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会　規

昆虫学の同好者は，誰でも本会に入会することが出来る。
本会は，適宜談話会（当分年二回）を開き，また採集会を行なう。
本会は会誌を年2回発行し，会員は自由にこれに寄稿することが出来る（ただし当分1印刷ページにつき全欧文のものは1,000円だけ，図は1論文1個とし，それ以上の分は原則として著者負担とする。原稿の形式を本誌既出論文に準じ，編集係宛送付のこと。）
入会の希望者は，郵便連絡地（勤め先または住所）を明記の上，福井市文京3丁目福井大学教育学部生物学教室生物研究刊行会あて所定の年会費(1200円)を添えて申込まれたい。

The Biology of Some Pith Burrowing Silver Mouth Wasps (Hym., Sphec., Crabroninae)

By K. TSUNEKI

1. *Crossocerus* (*Ablepharipus*) *shibuyai* (Iwata)

Summary: The wasp burrows the pith of Miscanthus used for the roof of the house in the montanic region of Fukui Prefecture. Partitions between cells are made of pith particles gnawed off the wall. The cells are 4–7 mm long and 2–3 mm wide at the medial widest place. When the condition is favourable some ten cells are linearly arranged. The prey are small flies of several families as given below and 15–45 of them are stuffed per cell. Following the general rule in the Crabronine wasps the egg is laid after the provisioning is completed, but it is always found on one of the bottommost prey, that is to say, the wasp rearranges the prey collected before oviposition. The method of attaching the egg to the prey follows the general rule of Crabroninae: it is laid to the neck of the pedestal prey with its anterior end placed crosswise against the length axis of the prey. The cocoon is greyish white in colour, spun by filling the cavity of the cell, usuálly covered with the remains (chiefly the wings) of the prey. The wasps appear late in June and disappear in the middle of September, possibly repeating two generations. In the region where the observation was made this species was very abundant and every time of the season we could see the wasps workig at the eaves of the thatched houses, carrying the prey, venter to venter, by holding it with the middle legs. The prey identified by Prof. M. Sasakawa* are as follows:

I. Sciaridae	(1)	*Psilosciara* sp. A, ♀ ♂. Most adundant.
	(2)	*Psilosciara* sp. B, ♀ ♂. Next abundant.
	(3)	*Sciara* (*Lycoriella*) *iridipennis* Zett., ♀. Rare.
II. Scatopsidae	(4)	*Scatopse brevicornis* Meigen, ♀♂. Not rare.
	(5)	*Scatopse litorea* Edwards, ♀ Rare.
	(6)	*Scatopse* sp., ♂. Not rare.
III. Chironomidae	(7)	*Limnophyes* sp. ♀. Fairly abundant.
	(8)	*Smittia* sp. ♀♂. Fairly abundant.
IV. Ceratopogonidae	(9)	*Dasyhelea* sp. ♀♂. Rather rare.
V. Ephydridae	(10)	*Scutella* sp. ♀. Very rare.
VI. Drosophilidae	(11)	*Drosophila lutea* Kikkawa & Peng, ♀. Very rare.

Abbreviation: SD... Stem diameter. TD... Tunnel diameter. TL... Tunnel length. CL... Cell length. OP... Outer partition of the cell.

Nest 1. Collected on July 5, 1970. The wasp was imprisoned with a bit of grass stem when she entered the tunnel with a prey. She had escaped, however, by digging and enlarging the tunnel along the tunnel wall, when I examined the nest. SD 5 mm, TL 146 mm, TD 2–3 mm, not uniform and smooth. The inner 23 mm is occupied by the larval chambers and the next inner gallery is loosely filled with pith particles for about 60 mm.

Cell 1: The bottom is thickly stuffed with pith particles, CL 8.5 mm, prey 35, of 4 species, Chironomidae most abundant, at the bottom part a larva of the wasp of about 6 mm eating the prey, OP 2 mm. Cell 2: CL 5 mm, 32 prey (Scatopsidae and

* Dr. M. Sasakawa, Professor of the Kyoto Prefectural Universarity, the specialist of Agromyzidae, who took trouble for me in identifying the flies out of his line and to whom I express my special thanks.

Chironomidae abundant), at about 3/5 from the interior a larva of about 5 mm long was eating, the position of it among the lamp of prey unnatural, it may be a parasite (a cuckoo wasp), OP 2 mm. Cell 3: 4.5 mm long, OP 1.5 mm, 43 prey (Sciaridae 25, Scatopsidae 9 and Chironomidae 9), a young larva eating at the innermost part of the prey lamp, already detaching its head from the pedestal prey. Another younger larva of about 2 mm present towards the middle of the cell, possidly a parasite of the cuckoo wasp. The prey at the outer part of the cell are mixed with pith particles of OP. Cell 4: In the course of provisioning, 11 prey (Scatopsidae 10 and Chironomidae 1) accumulated, no egg of the wasp.

