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A NEW SPECIES OF *PARANTHRENE* (LEPIDOPTERA: SESIIDAE)[1]

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Abstract.—A new clearwing moth species, *Paranthrene* **pellucida,** is described. This species is morphologically similar to *P. simulans* (Grote), from which it differs in the degree of scaling on the forewing and breeding season. Differences in the chemical structure of their sex pheromones may also exist.

Sex pheromones of two clearwing moths (Lepidoptera: Sesiidae) have been isolated, identified, and synthesized (Tumlinson et al., 1974). The compounds are ZZ- and EZ- isomers of 3,13-octadecadien-1-ol-acetate, hereafter referred to as 3,13-ODDA. Recent evidence suggests that these and other chemically related compounds are the major components of the sex pheromones of many Nearctic sesiids (Greenfield, 1978; Underhill et al., 1978). Because of their attractiveness to the males of many species, the various compounds are valuable in probing the ecology and evolution of Sesiidae. One area in which these compounds are particularly useful is the recognition of cryptic species in the family (Duckworth and Eichlin, 1977a; Purrington and Nielsen, 1977). In this paper we describe a new sesiid species in the genus *Paranthrene* Hübner, morphologically similar to *Paranthrene simulans* (Grote), discovered through field trapping with 3,13-ODDA isomers in Wisconsin.

Paranthrene pellucida Greenfield and Karandinos, NEW SPECIES

Fig. 1

Male.—Antenna bipectinate-ciliate ventrally, with an apical tuft; slightly clavate; black dorsally throughout, brown ventrally at proximal end, be-

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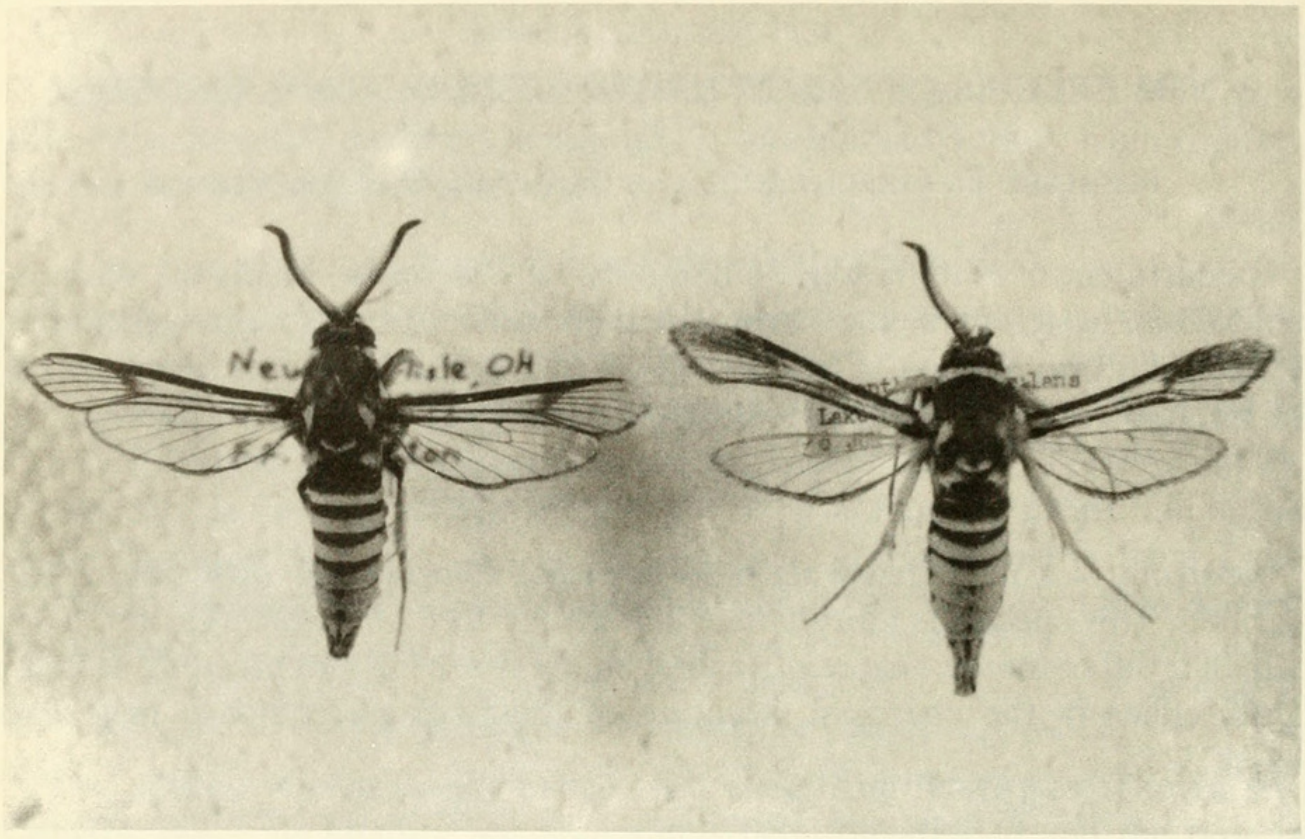

