

- GRIGORE, M. T. & J. WINDIS. 1994. Decline of the Karner blue butterfly in the Oak Openings of northwest Ohio, pp 135–142. *In* D. A. Andow, R. J. Baker & C. P. Lane (eds.), Karner blue butterfly: symbol of a vanishing landscape. Misc. Publ. 84-1994, Minn. Agric. Exp. Stat., Univ. Minn. St. Paul.
- HAFFERNIK, J. E., JR. 1992. Threats to invertebrate biodiversity: implications for conservation strategies, pp. 171–195. *In* P. L. Fiedler & S. K. Jain (eds.), Conservation biology: the theory and practice of nature conservation, preservation, and management. Chapman and Hall, New York.
- IFTNER, D. C., J. A. SHUEY & J. V. CALHOUN. 1992. Butterflies and skippers of Ohio. Ohio Biol. Surv. Bull. New Series Vol. 9, No. 1. 212 pp.
- METZLER, E. H. & V. P. LUCAS. 1990. An endangered moth in Ohio, with notes on other species of special concern (Lepidoptera: Saturniidae, Sphingiidae, Notodontidae, and Arctiidae). Ohio J. Sci. 90:33–40.
- OPLER, P. A. & G. O. KRIZEK. 1984. Butterflies east of the Great Plains. Johns Hopkins Univ. Press. Baltimore, Maryland. 294 pp.
- PANZER, R. D., D. STILLWAUGH, R. GNAEDINGER & G. DERKOVITZ. 1995. Prevalence of remnant dependence among the prairie- and savanna-inhabiting insects of the Chicago Region. Natural Areas Journal 15:101–116.
- RINGS, R. W., E. H. METZLER, F. J. ARNOLD & D. H. HARRIS. 1992. The owlet moths of Ohio: Order Lepidoptera, Family Noctuidae. Ohio Biol. Surv. Bull. New Series Vol. 9, No. 2. 219 pp.
- SHUEY, J. A., J. V. CALHOUN & D. C. IFTNER. 1987. Butterflies that are endangered, threatened, and of special concern in Ohio. Ohio J. Sci. 87:98–106.
- SHUEY, J. A., E. H. METZLER, D. C. IFTNER, J. V. CALHOUN, J. W. PEACOCK, R. A. WATKINS, J. D. HOOPER & W. F. BABCOCK. 1987. Status and habitats of potentially endangered Lepidoptera in Ohio. J. Lepid. Soc. 41:1–12.
- SWENGEL, A. B. 1994. Observations on the effects of fire on Karner blue butterflies, pp. 81–86. *In* D. A. Andow, R. J. Baker & C. P. Lane (eds.), Karner blue butterfly: symbol of a vanishing landscape. Misc. Publ. 84-1994, Minn. Agric. Exp. Stat., Univ. Minn. St. Paul.
- THOMAS, C. D. & S. HARRISON. 1992. Spatial dynamics of a patchily distributed butterfly species. J. Animal Ecol. 61:437–446.
- ZAREMBA, R. E. & M. PICKERING. 1994. Lupine ecology and management in New York State, pp. 201–208. *In* D. A. Andow, R. J. Baker & C. P. Lane (eds.), Karner blue butterfly: symbol of a vanishing landscape. Misc. Publ. 84-1994, Minn. Agric. Exp. Stat., Univ. Minn. St. Paul.

JOHN A. SHUEY, *The Nature Conservancy, Indiana Field Office, 1330 West 38th Street, Indianapolis, Indiana 46208, USA.*

Received for publication 22 August 1995; revised and accepted 13 July 1996.

Journal of the Lepidopterists' Society
51(3), 1997, 269–271

LIFE HISTORY NOTES FOR THE PALLID EMPEROR MOTH, *CIRINA FORDA* (SATURNIIDAE) IN NIGERIA

Additional key words: phenology, hostplants, Africa.

