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DESCRIPTION OF THE IMMATURE STAGES AND ADULT GENITALIA OF THE BANANA SCAB MOTH, *NACOLEIA OCTASEMA* (PYRALIDAE: PYRAUSTINAE), FROM NORTH QUEENSLAND

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Abstract: The egg, larva, pupa and adult genitalia of *Nacoleia octasema* from North Queensland are described.

The banana scab moth *Nacoleia octasema* (Meyr.) is an important pest of bananas in the island groups of the Southwest Pacific, the Malay Archipelago and tropical Queensland (Paine 1964).

The need for an extensive taxonomic study of the species is apparent as, at present, geographically separated races with different food plants are considered to form a single species, and workers on the taxonomy of the Pyraustinae agree that *N. octasema* fits no existing genus (Paine 1964). Some characteristics of the egg, larva and pupa were described in general terms by Paine (1964). Although the adult has been described superficially (Meyrick 1886, Leefmans 1916, Paine 1964), no description or figures of the genitalia have yet been published. Descriptions of the external morphology of the egg, larva and pupa, and the genitalia of the adult are presented here.

MATERIALS AND METHODS

All specimens used in this study were collected from banana plants in North Queensland. Eggs were examined and measured using a stereomicroscope with an eyepiece micrometer. All larval instars were examined either as whole specimens in 80% alcohol or as slide-mounted larval skins prepared according to Common (1965), the only modification being the use of acid fuschin stain instead of mercurochrome. Pupae were examined live or preserved in 80% alcohol. Illustrations of larvae and pupae were made using an eyepiece grid and squared paper. The nomenclature used for larval chaetotaxy is that of Hinton (1946) and pupal nomenclature is that of Mosher (1916).

For genitalia studies, entire abdomens were fixed in 80% alcohol or dissected fresh. Before the genitalia were dissected, abdomens were treated with boiling 10% KOH for 10 min. Genitalia were stained in 5% mercurochrome for 2 min. for examination with a stereomicroscope or remained unstained for phase contrast microscopy. Illustrations of genitalia were made with the aid of a drawing tube; nomenclature used for genitalia is that of Klots (1956).

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RESULTS

EGG

Paine (1964) describes the color, shape and surface sculpturing of the egg. The fine sculpturing of the chorion is illustrated in FIG. 1.

Mean length 1.3 mm (range 1.0-1.4 mm); mean width 1.0 mm (range 0.75-1.1 mm).

LARVA

Paine (1964) describes the color and sclerotization of the larva.

Cranium (FIG. 2). Vertical setae slightly diverging posteriorly from medial line. Puncture Va dorsad and slightly laterad from V2. P1 ventrad and slightly mesad from P2. Puncture Pa between P1 and L1, much nearer L1 than

