

ANASTREPHA SUSPENSA (LOEW)<sup>1</sup>

(DIPTERA: TEPHRITIDAE)

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SYNONYMS: (TRYPETA) ACROTOXA SUSPENSA (LOEW), ANASTREPHA UNIPUNCTA SEÍN, ANASTREPHA LONGIMACULA GREENE

INTRODUCTION: ANASTREPHA SUSPENSA (LOEW), A NEAR RELATIVE OF THE MEXICAN FRUIT FLY (ANASTREPHA LUDENS (LOEW)), IS ONE OF SEVERAL SPECIES OF FRUIT FLIES WHICH ARE INDIGENOUS TO THE WEST INDIES AND THE LARVAE OF WHICH ATTACK SEVERAL KINDS OF TROPICAL AND SUBTROPICAL FRUITS. WITHIN ITS NORMAL RANGE OF DISTRIBUTION THE ECONOMIC DAMAGE CAUSED BY THIS SPECIES HAS BEEN RELATIVELY SMALL, ALTHOUGH GUAVAS, ROSEAPPLES, AND SURINAM CHERRIES ARE SEVERELY ATTACKED AS A RULE. OVERRIPE ORANGES AND GRAPEFRUIT ON A FEW TREES IN ISOLATED SITES IN PUERTO RICO ARE DAMAGED IN SOME YEARS SUFFICIENTLY TO BE NOTICEABLE IN LATE SPRING, BUT THE SPECIES HAS NOT BEEN CONSIDERED A SERIOUS PEST OF CITRUS IN PUERTO RICO. HOWEVER, A SPECIES OF INSECT, OR A PARTICULAR STRAIN OF THAT SPECIES, SOMETIMES ACTS SUBSTANTIALLY DIFFERENTLY WHEN INTRODUCED INTO NEW AREAS AND MAY BECOME A SERIOUS PEST IN THOSE NEW AREAS. FOR THAT REASON SUSPENSA IS VIEWED WITH SOME CONCERN AS A POTENTIAL PEST OF COMMERCIAL CITRUS, MANGOES, AND PEACHES IN FLORIDA.

A STRAIN OF SUSPENSA, BELIEVED TO HAVE BEEN ESTABLISHED IN FLORIDA FOR MANY YEARS PRIOR TO ITS DISCOVERY THERE, WAS FIRST IDENTIFIED AS OCCURRING IN FLORIDA FROM ADULTS COLLECTED AT KEY WEST IN 1931. ON NOVEMBER 6, 1930, TWO LARVAE, IDENTIFIED AS BEING ANASTREPHA SP., WERE FOUND INFESTING HOG PLUMS IN KEY WEST. TWO ADDITIONAL LARVAE WERE COLLECTED FROM HOG PLUMS ON NOVEMBER 12, AND FIVE PUPAE WERE OBTAINED ON NOVEMBER 12 AND 14 BY SIFTING SOIL. LARVAE AND ADULTS OF A CLOSELY RELATED SPECIES, ANASTREPHA MOMBINPRAEOPTANS SEÍN, WERE REARED AT KEY WEST FROM HOG PLUMS IN SEPTEMBER 1931. ADULTS OF SUSPENSA WERE REARED FROM GUAVAS SOON THEREAFTER. GUAVA SUBSEQUENTLY PROVED TO BE THE PREFERRED HOST OF SUSPENSA IN THE KEY WEST AREA. AN ERADICATION PROGRAM FOR MOMBINPRAEOPTANS AND SUSPENSA IN KEY WEST WAS ESTABLISHED JOINTLY BY THE STATE PLANT BOARD OF FLORIDA AND THE UNITED STATES DEPARTMENT OF AGRICULTURE ON AUGUST 1, 1933. THESE MEASURES CONSISTED PRIMARILY OF THE MAINTENANCE OF HOST-FREE CONDITIONS ON THE ISLAND, PLUS THE APPLICATION OF TARTAR EMETIC SPRAYS AT TWO-WEEK INTERVALS. TRAPS WERE USED TO OBTAIN AN INDICATION OF THE PROGRESS OF ERADICATION.