Cirina forda Westwood has long been known as a serious pest of the sheanut tree, *Vitellaria paradoxa* (Sapotaceae) in Nigeria (Golding 1929). Packard (1914) described the larva, and Boorman (1970) and Leleup and Beams (1969) provided brief accounts of the biology and phenology of this moth. Leleup and Deams (1969) reported *Erythropheum africanum* as a larval host in northern Zaire, but that the tree does not occur in Nigeria. The dried larvae of *C. forda* are referred to locally as “manimani,” and are of economic

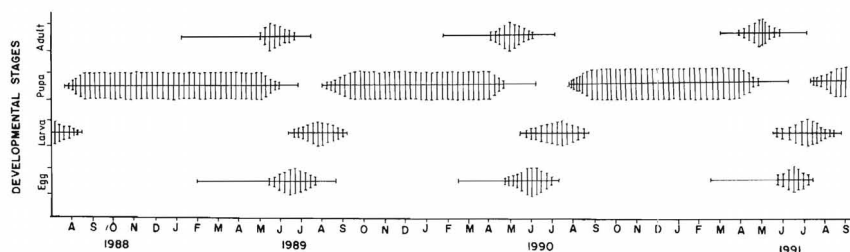
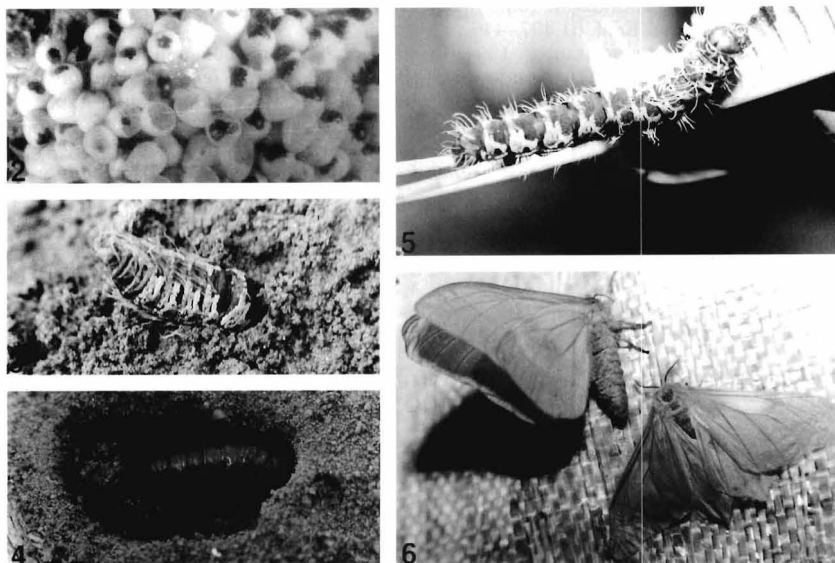


FIG. 1. Phenology of *Cirina forda* in Nigeria, 1988–1991.

importance as a food item among the Nupe tribe of Nigeria. For many decades, wild larvae have been collected, dried and sold to neighboring states within and outside the country, and the insect is considered a delicacy (Ande 1991, Fasoranti & Ajiboye 1993). We report here on the life history and biology of *C. forda* in Nigeria, and its association with *Vittalaria paradoxa*.

About 900 late instar *C. forda* were collected from *V. paradoxa* plants in August 1988, between km 107 and 108 on the Mokwa-Bida road in Niger State, Nigeria (9°05'N, 5°59'E). Subsequently, rearings were conducted in the laboratory at the University of Ilorin between 1989 and 1991. Egg clusters laid in the laboratory were observed daily for hatching. Larvae from the same egg clutch were reared separately on cut and potted twigs of *V. paradoxa* and again on *V. paradoxa* plants outside in an ornamental garden. Twigs were replaced as necessary to maintain freshness, and larvae were transferred carefully by hand and placed on the mid rib or leaf margin of new foliage. A wooden cage (30 cm × 30 cm × 50 cm) with ten compartments was filled to a depth of 20 cm with soil. Ten larvae were then placed in each compartment. As soon as pupation began, the soil was in all compartments examined for pre-pupae and pupae. Pre-pupa duration was defined as the pe-



