

OXIDUS GRACILIS (KOCH) AND ORTHOMORPHA COARCTATA (SAUSSURE),
TWO MILLIPED PESTS IN FLORIDA^{1/}

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SYNONYMY: FONTARIA GRACILIS KOCH 1847, P. 142; OXIDUS GRACILIS (KOCH), COOK 1911, P. 631 (TYPE OF GENUS BY ORIGINAL DESIGNATION).
POLYDESMUS COARCTATUS SAUSSURE 1860, P. 207; ORTHOMORPHA COARCTATA (SAUSSURE), BOLLMAN 1893, P. 149 (TYPE OF GENUS BY ORIGINAL DESIGNATION).

TAXONOMY: THE GENERA OXIDUS AND ORTHOMORPHA ARE PLACED IN THE CLASS DIPLOPODA, ORDER POLYDESMIDA, FAMILY PARADOXOSOMATIDAE. THIS FAMILY HAD BEEN KNOWN FOR MANY YEARS AS THE STRONGYLOSOMIDAE OR STRONGYLOSOMATIDAE, BUT JEEKEL (1963) PRESENTED REASONS FOR RECOGNITION OF PARADOXOSOMATIDAE.

INTRODUCTION: TWO POLYDESMID SPECIES OF MILLIPEDS MOST FREQUENTLY ENCOUNTERED IN FLORIDA GREENHOUSES, NURSERIES, AND HOMES ARE THE HOTHOUSE OR GREENHOUSE MILLIPED, OXIDUS GRACILIS (KOCH) (FIG. 1A), AND THE TROPICAL MILLIPED, ORTHOMORPHA COARCTATA (SAUSSURE) (FIG. 1B). BOTH OFTEN OCCUR IN LARGE NUMBERS, CAUSING CONCERN THAT THEY MAY BE CAUSING SERIOUS INJURY TO PLANTS. MCDANIEL (1931) REPORTED THAT OXIDUS GRACILIS WAS A SERIOUS PROBLEM IN FORCING-HOUSES BECAUSE IT ATE TENDER SHOOTS AND ROOTS OF PLANTS. HOWEVER, EXTENSIVE LABORATORY EXPERIMENTS WITH THIS SPECIES BY CAUSEY (1943) SHOWED NO EVIDENCE THAT EITHER LARVAE OR ADULTS EAT LIVING PLANT TISSUE. BOTH IMMATURES AND ADULTS FEED ON LOAM, MANURE, OR LEAFMOLD. IN NATURE THESE AND OTHER MILLIPEDS HAVE A SHARE IN THE BENEFICIAL WORK OF REDUCING DEAD PLANT MATERIAL TO HUMUS. PRUSSIC ACID AND OTHER CORROSIVE SECRETIONS OF THESE MILLIPEDS MAY AID IN THE PRECIPITATION OF COLLOIDAL SUBSTANCES IN THE HUMUS. BOTH OXIDUS GRACILIS AND ORTHOMORPHA COARCTATA HAVE BEEN ACCUSED OF EATING LIVING PLANTS OR THEIR ROOTS OR TUBERS, BUT PROBABLY THEY WERE EATING THE NECROTIC TISSUE RESULTING FROM INJURIES CAUSED BY MAN OR MACHINES, INSECT OR OTHER ANIMAL BITES OR TISSUE KILLED BY DISEASE. WHILE THEY MAY BECOME SOMEWHAT PESTIFEROUS IN HOUSES OR AROUND OR IN SWIMMING POOLS, THEY DO LITTLE DIRECT DAMAGE, AND THEIR SOIL CONVERSION ACTIVITIES GREATLY OUTWEIGH ANY DAMAGE THEY MAY DO. ANOTHER COMMON CONCERN OF THE HOMEOWNER IS THAT THESE AND OTHER KINDS OF MILLIPEDS MAY BE POISONOUS TO HUMANS. THIS MISTAKEN BELIEF PROBABLY IS DUE TO THE SUPERFICIAL RESEMBLANCE TO THE POISONOUS, MANY-LEGGED CENTIPEDES, BUT MILLIPEDS ARE HARMLESS TO HUMANS. WHILE THEY DO SECRETE FREE HYDROCYANIC ACID FROM REPUGNATORIAL GLANDS, THEY LACK TRUE POISON GLANDS. AS A GENERALIZATION THEY MAY BE DISTINGUISHED FROM CENTIPEDES BY HAVING 2 PAIRS OF LEGS PER BODY SEGMENT, WHEREAS CENTIPEDES HAVE 1 PAIR OF LEGS PER BODY SEGMENT. THE MOUTHPARTS OF MILLIPEDS ARE NOT ADAPTED FOR BITING OR CHEWING, BUT ARE EQUIPPED WITH MINUTE SCRAPERS AND COMBS FOR COLLECTING SOFT, DECAYING MATERIALS. THE ONLY LIVING PLANTS THAT ARE EATEN REGULARLY BY MILLIPEDS ARE THE FLESHY FUNGI.

