

## Description and Life Cycle of the Monkeypod-Kiawe Caterpillar, *Melipotis indomita* Walker (Lepidoptera: Noctuidae)<sup>1</sup>

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The monkeypod-kiawe caterpillar, *Melipotis indomita* Walker, was first collected in Hawaii on 8 June 1969 on a building wall in Manoa Valley, Oahu (Beardsley, 1970). During the month, 5 adults were recovered from light traps at Hickam Air Force Base (18 June) and Honolulu Airport (23 June), and adults were also reported in Lihue, Kauai (Hawaii Coop. Insect Report, 1969). By 7 August, the moth had been found on Molokai (Olson, 1970) and on Maui in September (Nakao, 1970).

After the initial discovery, there were numerous reports of larvae and adults on kiawe, *Prosopis pallida* (Humb. and Bonpl.). In August 1970 *M. indomita* larvae, which had previously been reported only from kiawe, were found under loose bark of defoliated monkeypod trees, *Samanea saman* (Jacq.) Merr. along with larvae of the monkeypod moth, *Polydesma umbricola* Boisduval (Summary of Insect Conditions—1970, Hawaii Cooperative Economic Insect Report). Surveys conducted on Oahu, Kauai, Maui, and Hawaii indicated that *M. indomita* was the predominant species of the two. In 1971 the predominant species collected from loose bark of monkeypod trees on Oahu was *P. umbricola* (Summary of Insect Conditions—1971, Hawaii Cooperative Economic Insect Report).

Crumb (1956) placed *M. indomita* into the family Phaelenidae (Noctuidae) and more specifically, the subfamily Catocalinae, Group I. Synonyms include *M. ochreipennis* Harvy (Tietz, 1952), *M. nigrescens* Grote and Robinson (Tietz, 1952), and *Aedia nigrescens* Hubner (Grote and Robinson, 1866).

### MATERIALS AND METHODS

The work described below was conducted in early 1970. Various instar larvae of *M. indomita* were collected at night from kiawe trees located on the University of Hawaii Manoa campus. The larvae were brought to the laboratory and transferred to rearing containers consisting of modified plastic shoe boxes (30.5 x 16.5 x 9.0 mm). Each container was bottom-lined with paper toweling. The center portion of the plastic

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cover was cut out and replaced with nylon organdy for ventilation. Fresh kiawe leaves were provided daily until the last larva had pupated. Adults were held in aluminum-framed screen cages (24 x 24 x 24 cm) and fed a honey-water mixture. Egg masses were removed and held in plastic sandwich boxes (11.5 x 10.5 x 3.5 cm). Early instar larvae were successfully reared in these plastic sandwich boxes. Only fresh young kiawe leaves were fed to these larvae. The temperature and relative humidity of the rearing room were  $25 \pm 3^\circ\text{C}$  and 36-48% respectively.

The modified system of nomenclature used by Peterson (1962) was used in the description of the larval stages of *M. indomita*. All descriptions and measurements were based on live or freshly killed specimens.

#### DESCRIPTION OF LIFE CYCLE STAGES

*Egg.* In the laboratory, the eggs of *M. indomita* were usually deposited as single-layered, irregularly shaped masses. The number of eggs per mass ranged from 2 to 25. The egg is basically dome-shaped, measuring approximately 0.6 to 0.8 mm in diameter. Freshly laid eggs are pearl yellow, although some eggs were observed to have a definite green tint.

Twenty-four hours after being laid brown spots were visible through the reticulated chorion. The color of the egg continued to darken until it was completely brown, 36 to 48 hours later. The larva could be seen moving inside the chorion 60 to 72 hours after the egg was deposited. The larva chewed its way out of the chorion about 72 hours after oviposition.

*Larva.* The following description is of a typical seventh instar larva. Earlier instar larvae have generally the same basic characters with the exception of the marking pattern on the first instar larva.

The head capsule (Fig. 1A) is highly sclerotized, especially around the frontal and adfrontal areas. The sclerotization gradually lessens towards the genal, lateral and caudal margins of the capsule.

The labial palp and spinneret (Fig. 1B, C) are also of considerable importance in the classification system used by Crumb (1956). The labial palp is characterized by possessing an extremely short third segment, and the spinneret is characterized by having a concealed silk pore in a median depression near the apex.

The mandibles (Fig. 1D) are heavily sclerotized and have 5 distinct teeth. The ventral surface of each mandible possesses a prominent dentate retinaculum. The dorsal surface possesses a slightly elevated, sub-circular setal area with two distinct setae.