Fig. 1. *Paranthrene pellucida*, male (left) and *Paranthrene simulans*, male (right). (Specimens courtesy of F. F. Purrington, O.A.R.D.C., Wooster, Ohio.)

coming more orange distally. Proboscis well developed. Labial palpus roughened and yellow ventrally, black dorso-exteriorly, segment 3 pointed and ½ the length of segment 2. Head with vertex black; front black, with yellow laterally; occipital fringe black dorsally, yellow laterally. Thorax primarily black dorsally with yellow patches directly anterior to and below forewing; tegulae yellow posteriorly and a transverse yellow band posteriorly on mesonotum; collar yellow laterally and dorsally on posterior portion, black dorsally on anterior portion; metathorax black dorsally with yellow patches laterally. Forewing mostly hyaline, except for a brown streak, in center of anterior transparent area, extending proximally from discal spot; wing base black; discal spot brown; costal and anal margins black dorsally, yellow orange ventrally; veins and fringes brown black. Hindwing hyaline, save costal and anal margins, discal spot, fringes, and veins brown dorsally, yellow orange ventrally. Legs with prothoracic coxae mostly yellow, but with black mesally, femora yellow orange with black proximally and rough yellow scales ventrally, tibiae yellow orange with rough yellow scales dorsally, tarsi yellow orange; mesothoracic legs with coxae black proximally, yellow distally, femora black anteriorly, yellow orange mixed with black posteriorly, yellow orange ventrally and dorsally, tibiae yellow orange with rough yellow scales dorsally, tibial spurs yellow orange, tarsi yellow orange; metathoracic legs with coxae black proximally,

yellow distally, femora mostly black, but with yellow ventrally, tibiae yellow proximally and with rough yellow scales dorsally, yellow orange distally, tibial spurs yellow orange, tarsi yellow orange. Abdomen black and yellow, segment 1 entirely black, venter of segments 2–7 each with anterior ⅔ black and posterior ⅓ yellow, dorsum of segments 2–4 each with anterior ½ black and posterior ½ yellow, dorsum of segment 5 with anterior ⅓ black and posterior ⅔ yellow, dorsum of segment 6 with anterior ⅙ black and posterior ⅚ yellow, dorsum of segment 7 entirely yellow. Genitalia indistinguishable from those of *P. simulans*, figured in Engelhardt (1946). Alar expanse 29 mm.

Female.—Antenna simple. Mesonotum lacking transverse yellow band posteriorly. Meso- and meta-thoracic legs with femora exhibiting more yellow than male. Maculation otherwise similar to male. Alar expanse 32 mm.

Host.—In Lake Co., Ohio and in Cromwell, Connecticut, F. F. Purrington and R. E. B. Moore, respectively, obtained adults from cuttings of *Quercus palustris* in which the larvae had bored. In Wisconsin, all locations at which specimens were captured in 3,13-ODDA-baited traps supported stands of *Quercus velutina*, indicating a possible host association with this oak species also.

Distribution.—Wisconsin, Ohio, New York (based on a specimen in the NMNH with label data: Bronx Park, N.Y., July 24, 1957), Connecticut.

Similar species.—*Paranthrene simulans* is very similar in size and overall appearance, but the region of its forewing distad of the discal spot is covered with brown scales, except for a hyaline area (window) between M_2 and Cu_2. This degree of suffusion by scales on the forewing is found in the holotype of *P. simulans* and in the holotypes of the forms *P. simulans luggeri* (Henry Edwards, 1891) (*Trochilium*) and *P. simulans palmii* (Henry Edwards, 1887) (*Fatua*). *Paranthrene pellucida* has the entire distal region of the forewing hyaline.

Types.—*Holotype:* ♂, Arena, Iowa Co., Wisconsin, VI-26-1977, Coll. M. D. Greenfield, deposited in the University of Wisconsin Insect Research Collection, Madison, Wisconsin. *Paratypes:* 14 as follows: 1 ♀, Cromwell, Connecticut, emerged from *Quercus palustris* VII-18-1977, Coll. R. E. B. Moore, 1 ♂, Mazomanie, Dane Co., Wisconsin, trapped with a 1:9 blend of ZZ-:EZ-3,13-ODDA between VI-30-1977 and VII-8-1977, Coll. M. D. Greenfield, and 1 ♂, New Carlisle, Lake Co., Ohio, emerged from *Quercus palustris* cutting between VI-14-1977 and VI-21-1977, Coll. F. F. Purrington, all deposited in the University of Wisconsin Insect Research Collection, Madison, Wisconsin; 1 ♂, Blue River, Grant Co., Wisconsin, trapped with a 2:8 blend of ZZ-:EZ-3,13-ODDA between VI-8-1977 and VI-17-1977, Coll. M. D. Greenfield, deposited in the collection of Cornell University, Ithaca, New York; 1 ♂, Mazomanie, Dane Co., Wisconsin, trapped with a 2:8 blend of ZZ-:EZ-3,13-ODDA between VI-30-1977 and VII-8-1977, Coll. M. D.

