

BEAUFORTIA

SERIES OF MISCELLANEOUS PUBLICATIONS

ZOOLOGICAL MUSEUM - AMSTERDAM

No. 115

Volume 10

June 14, 1963

Scale insects from Thailand with description of a *Filippia* n.sp.*)

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From Jhr. E. W. VAN HEURN, who resided from 1958—1960 in Thailand, I received about 30 samples of scale insects and plant lice.

Among the scale insects 3 species could not be identified with certainty, one species from coconut-leaves close to *Pseudococcus comstocki* (KUWANA, 1902), one from mango close to or identical with *Aulacaspis sumatrensis* (GREEN, 1930), and a species of the Monophlebinae of which only larvae were available (probably from *Icerya aegyptiaca* (DOUGLAS, 1890) which was found in the same locality and on the same date, but on another food-plant). The other scale insects belonged to common species with exception of a *Filippia* which is described in the following pages as *Filippia orientalis* n.sp. *Saissetia nigra* (NIETNER, 1861) and *Maconellicoccus hirsutus* (GREEN, 1908) were collected in 5, and *Nipaecoccus vastator* (MASKELL, 1894) in 4 localities. *Ceroplastodes chiton* (GREEN, 1909) and *Icerya aegyptiaca* (DOUGLAS, 1890) were found in 2 localities. *Planococcus lilacinus* (COCKERELL, 1905), *Filippia orientalis* n.sp., and the 3 species which could not be identified with certainty, are only represented from one locality.

Aphids were present in 12 samples, and identified by Mr. D. HILLE RIS LAMBERS. They also belonged to common species, namely *Aphis gossypii* (GLOVER, 1876), *Longiunguis sacchari* (ZEHNTER, 1897), *Ceratovacuna lanigera* (ZEHNTER, 1897), *Macrosiphoniella sanborni* (GILLETTE, 1908) and *Aphis malvoides* (VAN DER GOOT, 1916). The latter species is only known from the Indo-Malayan region, the other species are generally distributed in the tropics. The second and third species are often reported as *Aphis sacchari* and *Oregma lanigera*. *Aphis nerii* (FONSCOLOMBE, 1841), a species known from S. Europe, feeding on Asclepidiaceae and Euphorbiaceae, was also found in Thailand, on a plant with milky juice. Mr. HILLE RIS LAMBERS found among the aphids from Thailand also an undescribed species of the genus *Aphis*, which is closely allied to *Aphis gossypii*, and was collected from a kapok-tree.

*) Received March 6, 1963.

Filippia orientalis n.sp.

This species was collected in February 1959 from an unidentified plant at Pi-Mai, a town about 260 kms N.E. of Bangkok and 50 kms E. of Korat, on the river Nam-mun, an affluent of the Mekong. The same species was found among material from the Museum of Natural History at Leiden; though a label was missing it is pretty certain that these insects were collected in Indonesia. At variance with *Filippia viburni* (SIGNORET, 1873) from S. Europe the setae on the outer side of the anal plates are chisel-shaped like the setae around the margin of the body.

As far as I could ascertain no *Filippia*-species have been reported from the Indo-Malayan region. Prof. BORCHSENIUS informed me, however, that he has a *Filippia* sp. from South Yunnan in China (situated like Pi-Mai about 100° east of Greenwich). This Chinese species, which has still to be described, has ordinary setae on the anal plates, not chisel-shaped ones as the Thailand-species.

According to BORCHSENIUS (1957) 19 species of *Filippia* have been described, 4 palaeartic, 7 nearctic, 3 neotropic, and 5 ethiopic species.

The following description of *F. orientalis* refers to the specimens from Thailand, if not otherwise stated.

Adult female (♀ ad.)

Habit. According to the collector the specimens from Pi-Mai were covered by white wax, but this was no more observable in the alcohol-material. Body rather flat, sometimes with very irregular outline. Dimensions (on slide) 3.0—4.0 × 2.0—2.5 mm.

