

CAMELLIA MINING SCALE, DUPLASPIDIOTUS CLAVIGER (COCKERELL) <sup>1/</sup>

(DIASPIDIDAE: HOMOPTERA)

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SYNONYM: PSEUDAONIDIA CLAVIGERA COCKERELL, 1901:226

**INTRODUCTION:** CAMELLIA MINING SCALE, DUPLASPIDIOTUS CLAVIGER (COCKERELL) (FIG. 1), AN ARMORED SCALE, WAS DESCRIBED FROM SPECIMENS INFESTING TWIGS OF CAMELLIA SP. COLLECTED IN THE BOTANIC GARDENS, DURBAN, NATAL, SOUTH AFRICA IN 1901. THE FIRST COLLECTION OF THIS PLANT PARASITE IN CONTINENTAL UNITED STATES WAS FROM CAMELLIA SASANQUA THUNB. AT ST. PETERSBURG, FLORIDA IN JANUARY 1962, BY C. B. WRIGHT. A SURVEY DISCLOSED THE SCALE'S DISTRIBUTION TO BE EXTENSIVE IN PINELLAS COUNTY AND LOCALIZED IN HILLSBOROUGH COUNTY. INFESTATIONS WERE FOUND ON PRIVATE AND PUBLIC PROPERTIES, IN 19 COMMERCIAL NURSERIES, AND ON 38 SPECIES OF HOST PLANTS BY DECEMBER 28, 1962. THIS INDICATED THE SCALE WAS NOT A RECENT INTRODUCTION. IN JANUARY 1963, THE ERADICATION PROJECT FOR CAMELLIA MINING SCALE WAS REEVALUATED BY THE DIVISION. EMPHASIS WAS PLACED ON ERADICATION FROM INFESTED COMMERCIAL NURSERIES BY FUMIGATION AND ON AREA CONTAINMENT WITHIN THE INFESTED COUNTIES. PLANT SPECIALISTS INITIALLY SURVEYED PLANTS SUSPECTED OF BEING INFESTED BY SCRAPING STEMS LIGHTLY WITH A FINGERNAIL WHILE LOOKING FOR WHITE SPOTS (FIG. 2). THE WHITE SPOTS, REMNENTS OF THE VENTRAL PROTECTIVE COVER WHICH REMAINS ON THE STEMS, ARE NOT A SPECIFIC DIAGNOSTIC CHARACTERISTIC FOR CAMELLIA MINING SCALE. OTHER ARMORED SCALES ALSO LEAVE A CHARACTERISTIC WHITE SPOT WHEN SCRAPPED FROM THE STEM OF CAMELLIAS. OTHER SCALES MISTAKEN FOR CAMELLIA MINING SCALE INCLUDE PEONY SCALE, PSEUDAONIDIA PAEONIAE (COCKERELL) (FIG. 3); TESSERATE SCALE, DUPLASPIDIOTUS TESSERATUS (GRANDPRE & CHARMOY) (FIG. 4); MINING SCALE, HOWARDIA BICLAVIS (COMSTOCK) (FIG. 5); AND OCCASIONALLY CAMPHOR SCALE, PSEUDAONIDIA DUPLEX (COCKERELL) (FIG. 6).