LIFE HISTORY AND HABITS: OXIDUS GRACILIS AND ORTHOMORPHA COARCTATA, LIKE ALL OTHER DIPLOPODS, ARE ANAMORPHIC, THE LARVAE PASSING THROUGH SEVERAL MOLTS, DURING EACH OF WHICH THE NUMBERS OF LEGS AND POST-CEPHALIC SOMITES ARE INCREASED. ADDITIONAL LEGS AND SOMITES ARE ADDED IN THE EMBRYONIC REGION BETWEEN THE ANAL SOMITE THAT WAS FORMED LAST. IN THE 2 SPECIES TREATED HERE, 7 LARVAL STADIA CAN BE DISTINGUISHED BY DIFFERENCES IN BODY SIZE AND NUMBERS OF POST-CEPHALIC SOMITES AND PAIRS OF LEGS. THE 2ND THROUGH THE 7TH TAKE PLACE IN MOLTING CHAMBERS CONSTRUCTED IN THE SOIL BY THE LARVAE. STUDIES BY CAUSEY (1943) INDICATED THAT UNDER HEATED ROOM TEMPERATURES 148-177 DAYS ARE REQUIRED FOR THE DEVELOPMENT OF THE 7 LARVAL STADIA OF OXIDUS GRACILIS, AND LOWER TEMPERATURES INCREASE THE LENGTH OF THESE PERIODS. DURATION OF EACH STADIUM INCREASES SUCCESSIVELY FROM THE 1ST, WHICH LASTS APPROXIMATELY 24 HOURS, THROUGH THE 7TH, WHICH LASTS 60 OR MORE DAYS AT HEATED ROOM TEMPERATURES, AND THE 8TH (ADULT), WHICH MAY LAST MORE THAN 2 MONTHS. FEMALES OF ALL LARVAL INSTARS FROM THE 4TH THROUGH THE 8TH ARE LARGER AND HAVE 1 MORE PAIR OF LEGS THAN THE MALES. THE EGGS ARE DEPOSITED IN THE SOIL IN CLUTCHES OF 17-300 OR MORE. OVIPOSITION IN GREENHOUSES MAY OCCUR DURING ANY MONTH OF THE YEAR UNDER FAVORABLE CONDITIONS. THIS ABSENCE OF A REGULAR ANNUAL BREEDING SEASON IS TYPICAL OF MANY TROPICAL SPECIES OF ANIMALS. EXPERIMENTS BY CAUSEY (1943) SHOWED THAT QUICK FREEZING TEMPERATURES OVER A PERIOD OF 30 MINUTES ARE FATAL, BUT THAT ADULTS OF OXIDUS GRACILIS SURVIVED SUBMERSION IN WATER 5-7 DAYS. OXIDUS AND ORTHOMORPHA, LIKE MOST OTHER MILLIPEDS, ARE ESSENTIALLY NOCTURNAL, ALTHOUGH ON WARM, OVERCAST DAYS AND DURING PERIODS OF HEAVY RAINFALL, LARGE NUMBERS OF SPECIMENS MAY BE SEEN CRAWLING ABOUT IN THE OPEN.

