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THE CHORIONIC SCULPTURE OF THE EGGS OF SOME XYLENINAE (LEPIDOPTERA, NOCTUIDAE)

I. V. Dolinskaya

Schmalhausen Institute of Zoology, NAS of Ukraine,
B. Chmielnicky str., 15, Kyiv, 01601 Ukraine
E-mail: dd8v@mail.ru

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The Chorionic Sculpture of the Eggs of Some Xyleninae (Lepidoptera, Noctuidae). Dolinskaya I. V. — Eggs of sixteen species of fifteen genera of the subfamily Xyleninae occurring in Ukraine are described and illustrated with scanning electron microphotographs. The diagnostic characters of the genera and species are selected.

Key words: Xyleninae, Noctuidae, Lepidoptera, egg, chorion, description, diagnostic characters, scanning electron microscopy.

Скульптура хориона яиц некоторых совков подсемейства Xyleninae (Lepidoptera, Noctuidae). Долинская И. В. — С помощью сканирующего электронного микроскопа изучены и проиллюстрированы яйца 16 видов из 15 родов подсемейства Xyleninae, встречающихся в Украине. Выделены диагностические признаки для родов и видов.

Ключевые слова: Xyleninae, Noctuidae, Lepidoptera, яйцо, хорион, описание, диагностические признаки, сканирующий электронный микроскоп.

Introduction

This work continues a series of articles devoted to the morphology of eggs of noctuids from the fauna of Ukraine (Dolinskaya, 2010; Dolinskaya, Geryak, 2010). Before our investigations the detailed line drawings illustrated the eggs of 107 European species belonging to subfamily Xyleninae were presented by Döring (1955). The eggs of *Gortyna borelii* from England illustrated by Ringwood and other (2002). The eggs of one European species of Xyleninae from Poland were described and illustrated by Skudlik with authors (Skudlik et al., 2005). The eggs of 14 species of Canadian Xyleninae (= Amphipyrrinae sensu Salkeld) were described and illustrated with scanning electron microscopy by Salkeld (1984).

Material and methods

This work is based on the original material collected by the author in Ukraine. The eggs were obtained from females captured in the field. The eggs of 5 species (*Hoplodrina blanda* Denis et Schiffermüller, *Cirrhia icteritia* Hufnagel, *Lithophane ornitopus* Hufnagel, *Eupsilia transversa* Hufnagel and *Mniotype satura* Denis et Schiffermüller) withdrawn from the abdomen of dry females kindly given by Mr. Yu. Geryak (State Natural History Museum, Lvov, Ukraine). The eggs were examined with the use of a scanning electron microscopy.

The Noctuidae species were identified by Dr. A. Matov (Zoological Institute, St. Petersburg, Russia), Dr. Yu. Budashkin (Karadag Nature Reserve, Crimea, Ukraine) and Mr. Yu. Geryak (State Natural History Museum, Lvov, Ukraine).

The systematic arrangement follows Fibiger and Hacker, 2004.

Description

Paradrina clavipalpis (Scopoli, 1763)

Egg subspherical (fig. 1), height 0.35–0.4 mm, diameter 0.7 mm (n = 3). Egg pale yellow. As egg develops, it becomes pale pink and then grey. Before caterpillar emergence egg becoming taupe. Chorion white, transparent.

Characteristics. Chorion ridged. Egg marked on one second surfaces. Rosette with 9–10 petalled cells. Secondary and tertiary cells long, narrow and pointed (fig. 2). There are 32–35 moderately broad, elevated, longitudinal ridges radiate from tertiary cells. Longest ridges with high comb especially in anterior portions of egg (fig. 3). Transverse walls less broad and less distinct than ridges. Aeropyles weakly expressed at walls junctions.

Hoplodrina blanda ([Denis et Schiffermüller], 1775)

Egg subspherical (fig. 4, 5), height 0.45–0.55 mm, diameter 0.55–0.6 mm (n = 3). Chorion white, translucent.