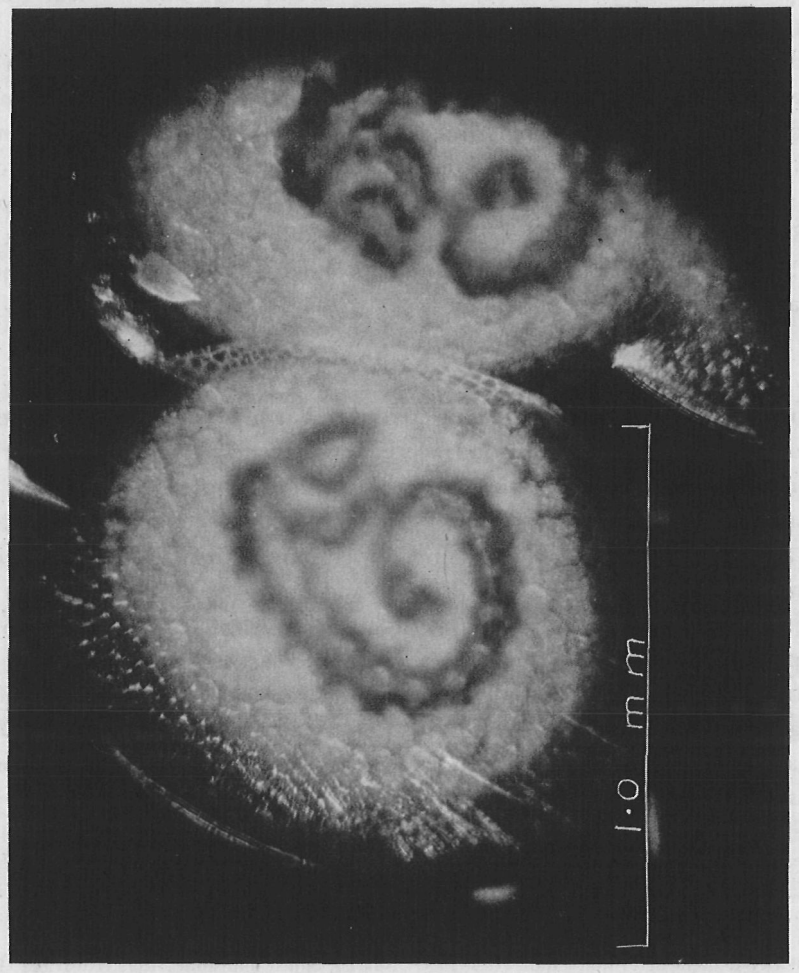

FIG. 1. Egg less than one day old.

P1. Pb between P1 and P2 nearer to and slightly mesad from P2. A1 ventrad and mesad from A2 which is slightly ventrad and mesad from A3. Puncture Aa dorsad and mesad from A2. Frontal puncture Fa mesad and ventrad from F1. F1 shorter than clypeal setae. AFa about halfway between AF1 and AF2. Distance between AF1 and AF2 approximately equal to that between AF1 and F1. AF1 shorter than AF2 which is slightly shorter than F1. C1 and C2 approximately equal in length, with C2 dorsad and mesad from C1. C1 much longer than A2. Puncture Oa anteroventrad from O2 near 6th ocellus. Puncture [not named by Hinton (1946)] between and anterior to 3rd and 4th ocelli. Genal seta (G1) minute with Ga anterodorsad from it. Variations observed: A2, AF2 and O3 duplicated.

Thorax and abdomen (FIG. 3). XD1 longer than XD2. D1 longer than D2 on abdominal segments 1-8; shorter than D2 on 9 and thoracic segments. On thorax, SD2 caudad and dorsad (only slightly dorsad on prothorax) from SD1. SD2 minute on abdominal segments anterodorsad from spiracle. SD1 very slender on meso- and metathorax and 9th abdominal segment. On prothorax, L1 close to, posteroventrad from, and longer than L2. On meso- and metathorax, L1 longest and L2 next longest. L2 ventrad and slightly cephalad from L1 and L3 caudad and slightly dorsad from L1. On abdominal segments 1-7, L3 longest and L1 and L2 subequal in length. On abdominal segment 8, L1 longer than L2. However, on abdomen of 1st-instar larva, L1 longer than L2 on all segments. L1 close to and posterodorsad from L2. L3 considerably separated and ventrocaudad from L2. Subventral setal group unisetose on meso- and metathorax and segments 8-9, bisetose on prothorax and segment 7 and trisetose on segments 1-6. On prothorax, SV1 ventrocaudad from SV2. On abdomen, SV2 and SV3 approximately equal in length. Variations observed: SD2 duplicated on prothorax; SD1 missing on abdominal segment 2; V1 missing on abdominal segment 9. Normal pyralid components of microsetae present. MXD1 situated just behind prothoracic shield midway between D1 and D2. On meso- and metathorax, MD1 near anterior margin on a level between D1 and D2. MSD1 and MSD2 also occur near anterior margin at level of SD1 and SD2. On abdomen, MD1 level with a point midway between D1 and SD1. Crochets arranged in triordinal circle. Numbers vary between 60 and 84. Spiracles oval.