MEANWHILE INVESTIGATIONS WERE CONDUCTED TO DETERMINE WHAT HOSTS MIGHT BE ATTACKED UNDER CAGED CONDITIONS, AS WELL AS UNDER FIELD CONDITIONS, TO DETERMINE THE RESULTS OF THE CROSSING OF SEVERAL SPECIES OF ANASTREPHA UNDER LABORATORY CONDITIONS, TO WORK OUT THE LIFE HISTORIES OF THE SPECIES FOUND TO OCCUR IN THE FLORIDA KEYS, AND TO DEVELOP CONTROL AND ERADICATION TECHNIQUES. AN EXPANDED DETECTION SYSTEM OF TRAPPING EVENTUALLY SHOWED BOTH SUSPENSA AND MOMBINPRAEOPTANS TO OCCUR THROUGHOUT THE KEYS AND ON THE MAINLAND OVER A FAIRLY EXTENSIVE AREA IN SOUTHERN FLORIDA. THIS RESULTED IN A DISCONTINUATION OF ERADICATION EFFORTS IN JANUARY 1937. DURING THIS PERIOD SUSPENSA WAS NEVER FOUND IN A FIELD HOST ON THE MAINLAND AND WAS REARED UNDER FIELD CONDITIONS ONLY FROM GUAVA IN THE FLORIDA KEYS. UNDER LABORATORY CONDITIONS AT KEY WEST, SUSPENSA WAS REARED FROM NEARLY A DOZEN OTHER HOSTS. IN EVERY CASE THE PREFERRED HOST, GUAVA, WAS PRESENT IN THE CAGE WITH OTHER HOSTS WHICH WERE ATTACKED. IN NO CASE WAS ORANGE, GRAPEFRUIT, OR MANGO ATTACKED. ONLY 19 SUSPENSA ADULTS WERE RECOVERED FROM TRAPS ON THE MAINLAND FROM DADE, BROWARD, AND PALM BEACH COUNTY, ONE IN LEE COUNTY ON PINE ISLAND, AND LESS THAN 200 ON THE FLORIDA KEYS. WITHIN THE FIRST THREE MONTHS FOLLOWING THE DISCOVERY OF SUSPENSA IN FLORIDA IN 1965, MORE THAN 14,000 ADULTS WERE TRAPPED IN DADE COUNTY AND IDENTIFIED BY STATE ENTOMOLOGISTS. IT MAY BE SIGNIFICANT THAT THE STRAIN OF SUSPENSA KNOWN TO BE ESTABLISHED IN FLORIDA DURING THE 1930'S WAS NEVER FOUND INFESTING CITRUS, OR ANY OTHER FRUIT, ON THE MAINLAND. IN CONTRAST A STRAIN FOUND IN PUERTO RICO OCCURS THERE IN LARGE NUMBERS AND ATTACKS A GOODLY NUMBER OF TROPICAL AND SUBTROPICAL FRUITS, INCLUDING CITRUS.

<sup>1</sup> CONTRIBUTION No. 62, ENTOMOLOGY SECTION

ANOTHER INDICATION THAT THE SUSPENSA OF PUERTO RICO HAS DIFFERENT "TASTES" THAN THE FLORIDA STRAIN IS INDICATED BY THE FACT THAT IN PUERTO RICO THIS INSECT HAS BEEN FOUND IN TROPICAL ALMONDS DURING EVERY WEEK OF THE YEAR. AT KEY WEST, WHERE THERE ARE MANY TROPICAL ALMOND TREES, THOUSANDS OF ALMONDS WERE EXAMINED OVER A PERIOD OF YEARS WITHOUT FINDING SUSPENSA. THIS RAISES THE QUESTION AS TO WHAT ASSURANCE THERE IS THAT THE PUERTO RICAN STRAIN, WITH "SOME DEVELOPED TASTE" FOR CITRUS, IF ESTABLISHED IN FLORIDA, WOULD NOT BECOME A MAJOR PEST OF CITRUS IN THE ABSENCE OF ITS PREFERRED HOSTS.