Greenfield, deposited in the Los Angeles County Museum (Natural History), California; 1 ♂, Mazomanie, Dane Co., Wisconsin, trapped with a 2:8 blend of ZZ-:EZ-3,13-ODDA between VII-8-1977 and VII-15-1977, Coll. M. D. Greenfield, and 1 ♂, Arena, Iowa Co., Wisconsin, trapped with a 4:6 blend of ZZ-:EZ-3,13-ODDA between VI-30-1977 and VII-8-1977, Coll. M. D. Greenfield, genitalia slide by M. D. Greenfield, both deposited in the USNMNH; 3 ♂, Arena, Iowa Co., Wisconsin, trapped with a 3:7 blend of ZZ-:EZ-3,13-ODDA between VI-30-1977 and VII-8-1977, Coll. M. D. Greenfield, all deposited in AMNH; 1 ♂, Arena, Iowa Co., Wisconsin, trapped with a 3:7 blend of ZZ-:EZ-3,13-ODDA between VII-8-1977 and VII-15-1977, Coll. M. D. Greenfield, and 1 ♂, Blue River, Grant Co., Wisconsin, trapped with a 5:5 blend of ZZ-:EZ-3,13-ODDA between VII-8-1977 and VII-15-18977, Coll. M. D. Greenfield, both deposited in the Field Museum, Chicago, Illinois; 1 ♂, Mazomanie, Dane Co., Wisconsin, trapped with a 4:6 blend of ZZ-:EZ-3,13-ODDA between VI-30-1977 and VII-8-1977, Coll. M. D. Greenfield, and 1 ♂, Mazomanie, Dane Co., Wisconsin, trapped with a 3:7 blend of ZZ-:EZ-3,13-ODDA between VI-30-1977 and VII-8-1977, Coll. M. D. Greenfield, both deposited in the Snow Entomological Museum, Lawrence, Kansas.

Etymology.—We have named this species *pellucida* because of its hyaline forewings.

Discussion

Morphologically similar species are common among insects (Mayr, 1970). Behavioral and ecological characters that allow these cryptic species to be distinguished from one another include host preference, time of day and season for mating, and sex communication signal. In insects using chemical sex communication signals, the chemical structure of the pheromone can be used to separate cryptic species. Purrington and Nielsen (1977) report a case of cryptic species in the sesiid genus *Podosesia* in which the two species have different, non-overlapping breeding seasons and appear to use different pheromones, although their host plants are identical. Another pair of morphologically similar sesiid moths, *Synanthedon fatifera* Hodges and *Synanthedon viburni* Engelhardt, exhibit an analogous relationship in which both species bore in *Viburnum* sp., yet appear to use different sex pheromones (Greenfield and Karandinos, *in press*).

Field trapping in Wisconsin with 3,13-ODDA isomers, singularly and in various isomeric combinations, provided data on the temporal activity and spatial distribution of the various sesiid species (Greenfield and Karandinos, *in press*). Adults of *P. pellucida* are active during late June and July in Wisconsin, as opposed to the earlier (late May and early June) activity of *P. simulans*. The seasonal activity periods of these species overlap negligibly.

Paranthrene pellucida males were maximally attracted by a 2:8 blend of ZZ-:EZ-3,13-ODDA, whereas *P. simulans* males exhibited maximum attraction to 100% ZZ-3,13-ODDA. The combination of seasonal and pheromonal separation reproductively isolates *P. pellucida* and *P. simulans*.

We also studied the diel activity of these two cryptic species and found that males of both respond to sex attractant compounds between 17:00 and 19:00. Both species are biennial, and in Wisconsin adults of both emerge only during odd years. Their spatial (habitat) distributions also overlap in Wisconsin, although *P. pellucida* appears to be restricted to xeric oak barrens supporting stands of *Quercus velutina*. *Paranthrene simulans*, known to bore in the trunks of several species of *Quercus* (Engelhardt, 1946), was trapped in a wide variety of habitats, including xeric oak barrens, dry-mesic oak forests, and wet lowland forests. Our interpretation of these data is that *P. pellucida* and *P. simulans* have overlapping host preferences.

Several thousand specimens of *P. pellucida* and *P. simulans* from Wisconsin were examined and the morphological difference (forewing scaling) between them is consistent. No intermediate forms were seen. Our observation of the similarity in genitalic structure between *P. pellucida* and *P. simulans* agrees with the overall genitalic uniformity among species of *Paranthrene*, noted by Duckworth and Eichlin (1977b). *Paranthrene simulans* tends to display more yellow on the dorsum of the abdomen, but this character is inadequate for distinguishing *P. pellucida* from *P. simulans*, since both species exhibit much color polymorphism. This type of polymorphism is found in one of the two cryptic species of *Podosesia*; and morphologically, these latter two species can only be differentiated through characters of their immature forms (Purrington and Nielsen, 1977). Further field investigations with 3,13-ODDA isomers and related compounds may help reveal a general pattern of speciation in Sesiidae.

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