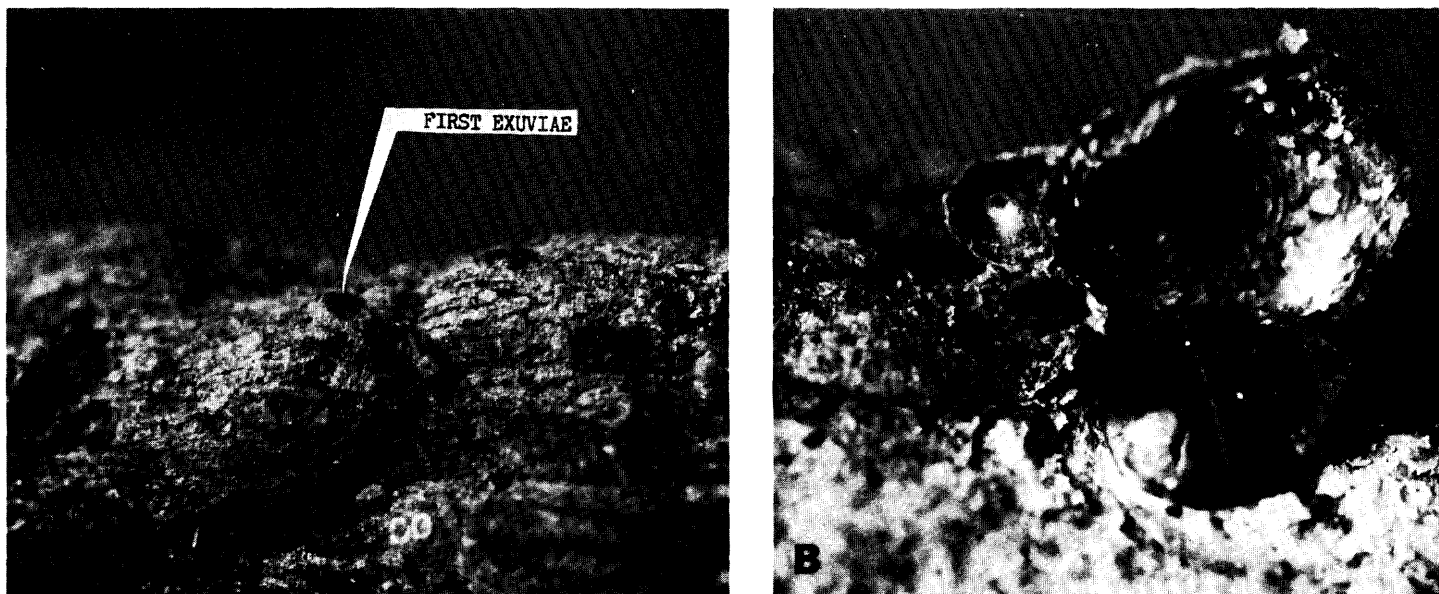


FIG. 1. A) CAMELLIA MINING SCALE, DUPLASPIDIOTUS CLAVIGER (CKLL.), FEMALES ON CAMELLIA STEM (X20); B) SCALE ARMOR RAISED TO EXPOSE THE ADULT FEMALE (X20).

**DESCRIPTION:** THE FEMALE ARMOR IS APPROXIMATELY CIRCULAR, SLIGHTLY CONVEX, GRAY, OPAQUE AND 2MM IN DIAMETER (FIG. 1). CAMELLIA MINING SCALE HAS BEEN DESCRIBED AS A "BURROWING SCALE" BECAUSE THE ARMOR IS ALMOST COMPLETELY COVERED BY THE OUTER LAYERS OF BARK WHICH MAKES IT DIFFICULT TO DETECT. ALL SLIGHTLY RAISED OR "BLISTER-LIKE" AREAS ON THE STEMS REQUIRE CLOSE EXAMINATION WITH A MAGNIFIER FOR THE AMBER-TO-BRONZE COLOR OF THE FIRST EXUVIAE (CAST LARVAL SKIN), WHICH IS USUALLY THE ONLY EXPOSED PART OF THE ARMOR (FIG. 1). A THIN VENTRAL PROTECTIVE COVER OCCURS BETWEEN THE INSECT AND THE BARK. WHENEVER THE INSECT IS REMOVED FROM ITS HOST, THE THIN VENTRAL PROTECTIVE COVER ADHERES FIRMLY TO THE BARK AND IS VISIBLE AS A DINGY, WHITE, IRREGULAR CIRCULAR SPOT (FIG. 2). THE LIVE FEMALE INSECT AND ITS OVAL-SHAPED EGG ARE LIGHT PURPLE.