ALTHOUGH NO ERADICATION MEASURES EVER WERE APPLIED ON THE MAINLAND OTHER THAN INSPECTION IN SOUTH DADE COUNTY, THE NATIVE POPULATIONS OF SUSPENSA AND MOMBINPRAEOPTANS APPARENTLY DIED OUT SOME TIME AFTER 1936, AS NOT A SINGLE SPECIMEN OF EITHER SPECIES WAS COLLECTED ANYWHERE IN FLORIDA IN THE FIELD AFTER 1936 UNTIL 1959, WHEN TWO ADULTS OF SUSPENSA WERE TAKEN FROM A TRAP AT KEY WEST. ONE LARVA IDENTIFIED AS SUSPENSA WAS FOUND IN 1964 IN ORANGES IMPORTED FROM HAITI AT A JUICE PLANT IN CENTRAL FLORIDA.

NO POSITIVE CONCLUSIONS CAN BE DRAWN ON THE PREVALENCE OF SUSPENSA IN FLORIDA SUBSEQUENT TO 1936, WHEN THE DETECTION PROGRAM WAS DISCONTINUED. NO SIGNIFICANT TRAPPING WAS CARRIED ON FOR THE DETECTION OF FRUIT FLIES UNTIL 1957, FOLLOWING THE REDISCOVERY OF THE MEDITERRANEAN FRUIT FLY (CERATITIS CAPITATA (WIEDEMAN)) IN 1956 AND ITS SUBSEQUENT COSTLY ERADICATION. DURING THE EARLY 1950's, O. D. LINK, A SPECIAL INSPECTOR FOR THE STATE PLANT BOARD OF FLORIDA, OPERATED 20 MCPHAIL TRAPS IN THE FLORIDA KEYS. THIS LIMITED TRAPPING PROGRAM WAS NOT SUFFICIENT TO PROVIDE CONCLUSIVE EVIDENCE AS TO THE OCCURRENCE, OR LACK OF OCCURRENCE, OF SUSPENSA DURING THAT PERIOD, NOR WAS THE BAIT USED IN THOSE TRAPS A HIGHLY EFFECTIVE LURE FOR SUSPENSA.

