

NESTING ACTIVITY AND LARVAL DESCRIPTION OF
TRYPOXYLON (TRYPOXYLON) BICOLOR SMITH
(Hymenoptera: Sphecidae) IN HAWAII

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Abstract: Observations on the nesting activities of *Trypoxylon (Trypoxylon) bicolor* Smith which were found in corrugated paper boards on the Bishop Museum grounds are reported upon. The nests of the wasps were found stocked with prey spiders (Salticidae). The nests were highly parasitized by dermestid and psocid larvae. The egg, larval and pupal stages of the wasp were noted and only the full grown larvae were preserved and described.

Members of the genus *Trypoxylon* occur throughout the world and their nests are frequently observed by entomologists. In Hawaii, Perkins (1910) first noticed the appearance of *Trypoxylon bicolor* Smith (fig. 1A), an oriental species, in Hilo, Hawaii around 1899-1900; this species nests in furniture, chairs, etc. In 1913, Swezey exhibited at the Hawaiian Entomological Society meeting a nest of a wasp resembling *Trypoxylon bicolor* in a corrugated paper box which was found under his house. The nest contained cells of cocoons and spiders. Williams (1927) reviewed the biology of two species found in Hawaii, *Trypoxylon bicolor* Sm. and *T. philippinensis* Ashmead. He mentioned that *T. bicolor* is likely to be found in the mountains of Oahu where it commonly nests in hollow twigs, old beetle borings, etc. In Japan, Iwata and Katayama (1931), Katayama (1931-1935), Masuda (1931) and Yasumatsu (1929) published their observations on the biology and behavior of the related species, *Trypoxylon obsonator* Smith. Krombein (1959) reported nest of *T. (T.) richardsi* Sandhouse from Maryland, U. S.

Illustrations were done by Eugene Bojarski, to whom I am thankful.

Twelve sheets of 45×30 cm corrugated paper boards used for pressing plant specimens which were left on a metal cabinet on the lanai of the Entomology Annex of Bishop Museum were found to be the nesting site of a colony of *T. bicolor* Smith. It was first discovered by Mr William Voss on 18 January 1964. During the week of 18-25 January the nesting activity was believed to be at its peak; the temperature was about 27° C and there was no precipitation. About 10 *bicolor* were seen in the neighborhood of the corrugated paper boards. Since the first observation, periodic visits were made to the nesting area. Occasionally, a few nests of *bicolor* were removed from the nesting site for examination. About two or three weeks after the initial discovery of the nesting activity, I noticed the wasp population was down to a mere two or three individuals. During that period, there was periodic rainfall and the temperature ranged from 21° to 23° C. Also, the number of corrugated paper boards with nests of *bicolor* were reduced to one-half of the original number. Nevertheless, despite the small number of individual *bicolor*, observations were continued until the end of February 1964.