Nest 2. Coll. 5. VII. 1970, at Taniyama cottage, old nest. TL. 150 mm, TD 2–3 mm, at the bottom 4 cells linearly arranged and one cell near the entrance, about 40 cm apart, possibly by the other wasp, each cell containing a perforated cocoon stuffed with saw dust and remains of prey, the cocoon roughly oval or ellipsoid, 5×3～7×4 mm in dimensions, comparatively tough, a numder of wings of Sciaridae could be detected. The lateral wall of the tunnel was perforated behind the outer isolated cell, possibly by the emerged wasp.

Nest 3. 20. VII. 1970. SD 5 mm, TL 165 mm, TD 2–3 mm. Cell 1: 4 mm, OP 1 mm, 32 prey, a dead egg on the neck of the innermost prey. Cell 2: 5 mm, OP 1.5 mm, a young larva eating a 2nd prey from the bottom, prey 28, mostly *Psilosciara* A (black bellied) and B (yellow bellied). Cell 3: Still provisioning, prey 17, loosely scattered within the range of 17 mm, further 4 prey at about 7 mm apart from the first group. No egg.

Nest 4. Do. TD about 2, TL 211 mm. Cell 1: 6 mm, OP 3 mm, with full-grown larva. Cell 2: In the course of provisioning, prey 21, scattered in several groups (possibly disturbed by the imprisoned wasp), Chironomidae and Sciaridae, each 10 in number, with one other.

Nest 5. Do. TL 217 mm, TD 2–2.5 mm, 5 cells, CL from inside 5, 4, 5, 5, 7 mm, cells 1 and 2 each with a cocoon, in cell 3 a full-grown larva, in cell 4 a medium-sized larva eating, in cell 5 a small larva at the bottom of the lump of prey. Cell 6 provisioning, prey 11, no egg. OP 1–15 mm.

Nest 6. Do. TL 90 mm, TD 2–2.5 mm. Cell 1 about 4 mm, prey 16, a small larval wasp on one of the innermost prey, OP 1.5 mm, cell 2 provisioning, 12 midges in a mass in front of the partition, no egg.

Nest 7. Do. TL 128, TD 2–3.5 mm, not uniform, two completed cells at the inner end, each including a cocoon, 6–7×3–3.5 mm. Cell 1: 6 mm, cell 2: 7 mm, cell 3 provisioning, including 17 prey in front of OP of cell 2, and another 10 prey scattered in 3 spots, possibly disturbed by the imprisoned wasp that was dead in front of the cotton plug made by the observer. No wasp's egg.

Nest 8. Do. TL 148, TD 1.5–2.0 mm (the mother wasp exceptionally small).

Cell 1: 7.5 mm, 28 intact prey and several detached wings, the larva presumably at the final instar just moulted, at the bottom of the cell, OP about 3.5 mm, obliquely inclined on both surfaces. Cell 2: Still being provisioned, with scattered 15 prey of *Psilosciara* A and B, no egg, but outside the prey a loose collection of gnawed dust, about 3 mm thick, a temporal closure? or a result of furious mother wasp imprisoned?

Nest 9. Do. This is a curious nest made, as a final outcome, by the cooperation with *Rhopalum venustum* m., not simply supersedured, but some cells contained the result of the work of both the wasps. TL 267 mm, the tunnel not smooth, enlarged or gnawed into a hollow from place to place. At 25, 40, 60 and 70 mm from the entrance the cocoon caps of possibly *Psenulus* sp. were scattered and at 60, 70, 90 and 110–120 mm one to several prey, together with a small quantity of saw dust, were discovered. Further, at 185–195 mm apart from the entrance 4 midges of Sciaridae, with a small mass of pith particles, were preserved and there the imprisoned wasp was dead. Curious to say, she was a female wasp of *R. venustum*. Behind her, and in front of OP of cell 3, a single Psocopterous prey was laid. The contents of the cells completed were:

Cell 1: 4 mm, a cocoon of *C. shibuyai*, covered consideradly with wings of *Psilosciara*, A, OP 2.5 mm. Cell 2: 4 mm, a cocoon of *C. shibuyai*, covered with wings of midges of *P.*, A, OP 3 mm. Cell 3: 9 mm, inner portion including loosely extended part of OP of cell 2, prey 30, including 3 flies of *P.*, A at the bottom and 27 Psocopterous insects. Near OP of its own cell a larval wasp of about 1.5 mm long was eating the food (a parasite?). Judging from the result this nest was originally a possession of *C. shibuyai*. When she completed the two bottom cells and provisioned 3 prey for cell 3 the nest was invaded by a wasp of *R. venustum* and this wasp completed a third cell. She was in the intention of making further cells. The mother wasp of *shibuyai* did not abandoned the nest, she frequently came back with a prey, but whenever she entered the tunnel she must have been driven out by the *Rhopalum*. The midges scattered in the tunnel must have been dropped or placed by the *Crossocerus*.