ON APRIL 23, 1965, ANASTREPHA LARVAE WERE DISCOVERED IN FRUIT OF SURINAM CHERRY BY A MIAMI SPRINGS HOMEOWNER NEAR THE MIAMI INTERNATIONAL AIRPORT. FOUR DAYS AFTERWARD ADULTS OF ANASTREPHA SUSPENSA WERE COLLECTED AT THIS SITE. INTENSIVE TRAPPING AND FRUIT CUTTING DURING THE NEXT SEVERAL WEEKS INDICATED AN ALARMING BUILDUP OF WHAT APPEARED TO BE A LOCALIZED POPULATION OF SUSPENSA. TRAPPING AND FRUIT CUTTING INDICATED EXTENSIONS OF THIS POPULATION BY MID-JULY AS FAR NORTHWARD AS RIVIERA BEACH AND AS FAR SOUTHWARD AS HOMESTEAD. MANY THOUSANDS OF ADULTS WERE TAKEN IN TRAPS WITHIN A FEW WEEKS, WITH THE HEAVIEST CONCENTRATION AROUND THE ORIGINAL FIND IN MIAMI SPRINGS. AN INTENSIVE FIELD SURVEY SHOWED THAT THE LARVAE WERE ATTACKING A FAIRLY EXTENSIVE LIST OF HOST PLANTS SIMILAR TO THE HOSTS OF THE PUERTO RICAN STRAIN OF SUSPENSA. THERE WERE SEVERAL STRONG INDICATIONS THAT THIS WAS A RECENTLY INTRODUCED STRAIN OF SUSPENSA, RATHER THAN A REAPPEARANCE OF THE OLD NATIVE STRAIN. THE DIVISION OF PLANT INDUSTRY OF THE FLORIDA DEPARTMENT OF AGRICULTURE (FORMERLY THE STATE PLANT BOARD OF FLORIDA) AND THE UNITED STATES DEPARTMENT OF AGRICULTURE EXPANDED THE DETECTION PROGRAM TO OBTAIN MORE INFORMATION ON THE DISTRIBUTION AND ABUNDANCE OF THIS "STRAIN" OF SUSPENSA IN FLORIDA, AND TO DETERMINE WHAT ADDITIONAL KINDS OF FRUIT MIGHT BE SERVING AS FIELD HOSTS. SPRAY OPERATIONS WERE INSTIGATED TO TRY TO CHECK THE FURTHER SPREAD AND INCREASE OF THIS FRUIT FLY. WITH THE FURTHER COOPERATION OF THE DEPARTMENT OF ENTOMOLOGY OF THE UNIVERSITY OF FLORIDA, FIELD EXPERIMENTS WERE SET UP TO TRY TO OBTAIN MORE ACCURATE INFORMATION ON THE SERIOUSNESS OF THE THREAT THIS "STRAIN" OF SUSPENSA MIGHT CONSTITUTE TO FLORIDA CITRUS, MANGOES, AND DOORYARD TROPICAL FRUIT PLANTINGS, AND TO INVESTIGATE IMPROVED METHODS OF DETECTION, CONTROL, AND ERADICATION. RESULTS OF THESE TESTS SHOULD DICTATE THE ADVISABILITY OF CARRYING OUT AN ERADICATION CAMPAIGN IN FLORIDA. TO DATE NO ADULTS HAVE BEEN OBTAIN FROM MANGO OR COMMERCIAL CITRUS. LARVAE HAVE BEEN RECOVERED FROM ONLY 3 MANGOES AND VERY FEW LARVAE IN EACH CASE. MANY ADULTS HAVE BEEN REARED FROM CALAMONDIN AND KUMQUAT, BUT NONE FROM ORANGES OR GRAPEFRUIT. ONE SOUR ORANGE WAS FOUND INFESTED WITH DEAD LARVAE IN MIAMI. SWEET ORANGES AND GRAPEFRUIT GROWING ON TREES AND RIPE FRUIT PLACED IN TREES IN HEAVILY INFESTED AREAS HAVE NOT BEEN INFESTED TO DATE. IT IS TOO EARLY, HOWEVER, TO DRAW FINAL CONCLUSIONS AS TO THE ECONOMIC THREAT WHICH THIS PARTICULAR SPECIES OF FRUIT FLY POSES TO FLORIDA. EXPERIMENTS CURRENTLY IN PROGRESS SHOULD PROVIDE ANSWERS TO SOME OF THE VITAL QUESTIONS.

**DISTRIBUTION:** CUBA, JAMAICA, HISPANIOLA, PUERTO RICO, SOUTHERN FLORIDA. A. SUSPENSA WAS DESCRIBED ORIGINALLY FROM SPECIMENS COLLECTED IN CUBA. NO SATISFACTORY COMMON NAME HAS BEEN ESTABLISHED FOR THIS SPECIES OF FRUIT FLY, SINCE ITS GEOGRAPHIC DISTRIBUTION AND HOST RANGE ARE VERY SIMILAR TO TWO OTHER SPECIES--A. MOMBINPRAEOPTANS SEIN AND A. STRIATA SCHINER. A. SUSPENSA HAS BEEN CALLED UNOFFICIALLY THE CARIBBEAN FRUIT FLY, THE CARIBFLY, AND THE GUAVA FRUIT FLY, WHILE A. MOMBINPRAEOPTANS HAS AN ESTABLISHED COMMON NAME, WEST INDIAN FRUIT FLY.

