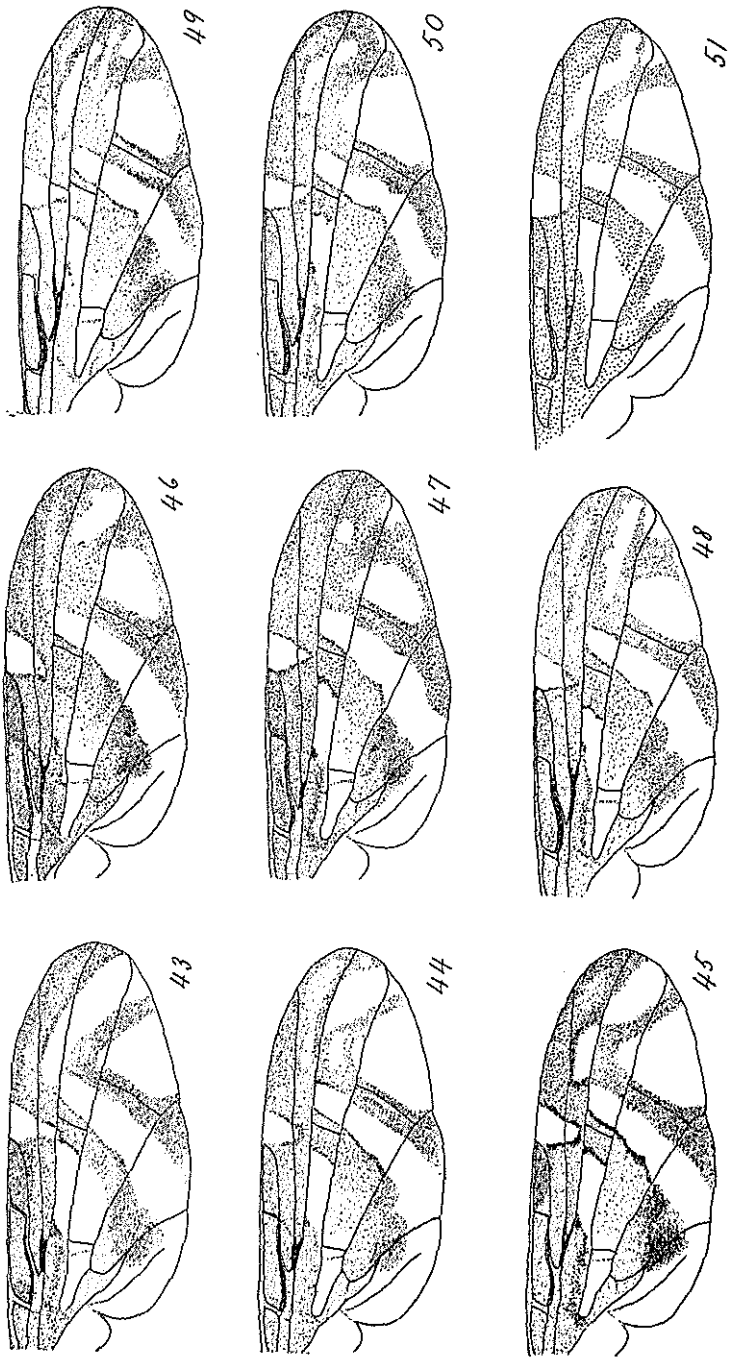
PLATE XIII.



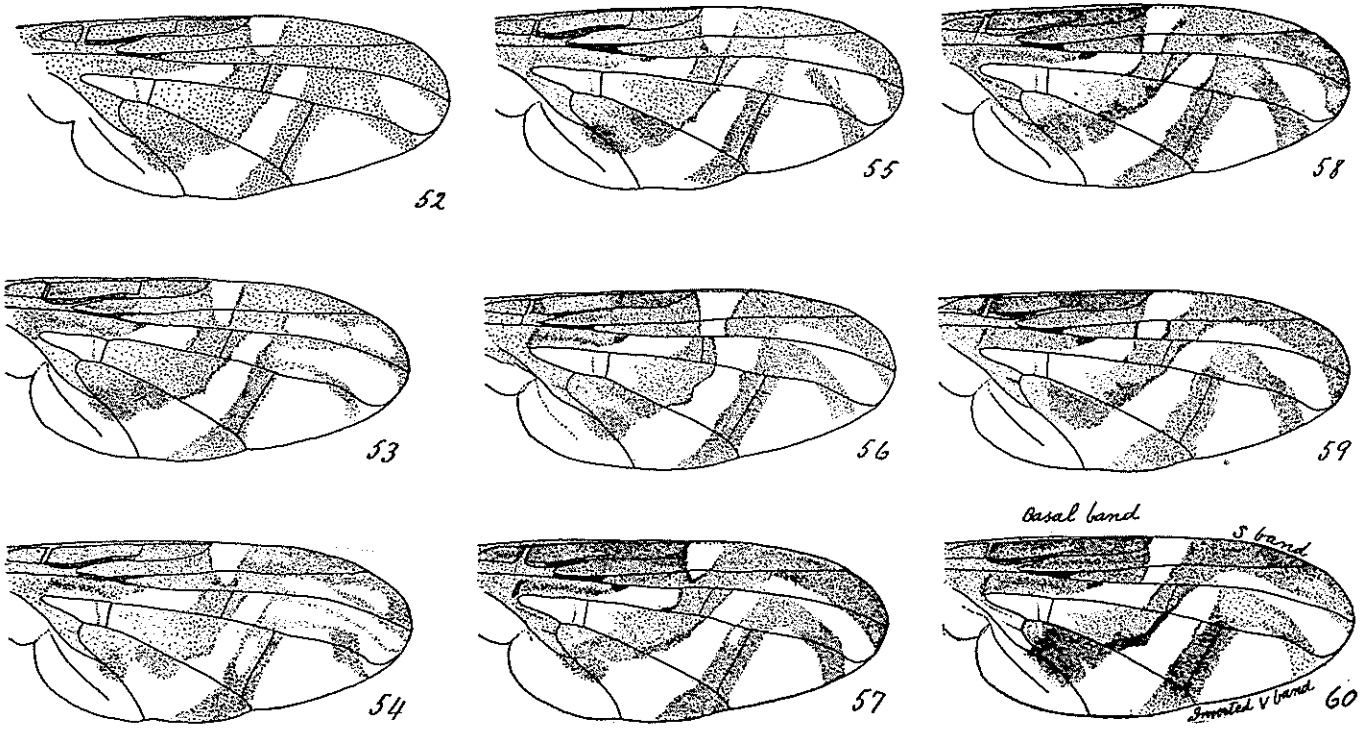


PLATE XIV.