Antennae 8-segmented, length ca. 0.60 mm (fig. 1). Segment III is about as long as IV + V, and longer than VI + VII + VIII. The antennae are only scantily provided with setae. On the basal segment (I) 3 setae were observed, 2 on segment II, 2—3 short setae near the top of segment III, 2—3 on IV, 3 on V, 1 on VI, 2 on VII, and 9—10 on VIII, the apical segment. On each of the segments VI—VIII a sensory seta is present; these 3 sensory setae are placed in a line parallel with the axis of the antenna. On segment VIII probably 3 sensory setae are present, but they are difficult to distinguish from the common setae.

Eyes seem to be absent in the adult female as well as in the older larvae. Minute eyes were, however, observed in the first stage larvae, but only in one of the three available specimens.

Labium one-segmented, with 5 pairs of setae (fig. 13). Rostral loop reaching the line of the middle coxae.

Legs with free tibiotarsal articulation (fig. 3). The hind legs have a length of about 1.0 mm; tibia 240—260 μ, tarsus (without claw) 110—120 μ, femur 250—300 μ. Digitules longer than the claw and knobbed, the unguinal digitules club-shaped (fig. 2). The claw has a denticle at its base (fig. 3) like that of *Filippia viburni* (Sign.) (cf. BORCHSENIUS 1957, fig. 178). In the

hind legs 7 setae were observed on the coxa, 4 on the trochanter (a long and a short seta, and 2 small spines on the opposite side), 4—6 on the femur, 5—6 on the tibia, and 5—6 on the tarsus (excluding the digitules). The trochanter has 2 elliptical sensoria on each side (fig. 2).

Dorsal surface. The dorsum shows a faint areolation of lighter coloured areolae with a glandular pore in the centre (fig. 8). The diameter of the areolae is about 10—20 μ , of the central pore ca. 2 μ . Distance of the pores 20—40 μ . On closer inspection it appears that the pores are short tubes, about as long as wide, but without a filament as present in the tubular ducts on the ventral side. Mediodorsally most pores show a narrow oral rim (diameter ca. 4 μ); further the tubes connected with these pores are about twice as long as wide, and sometimes bifurcated (fig. 8); even a few treble tubes were observed. Under a low magnification ($\times 100$) this mediodorsal strip of special pores is already visible.

The marginal spines are chisel-shaped (fig. 4), length 30—40 μ , space between the spines 25—35 μ . Between the anterior and posterior stigmatic spines from 40—45 chisel-shaped spines are present. At the base of these chisel-shaped spines usually 1—2 small wax-pores are visible (fig. 4). At the ends of the body (head, and apex of abdomen) about 10—15 broader and shorter spines are observed; dimensions ca. 25 \times 10 μ while the other marginal spines measure 30—40 \times 5 μ . It seems that these broad spines have arisen by fusion of 2 ordinary spines; at their base often 3—5 wax-pores are observed (fig. 5).

The stigmatic spines, placed in a depression of the body-margin, are cylindrical and pointed (fig. 6), not chisel-shaped like the other marginal spines. The central spine (fig. 7) has a length of about 70 μ ; the lateral spines are usually doubled (fig. 6) and of variable length (30—60 μ).