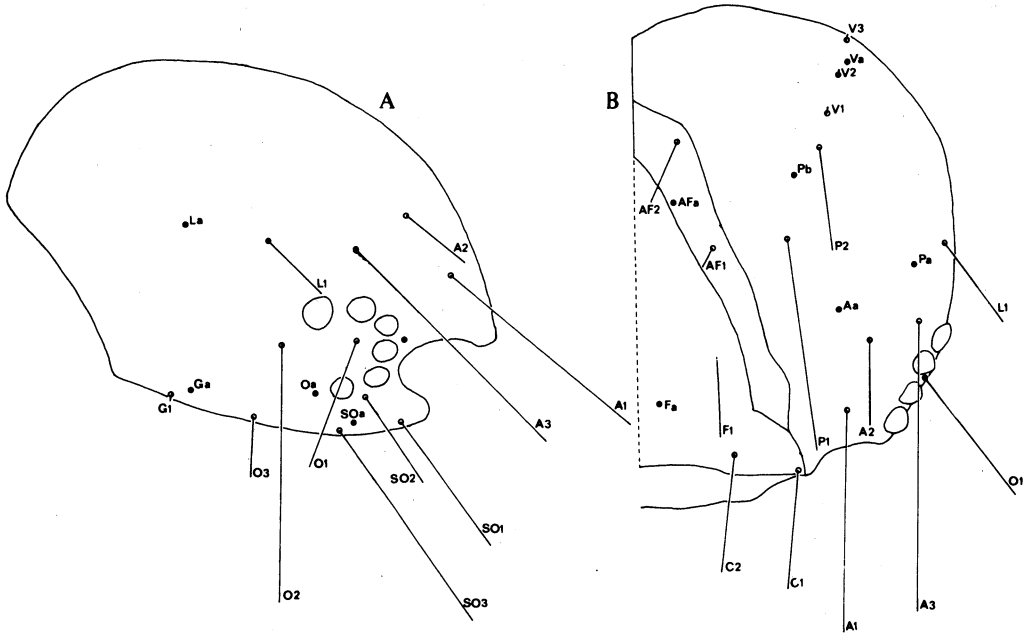

FIG. 2. Chaetotaxy of head of final-instar larva: A, lateral view; B, anterior view. Relative lengths of setae shown.

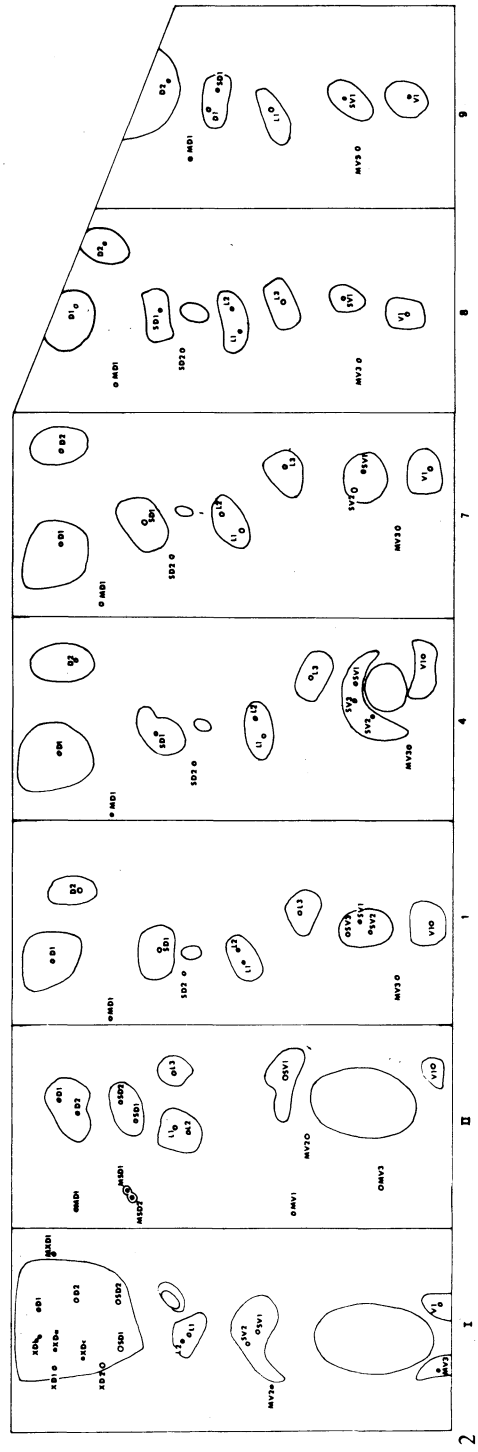

FIG. 3. Chaetotaxy of segments I, II, 1, 4, 7, 8, 9 of final-instar larva.