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DISTRIBUTION: THROUGH DECEMBER 1974, CAMELLIA MINING SCALE HAS BEEN COLLECTED IN 15 FLORIDA COUNTIES. IT IS CONSIDERED ESTABLISHED IN CHARLOTTE, CITRUS, HARDEE, HILLSBOROUGH, MANATEE, OSCEOLA, PASCO, PINELLAS, AND POLK COUNTIES, WHERE IT HAS BEEN COLLECTED MORE THAN ONE TIME. IT HAS BEEN FOUND AT SINGLE LOCATIONS IN ALACHUA, COLUMBIA, HERNANDO, ORANGE, MARION, AND SARASOTA COUNTIES (FIG. 7). THE SCALE HAS ALSO BEEN RECORDED FROM FORMOSA, GUAM, HAWAII, JAPAN, JAVA, PANAMA CANAL ZONE, SEYCHELLES, SOUTH AFRICA, AND TAIWAN. IT HAS BEEN INTERCEPTED FREQUENTLY FROM HAWAII BY USDA PLANT QUARANTINE OFFICIALS AT CALIFORNIA PORTS OF ENTRY.

HOSTS:

ANNONA SP. (CUSTARD APPLE)  
ARTOCARPUS HETEROPHYLLUS LAM. (JACKFRUIT)  
AVERRHOA CARAMBOLA L. (CARAMBOLA)  
BUXUS SP. (BOXWOOD)  
CALLICARPA AMERICANA L. (BEAUTY BERRY)  
CALLISTEMON SP. (BOTTLEBRUSH)  
CAMELLIA JAPONICA L. (CAMELLIA)  
C. SASANQUA THUNB. (CAMELLIA)  
C. SINENSIS (L.) O. KUNTZE (TEA)  
CARYA ILLINOENSIS KOCH (PECAN)  
CESTRUM SP. (JESSAMINE)  
COFFEA SP. (COFFEE)  
CORNUS FLORIDA L. (DOGWOOD)  
DURANTA REPENS L. (GOLDEN DEWDROP)  
EUGENIA JAMBOLANA LAM. (JAVA PLUM)  
E. PANICULATA BANKS (AUSTRALIAN BRUSH CHERRY)  
E. UNIFLORA L. (SURINAM CHERRY)  
FICUS BENJAMINA L. 'EXOTICA' (FIG)  
F. ELASTICA ROXB. (INDIARUBBER FIG)  
QUERCUS SP. (OAK - A SEEDLING)  
RHODODENDRON SPP. (AZALEA)  
RHUS RADICANS (POISON IVY)  
SCHINUS TEREBINTHIFOLIUS RADDI (BRAZILIAN PEPPER-TREE)  
SEVERINIA BUXIFOLIA TEN. (CHINESE BOXORANGE)

F. PUMILA L. (CREEPING FIG)  
F. RELIGIOSA L. (PEEPUL OR BO-TREE)  
F. REPENS (CREEPING FIG)  
FORTUNELLA SP. (KUMQUAT)  
GARDENIA SP.  
ILEX OPACA AIT. (AMERICAN HOLLY)  
JASMINUM SAMBAC AIT. (SAMBAC JASMINE)  
LAGERSTROEMIA SP. (CRAPE-MYRTLE)  
LIGUSTRUM JAPONICUM THUNB. (WAX PRIVET)  
MACADAMIA SP. (MACADAMIA NUT)  
MELALEUCA LEUCADENDRON L. (PUNK TREE)  
MYRCIARIA CAULIFLORA BERG. (JABOTICABA)  
MYRICA SP. (WAX-MYRTLE)  
OSMANTHUS HETEROPHYLLUS (G. DON) (OSMANTHUS, VARIEGATED)  
OSMANTHUS SP.  
PRUNUS CAROLINIANA (MILL.) AIT. (CHERRYLAUREL)  
PSIDIUM SP. (GUAVA)  
PYRACANTHA SP. (FIRETHORN)  
SWIETENIA SP. (MAHOGANY)  
TIBOUCHINA SP. (GLORY BUSH)  
URENA LOBATA L. (CASESAR'S WEED)  
VACCINIUM NITIDUM (HUCKLEBERRY)  
VIBURNUM SUSPENSUM LINDL.