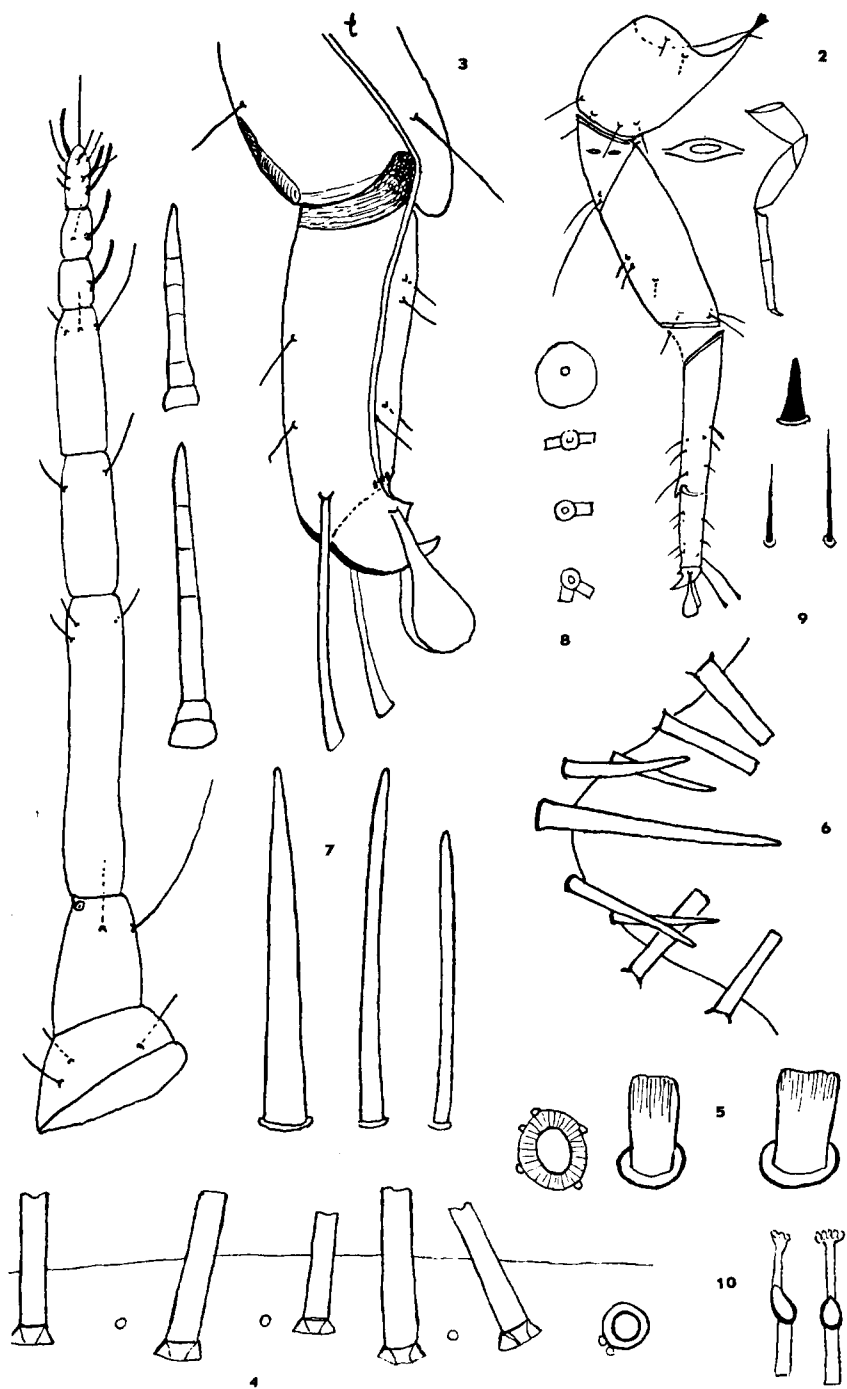
The dorsum is sparsely provided with short conical spines, length 15—20 μ (fig. 9); mediodorsally they are scarcer than elsewhere on the dorsum.

The anal plates have 4 chisel-shaped spines on the outer side, and 3 common setae on the inner side; the apical spine is broadened towards its tip which may show a tendency to bifurcation (fig. 11).

The anal ring (fig. 12) has 2 rows of elliptical pores and 6 anal setae, 4 large ones (270—300 μ) and 2 shorter and thinner setae (130—140 μ). On the anal tube 2 pairs of anal fringe setae are present of which the outer ones are about twice as long as the inner setae (length ca. 90 and 40 μ). The anal slit has a length of 0.60—0.65 mm, about $1/5$ — $1/6$ of the length of the body.

Ventral surface, sporadically provided with short slender setae, length 15—25 μ (fig. 9). Two pairs of longer setae (100—130 μ) in front of the anal ring, further one pair near each antenna (ca. 100 μ) and single setae of about 100 μ near the bases of the legs. The spiracle is provided with a bar (fig. 14).