Nest 10. Do. TL 388 mm, perforating 3 nodes of Miscanthus and 2 cells were completed at the end. Cell 1: 5.5 mm, OP 3 mm, 22 prey without a larval wasp. Cell 2: 5 mm, nearly full grown larva eating remains of prey, OP 2 mm thick. Cell 3: In the course of provisioning, 26 prey without the egg of the wasp scattered in a broad range of the tunnel till near the entrance. The imprisoned wasp was dead behind the entrance plug of cotton.

Nest 11. Do. TL 165 mm, TD at first 1.5 mm, then somewhat enlarged into about 1.7–1.8 mm and smoothly ran and at the cell part about 2 mm. Cell 1: 5 mm, prey 21 consisting of *Psilosciara* sp. A and B, one of the innermost prey carried the egg of the wasp. Cell 2: 6–7 mm, prey 9, OP not as yet tightly packed (a temporal closure? or the result of the struggle of the imprisoned wasp?). The partitions were,

as a rule, concave on both sides, suggesting that in this species the gravity would be the most important factor of larval orientation when pupated.

Nest 12. 30. VII. 1971, the same place, in the course of provisioning, the mother wasp was imprisoned when entered the nest with a cotton plug and the nest was examined the next day, a. m. SD 8.5, TD 2–4, not smooth, TL 328 mm, ending at the second node and the nest including 14 completed cells for inner 110 mm and a 15th cell was incompleted. In the empty part of the tunnel the old cocoon caps of *Psenulus* sp. were scattered hither and thither and several hollows clearly gnawed out by the wasp as if to have been used for the larval cells were observed. The facts seemed to suggest that the tunnel had been used repeatedly by generations of several species of wasps. In this nest the parts of the larval cells were very frequently enlarged into the ellipsoidal chambers. Cells 1–13 included respectively a completed cocoon, some of the cocoons were partly broken when the nest was cut open and showed a yellow shrunk prepupa in each. In the 14th cell the larva was still eating the prey and in cell 15 only two midges were stored, of course, without the egg. The remains of prey in most cells were pressed against OP, but in some half covering the cocoon of the cell. The cocoon filled whole the space of the cell, in some cells it was almost in contact with that of the next cell, in others widely separated by the packed saw dust.

Nest 13. Do. TL 178 and TD 2–2.5 mm, including 14 larval cells, cells 1, 3, 5, 6, 8 and 9 included a cocoon respectively, cells 2, 4, 7 filled with prey, with the egg unhatched and cells 10, 11, 12, 13 and 14 with the growing larva. Cell 15 in the course of provisioning, with 12 prey (all *Psilosciara* sp., A, ♀), but no egg. In the cells having a cocoon the prey remained were pressed at the rear side, all black A, and covered with mould. CL mostly 7–7.5 mm, but the cocoons were mostly about 5 mm, partitions comparatively thin, 3 mm thick, fairly compactly pressed. Cell 10: 7.5 mm, a full grown larva, just spinning the cocoon, remains of prey at the rear side. Cell 11: 7.2 mm, a larva of nearly full-grown, still eating. Cell 12: 7.0 mm, about a half grown larva at the bottom of the cell, prey 27, all A. Cell 13: 6.5 mm, prey 35 (12 A and 23 B), a young larva at the bottom of the cell, OP about 2 mm, 2 prey at the outer end were crushed by the hard pressing of OP. Cell 14: 5.5–6 mm, OP inclined, 24 prey, all B, all ♀, a larva about a day old was attached to the neck of the prey, still transverse.

Nest 14. 18. VIII. 1970, examined 3 days after. SD 5 mm, TD 2.5–4 mm, not smooth, with numerous hollows, TL 320 mm, within the inner 90 mm 10 cells were constructed, the inner 5 included cocoons, outer 5 the growing larvae, CL 5.5–7.0 mm, OP 2–4 mm. In the entrance gallery two accumulations of prey, one, 9 midges, at 50 mm, the other, 10 midges, at 70 mm from the entrance, all mixed with saw dust, no egg on any of them. The imprisoned wasp was dead near the entrance.