Characteristics. Chorion ridged. Egg marked on two thirds surfaces. Rosette elevated with 9–10 petalled cells. Central portion of rosette like a small round depression with 4–5 micropylar openings. Secondary and tertiary cells short, broad and polygonal (fig. 6). There are 12 of the 29 moderately broad, elevated, longitudinal ridges radiate from tertiary cells. Longest ridges with high comb especially in anterior portions. Walls of columnar cells narrower than ridges. Aeropyles weakly expressed at walls junctions (fig. 7). Chorion pebbled everywhere.

Hoplodrina ambigua ([Denis et Schiffermüller], 1775)

Egg subspherical (fig. 8), height 0.5mm, diameter 0.7–0.8 mm (n = 3).

Fresh egg pale yellow. A day after laying egg darkens, becomes yellow, faded. Then a pink spot at micropylar area and a pink narrow stripe on the perimeter of apical part of egg appear. In a day pink spot and stripe become pale brown. Before caterpillar emergence egg becoming taupe. Chorion white, translucent.

Characteristics. Chorion ridged. Egg marked on two thirds surfaces. Rosette elevated with 11–13 petalled cells. Central portion of rosette like a small round depression with 4–5 micropylar openings. Secondary cells long, narrow and pointed. There are 12 of the 29 moderately broad, elevated, longitudinal ridges radiate from secondary cells. Longest ridges with high comb especially in anterior portions. Walls of columnar cells narrower than ridges. Aeropyles weakly expressed at walls junctions (fig. 9). Chorion pebbled everywhere.

Oviposition. Eggs were laid solitary.

Rusina ferruginea (Esper, [1785])

Egg subspherical (fig. 10, 11), height 0.75–0.8 mm, diameter 0.75–0.85 mm (n = 3).

Egg pale yellow. As egg develops on perimeter of apical part of egg appears pale brown stripe (caterpillar). Chorion white, translucent.

Characteristics. Chorion ridged. Egg marked on two thirds surfaces. Micropylar rosette with 14 petalled cells (fig. 12). Central portion of rosette like a small round depression with 4 micropylar openings. Secondary and tertiary cells long, narrow and pointed. Cells of 4–6 series polygonal and broad. There are 18 of the 38 wavy, elevated, longitudinal ridges radiate from tertiary cells. Walls of columnar cells slightly narrower than ridges. Aeropyles clearly expressed at walls junctions (fig. 13). Chorion pebbled everywhere.

Charanyca trigrammica (Hufnagel, 1766)

Egg subspherical (fig. 14), height 0.45 mm, diameter 0.7–0.75 mm (n = 3).

Egg pale yellow. As far as egg develops it becomes yellow. For two days before caterpillar emergence on perimeter of egg appears pale brown stripe and the same spot in apical part of egg (caterpillar). Chorion white, translucent.