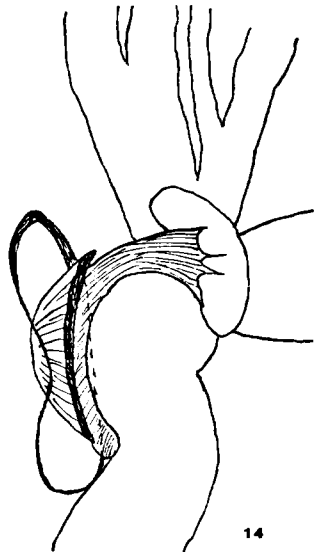
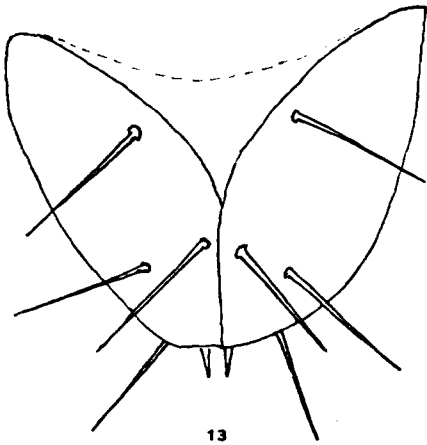
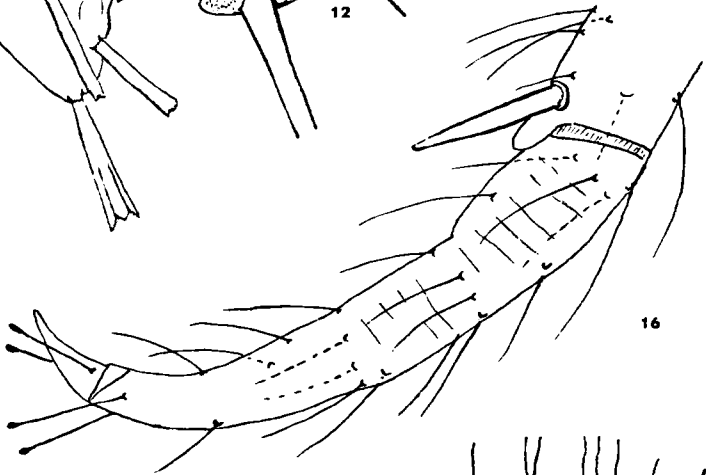
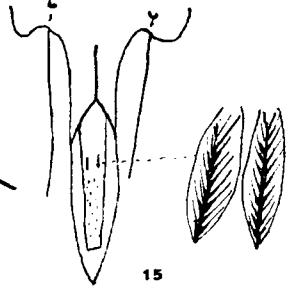
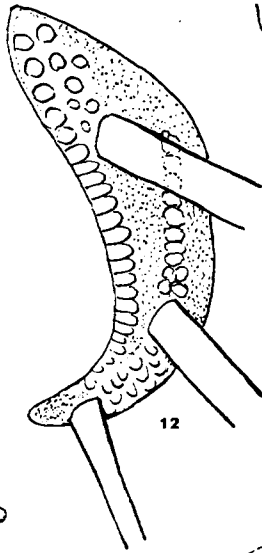
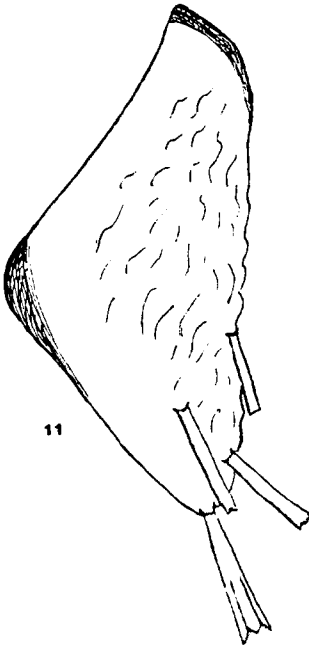
Three kinds of wax-pores are observed on the venter, multilocular pores in the anal region which are crowded in a small area, tubular ducts which are distributed over the whole venter, especially on the abdomen. Quinque-



ocular pores are distributed in a broad row in the stigmatic furrow; they are numerous near the stigmatic spines (usually 20—30) and spiracle (about 10), but scarce between these areas. In the tubular ducts the filament is about as long as the tube itself and rather thick, at least half as thick as the tube (fig. 10).

