1979, Science 204:847–851; Glendinning, J. I., A. Alonso Mejia & L. P. Brower 1988, Oecologia 75:222–227), this defense is thought to provide the monarch with protection from most vertebrate predators (Brower, L. P. 1984, pp. 109–134 *in* Vane-Wright, R. I. & P. R. Ackery (eds.), The biology of butterflies, Academic Press, London). Although birds do not appear to prey regularly on monarch butterflies, except at the Mexican overwintering sites (Brower & Calvert, *op. cit.*), there is little direct evidence to suggest that wild birds find monarchs aversive (Jeffords, M. R., J. G. Sternburg & G. P. Waldbauer 1979, Evolution 33:275–286). Beak marks found on the wings of monarchs are thought to result from predatory birds capturing and then rejecting the butterflies as unpalatable (Jeffords et al., *op. cit.*). Although Calvert et al. (*op. cit.*) and L. S. Fink and L. P. Brower (1981, Nature 291:67–70) report such behavior, no other accounts are available. I offer here an additional account.

On 25 August 1982 I witnessed a barn swallow, *Hirundo rustica* Linnaeus (Hirundinidae) capture and release a monarch butterfly at the top of a hill on a small farm in Butler County, Pennsylvania. It was late afternoon, on a partly cloudy, calm day (NNW wind at 3–6 m/sec). Mixed hay and fallow fields covered the hilltop. Monarchs, as well as other species of butterflies, foraged at the tips of goldenrod (*Solidago* sp., Asteraceae), Queen Anne's lace (*Daucus carota* (Linnaeus), Umbelliferae), and bull thistle (*Cirsuim vulgare* (Savi), Asteraceae) in the fallow field. An occasional monarch was seen migrating WSW, flying 12–15 m above the ground.

I first saw the barn swallow streaking up away from the earth about 20 m away from me. By the time I had fixed my eyes on the swallow it already had the monarch in its beak and was flying rapidly almost straight upward. A fraction of a second later the swallow dropped the monarch, turned abruptly down, and flew off. I could not tell whether the swallow had released the monarch or if the monarch had struggled free. If the monarch had escaped from the barn swallow, however, the swallow would have had no trouble recapturing it, as the monarch was 15 m above the ground and flying weakly. Yet the swallow made no effort at recapture.

Within moments of release the monarch started flying again. Flying slowly and seemingly insecurely at first, the butterfly flew SW. Gradually it flew with greater vigor, although not as robustly as the other migrating monarchs. Still flying high above the ground the monarch vanished from my view after two or three minutes, as I watched with 10 × 50 power binoculars.

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## ZYGAENIDAE TRAPPED WITH ENANTIOMERS OF 2-BUTYL(Z)-7-TETRADECENOATE

**Additional key words:** pheromones, attraction, isomers, Texas, Florida, Guatemala.

Enantiomers, or optical isomers, of 2-butyl(Z)-7-tetradecenoate (BTDO) have been found to be sex pheromones or sex attractants for three species of Zygaenidae in the United States. This compound was identified as a sex pheromone of the western grapeleaf skeletonizer *Harrisina brillians* (Barnes & McDunnough) by J. Myerson, W. F. Hadden, and E. L. Soderstrom (1982, Tetrahedron Lett. 23:2757–2760). E. L. Soderstrom, D. G.

TABLE 1. Numbers of males of species of Zygaenidae caught in traps baited with the R-/-(−) or S-/−(+) enantiomers of 2-butyl(Z)-7-tetradecenoate, or a 50:50 racemic mix (Guatemala only), at different geographic locations.

| Location | Species | No. captured R-/−(−) | No. captured S-/−(+) | No. captured Racemic |
|---|---|---|---|---|
| Waco, Texas | *H. americana* | 33 | 4 | — |
| | *H. coracina* | 2 | 26 | — |
| Retalhuleu, Guatemala | *H. guatemalena* | 1 | 12 | 13 |
| Gainesville, Florida | *A. falsarius* | 14 | 0 | — |
| | *A. novaricus* | 2 | 79 | — |
| | *H. americana* | * | * | — |
| Key Largo, Florida | *H. americana* | 4 | 0 | — |

* Numbers not recorded.

Brandl, J. Myerson, R. G. Buttery, and B. E. Mackey (1985, J. Econ. Entomol. 78:799–801) showed that the S-(+) enantiomer of this compound was active in field trapping tests and the R-(−) enantiomer was not. Subsequently, P. J. Landolt, R. R. Health, P. E. Sonnet, and K. Matsumoto (1986, Environ. Entomol. 15:959–962) found that male *Harrisina americana* (Guerin) and *Acoloithus falsarius* Clemens are attracted principally to the R-(−) enantiomer, with very little response to the S-(+) enantiomer.

G. Tarmann (1984, Entomofauna Zeitschrift fur Entomologie, Suppl. 2, Vol. I, Linz, Austria) listed 134 species of American Zygaenidae in 24 genera. They occur throughout the tropics and subtropics with few species in temperate North America. Only two, *Harrisina americana* and *Harrisina brillians*, are recorded as pests of agricultural crops.

Trapping efforts have been continued to determine if other species of Zygaenidae are also attracted to this compound, and if Zygaenidae attracted are specific to an enantiomer of BTDO. We report here the trapping of additional species attracted to enantiomers of BTDO as well as new distribution records obtained during these studies.