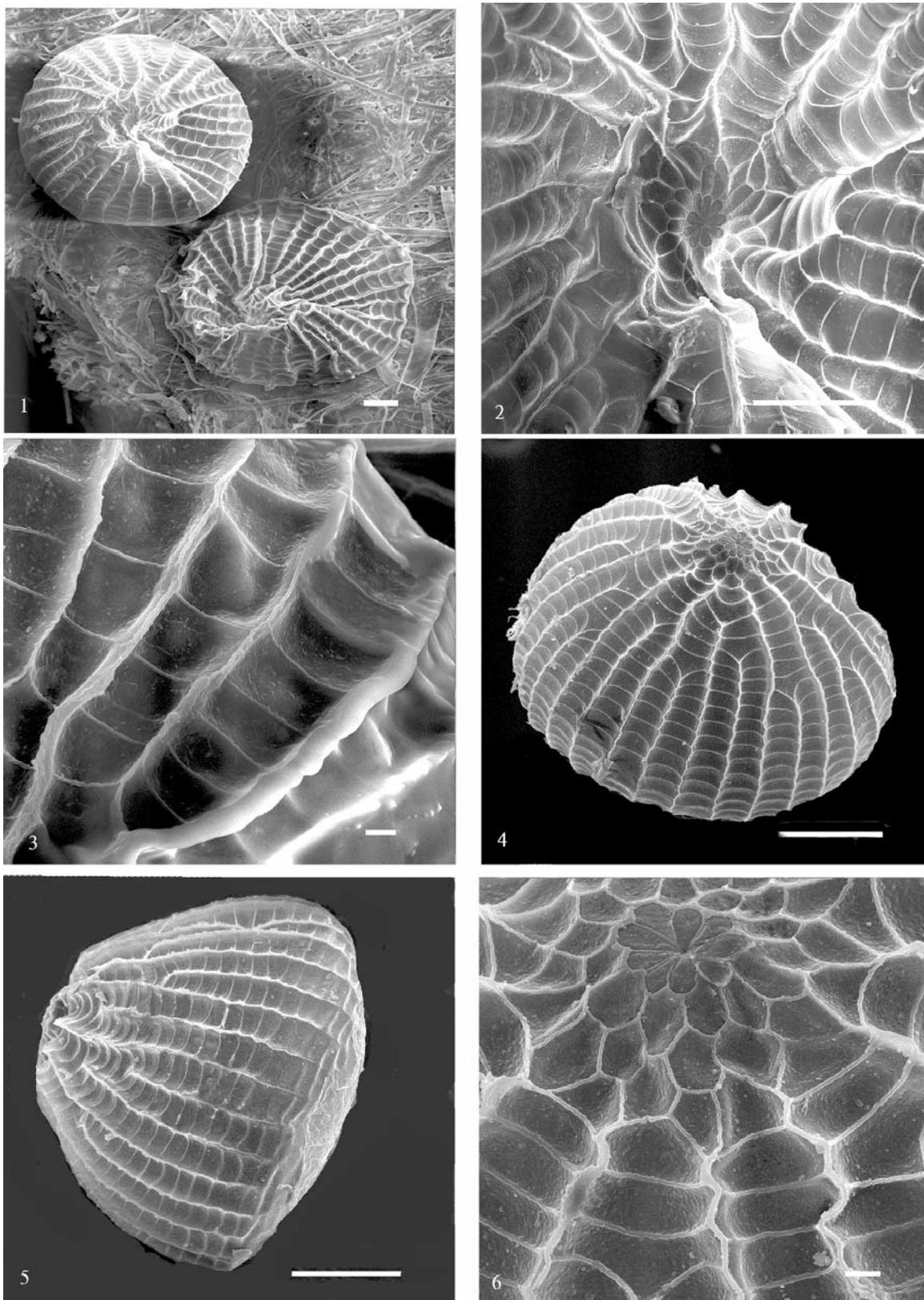


Fig. 1–6. Eggs of Xyleninae: 1 — *Paradrina clavipalpis* (x72); 2 — *Paradrina clavipalpis* (x260); 3 — *Paradrina clavipalpis* (x600); 4 — *Hoplodrina blanda* (x200); 5 — *Hoplodrina blanda* (x220); 6 — *Hoplodrina blanda* (x720). Scale bars: 1, 2, 4, 5 — 100 μm ; 3, 6 — 10 μm .