The adult females from the Leiden Museum show slight differences with those collected in Thailand; in both cases 4 prepared specimens were examined. It seems that in the specimens from Leiden no more than 3—7 broad spines are present at the ends of the body (in those from Thailand usually 10—15). Most of these spines were broken, but their socket was twice as wide as in the other spines. When the spines were present they were somewhat thicker than the other spines, but about of the same length. The second stage larvae in this sample showed the same features. The apical seta of the anal plates is less broadened, and the stigmatic depressions of the body-margin are less pronounced. In the antennae the third segment is only 140—160 μ long, in the specimens from Thailand 180—190 μ . In the mediodorsal region no bifurcated tubes were observed and the oral rim seemed to be absent, so that this region is not conspicuous by its special tubes as in the specimens from Thailand. The conical dorsal spines are more slender, and scarcer. The food-plant is unknown in both cases.

FIGURES 1—10. *Filippia orientalis* nov. spec. Adult female. 1. Antenna ($\times 200$). The sensory setae are drawn too thick to show them clearly. On the right the outline of the antennae of larva I (upper fig.) and larva II (lower fig.) are shown for comparison of dimensions ($\times 200$). 2. Hind leg ($\times 90$). On the right outline of hind leg of larva II for comparison of dimensions ($\times 90$). Middle fig., sensorium of trochanter of adult female ($\times 650$). 3. Tarsus of hind leg, showing the free tibiotarsal articulation ($\times 450$). From the structure it appears that the tarsus is moved by the tendon t of the claw which slides in a groove of the sclerotic process at the base of the tarsus. The thickness of the tendon is conspicuous. It seems that movement of the claw is restricted in this case where the tarsus is movable. 4. Marginal spines opposite base of hind leg ($\times 650$). On the right of this fig. the base of a broken spine, with 2 gland-pores; the small circlets between the spines are gland-pores. 5. Marginal spines from head and apex abdomen ($\times 650$). The right spine belongs to the head, the middle one to the abdomen; on the left the base of a marginal spine of the head, with 5 gland-pores. 6. Stigmatic spines opposite the anterior spiracle; the central spine is flanked on both sides by 2 lateral spines ($\times 450$). The stigmatic spines are pointed, the other marginal spines chisel-shaped. 7. Middle stigmatic spine of adult female (on the left) compared with that of larva II (middle fig.) and larva I ($\times 650$). 8. Dorsal wax-pores ($\times 650$). Upper fig. a dorsolateral pore with a light-coloured areola; the 3 lower figures show pores from the mediodorsal region with an oral rim, and single or bifurcated tubes. 9. Conical spine from dorsum, and 2 setae from the venter ($\times 650$). 10. Tubular ducts from the ventral side ($\times 650$).



Adult male (♂ ad.)

Among the material from Thailand 5 adult males were found. Length of body (including stylus) 1.60—1.75 mm; length of stylus ca. 0.35 mm. The wings have a length of about 1.50 mm; halteres seem to be absent. A distinct reticulation is observed on the dorsal side of the thorax near the base of the wings.

Antennae 10-segmented, length 1.35—1.40 mm. The 3 basal segments (fig. 18) and the 2 apical segments are the shortest ones (100 μ or less). Segments V—VII are the longest ones (200—250 μ). In 2 antennae which were entire (most of them were broken) the length of the different segments in microns was as follows: I (basal segment) 40, 40; II 70, 55; III 70, 80; IV 170, 150; V 250, 230; VI 240, 240; VII 210, 220; VIII 175, 150; IX 100, 100; X 80, 90. Total length, calculated from these data, 1405 and 1335 μ . The 3 basal segments have a width of 40—65 μ , the other segments of only 25—30 μ , so that the ratio of width to length of the antenna is about 1 : 50. The second segment shows a reticulation on its surface, and is provided with a whorl of long setae (fig. 18); the sensorium, by which the second segment is characterized, is very small. Segments II—X are provided with many long setae; some thicker setae are observed on the apical segment which are probably sensory setae.