Nest 15. 2. IX. 1972, examined 5. I. 1973. TL 200 mm, TD 2–2.5 mm. Inner

65 mm included 6 larval cells. Cell 1, 10 mm, the following 6.5, 5.0, 5.5, 7.0 and 5.5 mm, cells 1, 2, 3, 4 included cocoons, all with the anterior end nearly truncate, in cells 5 and 6 a complete set of prey, 28 and 27 of sp. A and B, outside the OP of cell 6 two flies were accumulated.

*2. **Rhopalum** (**Rhopalum**) **clavipes jessonicum*** (Bischoff)

Nest 1. July 13, 1970, the same place as above. TD 3,8 mm, CL from interior (numerals within parentheses thickness of OP made of pith dust): 13 (3), 14 (7), 13 (6), 14 (5), 9 (2), 9 (6), 13 (10), 10 (15), 5 (10), 70 (10, the entrance stopper) mm. Cells 1, 8, 9 and 10 empty, cell 2 with a number of remains of prey and a dead larva, cell 7 filled with dead prey, cells 3. 4. 5 and 6 included respectively a ccoon. The prey were Psocopterous insects, mostly the adults, containing aprarently 4 species. Judging by the venation and general appearance one of them belonged to *Methlophorus nebulosus* or the species closely allied to it. The cocoons were slender, elongated suboval, 9, 9, 7 and 6 mm long from the inside, thin, semitransparent, with the excrement at the posterior end. Strange to say, all directed the anterior end inwards. In cell 4 25 fore wings could be collected and in cell 7 15 prey involving 13 adults and 2 nymphs.

Two days after the collection 4 imagoes were found in the test tube in which the nest was placed, 2 ♀ and 2 ♂, possibly ♀♀ from cells 3 and 4 and ♂♂ from cells 5 and 6, judging from the size of the cocoons and the emerged wasps.

*3. **Rhopalum** (**Rhopalum**) **venustum*** Tsuneki

Nest 1. July 20, 1970, the same place as above. TD about 1.5-2 mm. TL 108 mm, the tunnel was further extended inwards for 25 mm, but the wasp excluded the place by constructing a partition with the saw dust. In front of this partition 15 Psocopterous insects, with 8 winged, were stored, including at least 3 species, no egg. The imprisoned mother wasps was dead behind the entrance stopper.

Nest 2. Do. TL 75 mm, TD 1.5-2 mm. The first partition was made 7 mm apart from bottom of the tunnel, using pith particles loosely packed, 6-7 mm thick. Cell 1: CL 7-8 mm, 14 Psocoptera with 3 winged, belonging at least to two species. These were tangled together with silk thread, not easily separable, OP 8 mm, not compactly pressed and in it 2 prey insects were stuffed together, no egg of the wasp on of them. Cell 2: 21 Psocids, tangled together, 7 winged, 2 spp., no egg, as yet no OP, the imprisoned wasp was dead in the tunnel. It remeined uncertain whether the second wall is a true partition or not, because it was too loose and too long and the number of the *Psocus* in cell 1 was too small and without the egg. All the prey might be the ones provisionally stored and the loose wall might be the result of the struggle of the imprisoned wasp.

Nest 3. Do. See nest 9 of *Crossocerus shibuyai* Iwata.

Nast 4. August 10, 1970, examined the next day at the laboratory. TD 2-3.5

mm, TL 215 mm, the part of the cells was distinctly enlarged, 5 completed and 1 incompleted cell, CL and OP (within parentheses) as follows: 6 (2.5), 7 (3.5), 7 (4.0), 8 (5.0), 7 (5.0), outside of OP of cell 5, 75 mm apart from there, a loose tampon of pith dust was constructed and in front of this tampon the imprisoned wasp was dead. The prey all Psocids, the numder from cell 1 (within parentheses winged): 54 (5), 64 (11), 38 (5), 35 (11) and 10 (6), those of cells 1 and 2 dried up, in cell 4 the egg could not de discovered, in cell 5 on a prey located towards the middle an egg was laid. This was exceptional, but the mode of oviposition was certainly that of the Crabonine wasp.

Nest 5. July 30. 1971, the same place. SD 5, TD 1.5–2.5 and TL 60 mm, the first wall at 5 mm apart from the bottom, the space empty, containing several small balls of pith particles gathered together, in front of the wall 16 Psocids (4 winged) were stored, all tangled together with silk threads.

