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NESTING ACTIVITY OF THE MUD-DAUBING WASP, PISON ARGENTATUM SHUCKARD IN HAWAII

(Hymenoptera, Sphecidae, Trypoxyloninae)

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Abstract: Observations of the nesting activity of *Pison argentatum* Shuckard found in tiny holes in lava-stonewall archway are reported. Photographs of the nests and the nest site are included.

Tiny holes in the lava-stonewall archway of the Bishop Museum rear entrance (fig 1) served as the nesting sites of *Pison argentatum* Shuckard and *Trypoxylon (Trypoxylon) bicolor* Smith. The nesting activity of *P. argentatum* is discussed here. Because of lack of new data on *Trypoxylon bicolor*, I am not including it in this report. An account of the nesting activity of *T. bicolor*, including the larval description, was previously presented by Yoshimoto (1964).

Pison argentatum is widely distributed over the world. Williams (1927) cited Africa, Madagascar, Mauritius, Philippines, and parts of the other continents. Krombein (1949) recorded it from the Mariana and Caroline Is., and Yasumatsu (1953) listed Tenasserim, Burma, Malaya, Borneo, Japan, Palau, and Hawaii. Later records include Samoa, Fiji and Kauai (Hawaiian Is.) as reported by Yoshimoto (1960).

In Japan, the nesting behavior of the related species, *Pison iwatai* Yasumatsu was observed by Masuda (1939). Iwata (1964) observed the nest of *P. argentatum* in Thailand. An oriental immigrant, *Pison koreense* (Rad.) was presumably introduced into the United States since the war and is now established in the midwestern and eastern States (Krombein 1958). In 1964, Iwata reported that the female of *P. koreense* is known to make aggregations of fragile clay cells similar to those of *P. argentatum.*

On a clear, warm sunny day (about 26° C) with a gentle breeze, on 19 February 1964, I discovered a female *P. argentatum* constructing a nest in a tiny air hole of the lava-stonewall archway. Also in the same vicinity I found several cell nests of *Trypoxylon bicolor* with empty puparia (fig 2).

The entrance of the *argentatum* nest was no larger than the length of her body. The female wasp was observed "plastering" mud pellets by pounding and shaping the cell wall (fig 3) with her mandibles. After 1 or 2 minutes of labor, she flew away to fetch more mud pellets from a nearby garden. The construction of a single cell nest continued for 2 days with intermittent pauses at times after several trips. This operation may be prolonged if weather is not favorable. A related species *P. iwatai* has a similar habit in constructing her cell and gathering materials for her nest in bamboo or reed tubes.

P. argentatum constructs one to three cells per nest depending upon the size of the air hole in the lava stone. In an aggregate of a 3-cell nest, the first cell is constructed deep inside the hole with the 2nd and 3rd following. The data from 7 nests are elaborated below:

Table 1. Data from nests of *Pison argentatum*

Opening of cell entrance	Size of hole in stonewall	Number of cells per nest	Size of cell
3 mm	5×10 mm	1	3×7 mm
4 mm	8× 8 mm	2	——
3 mm	5× 4 mm	1	4×3 mm
3 mm	3× 8 mm	1	4×4 mm
4 mm	10×15 mm	3	——
4 mm	15×8×7 mm	2	——
4 mm	15×15×10 mm	3	——

At Shogoin, near Kyoto, the female *P. koreensis* constructed 12 cells which were exposed under wooden tablets; in another locality in Kyoto, a colony of 16 nests ranging from 1 to 21 cells per nest were attached to the nooks of the mud wall under protective eaves.