The legs are long and slender. Length of hind leg about 1.20 mm; femur ca. 0.30, tibia 0.50, tarsus 0.20 mm; width of tibia only 0.03 mm, so that the ratio of width to length is about 1 : 17. The legs are provided with many setae; those on the tibia have a length of 60—80 μ . Tarsal and ungual digitules slightly longer than the claw, and knobbed. At the end of the tibia a robust spine is present (fig. 16). The trochanter has 3 sensoria on each side.

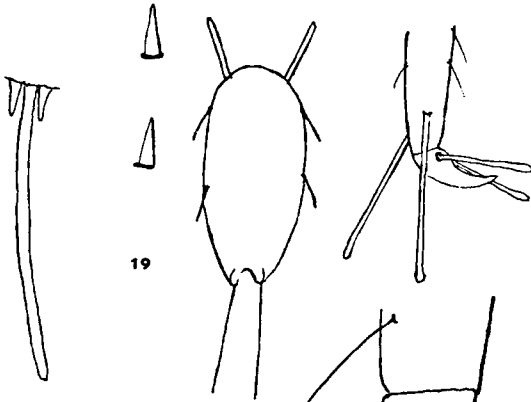
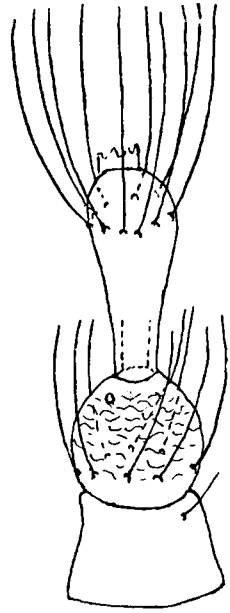
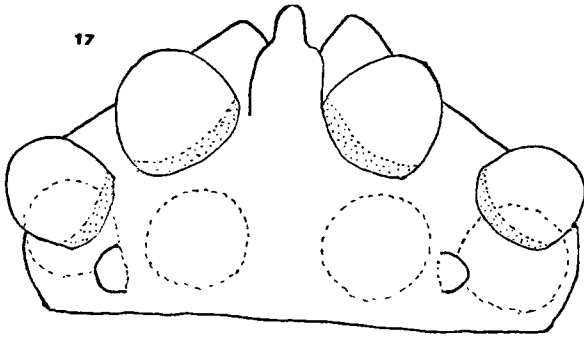
The head shows 4 large eyes on the dorsal side and 4 large ones on the ventral side (fig. 17). Further a small eye was seen dorsally at the sides of the head, but this could only be clearly observed in one of the 5 adult males. The ventral side of the head behind the antennae shows a reticulation.

The robust setae which support the caudal wax-tails have a length of about 250 μ (variation 235—275 μ). Only single setae arise from the two glandular depressions which produce the caudal wax-tails, but in 3 specimens the seta is doubled, though the second seta is very thin and its length only $1/3$ — $1/2$ of that of the main seta.

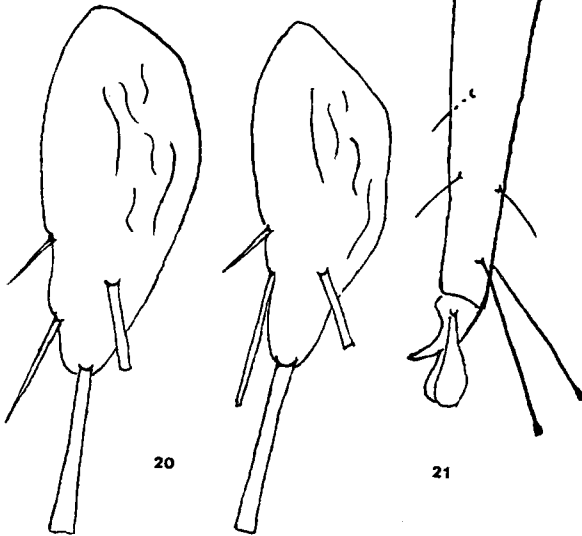
The copulatory apparatus shows a cylindrical penis with sclerotized wrinkles in 2 small areas (fig. 15).