FIGS. 2–6. 2, egg cluster. 3, pre-pupa. 4, fully formed pupa. 5, late instar. 6, adults (female above, male below).

riod between soil penetration and actual pupation (in days). Subsequently, 30 pre-pupae were randomly selected and placed individually in soil 10 cm deep, each in cylindrical paper eclosion chambers (8 cm diam \times 15 cm deep \times 2 cm thick). The open end of the cylinder was covered with a nylon mesh secured by a rubber band. Each compartment was examined daily for emerging adults. Pupal duration was calculated as the mean number of days between pupal formation and date of adult emergence. Notes were also kept on adult longevity.

Fig. 1 shows the phenology of *C. forda* for the period between 1988 and 1991. Adult moths lived for between 36 and 48 hours (mean = 39.7) and were found primarily in May, with peak oviposition at the end of the month. Figs. 2–6 show the immature stages of *C. forda*. The egg (Fig. 2) hatches after an incubation period of 30 to 34 days (mean = 31.8) into an active and voraciously feeding larva, and passes through 5 to 6 instars (Fig. 5) in 42 to 50 days (mean = 47.5) between June and August. By the first few days in August, most of the larvae reach the pre-pupal stage (Fig. 3) and burrow into the soil. The pre-pupa develops into a pupa (Fig. 4) in 6–7 days and remains in diapause for 9 months (261 to 296 days, mean = 267.5). Adult moths (Fig. 6) emerge in May of the following year.

The life cycle of *C. forda* is tightly linked to the biology of its host, *Vittellaria paradoxa*. The only savannah species of the family Sapotaceae in Nigeria, *V. paradoxa* blossoms fully between May and August when mature fruits become available, and sheds leaves between November and February (Kaay et al. 1964). May and August is when the majority of *C. forda* larvae are developing in the field, and pupation takes place during the dry months of November and April. *C. forda* is univoltine in Nigeria and the phenology reported here agrees with those given by Golding (1929) and Boorman (1978). However, Leleup and Deams (1969) indicate that the active period for *C. forda* in Zaire is between June and September during dry months. In Nigeria, the active periods occur during the wet months of May and August.

ACKNOWLEDGMENTS

We acknowledge a postgraduate fellowship and Senate Research Grant awarded by the University of Ilorin, Ilorin, Nigeria.

LITERATURE CITED

- ANDE, A. T. 1991. Some aspects of the biology of *Cirina forda* Westwood (Lepidoptera: Saturniidae) Unpubl. Ph. D. Thesis, Dept. Biol. Sciences, Univ. Ilorin, Nigeria. 327 pp.
- BOORMAN, J. P. T. 1970. The emperor moths (Saturniidae) of Nigeria. *Nigerian Field* 35:99–122.
- . 1978. *West African Butterflies and moths*. Longman Group Ltd., London. 2nd Ed. 79 pp.
- FASORANTI, J. O. & D. O. AJIBOYE. 1993. Some edible insects of Kwara State, Nigeria. *Amer. Entomol.* 93:113–116.
- GOLDING, F. D. 1929. Preliminary notes on the pests of sheanut tree in Northern Nigeria. *Bull. Dept. Agric. Nigeria* 8:101–103.
- KEAY, R. W. J., ONOCHIE, C. F. A. & D. P. STANDFIELD. 1964. *Nigerian trees*. Dept. Forest Research. Ibadan, Nigeria. 495 pp.
- LELEUP, N. & H. DAEMS. 1969. Les chenilles alimentaires du kwango causes de leur rarefaction et mesures pre-conisees pour y remedier. *J. Agric. Trop. & Botany Appl.* 16:1–21.