Рис. 1–6. Яйца Xyleninae

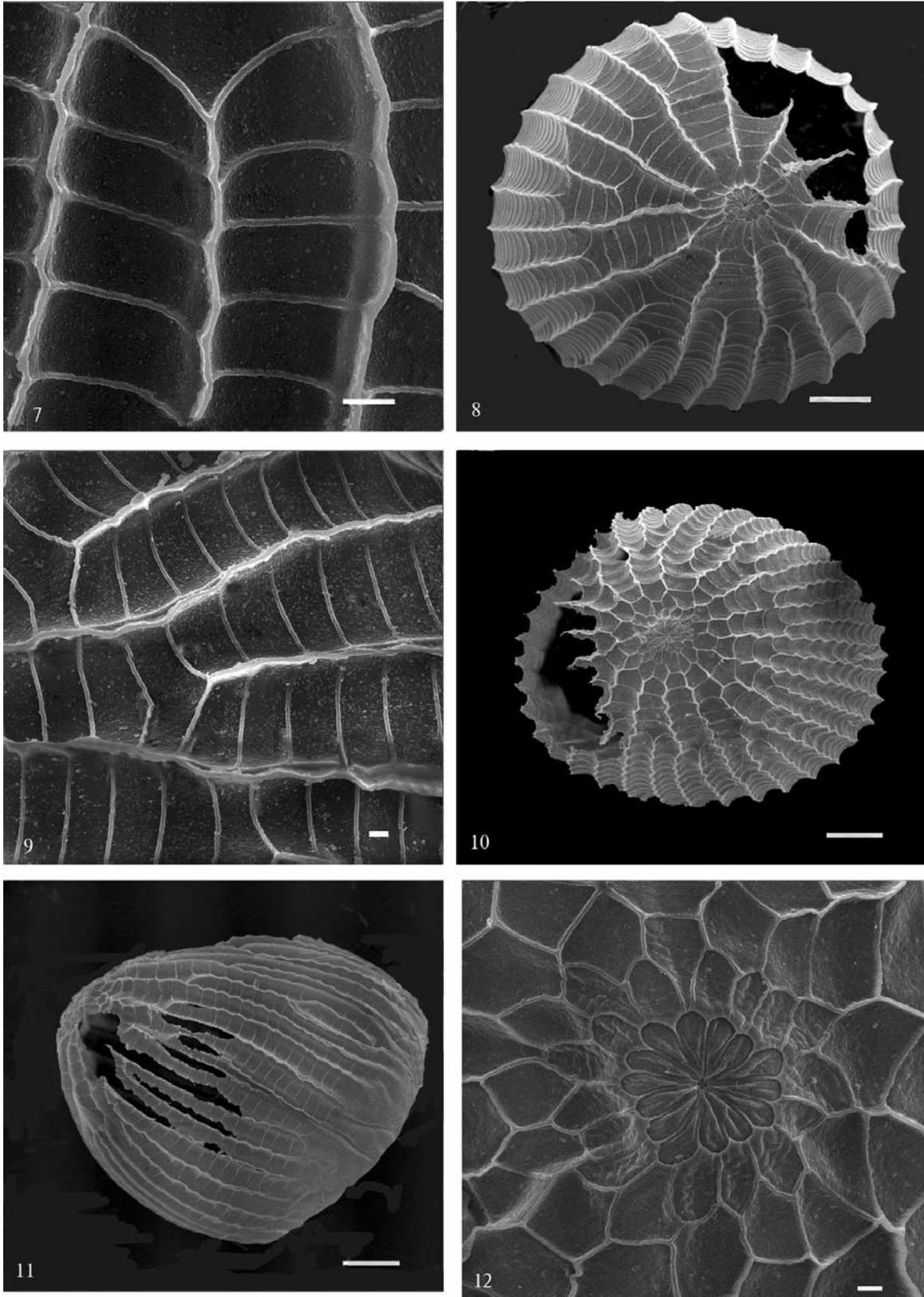


Fig. 7–12. Eggs of Xyleninae: 7 — *Hoplodrina blanda* (x1100); 8 — *Hoplodrina ambigua* (x120); 9 — *Hoplodrina ambigua* (x400); 10 — *Rusina ferruginea* (x110); 11 — *Rusina ferruginea* (x110); 12 — *Rusina ferruginea* (x120). Scale bars: 8, 10, 11, 12 — 100 μm ; 7, 9 — 10 μm .

Рис. 7–12. Яйца Xyleninae.

Characteristics. Chorion ridged. Micropylar rosette with 10–11 petalled cells. Central portion of rosette like a small round depression with 4–6 micropylar openings. Secondary and tertiary cells long, narrow and pointed (fig. 15). There are 12 of the 27–28 elevated, longitudinal ridges radiate from tertiary cells. Longest ridges with high comb especially in anterior portions (fig. 16). Walls of columnar cells slightly narrower than ridges. Aeropyles weakly expressed at walls junctions. Micropylar and secondary cells deeply folded. The rest of surface smooth.

Oviposition. Eggs laid in single-layer tight clusters where they pressed one to another. Eggs can be laid solitary.

Cosmia trapezina (Linnaeus, 1758)

Egg subspherical, diameter 0.7–0.8 mm (n = 3). Egg greenish-grey.