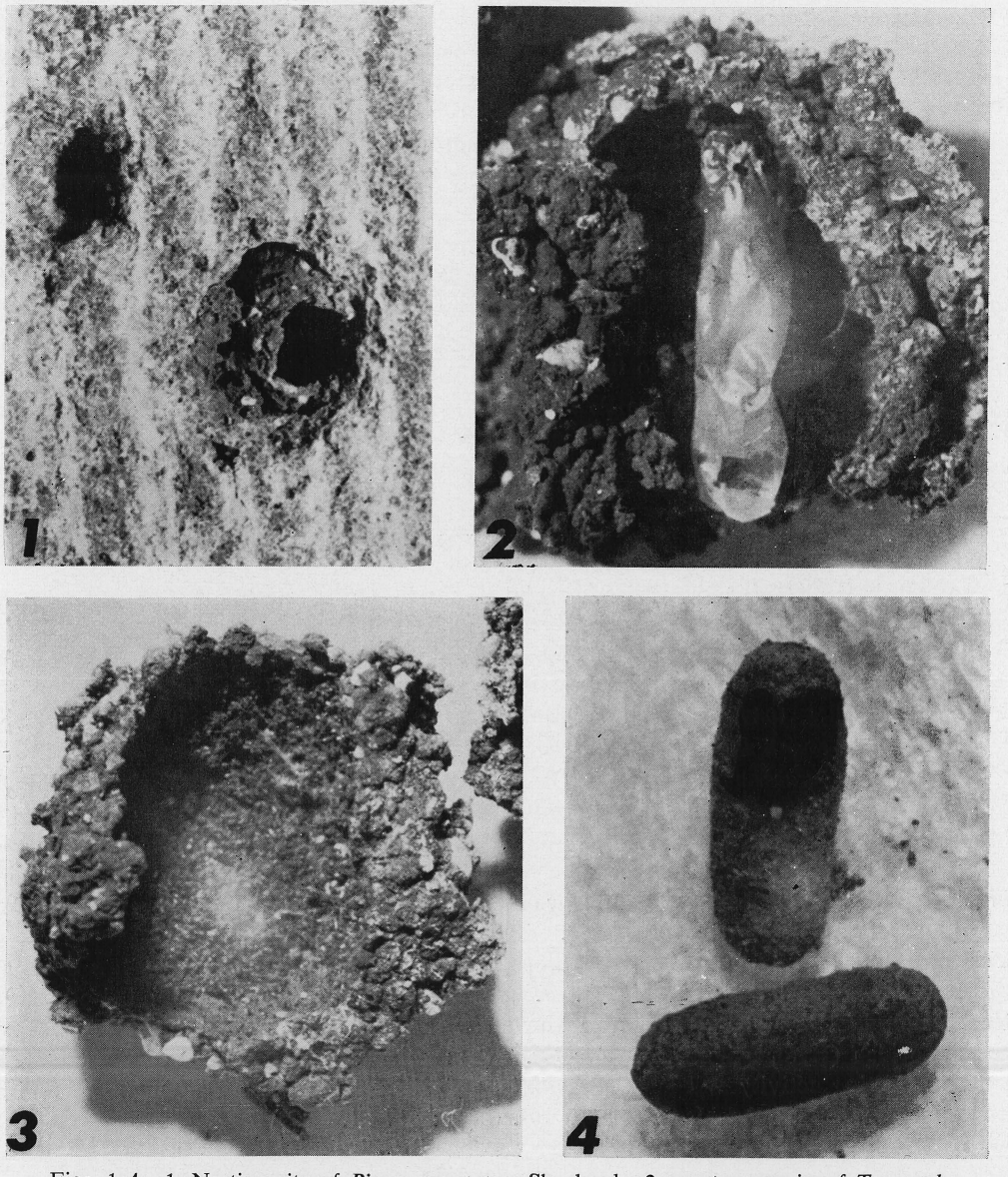
After the completion of her cell, the female wasp started hunting for prey. *P. iwatai* preys on several families of spiders (Argiopidae, Pisauridae, Agelenidae, Thomisidae and Salticidae), and *P. koreensis* provisions its young with *Araneus* sp. spiderlings. The 9 prey spiders found in a cell of *argentatum* all belonged to the family Salticidae and they were all permanently paralyzed. Similarly, Iwata (1964) noted that *P. argentatum* in Thailand provisions 6–9 prey per cell. In contrast to *argentatum*, *iwatai* stocked 9 to 24 prey spiders per cell. When the cell (either 1 or 3 cells) is completely stocked with prey, the egg is then laid on the last and usually the largest spider.

An opaque white egg of *argentatum*, 1 mm long and crescent-shaped was laid ventrolaterally in a diagonal position close to the base of the abdomen of the spider. The egg hatched in two days and within seven days the larva consumed all the 9 spiders in the cell. I placed the full grown larva on a layer of cellucotton in a small pill box. For three days, the larva wiggled and tossed around in the small pill box; on the 5th day, the larva appeared to be in an immobile stage. However, upon examining it several days later, the once transparent body had turned a "milky color" and appeared stiffened. After six weeks, I opened the pill box and found a dead male adult. The semi-flexible body indicated that the wasp probably transformed from its pupa a week prior to my discovery.

After the cell is completely stocked with prey and the egg is laid on the last prey spider, the female seals the entire entrance of the nest with a pack of mud 5 mm thick. The final closure of the nest entrance resembles a tiny oblong or spherical mud mount depending upon the size and shape of the aperture. One can distinguish the completed nest from an incompleted one by its mud mount.

When the adult wasp emerges from its cocoon she neatly cuts with her mandibles a tiny circular hole (2 mm in diameter) through the mud seal. On February 20 I found an empty 2×6 mm capsule-shaped cocoon of *P. argentatum* (fig 4). The cocoon, made of fine soil interwoven with silk resembled a miniature clay vase when broken in half.

The male of *P. iwatai* is known to cooperate with the female during her nesting acti-



Figs. 1–4. 1, Nesting site of *Pison argentatum* Shuckard; 2, empty puparia of *Trypoxylon (T.) bicolor*; 3, *P. argentatum* cell; 4, *P. argentatum* cocoon (empty).

vity by standing guard at the mouth of the nest to protect the female from intruders. This practice, however, was not observed in *P. argentatum.*

From the 7 *argentatum* nests examined, I found a single cell with larval instar exuviae of the dermestid *Trogoderma anthrenoides* (Shp.); 3 of the 7 nests were parasitized by an eulophid wasp, *Melittobia hawaiiensis* Perkins. *M. hawaiiensis* is also known to attack co-

coons of *Trypoxylon bicolor* Smith (Williams 1927).

Based on the known biologies in Pacific, the members of the Trypoxyloninae can temporarily be placed in two general categories: 1) the mud cell builder, and 2) non-mud cell builder. The former can be further divided into two classes: a) mud cell constructed in partially enclosed chamber, and b) mud cell constructed on wall surfaces. The non-mud cell builders construct their nests in wooden burrows of boring beetles or corrugated paper boards.

In the Hawaiian Trypoxyloninae thus far, two types are known. *Pison argentatum* constructs its mud cell in crevices or holes, while *Trypoxylon* (*T.*) *bicolor* utilizes both the mud cell and partitioned cell nests. In Thailand, *P. argentatum* constructs its mud cell on walls, while *P. punctiforms* Shuckard, *P. suspiciosum* Smith and *P. strandi* Yasumatsu utilize beetle burrows or bamboo tubes to construct their partitioned cell nest.

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