A. TAIWO ANDE AND J. OLANIYAN FASORANTI *Department of Biological Sciences, University of Ilorin, P.M.B. 1515, Ilorin, Nigeria.*

Received for publication 6 December 1994; revised and accepted 26 January 1997.

Journal of the Lepidopterists' Society
51(3), 1997, 272–273

SUPPLEMENT TO THE LIST OF THE BUTTERFLIES OF MICHIGAN

Additional key words: HesperIIDae, LycaenIDae, NymphalIDae, faunal surveys, checklists.

The following contribution represents an addition to the previously published faunal lists for Michigan Lepidoptera (Moore 1960, Perkins 1968, Nielsen 1970). Records range from 1941 to the present time, and represent collecting by myself. Two state zones (NLP = Northern Lower Peninsula; SLP = Southern Lower Peninsula) are recognized, and county names are given for individual records. A date with a trailing asterisk represents the earliest date captured whereas a leading asterisk represents the latest date of capture in a zone. Nomenclature follows Hodges (1983).

Erynnis icelus (Scudder & Burgess) (HesperIIDae) SLP: Barry; *June 26
Erynnis horatius (Scudder & Burgess) (HesperIIDae) SLP: Oakland
Cartrocephalus palaemon mandan (Edwards) (HesperIIDae) SLP Oakland; June 20*
Thymelicus lineola (Ochsenheimer) (HesperIIDae) NLP: Newaygo. SLP: Huron
Hesperia sassacus Harris (HesperIIDae) SLP: Barry
Polites coras (Cramer) (HesperIIDae) SLP: Barry
Wallengrenia egeremet (Scudder) (HesperIIDae) NLP: Newaygo
Pompeius verna (Edwards) (HesperIIDae) SLP: *19 August
Poanes hobomok (Harris) (HesperIIDae) SLP: Barry; *July 11
Euphyes bimacula (Grote & Robinson) (HesperIIDae) NLP: Newaygo; *July 15
Euphyes ruricola metacomet (Harris) (HesperIIDae) SLP: *August 19
Papilio polyxenes asterius Stoll (PapilionIDae) SLP: Huron
Papilio troilus Linnaeus (PapilionIDae) NLP: Newaygo
Artogeia rapae (Linnaeus) (PierIDae) SLP: Lapeer, Sanilac, Tuscola
Colias philodice Godart (PierIDae) NLP: Newaygo. SLP: Sanilac, Tuscola; May 4*
Colias eurytheme Boisduval (PierIDae) SLP: Huron, Lapeer, Sanilac, Tuscola
Lycaena phlaeas americana Harris (LycaenIDae) NLP: Newaygo. SLP: *October 1
Hylohycaena hyllus (Cramer) (LycaenIDae) SLP: Tuscola
Epidemia dorcas (Kirby) (LycaenIDae) SLP: June 13, *August 19
Epidemia helloides (Boisduval) (LycaenIDae) NLP: Newaygo
Harkenclenus titus (Fabricius) (LycaenIDae) NLP: Newaygo
Satyrrium edwardsii (Grote & Robinson) (LycaenIDae) SLP: *5 August
Satyrrium caryaevorum (McDunnough) (LycaenIDae) SLP: June 26*
Satyrrium liparops strigosum (Harris) (LycaenIDae) SLP: *August 19
Everes comyntas (Godart) (LycaenIDae) NLP: Newaygo. SLP: Huron
Celastrina ladon (Cramer) (LycaenIDae) NLP: Newaygo
Aglaia milberti (Godart) (NymphalIDae) SLP: Barry
Vanessa virginiensis (Drury) (NymphalIDae) SLP: Barry
Vanessa cardui (Linnaeus) (NymphalIDae) SLP: Huron
Phyciodes tharos (Drury) (NymphalIDae) SLP: Lapeer; *Oct 1
Euphydryas phaeton (Drury) (NymphalIDae) SLP: *August 7
Basilarchia archippus (Cramer) (NymphalIDae) SLP: Tuscola
Cercyonis pegala nephele (Kirby) (Satyridae) SLP: July 3*

LITERATURE CITED

- HODGES, R. W. (ed.). 1983. Check list of the Lepidoptera of America north of Mexico. E. W. Classey Ltd. and The Wedge Entomological Research Foundation. London. 284 pp.
 MOORE, S. 1960. A revised annotated list of the butterflies of Michigan. Occ. Papers Mus. Zool. Univ. Michigan 617:1–39.