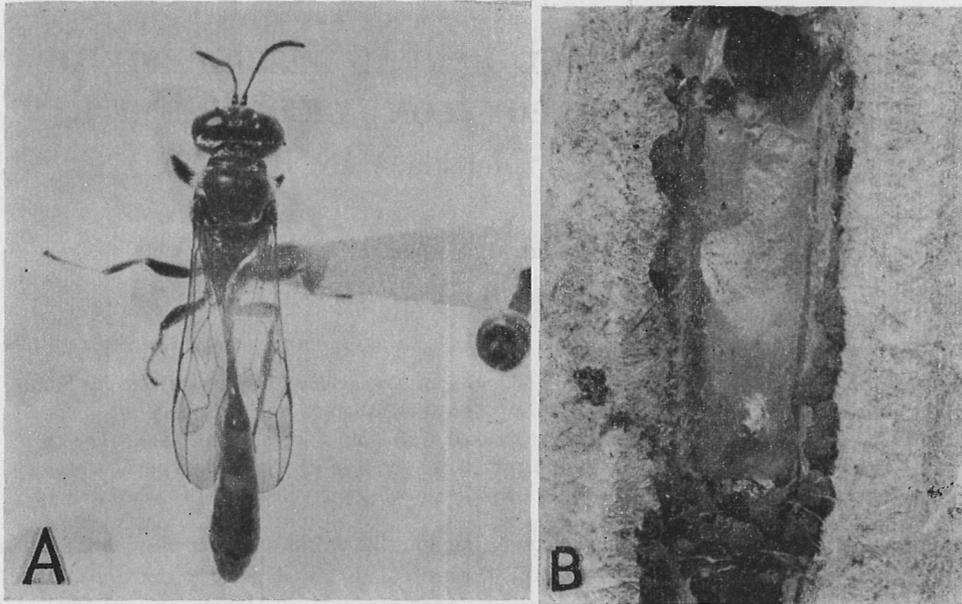


Fig. 1. A, ♀ *Trypoxylon bicolor* Sm.; B, cell with puparium.

Many observations were made of female *bicolor* carrying prey to the nests. The female wasp generally made a single orientation flight over the nesting area and landed near her nest entrance. The prey was straddled and held against the venter of her body by her fore legs; a small spiderling was held with her mandibles. The large prey was momentarily dropped at the foot of the entrance and she instantly grasped the coxa with her mandibles and walked head first into the nest. The spiderling was carried directly into the nest with her mandibles. She walked forward into the nest when bringing construction materials—mud pellets, pebbles, bits of mosses, pieces of insect integument, etc.

On two occasions, when searching for the *bicolor* nest in the corrugated board, I came across a female inside a single cell located in the center of the longitudinal trough. The cell was 3×20 cm (fig. 1B) and both end partitions were 0.5–1.0 mm in thickness. The entrance of the cell was temporarily closed with a scanty pile of mud. This led to my belief that this was not an ordinary nest cell, but what I called a “temporary shelter” to house the female during non-active nesting periods. The female *bicolor* momentarily hesitated to leave her nest while moving her head in several directions in an erratic manner and stood there in the cell for a few seconds before flying away.

In summarizing the data from Table 1, the average number of cells per nest is 4; the average size of the cell is 2×1.2 mm; the average thickness of the outer enclosure is 3 mm and the average thickness of the saucer-shaped partition is 1.5 mm (fig. 2B).

There are no data on the length of time from egg stage to full grown larva. When the larva completely devours the prey spiders, it begins to spin its cocoon. In one day, the larva encased itself in a whitish yellow cocoon 10 mm long, resembling a miniature baseball bat. The egg is opaque, 1 mm long and crescent-shaped; it is laid lateroventrally in a diagonal position close to the base of the abdomen on the last prey and generally the

Table 1. Data on nests of *Trypoxylon bicolor* Smith from corrugated paper boards

Nest No.	Date	No. cell per nest	Length of nest	Size of cell	Thickness of outer enclosure	Thickness of partitions	Parasites	Stages of larva & prey in cell (empty)					
								Prey	Cell	Egg	Larvae	Pupae	Emerged
1	Jan. 21	6	10 cm	2 mm×1.2 cm	3 mm	1.5 mm	-	5	1	1	1	2	1
2	21	4	30 cm	" "	"	2.0 mm	-	6	1	-	1	2	3/pupal skins
3	21	"	16 cm	2 mm×0.7 mm	"	1.5 mm	-	10 & 2	1	-	1	-	-
4	24	"	6 cm	2 mm×1.0 cm	2 mm	"	+c	7	2	-	1	-	-
5	24	3	30 cm	" "	3 mm	"	-	5	4	-	-	-	-
6	27	4	15 cm	" "	"	"	+ab	-	4	-	-	-	-
7	27	5	30 cm	" "	"	"	+bc	-	1	-	-	-	1/pupal skin
8	Feb. 4	6	30 cm	" "	"	"	-	-	3	-	-	-	4/pupal skins
9	11	3	15 cm	" "	"	"	+b	-	-	-	-	-	-
10	15	5	14 cm	2 mm×1.2 cm	2 & 3 mm	"	-	-	2	-	-	5	-
11	15	1	15 cm	" "	"	"	-	7	3	-	-	-	-
12	20	5	15 cm	" "	"	"	+a	-	2	-	-	-	3/pupal skins
13	20	4	15 cm	" "	"	"	*	-	3	-	-	-	1/pupal skin
14	20	6	15 cm	" "	"	"	*	-	2	-	-	-	1/pupal skin
15	20	2	15 cm	" "	"	"	+c	-	2	-	-	-	-

Legend: +a (adult dermestid); +b (dermestid exuviae); +c (dermestid larva); * (psocid adult).