4. ***Rhopalum*** **(*Rhopalum*)** ***kuwayamai nikkoense*** Tsuneki

Nest 1. July 5, 1970, the same place as above. SD 4, TD 1.7 and TL 62 mm. Cell 1: 9.5 mm, OP 1.7 mm made of pith particles compactly stuffed, 18 Psocids, large and small, adults and nymphs (mostly nymphs), involving two unknown species, the yellow coloured, with non maculated wings and the grey coloured, with non maculated wings, the former more in number, the larva of the wasp among the prey near the bottom, eating the prey. Cell 2: 6 mm, OP 2.2 mm, 17 Psocids, the waspling among the prey stuck together near the bottom. Cell 3: 9.5 mm, OP 2.5 mm, rather loosely packed, prey 19, two species of Psocids, mostly nymphs, on one of the prey at the bottom a young larva was attached in the manner as done by the egg. Cell 4: 14 Psocids, no OP, no egg nor larva, the cell in the course of provisioning. The imprisoned wasp was dead in the tunnel.

5. ***Rhopalum*** **(*Rhopalum*)** ***succineicollare*** (Tsuneki)

Nest 1. August 18, 1971, in the pith of Miscanthus collected from the roof of a cottage at the shaded place in the montanic region of Fukui Prefecture, at about 600 m a. s. l. SD 6.5–7.0 mm, TD 3.5–4.0 mm and TL 103 mm. Innermost 7 mm was stuffed with saw dust, mixing old wings of flies, possibly of the prey of some other Crabronine wasp, showing that the nest was the old one reutilized. Cell 1: 10 mm long, OP 1.7 mm, 24 prey consisting of three species of Psocoptera, one was large, about 6 mm, with dirty brown maculated wings (possibly *Psococerastis nubila* Enderlein), two were medium-sized, with blackish maculated wings (near *Psococerastis tokyoensis* Enderlein), all others much smaller, with immaculated wings, ♀ and ♂ mixed. The egg of the wasp not discovered, also the larval wasp. Cell 2: 9 mm, OP 2.6 mm loosely collected pith particles, 19 prey, all belonging to the smallest one of cell 1. The egg could not be found out, probably the cell was during the course of provisioning.

6. *Rhopalum* (*Calceorhopalum*) *watanabei* Tsuneki

Nest 1. July 30, 1971, the same place as above, the Miscanthus collected from the roof of a cottge with SD 5.5 mm, TD 2.5 and TL 47 mm. Only a single midge belonging to Empidae was found, together with the imprisoned and dead wasp.

Nest 2. Do. SD 4.0, TD 2.5, TL 130 mm. Cell 1: 12 mm, OP 2 mm, consisted of saw dust hardly packed, prey Empid flies, 27 in number, fairly hardly stuffed, on one of which located at about a third from the outermost one a young larva of the wasp. Judging by its situation, however, I thought it doubtful to assume it to be the true offspring of the owner of this nest, and presumed to be the young of the parasite, possibly the cuckoo wasp.

Nest 3. August 18, 1971, the same place. SD 7, TD 4 mm for the first 200 mm (possibly the old tunnel of some wasp), then narrowed into 2-2.5 mm for the next 130 mm. As yet no prey, only the imprisoned dead wasp was in the tunnel.

Two nests of *Spilomena dezcli* Tsuneki in Japan (Hym., Sphec.)

By K. TSUNEKI

Nest 1. The Miscanthus in which the nest was built was collected on August 10, 1970, from a roof of one of the summer working houses in Taniyama, Fukui Prefecture. SD 3 mm, TD about 1 mm, TL 40 mm. At the end of the tunnel which ran nearly straight 64 thrips of unknown species (incl. reddish and yellowish insects), all nymphs, were collected in a mass and in front of it the imprisoned mother wasp was dead. This wasp became later the type of the species.

Nest 2. On September 29, 1971, the same place as above, but collected at random. SD 2.5 mm, TD about 1 mm, TL 50 mm. The thin stem was split into two halves by a knife and of the larvae was crashed by the moved pith wall and six of them were splashed. Three of them were slightly larger than others, about 3 mm in length and the remaining ones were about 2 mm or so, all were tapering posteriorly. On the wall of the tunnel the small elliptic hollows were from place to place observed, possibly the place of the cell. Remains of the prey were all thrips of unknown species. According to the hollows and the two inner cells left in the tunnel the larval chambers are linearly and smoothly arranged and separated from each other by the wall of pith particles, about 1 mm or less.

At the place where the Miscanthus stem was collected only *S. dezcli* was known to live and I thought that the nest was made by a wasp of this species.