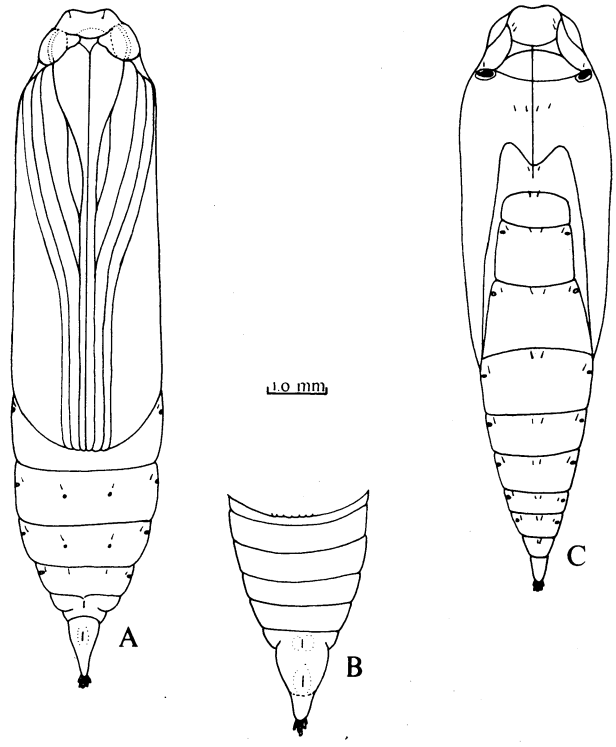

FIG. 4. Pupa: A, ♀, ventral view; B, ♂, abdominal segments, ventral view; C, ♂, dorsal view.

Subprimary setae. Thorax: prothorax, nil; mesothorax, L2 and L3; metathorax, L2 and L3. Abdomen: segments 1-6, L3 and SV3; 7, L3 and SV2; 8, L3; 9, nil.

PUPA

Paine (1964) describes the color, the cremaster and the differences between the sexes of the pupae.

Pupa (FIG. 4) obtect, adecticous. Front slightly produced anteriorly into 2 lobes. Vertex short, epicranial suture continuing caudad into metathorax. Pilifers present; labial palps small, pentagonal. Antennae and maxillae reaching caudal margin of the wings; maxillary palpi small. Mesothoracic spiracle with heavily sclerotized, densely setose margin; caudal margin of prothorax humped above spiracle, bearing series of minute longitudinal ridges. Abdominal segments smooth; spiracles oval and slightly produced except that on segment 8 which is slit-like. Three moveable abdominal segments. Cremaster well developed with 8 hooked setae, the number being constant in 40 specimens examined. ♀ genital opening elongate, longitudinal; ♂ opening between a pair of elevated tubercles. Anal opening slit-like, situated on an ovoid anal rise.

♀: mean length 13.0 mm (range 11.8-14.9 mm); mean width 3.0 mm (range 2.7-3.3 mm).

♂: mean length 11.9 mm (range 11.6-12.2 mm); mean width 2.7 mm (range 2.6-2.8 mm).