**HOSTS:** PREFERRED HOSTS INCLUDE PSIDIUM GUAJAVA (COMMON GUAVA), EUGENIA UNIFLORA (SURINAM CHERRY, PITANGA, OR FRENCH CHERRY), SYZYGIUM JAMBOS (ROSEAPPLE), PRUNUS PERSICA (PEACH), AND TERMINALIA CATAPPA (TROPICAL ALMOND)

FIELD HOSTS IN FLORIDA BEFORE 1965: PSIDIUM GUAJAVA (COMMON GUAVA)

CAGED HOSTS IN FLORIDA BEFORE 1965: PSIDIUM SPP. (GUAVA), FORTUNELLA SP. (KUMQUAT), SPONDIAS PURPUREA (MOMBIN), EUGENIA UNIFLORA (SURINAM CHERRY), CITRUS MITIS (CALAMONDIN), SYZYGIUM JAMBOS (ROSEAPPLE), ANNONA CHERIMOYA (JAMAICA APPLE), PRUNUS SP. (WILD PLUM), CARISSA GRANDIFLORA (NATAL PLUM), AND CARICA PAPAYA (PAPAYA)

FIELD HOSTS IN MIAMI IN 1965: EUGENIA UNIFLORA (SURINAM CHERRY), SYZYGIUM JAMBOS (ROSEAPPLE), PSIDIUM GUAJAVA (COMMON GUAVA), PSIDIUM CATTLEIANUM (CATTLEY GUAVA), CITRUS MITIS (CALAMONDIN), FORTUNELLA SP. (KUMQUAT), MALPIGHIA GLABRA (BARBADOS CHERRY), PRUNUS PERSICA (PEACH), MOMORDICA BALSAMINA (BALSAMAPPLE), AND MANGIFERA INDICA (MANGO) (LARVAE ONLY IN MANGO)

GREATER ANTILLES FIELD HOSTS: TERMINALIA CATAPPA (TROPICAL ALMOND), PSIDIUM GUAJAVA (COMMON GUAVA), PSIDIUM CATTLEIANUM (CATTLEY OR STRAWBERRY GUAVA), PSIDIUM GUINEENSE (BRAZILIAN GUAVA), SYZYGIUM JAMBOS (ROSEAPPLE), SYZYGIUM (=EUGENIA) MALACCENSIS (OHIA, MALAYAPPLE, OR MOUNTAINAPPLE), CITRUS GRANDIS (PUMMELO OR SHADDOCK), CITRUS PARADISI (GRAPEFRUIT OR POMELO), CITRUS AURANTIUM (SOOR ORANGE, BITTER ORANGE, OR SEVILLE ORANGE), CITRUS SINENSIS (SWEET ORANGE OR KONA ORANGE), FORTUNELLA MARGARITA (OVAL OR NAGAMI KUMQUAT), CHRYSOBALANUS ICACO (ICACO COCOPLUM), SPONDIAS MOMBIN (YELLOW MOMBIN, JOBO, OR HOGPLUM), CHRYSOPHYLLUM CAINITO (STARAPPLE OR CAINITO), ACHRAS ZAPOTA (SAPODILLA OR CHICLE TREE), MALPIGHIA GLABRA (BARBADOS CHERRY), AND GARCINIA SP. (GARCINIA)

**LIFE HISTORY:** A. SUSPENSA INFESTS ONLY MATURE TO OVERRIPE FRUITS. EGGS ARE LAID SINGLY AND HATCH IN ABOUT 2-3 DAYS; THE LARVAL FEEDING PERIOD OCCUPIES 10-14 DAYS, AND PUPATION ABOUT THE SAME. THESE STAGES ARE PROLONGED IN COOL WEATHER.