- NIELSEN, M. C. 1970. New Michigan butterfly records. *J. Lepid. Soc.* 24:42–47.
PERKINS, O. A. 1968. Addenda to the list of the butterflies of Michigan. *J. Lepid. Soc.* 22:119–120.

OWEN A. PERKINS, 2806 Linwood, Royal Oak, Michigan 48073-3023, USA.

Received for publication 18 February 1997; revised and accepted 5 April 1997.

Journal of the Lepidopterists' Society
51(3), 1997, 273–275

REDISCOVERY OF *LETHE EUROPA TAMUNA* WITH NOTES ON
OTHER THREATENED BUTTERFLIES FROM THE ANDAMAN AND
NICOBAR ISLANDS

Additional key words: Legal protection, status reassessment.

Drawing on data from the IUCN Conservation Monitoring Centre, the United Nations Environment Program (UNEP) (1987) listed six species of butterflies as threatened from the Indian coastal region. Four of these—one species and three subspecies—are endemic to the Andaman and Nicobar islands (Table 1). Three of these taxa have been termed “very rare” while *Graphium epaminondas* Oberthur was termed “locally common” by both Evans (1932) and Ferrar (1948). Khatri (1996) recently reported that two of these taxa, *Lethe europa tamuna* de Niceville and *Neptis sankara nar* de Niceville, were extirpated on these islands. We present here new information on three of the four taxa rated “threatened” from the Andaman and Nicobar islands, including biological notes on the rediscovery of *Lethe europa tamuna*.

Lethe europa tamuna de Niceville (Nymphalidae: Satyrinae). This is one of the rarest butterflies from the islands, being known previously from a single female specimen collected on Little Nicobar. Ferrar (1948) reported observing another female on Great Nicobar some time before he left the islands in 1931. On a collecting trip to Great Nicobar Island in December 1996, the senior author observed four females, and found two eggs and two larvae of this butterfly at three localities in the Campbell Bay area of Great Nicobar. Both the adults and immatures were found along roadsides where the forests had been disturbed by human activity. One of the females was seen resting on moist sand on the banks of a stream. Another female was observed ovipositing on the upper surface of a leaf of the climbing bamboo, *Dinochloa andamanica* Kurz. Eggs were laid on leaves well within the clump, not on the fringes. The larvae (Fig. 1B) were sleeved and observed periodically for about two weeks. They fed and passed through several instars, and confirmed *D. andamanica* as a host plant that supports development. We suspect this butterfly is not as rare as previously thought, but its status can be reliably assessed only after further studies are conducted.

Doleschallia bisaltide andamana Fruhstorfer (Nymphalidae: Nymphalinae). This butterfly has been considered rarer in the Nicobars (Car and Central Nicobar) than in the Andaman islands (Evans 1932, Ferrar 1948). Its cryptic habits have perhaps contributed to an underestimate of its abundance. We have observed eggs, larvae and adults of this butterfly at S. Andaman and at Great Nicobar. The larvae completed their life cycles on the plants on which they were found, when sleeved (see Table 1). We found from 15 to 58 adults feeding on the small white blossoms of medium sized trees of *Ligustrum glomeratum* Blume (Oleaceae) at Chidyatapu (Fig. 1D) in S. Andaman in 1994, 1995 and 1996. At Campbell Bay on Great Nicobar, 16 eggs were observed on *P. album* (Nees) Merr. (located in less than 30 min of search); 3 females were also observed in flight.