Table 2. Prey records of *Trypoxylon bicolor* Smith

No. Nest	Cell No.	Prey	Comments
1	3	mature Salticidae (alive?)	found egg on spider but unable to hatch in artificial nest
-	2	immature (juvenile) Salticidae	
3	3	adult? Salticidae	found no egg on spider
-	3	juvenile Salticidae	
4	3	3 adults? Salticidae (alive) 7 immature (juvenile) Salticidae	found 1st instar larva feeding; base of larva toward base of abdomen.
-	2	1 adult (abdomen partially eaten) 1 immature	mouthparts deep inside spider's abdomen found 2 or 3 dermestid larvae in same cell
11	1	juvenile and adult? Salticidae	found no egg on spider

largest prey spider. All the spiders are permanently paralyzed and are laid on their backs. The female wasp stocks her cell with an average of 7 spiders, largely juvenile, of the family Salticidae (jumping spiders). On some occasions, one or both 4th (hind) legs were missing from the base of the trochanter. Perhaps, the female wasps lick the fluid oozing from the wound as a source of food. Some other known members of solitary wasps go through this behavior pattern also.

There was a high percentage of mortality in the nest of *T. bicolor*. Of 15 nests examined, about 50% of the cells contained many larval exuviae of *Trogoderma anthrenoides* (Shp.) (Coleoptera: Dermestidae), as well as live larvae and adults of *Liposcelis divinatoris* (Müller) (Psocoptera: Liposcelidae) in an empty cell or cell containing mummified prey spiders.

Larval description: Body length: 10 mm; maximum width 2 mm; pleural lobes prominent, conical, and sharply contrasted from sterna (fig. 2D). Posterior end conical, anus large and in ventral position. Pleural lobes on thorax less definite. Integument smooth. Setae on abdomen not evident. Spiracles not detected.

Head: 1.0 mm; height 0.8 mm (fig. 2A); coronal suture not evident; parietal bands long and weak; epistomal suture strong; antennal orbits subcircular with 3 sensilla in a triangular position (fig. 2C). Head with small punctures bearing long setae; numerous setae on sides of antennal orbits. Clypeus bearing 3 long setae at each lateral area. **Mouth parts:** Labrum quadrangular, nearly 2X as wide as high, 9 long setae on each side of median line (fig. 2F). Epipharynx spinose. Mandible 0.31 mm long and 0.19 mm in maximum width; upper surface rough with 3 small teeth, inner margin with 2 small teeth surrounded by hollow-out area (fig. 2E). Maxillae smooth apically, papillae stubby, galeae much shorter than former, few spinules on lacinial area. Labium smooth apically, with evidence of 2 patches of spinules toward base, spinnerets slender and upright, longer than palpi (fig. 2G).

SPECIMENS EXAMINED: 4 larvae from nest, Bishop Museum grounds, Honolulu, Hawaii, 18.I-20.II.1964, C. M. Yoshimoto.

In Evans' 1957 study of the larvae of Nearctic Trypoxyloninae, he included the characters of the family, genera, subgenera, and species. In the subgenus *Trypargilum*, he pointed out that the posterior end of the body is truncate and the spinnerets are slightly longer than the labial palpi. As contrasted to *Trypoxylon* group, the posterior end of the body is somewhat conically produced beyond the anus and the spinnerets are much longer than the labial palpi.