In the material from the Leiden Museum several male puparia, and some

FIGURES 11—16. *Filippia orientalis* nov. spec. Adult female. 11. Left anal plate ($\times 300$). 12. Half of anal ring, with basal part of anal setae ($\times 650$). The dotted parts are brown and sclerotized. 13. Labium, seen from the ventral side ($\times 465$). 14. Posterior spiracle ($\times 300$). Adult male. 15. Stylus, seen from the ventral side ($\times 90$); on the right sclerotized wrinkles of penis ($\times 465$). 16. Tarsus of hind leg of adult male ($\times 465$).

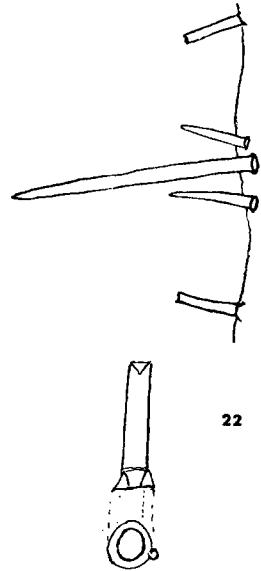


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pupae and prepupae were present. The puparia resemble those of *F. oleae* (COSTA, 1828), the pupae and prepupae those of *F. viburni* (SIGN.); see SILVESTRI (1939, fig. 720, No 11) and BORCHSENIUS (1957, figs. 79—80). The pupae as well as the prepupae show a group of 10—15 quinquelocular pores in front of the anterior spiracle. This group of pores is wanting near the posterior spiracle. In the male larvae and in the adult males this group of pores was not observed near the anterior spiracle. Dimensions of pupae and prepupae from 1.5×0.5 to 1.6×0.6 mm.

First stage larva (larva I)

In the material from Thailand only 3 larvae I were found (fig. 19). Length 0.40—0.45, width 0.18—0.24 mm. Antenna 6-segmented (fig. 1), length about 130—140 μ ; the apical segment has a very long seta which is at least as long as the whole antenna. The marginal setae of the body are slender conical spines, 8—10 μ long (fig. 19). One such spine is present between the anterior and posterior stigmatic spines; before the anterior stigmatic spine 5 conical marginal spines are observed, and 8 behind the posterior stigmatic spine, if one half of the body is taken into account. The stigmatic spines are very conspicuous as the middle spine has a length of about 60 μ , so that it is almost as long as in the adult female; the 2 lateral stigmatic spines have a length of only 8—10 μ (fig. 19). In the hind legs tarsus and tibia are about equal in length (ca. 40 μ); the femur is about 70 μ long, and the whole hind leg 215 μ . The digitules are longer than the claw and slightly knobbed (fig. 19). The apical setae of the anal plates have a length of 220—240 μ ; further 3 small setae are present near the top of the plates. The anal ring has already 2 rows of pores, and 6 anal setae of which the posterior pair is more slender and about half as long as the 4 other setae (length 45—50 μ , and 85—90 μ). The anal tube has only one pair of anal fringe setae; length 24—26 μ . The rostral loop reaches the anal ring.

Second stage larvae (larvae II)

Among the material of the Leiden Museum 12 larger larvae were found; larvae I, as described above, were lacking. The dimensions of the 2 smallest

FIGURES 17—22. *Filippia orientalis* nov. spec. Adult male. 17. Head with eyes, seen from the dorsal side ($\times 200$). The pigmented parts are shown by dots, the 4 ventral eyes by a broken line. 18. The 3 basal segments of the male antenna ($\times 300$). 19. Larva I, seen from dorsal side ($\times 65$). On the left stigmatic spines, and marginal spines from head (above) and abdomen (below); on the right claw with digitules ($\times 650$). 20. Larva II, right anal plate ($\times 650$); on the left from female larva. 21. Tarsus of hind leg of male larva II ($\times 650$). 22. The 3 stigmatic spines of larva II, opposite anterior spiracle ($\times 465$); on each side one of the common marginal spines is figured. Lower fig. shows a chisel-shaped marginal spine, and its base with one gland-pore ($\times 650$); compare figs. 4 and 6.