Characteristics. Chorion faintly ridged. Egg marked on one thirds surfaces, only in apical part of egg. Remaining egg surface smoothed (fig. 17). Micropylar rosette with 11 petalled cells. Secondary cells long, narrow and petalled. Cells of third, fourth and fifth series mainly tetragonal, wide and shot (fig. 18). Cells of 6–11 series in shape of columnar cells with slightly expressed transverse walls. Longitudinal ridges interrupted. All cells sharply pebbled (fig. 19).

Border between polygonal and columnar cells indistinct (fig. 17).

Oviposition. Eggs laid in single-layer tight clusters where they pressed one to another.

Dicycla oo (Linnaeus, 1758)

Egg pale yellow (n = 3).

Characteristics. Egg marked on anterior quarter of egg by polygonal cells and smoothed on the remaining surface (fig. 20). Cell walls thin, slightly expressed. Micropylar rosette with 16 petalled cells. Aeropyles small, slightly expressed at walls junctions. All cells pebbled (fig. 21).

Oviposition. Eggs are laid by clusters, are disposed chaotically one on the other.

Trachea atriplicis (Linnaeus, 1758)

Egg subspherical (fig. 22), diameter 1.1–1.2 mm. Egg pale yellow. As far as egg develops it becomes pale brown (n = 3).

Characteristics. Chorion ridged. Egg marked on all surface. Micropylar rosette elevated with 11 deeply folded petalled cells. Walls rosette cells elevated (fig. 23). Central portion of rosette like a small round depression with 5 micropylar openings. Cells of 2–8 series tetragonal. There are 14 of the 28–30 longitudinal, very elevated ridges, radiate from 7–8 series of cells. Longest ridges with high comb especially in anterior portions of egg. Along all surface of ridges densely placed aeropyles are present. Aeropyles sharply expressed, large, bordered by roller-like edges (fig. 24). Area by which egg attached to substrate consists of rounded cells (fig. 25, 26). All cells pebbled.

Polyphaenis viridis (Villers, 1789)

Egg subspherical (fig. 27), height 0.4 mm, diameter 0.6 mm (n = 3). Egg pale yellow. As egg develops it becomes pale brown.

Chorion white, transparent.

Characteristics. Chorion ridged. Egg marked on two thirds surfaces. Micropylar rosette with 6–7 petalled cells. Cells of second, third, fourth and fifth series mainly concave, wide and shot. Cell walls of second, third and fourth series are sharply expressed,