FIG. 2. WHITE SPOTS ON CAMELLIA STEM FOLLOWING REMOVAL OF CAMELLIA MINING SCALE (X20).

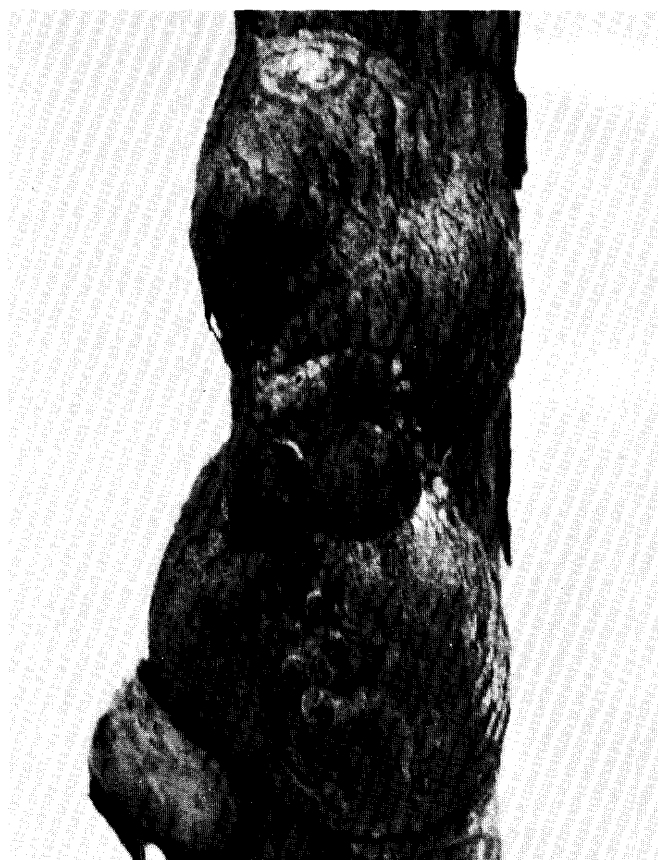


FIG. 3. PEONY SCALE, PSEUDONIDIA PAONIAE (CKLL.), FEMALES ON CAMELLIA STEM (X12).



FIG. 4. TESSERATE SCALE, DUPLASPIDIOTUS TESSERATUS (GRANDPRE & CHARMOY), FEMALES ON CAMELLIA STEM (x16).



FIG. 5. MINING SCALE, HOWARDIA BICLAIVIS (COMSTOCK), FEMALES ON CAMELLIA STEM (x18).



FIG. 6. CAMPHOR SCALE, PSEUDAONIDIA DUPLEX (CKLL.), FEMALE ON CAMELLIA STEM (x20).