The cervical shield is divided in half by a gray mid-dorsal line (may appear broken) which extends from the prothorax to the anal shield (Fig. 2A). On each side of this line, there is a gray dorsal band (about 1 mm wide in the 7th instar larva) which extends the entire length of the body.

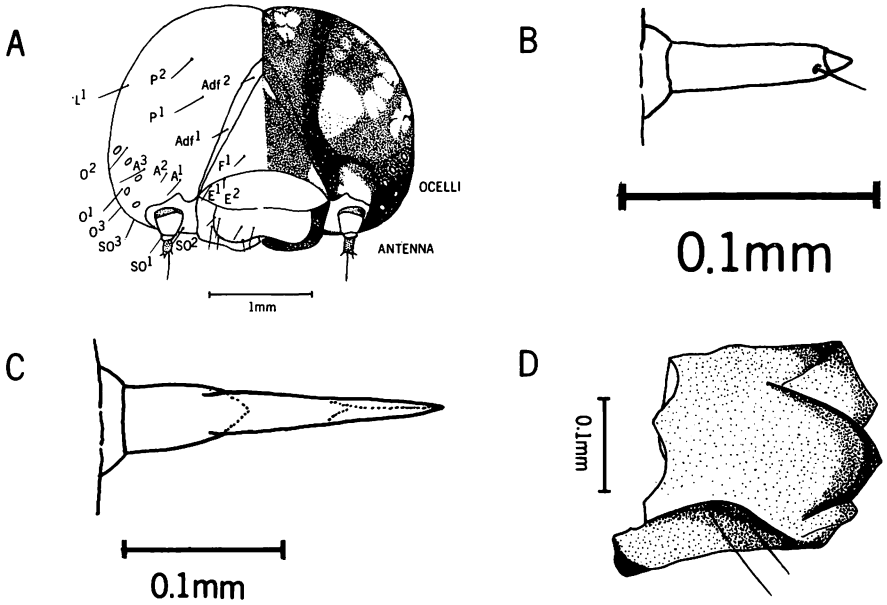


FIG. 1. *Melipotis indomita* Walker. Seventh instar larva. A. Frontal aspect of head capsule; B. Labial palp; C. Spinneret; D. Outer face of right mandible.

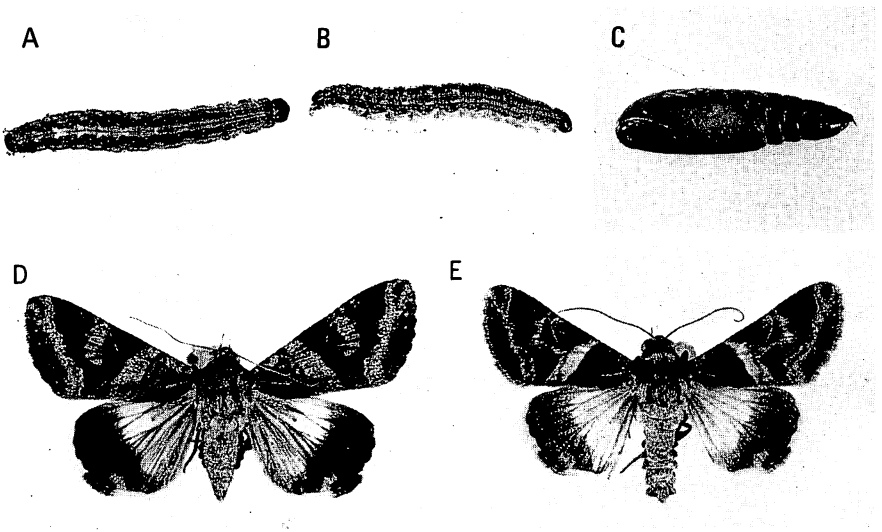


FIG. 2. *Melipotis indomita* Walker. A. Dorsal aspect of seventh instar larva; B. Lateral aspect of seventh instar larva; C. Pupa; D. Female; E. Male.

The sub-dorsal and supra-spiracular areas consist of several light gray, broken lines, also extending the length of the body. A spiracular band (Fig. 2B) (approximately 0.7-0.8 mm wide in the 7th instar larva) originates from the caudal margin of the head capsule and extends to the anal shield. This band encloses the easily distinguishable black spiracles (Fig. 3A, B, C). Under 10X magnification the lines and bands consist of several pigmented areas occurring closely together to give the appearance of a solid line or band to the naked eye. The unpigmented areas appear granulose without any spines or protuberances. The sub-spiracular area is pale with no definite stripes or spots.