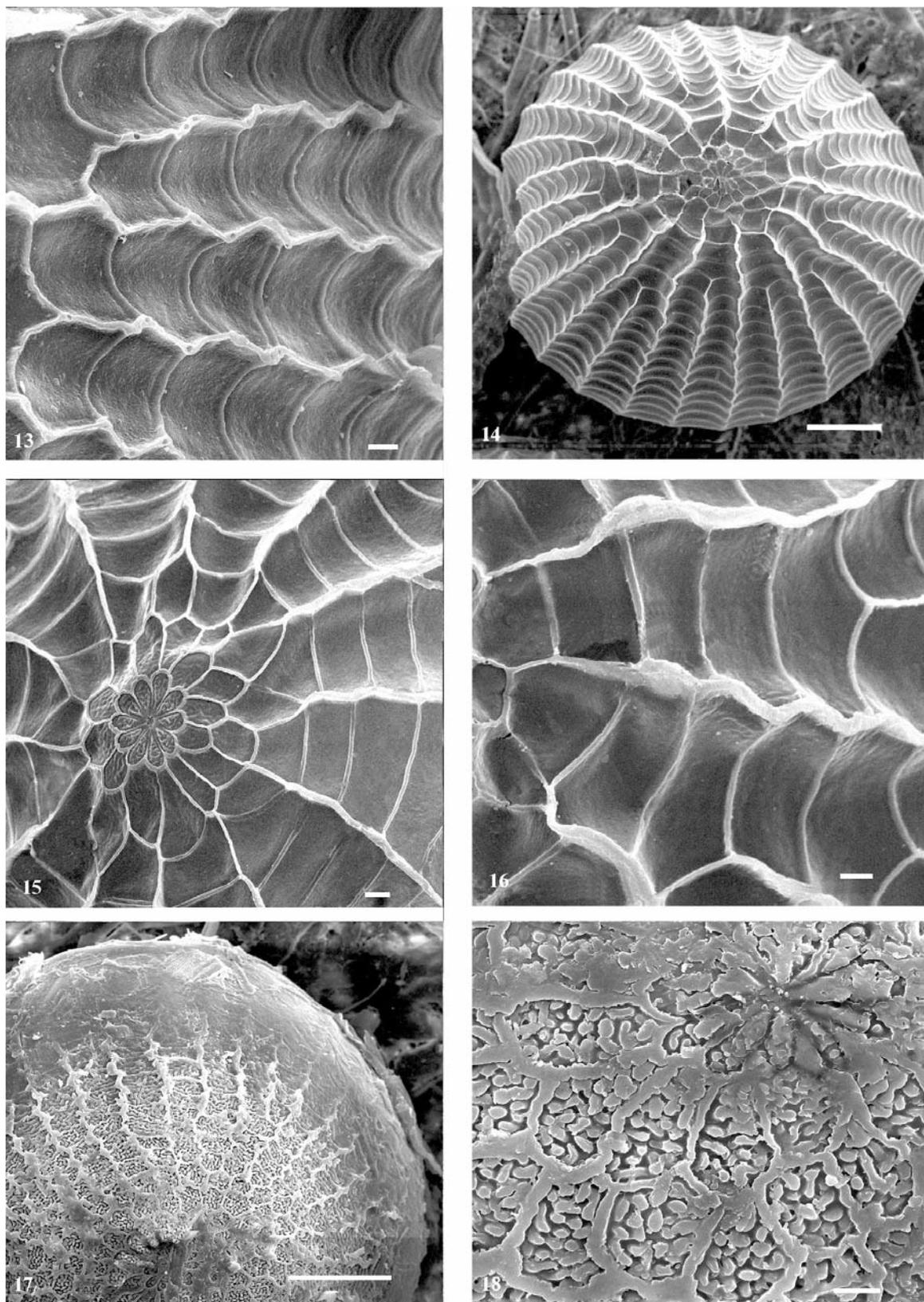


Fig. 13–18. Eggs of Xyleninae: 13 — *Rusina ferruginea* (x600); 14 — *Charanyca trigrammica* (x130); 15 — *Charanyca trigrammica* (x540); 16 — *Charanyca trigrammica* (x660); 17 — *Cosmia trapezina* (x130); 18 — *Cosmia trapezina* (x940). Scale bars: 14, 17 — 100 μm ; 13, 15, 16, 18 — 10 μm .

Рис. 13–18. Яйца Хыленинае.

