(J. Brock, *in litt.*) of early spring breeding near Bakersfield in the San Joaquin Valley (in another year). It is worth noting that populations of *N. milberti* were unusually high in the Sierra Nevada (Nevada, Sierra counties) and the Trinity Alps (Trinity Co.) in late 1977. On 16 August 1977 several dozen fresh individuals were observed on *Monardella* flowers on the south slope of Mount Shasta, 1,425 m. If enough low-elevation records can be accumulated it may be possible to demonstrate regular altitudinal dispersal even in a species so rare that tagging is unlikely to bring significant results.

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HISTORIS ODIUS (NYMPHALIDAE) SUCKING ON COCOA SEEDS (STERCULIACEAE) IN NORTHEASTERN COSTA RICA

Although many genera of the subfamily Nymphalinae in the American tropics suck juices from dung, rotting fruit, and sap flows on trees (e.g., Seitz 1924, Macrolepidoptera of the World, Vol. 5, American Rhopalocera, A. Kernan Verlag, Stuttgart, 615 pp.; Gilbert 1972, Proc. Natl. Acad. Sci. USA, 69: 1403–1407), among the best known for such behavior are *Historis* and *Prepona. Historis odius* Fabricus is a large, robust, and swift-moving species widespread throughout the West Indies, Mexico, and Central and South America (Seitz, op. cit.). Although a familiar species in forest light gaps and borders in tropical rain forest regions generally below 600 m elevation (pers. obs.), *H. odius* adult food records are scarce. From the available literature, one must assume that they feed on rotting fruit, fermenting sap, and dung. While this is very likely the case, I wish to report *H. odius* sucking on the drying seeds of the well known commercially-cultivated, tropical cash crop, *Theobroma cacao* Linnaeus (Sterculiaceae) commonly known as "cacao" or "cocoa."

The farm complex Compañia Agricola Huntro S.A. (CAHSA) includes extensive plantings of cacao. During the latter part of the wet season each year, large quantities of seeds are extracted from pods and placed on drying tables. Before being shipped, the seeds must be dried. In sunny weather this process usually takes 2–3 days, with 4–7 h exposure each day. When extracted from the pods and placed on the drying tables, the 30–40 mm long ovoid seeds are individually encased in a white pulp which is known to be sweet, highly aromatic, and palatable to mammals, which act as dispersal agents (Cuatrecasas 1964, Contribut. U.S. Nat. Herbarium, 35: 379–614), even though the seeds are scentless and tasteless to humans. These properties of the pulp apparently attract small mammals which remove the seeds, suck the pulp, and disperse the seeds (ibid.). Little is known about invertebrates being attracted to the seeds and pulp. Between 30 July and 2 August 1978, I had the opportunity to observe *H. odius* and other insects visiting the freshly extracted and drying seeds (with pulp intact) at "Finca La Tirimbina," a part of the CAHSA complex near La Virgen (220 m elev.), Heredia Province, Costa Rica. Although the weather is generally rainy and overcast at this time of the year, the three days of observation were clear and sunny.

At 1100 h 30 July, I noticed three individuals of *H. odius* sucking on the sticky, moist surfaces of the drying seeds; all of the butterflies were on the same drying table (about 4 × 5 m) and each had its proboscis wedged down between the seeds (Fig. 1). This table was shaded under a roof, and other tables in direct sunlight and containing seeds which had been drying for longer periods had attracted no butterflies or other insects. Other insects seen on the shaded table included one freshly eclosed *Hamadryas februa*

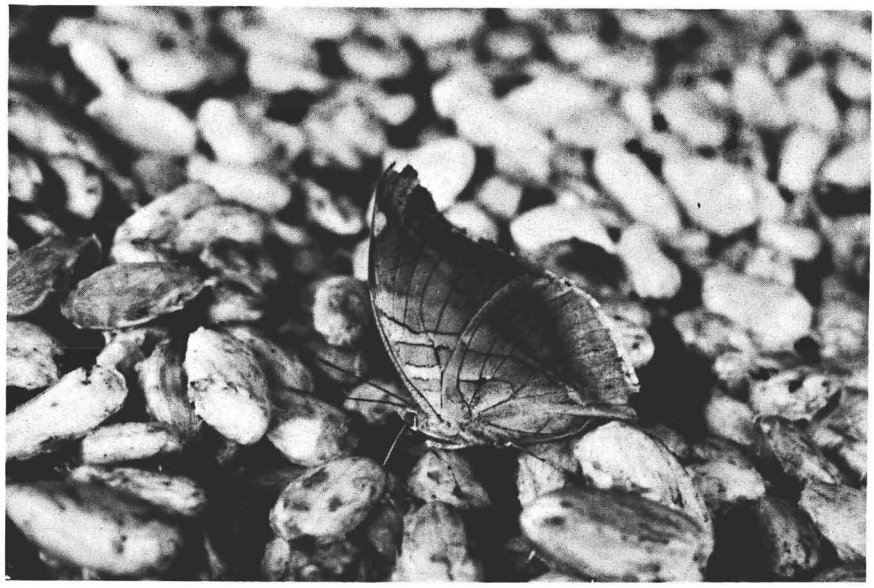

FIG. 1. *Historis odius* sucking on the moist pulp of cacao seeds on a drying table at "Finca La Tirimbina," La Virgen, Heredia Province, Costa Rica (30 July 1978, 1130 h).