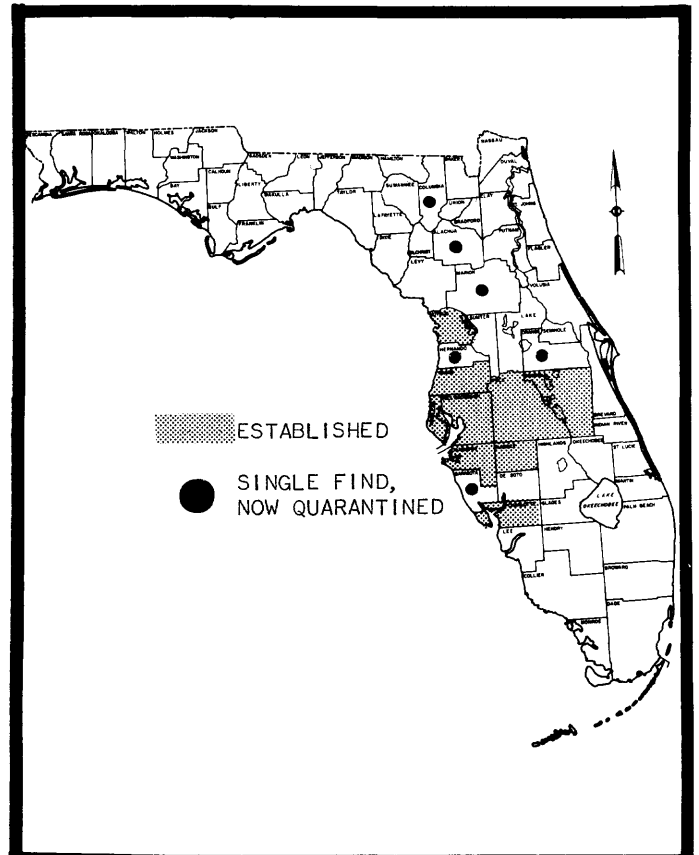


FIG. 7. CAMELLIA MINING SCALE DISTRIBUTION IN FLORIDA.

**ECONOMIC IMPORTANCE:** WHEREVER SEVERE INFESTATIONS ARE ENCOUNTERED THERE IS CONSIDERABLE DIEBACK OF TWIGS AND BRANCHES AND VERY LIMITED NEW GROWTH. HIGH SCALE POPULATIONS AND EXTENSIVE PLANT DAMAGE WERE FREQUENTLY FOUND IN PINELLAS COUNTY ON CAMELLIA JAPONICA, C. SASANQUA, AND LIGUSTRUM JAPONICUM. DISSEMINATION OF THIS SCALE HAS OCCURRED PRIMARILY THROUGH THE MOVEMENT OF INFESTED NURSERY STOCK.

**CONTROL:** APPLY ONE OF THE FOLLOWING INSECTICIDES WHICH HAVE GIVEN GOOD CONTROL. THEY HAVE BEEN REGISTERED FOR USE IN FLORIDA ON ORNAMENTAL PLANTS, AND DOSAGES ARE THOSE RECOMMENDED BY IFAS, UNIVERSITY OF FLORIDA:

DIMETHOATE 267 EC (CYGON OR DE-FEND) AT 1 QUART PER 100 GALLONS OF WATER OR ETHION 46% EC, 1 QUART PLUS 2 QUARTS SUMMER OIL PER 100 GALLONS OF WATER.

**NOTE:** MINING SCALES ARE ESPECIALLY DIFFICULT TO CONTROL BECAUSE THEY ARE SOMEWHAT PROTECTED BY THE ENCIRCLING BARK. SCALE CRAWLERS ARE SOMETIMES TRAPPED BENEATH THE OLD FEMALE. THESE CRAWLERS INSERT THEIR HAIR-LIKE MOUTHPARTS INTO THE HOST AND BEGIN GROWTH; THUS, THE DEVELOPING NYMPHS HAVE THE ADDITIONAL PROTECTION FROM THE OLD FEMALE ARMOR. WHEN APPLYING A CONTROL SPRAY IT IS ESSENTIAL THAT ALL PORTIONS OF THE BARK BE TREATED. BE AWARE THAT DEAD SCALES OFTEN REMAIN ATTACHED TO THE HOST FOR LONG PERIODS OF TIME FOLLOWING CONTROL APPLICATIONS. SCALES MUST BE EXAMINED BY REMOVING THE ARMOR TO DETERMINE IF THEY ARE ALIVE; ADULTS ARE LIGHT PURPLE, LIVE NYMPHS ARE FLESH COLOR. FOR BEST RESULTS IFAS ENTOMOLOGISTS SUGGEST PRUNING ALL DEAD AND INFESTED BRANCHES FROM INFESTED PLANTS IN THE SPRING BEFORE MAKING THE SPRAY APPLICATION.

**REMARKS:** J. K. CONDO, CHIEF, BUREAU OF PLANT INSPECTION, DIVISION OF PLANT INDUSTRY, HAS SUMMARIZED THE DIVISION'S REGULATORY RESPONSIBILITIES AS FOLLOWS: "THE SAME REGULATORY EFFORTS IMPLEMENTED IN 1962 TO PREVENT THE SPREAD OF CAMELLIA MINING SCALE TO NON-INFESTED AREAS OF THE STATE WILL BE CONTINUED. THE DIVISION'S POLICY IS TO PROHIBIT THE MOVEMENT OF INFESTED STOCK OUTSIDE THE HEAVILY INFESTED AREAS OF THE WEST COAST WHERE THE INITIAL INFESTATIONS WERE DISCOVERED. NURSERY STOCK FOUND INFESTED IN ISOLATED AREAS OF OTHER COUNTIES AROUND THE STATE WILL BE QUARANTINED UNTIL EFFECTIVE CONTROL IS ATTAINED."