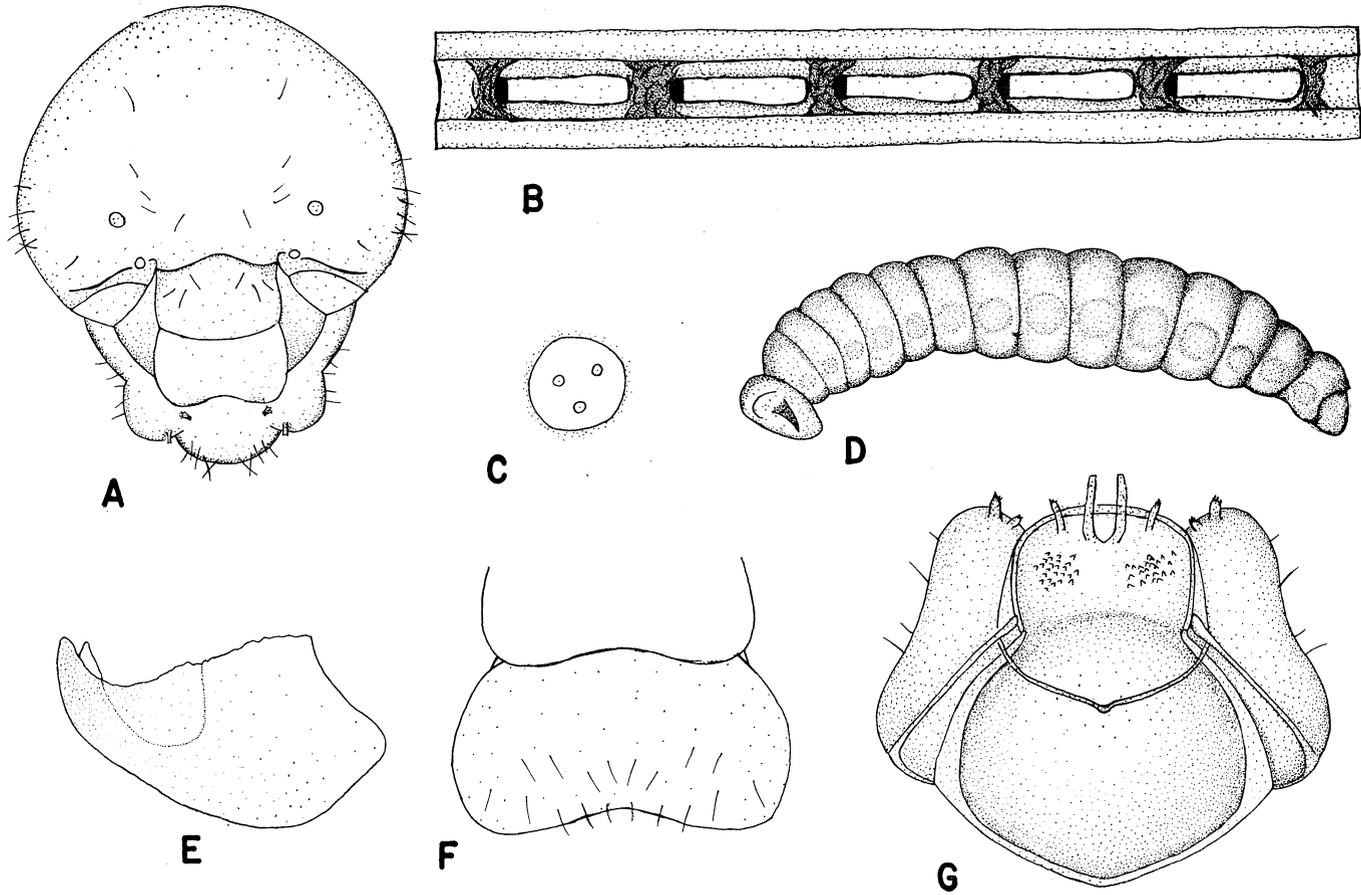


Fig. 2. *Trypoxylon bicolor* Sm., larva. A, head; B, nest; C, antenna; D, body; E, mandible; F, labrum; G, underside of head showing labium and maxillae.