(Nymphalinae) and many *Trigona* bees (entirely black species). Intermittently throughout this day and the next one, I noticed that the *H. odius* adults were present, usually 1–3 at any one time. One adult was very tattered while the other two appeared freshly eclosed. The latter were extremely wary and would take flight at the slightest disturbance, while the tattered individual was more sedentary and could be photographed. Typically when disturbed, an adult would fly off and perch on a nearby fence or roof top, only to return to the seeds within 5–20 min. Although all three adults perched on the seeds within a meter of each other, there were no interactions (aggressive or otherwise) among them. Because of its distinctive and easily recognizable wind damage, the tattered butterfly seen over a two-day period was assumed to be the same individual; possibly the same is true for the two fresh adults. By the third day, the seeds were very dry and the butterflies (and the other insects) ceased to visit them. On the first day of observation, the seeds were placed on the table by 0800 and had been drying only a few hours when the butterflies first appeared. During the first day, one fresh male of *Morpho peleides* fluttered around the seeds. As my observation periods were inconsistent, it is not known how many other butterflies exhibited an interest in the seeds. It was clear that *H. odius* was feeding on the moist pulp around the seeds. The drying seeds were highly aromatic to me and to others in the area, presumably the result of a fermentation process brought on by the drying process.

Owing to the relative inaccessibility of these seeds under natural conditions (encased in a tough pod or pulp quickly eaten by vertebrates), the pulp is probably not a major food source. *Historis odius* and other nymphalines exploit a broad range of rotting organic substrates in lowland tropical rain forests of Central America. While these observations occurred during the wet season, *H. odius* is active throughout the year in this region since two fresh adults were captured during February and April (1970) at nearby "Finca La Selva." Different tribes within the Nymphalinae contain genera that feed on rotting fruit and tree sap (Howe 1975, The Butterflies of North America, New

York: Doubleday & Co., 633 pp.) and these insects obtain nitrogenous compounds and other substances that may increase various parameters of reproductive effort or adult longevity (Gilbert 1972, op. cit.). The timing of visits by the butterflies to the drying seeds is a behavioral response to products of decay in the pulp. This is a time when the seeds are highly aromatic but not in the sense traditionally maintained since no vertebrates appeared at them on the drying tables.

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NEW OVIPOSITION PLANT FOR *EUPHYDRYAS PHAETON* (NYMPHALIDAE)

Larvae of the checkerspot *Euphydryas phaeton* Drury feed on several species of Scrophulariaceae and a few other species such as *Plantago* sp. (Tietz 1972, An index to the described life histories, early stages and hosts of the Macrolepidoptera of the continental United States and Canada, vol. 1, Allyn, Sarasota, Florida). However, female *E. phaeton* have only been reported depositing eggs on turtlehead (*Chelone* sp.: Scrophulariaceae) (Edwards 1884, Butterflies of North America, vol. 2, Houghton Mifflin, Boston; Tietz, op. cit.). Here I report oviposition by *E. phaeton* on English plantain (*Plantago lanceolata* L.).

I observed four females depositing clusters of eggs on English plantain in an old field in Manlius, New York on 12–13 July 1978. Twenty-nine egg clusters were collected on plantain: six occurred on two large plants which were touching at the bases, two were found on the same plant, two others occurred on the same leaf, and the rest were found singly on plants. Nine of these were on the top side of the leaves rather than on the under surface. The mean number of eggs in these clusters was 278.7 (range 115 to 516) which was not significantly different from clusters deposited on turtlehead (*C. glabra* L.), a larger and broader-leaved plant than plantain ($t = 0.00045$, $P > 0.50$, $df = 58$) (Stamp, unpubl. data). I spent a total of 6 afternoon hours following females ($n = 7$) for periods of 20 to 105 min. All of these females exhibited plant search behavior for oviposition sites (going quickly from plant to plant), but only two females performed leaf search behavior (searching plant and touching leaf with tip of abdomen). This second behavior occurred only on plantain and the first time these females encountered it during the observation period. The females in this field spent much more time exhibiting plant search behavior than females observed in areas with turtlehead (Stamp, unpubl. data). This probably reflects some major differences between the two host plants. Turtlehead grows 2–4 ft in height, may occur in large, dense patches (diameter several ft across) and leaves of the plants frequently are touching. In contrast, plantain is a small plant (height of leaves less than 1 ft), is not common in this field, and occurs in small patches with plants generally not touching each other. A second population of *E. phaeton* in a bog near McLean, New York was also using English plantain for oviposition sites. Neither of these areas had turtlehead.

The field in Manlius supported a large number of *E. phaeton*. Using mark-and-recapture methods and Bailey's modification of the Lincoln index (Ehrlich and Davidson 1960, J. Lepid. Soc. 14: 227–229; Poole 1974, An Introduction to Quantitative Ecology, McGraw-Hill, New York), I estimated 292 adults during this period (peak of flight season). This was probably only a third of the colony at that time as two adjacent areas also had *E. phaeton* and *P. lanceolata*. One of these areas was a first-year old field in