**IDENTIFICATION:** SMALL YELLOW-BROWN SPECIES 1/2 TO 2 TIMES LARGER THAN A HOUSE FLY, WITH RATHER LONG, PATTERNED WINGS (FIG. 1). WING BANDS ARE YELLOW BROWN TO BROWN; COSTAL AND S BANDS TOUCHING OR RATHER NARROWLY SEPARATED AT SECOND LONGITUDINAL VEIN (VEIN  $R_{4+5}$ ); IN THE MALE THE INVERTED V BAND IS ALWAYS DISTINCTLY CONNECTED AT ITS APEX WITH THE S BAND; IN THE FEMALE IT IS LESS DISTINCTLY CONNECTED, OR THE CONNECTION MAY BE OBSOLESCENT. THE THIRD VEIN (VEIN  $M_{1+2}$ ) ENDS SLIGHTLY WITHIN OR AT THE JUNCTION WITH THE S BAND AT THE APEX OF THE WING; THIS IS A RELIABLE CHARACTER FOR DISTINGUISHING SUSPENSA FROM FRATERCULUS, STRIATA, AND MOMBINPRAEOPTANS, FOR IN THE LATTER THREE THE S BAND ENDS AT THE APEX OF THE WING INTERMEDIATE BETWEEN THE SECOND AND THIRD LONGITUDINAL VEINS. A DISTINCT SCUTOSCUTELLAR SPOT IS ALWAYS PRESENT IN FLORIDA SPECIMENS, WHEREAS FRATERCULUS AND MOMBINPRAEOPTANS LACK THIS SPOT. GREENE'S LONGIMACULA FROM JAMAICA DIFFERS SLIGHTLY FROM SPECIMENS FROM OTHER PORTIONS OF THE RANGE IN THAT THE SCUTOSCUTELLAR SPOT USUALLY IS ABSENT AND THE COSTAL BAND IS USUALLY SLIGHTLY DARKER THAN THE REST OF THE WING PATTERN; STONE (1942, P. 75) DID NOT CONSIDER THESE DIFFERENCES TO BE SIGNIFICANT, BUT STATED THAT IT MIGHT BE POSSIBLE TO CONSIDER LONGIMACULA AS A JAMAICAN RACE. STONE FURTHER STATED THAT "IN THE NATIONAL MUSEUM COLLECTION ARE 19 SPECIMENS, THE OFFSPRING OF TWO SUSPENSA FEMALES AND TWO MOMBINPRAEOPTANS MALES. THE CROSS WAS MADE AT KEY WEST, FLA. THESE SPECIMENS SHOW CHARACTERS OF BOTH PARENTS AND A WING PATTERN WITH THE V BAND RATHER WIDELY SEPARATED FROM THE S BAND AND THEREFORE SCARCELY AGREEING WITH EITHER. THERE IS ALSO A SPECIMEN REARED BY I. W. BERRYHILL AT SAN JUAN,

P. R., IN AUGUST 1938, WHICH IS THE RESULT OF THE CROSSING OF THE TWO SPECIES. THE WRITER HAS NEVER SEEN ANY SPECIMENS COLLECTED IN THE FIELD THAT AGREED WITH THESE HYBRID SPECIMENS, AND IT IS RATHER DOUBTFUL THAT SUCH CROSSING TAKES PLACE IN NATURE." THE OVIPOSITOR OF THE FEMALE, IN COMPARISON WITH SOME OTHER SPECIES OF ANASTREPHA, IS SHORT, STOUT, THE BASE WIDENED, THE TIP DISTINCTLY NARROWED BEYOND THE OVIDUCT, WITH SERRATIONS RATHER ROUNDED AND OCCUPYING THE APICAL TWO-THIRDS OF THE TIP.

ACCURATE LARVAL IDENTIFICATION OF SUSPENSA AND OTHER SPECIES OF ANASTREPHA IS DIFFICULT, IF NOT IMPOSSIBLE, ON THE BASIS OF CURRENTLY AVAILABLE INFORMATION.