The posterior extremity (Fig. 3D) is important in the classification of *M. indomita* into the subfamily Catocalinae. This subfamily is characterized by having the posterior extremity of the venter of abdominal segment 10 with a triangular or elongate median area, impressed or margined by impressed lines (Crumb, 1956).

The setal pattern of the seventh instar larva is shown in Figure 3 (A, B, C). All of the setigerous tubercles, with the exception of 1c, 2c, 4, and 5 of the prothorax and 2b of the meso- and metathorax, are not

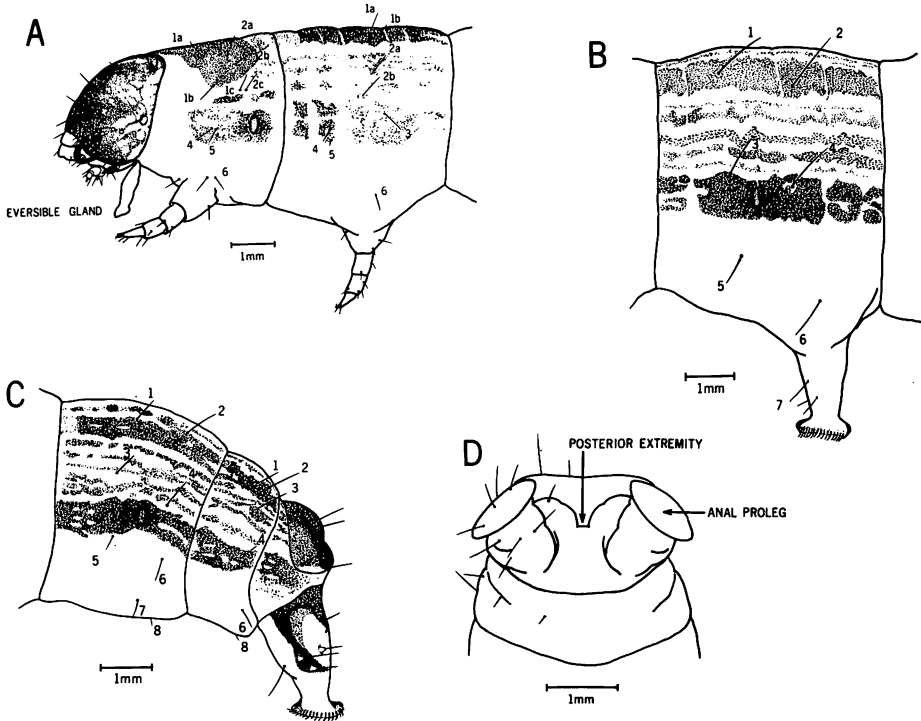


FIG. 3. *Melipotis indomita* Walker. Seventh instar larva. A. Lateral aspect of head, prothorax, and mesothorax; B. Lateral aspect of fourth abdominal segment; C. Lateral aspect of eighth, ninth, and tenth abdominal segments; D. Ventral aspect of tenth abdominal segment.

noticeably sclerotized. It should be noted that seta 3c, one of which is located adjacent to the abdominal spiracles, is not illustrated because of its minute size.

Head capsule width measurements of each instar larva are presented in Table 1. These measurements were used along with laboratory observations to determine the number of larval instars (Dyar, 1890). Table 2 gives the approximate duration of each larval stadium in the *M. indomita* life cycle.

The first instar larva at hatching is approximately 3 mm long. The larva at this time is unpigmented except for the head capsule and the prothoracic shield which are lightly pigmented. Upon feeding the larva takes on a greenish color and eventually turns gray with characteristic black striations. In this stage only the dorsal and spiracular bands are distinguishable. Although the larva has four pairs of ventral prolegs, only the third and fourth are well developed. The larva is generally very active and moves about in a looping manner. In the laboratory the larvae

TABLE 1. Head capsule measurements of the seven larval instars of *Melipotis indomita* Walker.

Larval Instar	Number Measured	Head Capsule Width (mm)		
		mean	SD	range
1	27	0.44	0.051	0.4-0.5
2	98	0.60	0.010	0.6-0.7
3	145	0.99	0.028	0.8-1.3
4	129	1.59	0.138	1.4-1.9
5	120	2.31	0.214	2.0-2.7
6	13	2.98	0.037	2.8-3.2
7	7	3.46	0.113	3.3-3.6

TABLE 2. Duration of the various stages of *Melipotis indomita* Walker.