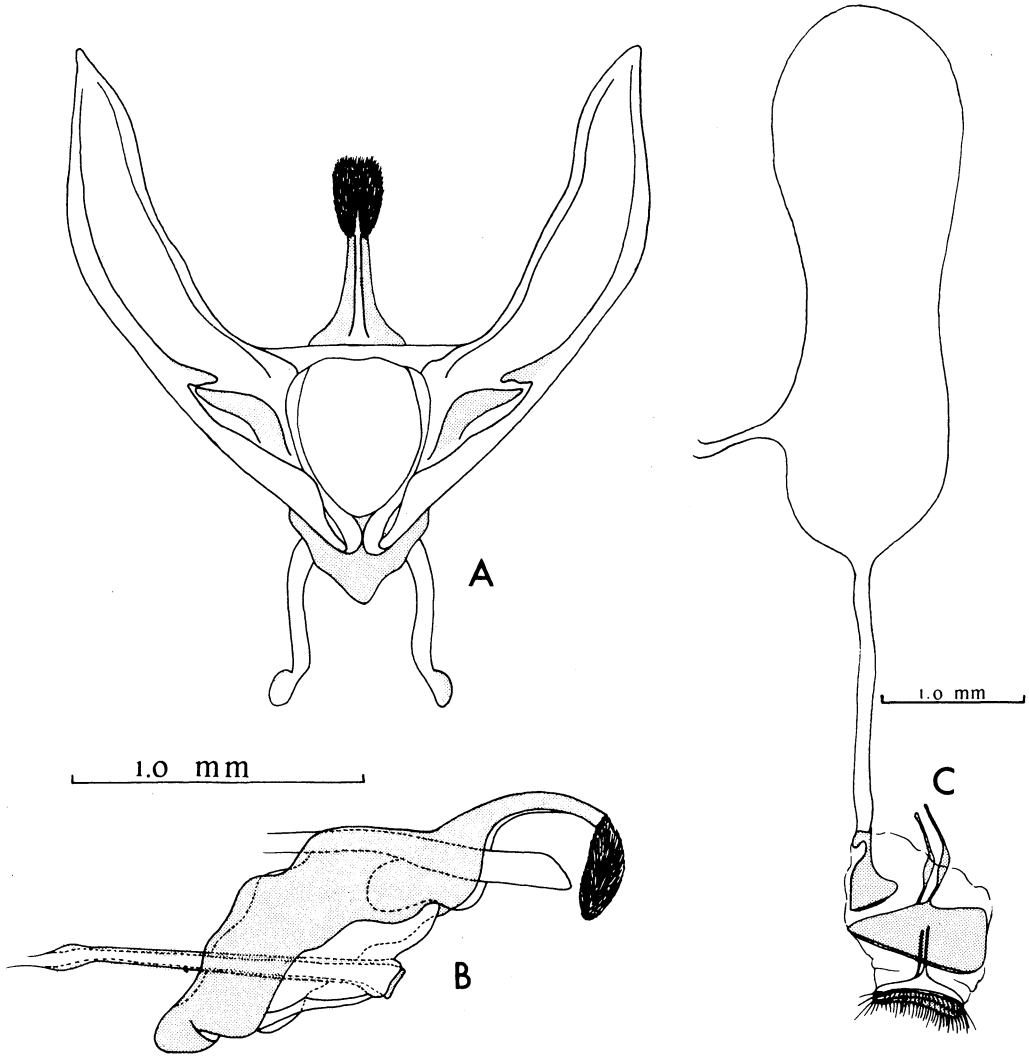

FIG. 5. A-B, adult ♂ genitalia: A, ventral view with tuba analis and adeagus removed; B, lateral view with valvae removed. C, adult ♀ genitalia with periostial area, lateral view.

ADULT

♂ *genitalia* (FIG. 5A,B). Uncus large and curved; apex broad, heart-shaped, densely covered with short setae. Tegumen broad, ridged dorsolaterally. Coremata slender with long posteriorly-directed hairs arising distally to enclose entire genitalia in resting position. Vinculum deep, broad, produced anteriorly into cup-shaped saccus. Transtilla narrow, lightly sclerotized medially, dorsally continuous with tuba analis. Scaphium, subscaphium absent. Valvae long, narrow, tapering from 2/3 length to rounded apex. Costa heavily sclerotized; sacculus large, wider basally with ovoid patch of distally-directed setae. Many setae on mesal face and costal regions with a

somewhat denser row costally, and another apically. Two heavily sclerotized claspers per valva. Proximal clasper lanceolate, distally-directed, approximately 4 × as long as distal clasper. Distal clasper triangular, basally directed. Juxta lightly sclerotized, shield-shaped, anteroventral, between annellus and vinculum; diaphragma otherwise membranous. Penis cylindrical, about 10 × as long as wide, basally rounded, devoid of cornuti.

♀ *genitalia* (FIG. 5C). Papillae anales slender, rounded posteriorly, densely spinose. Ostium bursae deep; ductus bursae long slender and membranous, expanding abruptly into an elongate corpus bursae. Signum absent. Ductus seminalis leaving corpus bursae 1/4 of length from ductus bursae. Lamella antevaginalis membranous with folded and wrinkled surface; lamella postvaginalis large, triangular. Apophyses anteriores long, curving ventrally with expanded area at 1/3 of length at point of curvature. Apophyses posteriores slender, 2/3 length of apophyses anteriores. Receptaculum seminalis bifurcate, opening into oviductus communis opposite ductus seminalis. Glandulae sebaceae opening via ductus into posterior part of vestibulum; vestibulum thick walled, lobular.

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