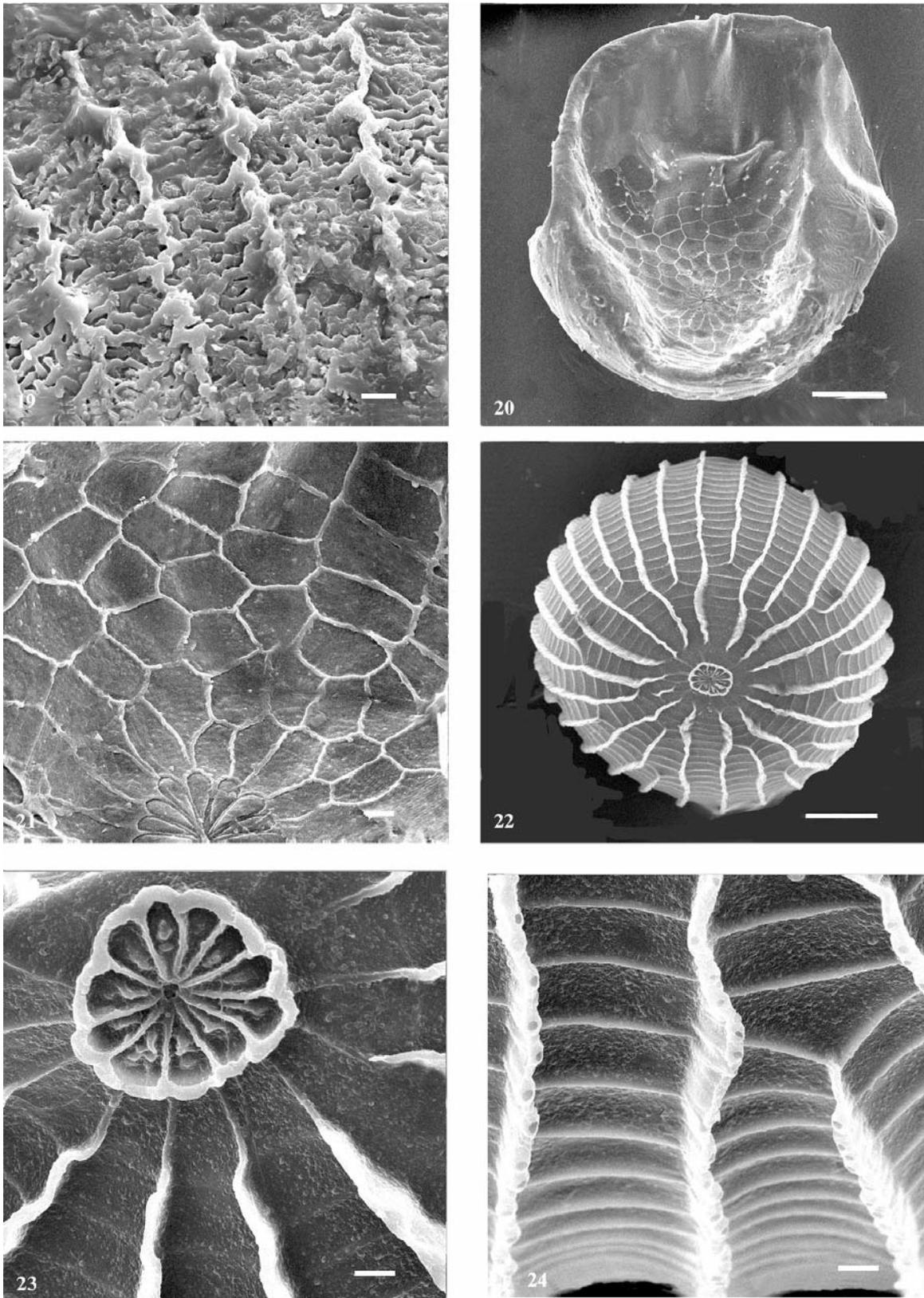


Fig. 19–24. Eggs of Xyleninae: 19 — *Cosmia trapezina* (x720); 20 — *Dicycla oo* (x150); 21 — *Dicycla oo* (x540); 22 — *Trachea atriplicis* (x150); 23 — *Trachea atriplicis* (x860); 24 — *Trachea atriplicis* (x860). Scale bars: 20, 22 — 100 μm ; 19, 21, 23, 24 — 10 μm .

Рис. 19–24. Яйца Хыленинае.