larvae were 1.0×0.6 and 1.4×0.8 mm. The 10 other specimens were 1.8—1.9 mm long, and 0.75—0.85 mm wide. As far as I have observed all these larvae show the same structure, but tubular ducts were not found in the 2 smallest specimens. All these larvae seem to belong to the second stage, though this is not quite certain. Among the 15 available larvae (3 larvae I, 12 larvae II) no specimens were found that were ready to moult; claws and mouthsetae of the next stage were nowhere visible. As the antennae and hind legs in the adult female are $2\frac{1}{2}$ —3 times as large as in the above-mentioned larvae (cf. figs. 1 and 2), I suppose that the latter belong to the second stage, and that larvae of the third stage (pre-adults) are lacking in our material.

Apart from the larger dimensions these larvae II are distinguished from larvae I by the presence of chisel-shaped marginal spines (fig. 22) as found in the adult female. The length of these spines is 20—25 μ (in ♀ ad. 30—40 μ) and the space between the spines about 35 μ (in ♀ ad. 25—35 μ). Between the anterior and posterior stigmatic spines 8—10 chisel-shaped marginal spines are present (in ♀ ad. 40—45). The middle stigmatic spines are 60—70 μ long; the lateral ones are of variable length ($\frac{1}{2}$ — $\frac{1}{3}$ \times length of middle spine) and not double as in the adult female (fig. 22). On the anal plates (fig. 20) the apical and discal setae are chisel-shaped, but the 2 setae on the medial edge of the plates are of common shape; the posterior medial seta is twice as long as the anterior one and sometimes slightly flattened (fig. 20). Both pairs of anal fringe setae are developed; the outer setae are about 26 μ , the inner ones 13 μ (in ♀ ad. 90 and 40 μ). The anal ring with its 6 setae shows the same picture as in the adult female (2 short setae of 70—90 μ and 4 long ones of 130—170 μ).

Antennae 6-segmented, 200—220 μ ; the third segment occupies about $\frac{1}{3}$ of the total length of the antenna. (fig. 1). Hind legs 300—350 μ in length (fig. 2), femur 80—100, tibia 70—80, tarsus 70—80 μ (fig. 21). A free tibiotarsal articulation, as observed in the adult female, is wanting in larvae I and II. The unguis digitules are already club-shaped as in the adult female, and not cylindrical as in larva I (cf. figs. 21 and 19). The rostral loop reaches the middle coxae as in the adult female.

The stigmatic furrows have only one row of quinquelocular pores. Tubular ducts are rather numerous on the ventral and dorsal side of the larger specimens (1.8—1.9 mm), but were not observed in the 2 smallest specimens (1.0—1.4 mm). I suppose that the larger specimens are male larvae; as observed above prepupae and pupae were also present in this sample. The 2 smallest specimens are probably female larvae II, as tubular ducts seem to be lacking. In the male larvae the length of the body is somewhat more than twice the width, and in the female larvae slightly less. In the female larvae the dimensions of antennae and legs are somewhat smaller than in the male larvae (antennae 200 μ , hind legs ca. 300 μ).

SUMMARY

Filippia orientalis n.sp. can be recognized by the following characters.

The adult female has next to chisel-shaped spines around the margin of the body 4 such spines on the outer side of the anal plates (fig. 11). The adult male has only one long seta (about 250 μ) in the glandular depressions which produce the caudal wax-tails. The first stage larva is provided with long stigmatic spines (ca. 60 μ) and slender conical spines along the margin of the body (fig. 19). The second stage larva has chisel-shaped spines around the margin of the body like the adult female (fig. 22). On the anal plates only the discal and the apical seta are chisel-shaped, the 2 setae on the mesal side of the plate have the usual shape (fig. 20).

Types in the Zoological Museum at Amsterdam, of second stage larvae, prepupae and pupae in the Museum of Natural History at Leiden.

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