DESCRIPTION: THE 2 SPECIES ARE VERY SIMILAR IN SIZE AND GENERAL APPEARANCE. EGGS OF BOTH SPECIES DEPOSITED IN THE SOIL ARE CREAMY YELLOW OR OCCASIONALLY BROWN, SPHERICAL OR SUBSPHERICAL, SMOOTH, AND COATED WITH A GLUTINOUS FLUID WHICH CAUSES THEM TO ADHERE IN CLUSTERS OF 17-300 OR MORE. ADULT MALES OF BOTH SPECIES VARY BETWEEN 18.5 AND 20.0MM IN LENGTH AND 2.0 AND 2.2MM IN WIDTH; FEMALES VARY BETWEEN 19.4 AND 22.2MM IN LENGTH AND 2.0 AND 2.5MM IN WIDTH. RECENTLY MOLTED SPECIMENS ARE CREAMY WHITE, BUT BEFORE THEY LEAVE THE MOLTING CHAMBER THE COLOR MAY CHANGE TO LIGHT BROWN. IN OLDER SPECIMENS THE DORSUM IS DEEP CHESTNUT BROWN TO BLACK; THE LATERAL PROJECTIONS, KNOWN AS KEELS OR CARINAE, ARE BORDERED WITH LEMON YELLOW; THE SIDES ARE CHESTNUT BROWN; THE STERNA AND BASAL JOINTS OF THE LEGS ARE PALLID, THE DISTAL JOINTS OF THE LEGS AND THE

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DISTAL END OF THE BODY ARE LIGHT BROWN, AND THE ANTENNAE AND VERTEX OF THE HEAD ARE DARK BROWN. IMMATURES OF THE LATER INSTARS RESEMBLE THE ADULTS, BUT ARE SMALLER, PALER IN COLOR, LACK THE YELLOW COLOR OF THE CARINAE, LACK MATURE MALE ORGANS, OR GONOPODS, AND HAVE FEWER POST-CEPHALIC SOMITES. ADULTS HAVE 20 POST-CEPHALIC SOMITES WHICH BEAR 30 PAIRS OF LEGS IN MALES, 31 PAIRS IN FEMALES. THE GONOPODS, THE PAIR OF HIGHLY MODIFIED 8TH LEGS PRESENT ONLY IN ADULT MALES, PROJECT FROM THE 7TH POST-CEPHALIC SOMITE BETWEEN THE 7TH AND 9TH NORMAL PAIRS OF LEGS. OXIDUS HAS LATERAL MARGINS OF SEGMENT 1 BROAD, ROUNDED, NEARLY AS LONG AS OUTER MARGIN OF SEGMENT 2 WHICH HAS ITS FRONT CORNER EXTENDED FORWARD SOMEWHAT BENEATH THE SIDE OF SEGMENT 1. A REPUGNATORY PORE IS IN THE MARGIN OF EACH LATERAL KEEL OF SEGMENTS 5, 7, 9, 10, 12, 13, 15-19; KEELS OF THE PORELESS SEGMENTS ARE THINNER. THE LAST SEGMENT ENDS IN A PAIR OF SMALL, MORE OR LESS ROUNDED, PROJECTIONS OR TUBERCLES. GONOPODS WITH THE BASE OF OUTER JOINT HEAVY, ENDING IN 2 LONG, SICKLE-SHAPED BLADES (FIG. 2A). ORTHOMORPHA HAS OUTER MARGIN OF SEGMENT 1 ONLY ABOUT HALF AS LONG AS OUTER MARGIN OF SEGMENT 2, STRAIGHT TO SLIGHTLY ROUNDED. FRONT CORNER OF SEGMENT 2 IS NOT EXTENDED FORWARD BENEATH SIDE OF SEGMENT 1. MARGINS OF LATERAL KEELS THICKENED, ESPECIALLY THOSE WITH PORES. LAST SEGMENT ENDING IN 2 JOINTED PROJECTIONS OR TUBERCLES BENT DOWNWARD TO SOME EXTENT. GONOPODS WITH OUTER JOINT LONG, SLENDER, AND ALMOST STRAIGHT (FIG. 2B).