The enantiomers of BTDO were synthesized, purified, and formulated as described by Landolt et al. (*op. cit.*). All tests were conducted using plastic bucket traps, the Unitrap® of International Pheromones Limited (Merseyside, England). A rubber septum formulated with 500 $\mu$g pheromone was pinned to the inside top of each trap. Small pieces of No-Pest Strip (Texize, Greenfield, South Carolina) ($\frac{1}{16}$ of a strip/trap) were placed inside the buckets to kill captured moths. Generally, pairs of traps were placed at sites, baited with each of the two enantiomers of BTDO. Sites were selected near *Vitis* species (Vitaceae) where possible, but were determined largely by travel arrangements made for other studies. Traps were placed ca. 2 m above ground with a minimum of 10 m between traps. Pairs of traps were placed in the field at four sites reported here. Traps were hung in shrubs along a stream near Waco (McLennan Co.), Texas, 4–10 June 1986, along an abandoned roadway in upper Key Largo (Munroe Co.), Florida, 21–23 July 1986, in a mixed papaya, pineapple, and citrus planting near Retalhuleu, Guatemala, 20–23 June 1986, and in understory grapevines in a mesic hardwood forest near Gainesville (Alachua Co.), Florida, 20 April to 10 July 1989. At the Retalhuleu, Guatemala site, an additional trap baited with 1 mg of racemic 2-butyl(Z)-7-tetradecenoate was included.

*Harrisina guatemalena* (Druce) males were caught at Retalhuleu, Guatemala, primarily in traps baited with the S-(+) enantiomer or racemic material (Table 1). Moths were observed in flight at traps near dusk. Moths of an undescribed species of *Neofelderia* (Zygaenidae) collected at this site during the same time period were not caught in traps. Near Waco, Texas, *Harrisina coracina* (Clemens) males were captured in the trap baited with the S-(+) enantiomer, whereas most *H. americana* were in the trap baited with the R-(−) enantiomer. Both species are known to feed on grape (*Vitis* sp.), which was abundant in the study area. Three species of Zygaenidae were captured in traps placed in Alachua County, Florida: *H. americana*, *A. falsarius*, and *Acoloithus novaricus* (Barnes &

McDunnough) (Table 1). Catches of *H. americana* were not recorded. Most *A. falsarius* were in the trap baited with the R-(−)-enantiomer of BTDO, whereas nearly all *A. novaricus* were captured in the S-(+) baited trap.

This is the first documentation of attraction of *H. guatemalena*, *H. coracina*, and *A. novaricus* to BTDO and the first record of *A. novaricus* in the State of Florida (Kimball, C. P. 1965, Lepidoptera of Florida, Fla. Dept. Agric., Division of Plant Industry, Gainesville, Florida). Four male *H. americana* were caught in the R-(−)-BTDO trap in upper Key Largo (Table 1), which is a first record for this species in Munroe County, Florida (C. P. Kimball 1965, *op. cit.*).

Six species of Zygaenidae are now known to be attracted to 2-butyl(Z)-7-tetradecenoate, and all six appear to be fairly specific to either the R-(−) (*H. brillians*, *A. falsarius*) or S-(+) (*H. brillians*, *H. coracina*, *H. guatemalena*, *A. novaricus*) enantiomers. Although such specificity to optical isomers of a pheromone compound is known for other insects, it is uncommon (Silverstein, R. M. 1979, Chemical ecology: Odour communication in animals, pp. 133–146, Elsevier Press, Amsterdam).

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## FIRST RECORD OF *SATURNIA ALBOFASCIATA* JOHNSON (SATURNIIDAE) FROM MEXICO

**Additional key words:** Baja California Norte, chaparral.

*Saturnia albofasciata* Johnson is widely distributed throughout much of California. It is recorded from Los Angeles, Riverside, San Diego, Ventura, and Kern counties in Southern California and from El Dorado, Lake, Mariposa, Tulare, Glenn, and Tehama counties in Northern California (Johnson, J. W. 1938, Bull. Brooklyn Entomol. Soc. 33: 128–130; Hogue, C. L. et al. 1965, J. Res. Lepid. 4:173–184; Ferguson, D. C. 1972, Bombycoidea (in part), Saturniidae, *in* Dominick, R. B. et al. (eds.), The moths of America north of Mexico, fasc. 20.2B:155–275, E. W. Classey, London; Lemaire, C. 1978, The Attacidae of America. Attacinae. Edition C. Lemaire, Neuilly-sur-Seine, France, 238 pp.; 1990 Field Seasonal Summary NEWS Lepid. Soc., 1991, No. 3, p. 18). Like many elements of the Californian fauna, *S. albofasciata* is suspected to occur in adjacent Baja California Norte; however, it previously was unreported from this or any other Mexican state.

On 28 October 1989, I caged four unmated, reared females of *S. albofasciata* at a site 11.5 km (7.1 mi) SW of Parque Nacional Constitucion de 1857 on the Laguna Hanson road in the Sierra de Júarez, Baja California Norte, Mexico (elev. ca. 1525 m). The site is 68 km south of the international border and 80 km south of the nearest known United States locality for *S. albofasciata* at Kitchen Creek, San Diego County, California. With sunny conditions between 1610 and 1700 h PST, 37 wild males were attracted to the virgin females, all of which were captured.

The Sierra de Júarez site is characterized by a mixed chaparral community, a habitat known to support *S. albofasciata* populations (Ferguson, *op. cit.*). Dominant plants include