Stage	Duration in Days
Egg	2.5 to 3
1st larval stadium	3 to 4
2nd larval stadium	3 to 4
3rd larval stadium	3 to 4
4th larval stadium	3 to 4
5th larval stadium	3 to 4
6th larval stadium	4 to 5
7th larval stadium	9 to 10
Prepupa	4 to 5
Pupa	16 to 17
Total Life Cycle Duration (Egg to Adult)	50.5 to 60

were particular in their diet and fed only on fresh, young kiawe leaflets. Feeding imparted a "shot-gun" pattern on the leaflets.

The second instar larva has the characteristic coloration and striated pattern of later instar larvae. The medio-dorsal line is present but distinct only upon magnification. The markings of the sub-dorsal and supra-spiracular areas are clearly visible.

The seventh instar larva (2A, B) is a semi-looper. Its third and fourth abdominal prolegs are smaller than the fifth and sixth prolegs. After approximately 9-10 days, the mature larva encloses itself in a case and becomes sessile. The prepupal case consists of a silk framework which is covered with pieces of litter. The prepupal larva molts into the pupa about 4-5 days after forming the case.

The pupa of *M. indomita* (Fig. 2C) is smooth, hairless, dark brown, and has characteristic cremaster hooks attached to the tip of the tenth abdominal segment. The pupa measures approximately 20 mm in length and 6.3 mm in width.

The adults (Fig. 2D, E) have been described by various authors besides Walker. Sexual dimorphism, which was reported by Grote and Robinson (1866) and Forbes (1954), was also observed in the adults which were studied. Figure 2 (D, E) shows the male and female moths with their wings spread. The wing span of the adults which were studied measured 30 to 38 mm for females and 28 to 36 mm for males.

The following characters can be used to sex the adults. The tip of the abdomen of the male is truncate while that of the female is distinctly pointed. The thoracic legs of both sexes possess various accessory structures such as epiphyses and spurs; however, the male has a prominent brush of hair-like scales on the middle tibiae while the brush is absent on those of the female. The wing pattern of the adult female is similar to that of the male in most respects, but in the female, the medial band and reniform spot are darker in hue and not as easily distinguished as in the male. Zimmerman (1958) illustrates the location of these wing markings.

#### NOTES ON BIOLOGY

Adults were observed in various places in the field. These included walls of buildings, tree trunks, and rocks. The larvae were observed moving up the tree trunks during the early evening and began feeding by nightfall. Feeding apparently continued throughout the night and movement down the tree trunk began at sunrise. The larvae spend daylight hours in holes or cracks in the tree trunk, under loose bark, and in litter at the base of the trunk.

Two specimens of a dipterous parasite were recovered from pupae of field collected larvae. The parasite was determined by J.W. Beardsley to be *Chaetogaedia monticola* (Big.) (Diptera: Tachinidae). Predators observed in the field included birds and wasps (*Polistes* sp.).

LITERATURE CITED

- Beardsley, J. 1970. Notes and Exhibitions. Proc. Hawaiian Entomol. Soc. **20**: 494.
- Crumb, S.E. 1956. The larvae of Phalaenidae. U.S. Dept. Agr. Tech. Bull. **1135**. 356 pp.
- Dyar, H.G. 1890. The number of molts of lepidopterous larvae. Psyche **5**: 420-2.
- Forbes, W.T.M. 1954. Lepidoptera of New York and neighboring states; Noctuidae Part III, Memoir 329. Cornell University Agr. Expt. Sta. New York State College of Agriculture. 433 pp.
- Grote, A.R. and C.T. Robinson. 1866. Lepidopterological notes and descriptions—No. 2. Entomological Society of Philadelphia, Proc. **6**: 1-30.
- Nakao, H. 1970. Notes and Exhibitions. Proc. Hawaiian Entomol. Soc. **20**: 503.
- Olson, F. 1970. Notes and Exhibitions. Proc. Hawaiian Entomol. Soc. **20**: 495.
- Peterson, A. 1962. Larvae of insects, an introduction to Nearctic species, Part I (Lepidoptera and Hymenoptera). Edwards Brothers, Inc., Ann Arbor, Michigan. 416 pp.
- Tietz, H.M. 1952. The Lepidoptera of Pennsylvania, a manual. The Pennsylvania State College, School of Agriculture. 194 pp.
- Zimmerman, E.C. 1958. Insects of Hawaii. Volume 7: Macrolepidoptera. University of Hawaii Press, Honolulu, Hawaii. 542 pp.