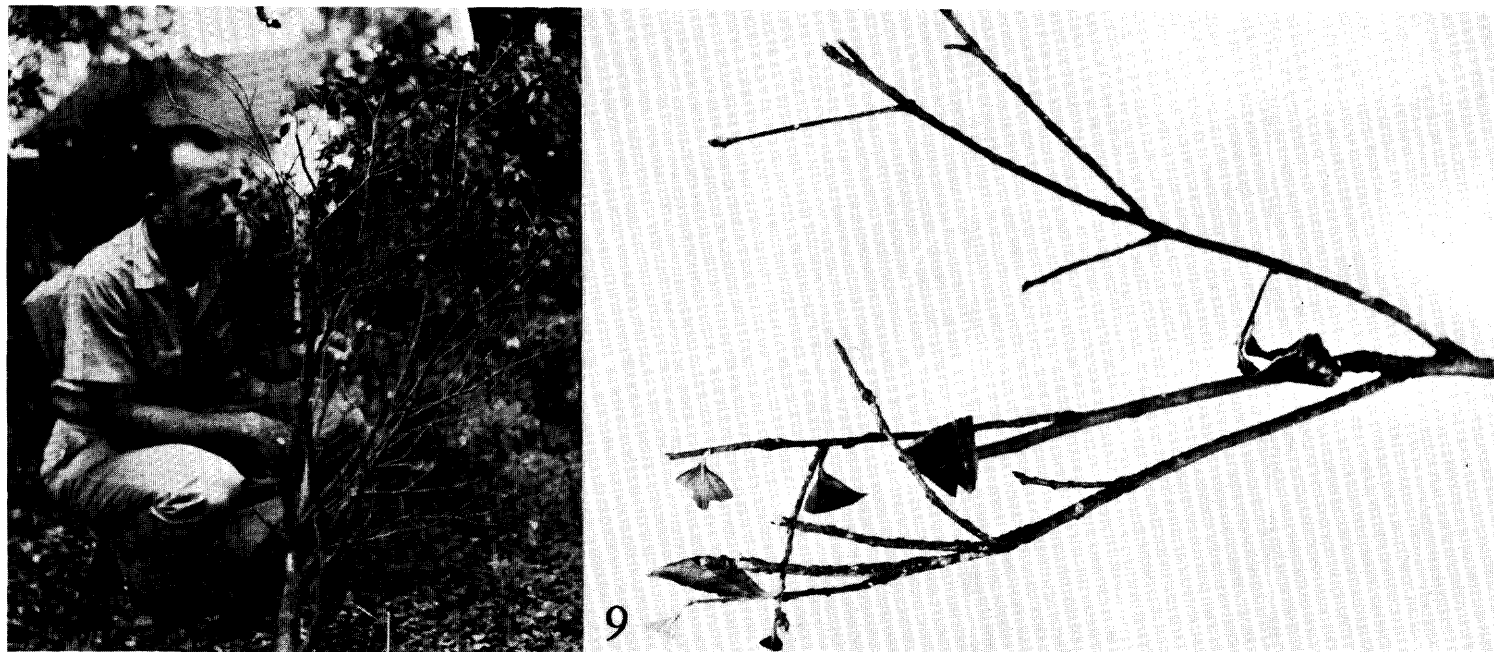


FIG. 8-9: 8) PLANT SPECIALIST MAKING OBSERVATIONS ON DAMAGE TO CAMELLIA SASANQUA BY CAMELLIA MINING SCALE; 9) TERMINAL DIEBACK, CAUSED BY CAMELLIA MINING SCALE.

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