

VOL. LVI

JUNE, 1961

No. 3

BULLETIN
OF THE
BROOKLYN ENTOMOLOGICAL
SOCIETY

NEW SERIES



PUBLICATION COMMITTEE

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Published for the Society by

Business Press, Inc.

N. Queen St. and McGovern Ave., Lancaster, Pa.

Price, 85 cents

Subscription, \$4.00 per year

Mailed September 15, 1961

Entered as second-class matter January 21, 1919, at the post office at
Lancaster, Pa. under the Act of March 3, 1879

DIV. INS.
U.S. NATL. MUSE.

INSECTS FROM TUNNELS OF *XYLOCOPA*
VIRGINICA (LINN.)
(COL., LEP., DIPT., HYM.)

By W. V. BALDUF, University of Illinois, Urbana¹

On September 17, 1957, I dissected a four-foot long piece of 1 × 4 in. pine board that had housed a part of a colony of the carpenter bee, *Xylocopa virginica* on a garage at Longview, Champaign County, Illinois. Representatives of six species of other insects were then present. Excepting the cocoons of *Osmia lignaria* reported below, all the insects were then dead, possibly due to plugs of putty the owner had placed into the entrances of the tunnels to discourage the carpenter bee.

Following are the species involved, plus the gist of published biologies and my own observations on the materials found in the tunnels.

COLEOPTERA

Ahasversus advena (Waltl.), Cucujidae. Four adults.

Trogoderma glabrum (Herbst), Dermestidae. A living advanced larva, and exuviae.

LEPIDOPTERA

Nephoteryx subcaesiella (Clem), Phycitidae. The material consisted of three imperfect adults, one chrysalis and 25 individuals; some of the latter were obviously still larvae, whereas nine appeared to have developed abnormally beyond the larval state. The latter nine are remarkable in that the head and thorax retain the larval form, texture and appendages typical of caterpillars whereas the abdomen has assumed the characteristic color, form and texture of chrysalids.

In his report to me on the identity of the wasps and bees, Mr. Krombein commented that the above *Nephoteryx* "probably were prey of a solitary vespid wasp." This may explain the partial transformation of the nine *subcaesiella*. Assuming that the wasp takes only caterpillars, the presence of a chrysalis and adults in the tunnel could mean that these, as larvae, were paralyzed lightly or temporarily, and thus recovered enough to complete their transformation in the tunnel. On the other hand, the nine half-transformed individuals, when seized by the wasp, were paralyzed more

¹ I am indebted to specialists at the U. S. National Museum for identification of the insects concerned here.

seriously, so that the head and thorax were deadened, yet the abdomen received little or no venom, and therefore proceeded to pupate. It is of interest also that these individuals retained the larval cuticle intact over the entire body, perhaps because the anterior body regions, where molting begins, were incapacitated by paralysis.

Reference to the biologies of eumenine vespid wasps cited by Muesebeck, et al (1951, 1958) indicate that either *Pseudodynerus quadrisectus* (Say) (Rau, 1935) or *Monobia quadridens* (Linn.), (Ashmead, 1894; Rau, 1931; Frost, 1944) could have stored the *Nephoptyx* larvae in the tunnels of *X. virginica* at Longview, Illinois. Both utilize caterpillars as prey, and are known to nest sometimes in tunnels of this carpenter bee.

Since several species of *Nephoptyx* are known pests of plants—some as leaf-tiers (Rev. App. Ent., A, 1913–1958), it may be assumed that *N. subcaesiella* at Longview occurred on one of the many ornamental plants grown near the nest of *X. virginica*.

DIPTERA

Tachinidae. Two adults, in poor condition, and several puparia of a fly that occurred in one of the tunnels, were identified doubtfully as Tachinidae. The larvae possibly parasitized some of the caterpillars of the above *Nephoptyx*.

HYMENOPTERA

Trypoxylon striatum Prov. (*T. albopilosum* Fox), Sphecidae. My materials of this solitary wasp consisted of nine cocoons. Each contained a dead, yet not decomposed limp apodous yellow prepupa with prominent mandibles. All occurred in abandoned tunnels of *X. virginica*, each in a cell walled off from adjacent cells by partitions of mud. One tunnel contained a series of eight cells and shrivelled immature larvae. Another housed eleven cells in a series; each of the four older or innermost cells contained a *Trypoxylon* cocoon.

The cocoon is described by Krombein (1956) as "made of a thin layer of tightly woven pale silk impregnated with a fluid, possibly of meconial origin, which dries to form a varnished, brittle, dark brown substance." My specimens are round and somewhat bulbous at the posterior end; narrower and cylindrical in the median half, and flared out at the cephalic end, which is transversely flattish-convex. One cocoon measured 16 mm. long, 6.0 mm. in diameter at the round end, 5.5 mm. in the median part and 5.4 at the flattish end. The corresponding dimensions of a second cocoon were 15.5, 5.5, 4.5 and 5.0 mm.