DISTRIBUTION: ORTHOMORPHA COARCTATA IS TROPICOPOLITAN, HAVING ORIGINATED IN THE MALAY ARCHIPELAGO. IT HAS BEEN OR PROBABLY WILL BE FOUND IN OR NEAR MOST LARGE URBAN AREAS OF MEXICO AND CENTRAL AMERICA. IN FLORIDA IT IS RESTRICTED TO THE CENTRAL AND SOUTHERN PORTIONS OF THE PENINSULA, LIKE OXIDUS GRACILIS OCCURRING COMMONLY IN NURSERIES AND IN NATURAL AREAS. IT HAS BEEN REPORTED FROM LOUISIANA AND TEXAS. OXIDUS GRACILIS ORIGINATED IN THE EAST INDIES AND IS COSMOPOLITAN IN GREENHOUSES. IT OCCURS IN THE OPEN IN MUCH OF MEXICO AND CENTRAL AND SOUTH AMERICA AND THROUGHOUT FLORIDA NORTHWARD TO SOUTHERN OHIO. IT IS DISTRIBUTED GENERALLY IN GREENHOUSES THROUGHOUT MUCH OF THE UNITED STATES AND CANADA. IT HAS BEEN FOUND IN 1 CAVE IN PENNSYLVANIA.

CONTROL: WHERE THESE MILLIPEDES OCCUR IN SUFFICIENTLY LARGE NUMBERS TO BE A NUISANCE, THEY MAY BE CONTROLLED WITH BAYGON OR SEVIN. READ LABEL CAREFULLY FOR DOSAGE, APPLICATION DIRECTIONS, AND CAUTIONS REGARDING CONTROL OF MILLIPEDES.

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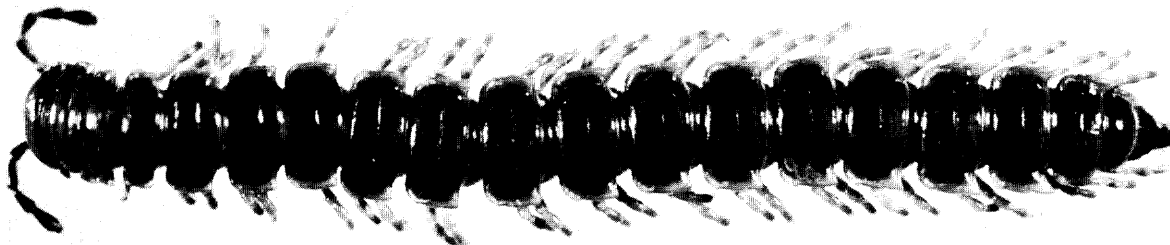


FIG. 1A. OXIDUS GRACILIS (Koch)



FIG. 1B. ORTHOMORPHA COARCTATA (SAUSSURE)

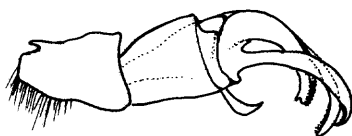


FIG. 2A. MALE GONOPOD OF OXIDUS GRACILIS (Koch)

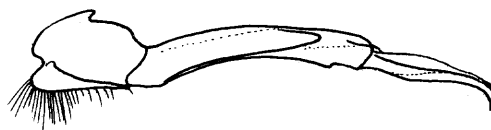


FIG. 2B. MALE GONOPOD OF ORTHOMORPHA COARCTATA (SAUSSURE)