REFERENCES:

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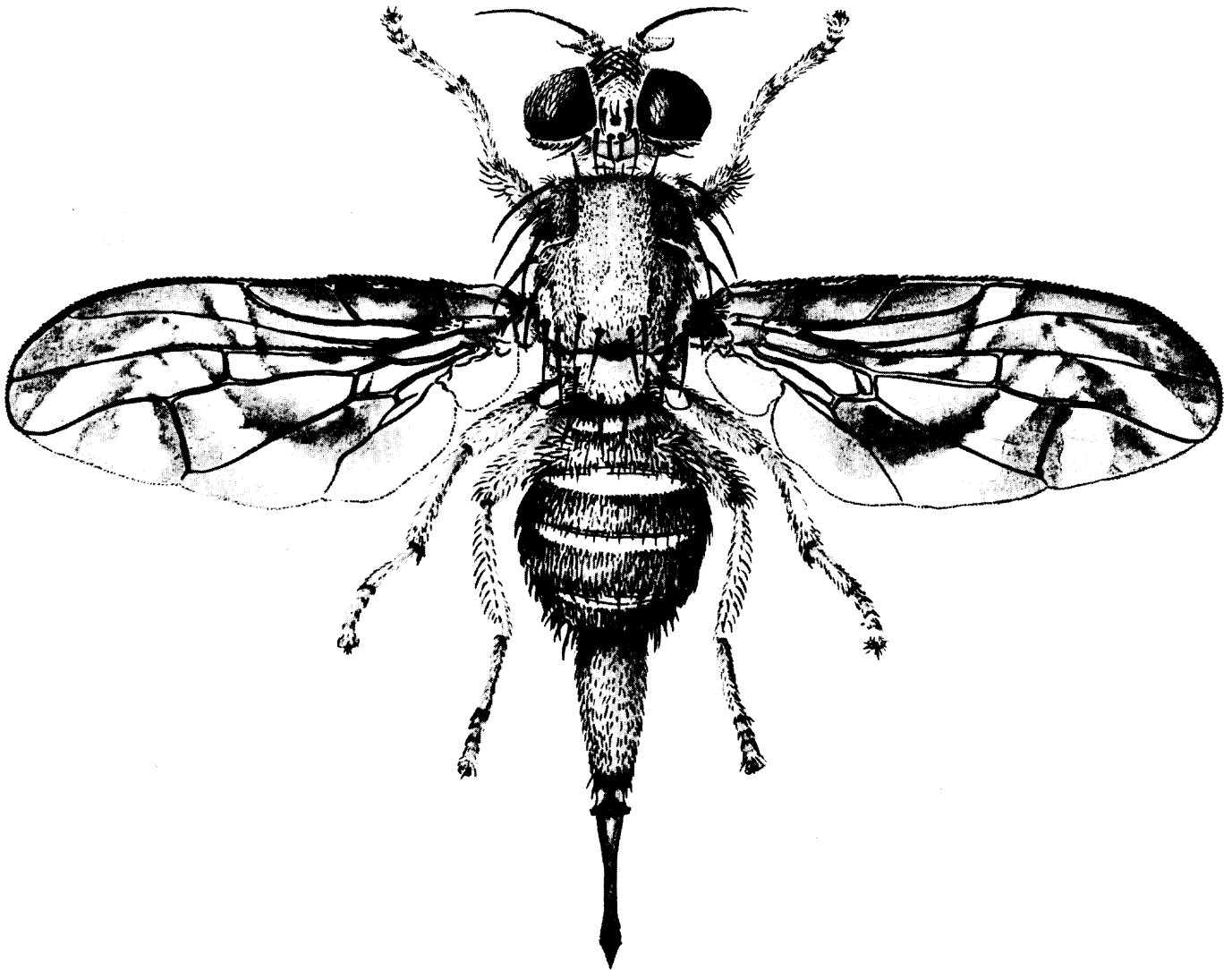


FIG. 1. ANASTREPHA SUSPENSA (LOEW), ADULT FEMALE