The biology of *T. striatum* was made known by Rau (1928), G. W. and E. G. Peckham (1895, 1895) and Krombein (1956). It nests in bee burrows in wood or ground, and utilizes only spiders, and particularly Epeiridae. The eggs are placed, one per cell, on the abdomen of the spider. According to Krombein, this species apparently develops only one generation a year.

Osmia lignaria Say, Megachilidae. In the spring of 1956, a female was discovered carrying pollen into an old tunnel of *X. virginica*. She was first seen at work on April 27 and again on six later dates to May 10. On the posterior venter of the abdomen, she invariably bore pale yellowish-white pollen, but later in the period returned several times without a load. She remained inactive on May 7, when the atmospheric temperature stood near 50° F.

The bee worked rapidly and steadily. The round trip from the nest board to the flower garden, located about 50 feet away, and back to the nest board required 4.5 to 5.5 minutes. This included acquisition of the load of pollen. After each return, 1.0 to 1.5 minutes were spent in the nest in depositing pollen. The outcome of all this activity was not observed.

A second opportunity to learn about *O. lignaria* came in 1957-58. Dissection of a four-foot long nest board of *Xylocopa virginica* on September 17, 1957, revealed two dead dry adult *O. lignaria* in an old tunnel. These may have been the progenitors of 12 cocoons found on the same day in another burrow of the same piece of nest board. The cocoons are elongate-oval, shaped much like a football. A tangle of silk envelops the medium brown cocoon. They varied from 10 to 13 mm. in length and 5-7 mm. in maximum diameter. Two of the cocoons opened on September 18, 1957 contained mature living adults.

The remaining 10 cocoons were placed in a cage on September 19, and subjected to natural weather conditions at Urbana through the winter. On and about April 21, 1958, eight adult *Osmia* emerged from the cocoons. The other two then contained dead pupae. Emergence took place through the side of the cephalic third of the cocoon. The above time data indicate that *O. lignaria* completes one generation in a year in central Illinois.

Linsley and McSwain (1941) note the wide distribution of *lignaria* in North America, the nesting sites chosen, the construction of the nests, storage of pollen in the cells and the development from egg to adult in California. As in Illinois, this bee passes the cold season as adult in the cocoon. Hicks (1934) suggests this manner of wintering may be general among certain of the *Osmias*, and in-

cludes *O. l. propinqua* Cress. in this group. In California (Linsley and McSwain), the adults emerge in February and March,—decidedly earlier than in Illinois.

Osmia lignaria is sometimes involved in supersedure with *O. californica* Cress. Bohart (1955) describes two types of this phenomenon,—abrupt, in which a series of brood cells started by *lignaria* is completed by *californica*, and gradual, where both species work simultaneously for a period in the same nest.

SUMMARY

Six species of insects inhabited the abandoned tunnels of a colony of carpenter bees, *Xylocopa virginica* that nested in a fascia of a garage at Longview, Illinois. The Coleoptera, *Ahasversua advena* (Waltl.) Cucujidae and *Trogoderma glabrum* (Herbst), Dermestidae, were present in small numbers. The phytophagous larvae of a phycitid moth, *Nephoptyx subcaesiella* (Clem.), had been stored by a wasp,—probably an eumenine vespid. Puparia of a tachinid ? sp. may have represented parasites in the larvae of *Nephoptyx*. A spider-storing sphecoid wasp, *Trypoxylon striatum* Prov. was identified from its cocoons and brood cells. All the above materials were found dead. However, the megachilid bee, *Osmia lignaria* Say was seen storing pollen in an old *Xylocopa* burrow in one instance; in another, adults emerged in spring from a series of cocoons that contained fully-developed adult *Osmia* in the previous fall.

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STUDIES ON THE PLECOPTERA OF NORTH AMERICA: IX. *CAPNIA MANITOBA* IN THE NORTHEAST¹

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The genus *Capnia* is generally considered to be a western genus of North American stoneflies. Of approximately 45 North American species, only three have been reported in the eastern part of the continent: *C. labradora* Ricker (1954) and *C. vernalis* Newport from Labrador and northern Quebec (Brinck, 1958), and *C. nearctica* Banks from the Canadian far north (Ricker, 1944, 1954).

No species of *Capnia* have been recorded from the United States east of Minnesota. Therefore, we were very much surprised when we separately collected specimens of *Capnia manitoba* Claassen in New England. This particular species had not previously been reported east of Manitoba.

¹ Supported by NIH Grant E-1442(C5), U. S. Public Health Service. Contribution No. 1344 from the entomological laboratory of the University of Massachusetts.

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