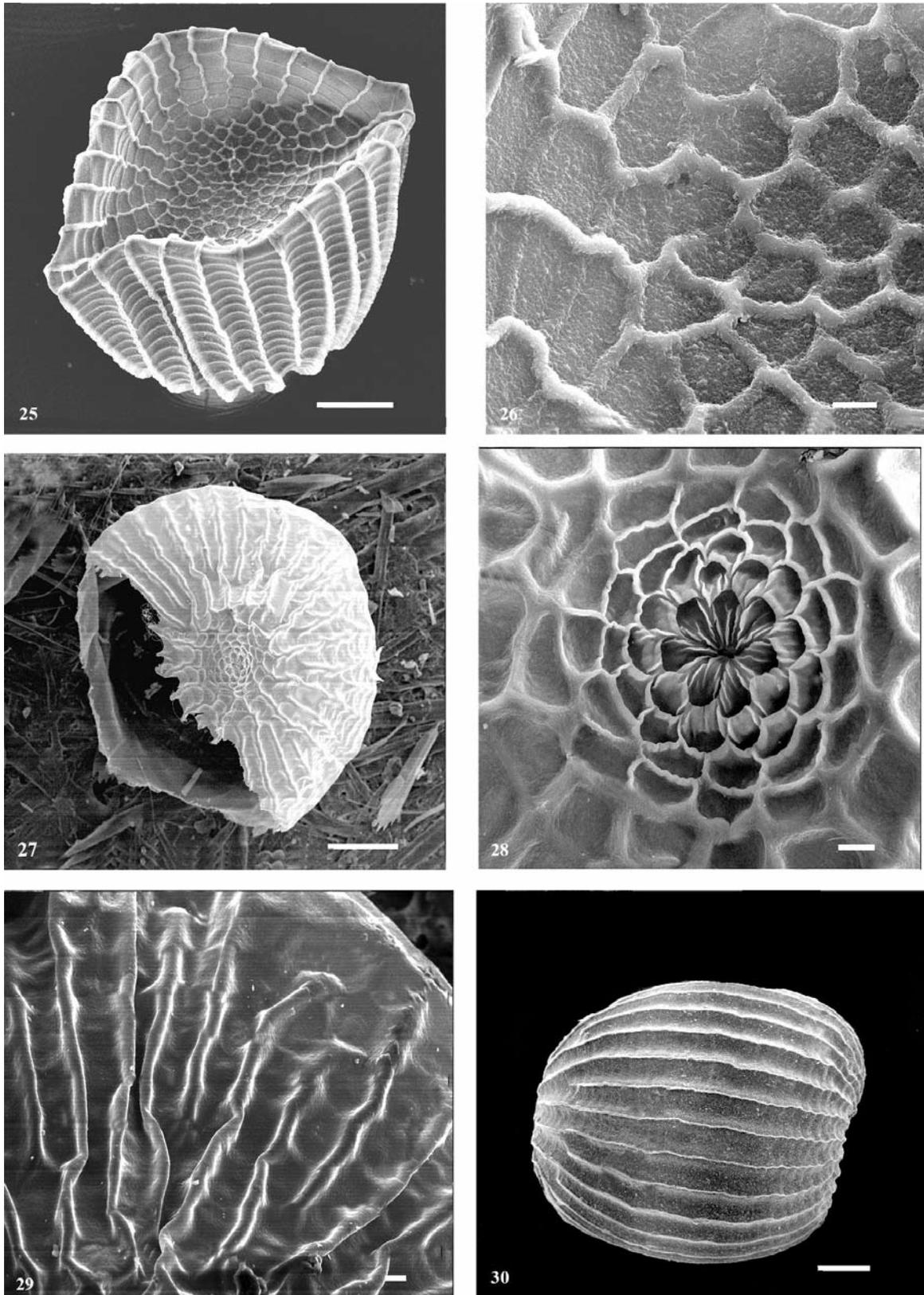


Fig. 25–30. Eggs of Xyleninae: 25 — *Trachea atriplicis* (x160); 26 — *Trachea atriplicis* (x940); 27 — *Polyphaenis viridis* (x150); 28 — *Polyphaenis viridis* (x780); 29 — *Polyphaenis viridis* (x440); 30 — *Thalpophila matura* (x110). Scale bars: 25, 27, 30 — 100 μm ; 26, 28, 29 — 10 μm .

Рис. 25–30. Яйца Хыленинае.

thin and wavy. Cell walls of fifth row weakly expressed, broad. Rosette and secondary cells have floors deeply folded (fig. 28). There are 15–16 of the 33–36 broad, elevated, longitudinal ridges radiate from cells of fourth row. Transverse ridges weakly expressed (fig. 29). Aeropyles very small, slightly expressed.

Oviposition. Eggs were laid solitary.

Thalpophila matura (Hufnagel, 1766)

Egg subspherical (fig. 30, 31), height 0.7–0.9 mm, diameter 0.75–0.8 mm (n = 5).

Egg pale yellow. As far as egg develops it becomes brownish-pink and then violet.

Characteristics. Chorion ridged. Egg marked on all surface. Micropylar rosette elevated, with 11–12 petalled cells. Walls rosette cells elevated. Secondary cells long, narrow and pointed. There are 15–17 of the 26–27 narrow elevated longitudinal ridges, radiate from secondary cells (fig. 32). Longest ridges with high comb especially in anterior portions. They are wavy, waviness, expressed more clearly near the base of egg. Transverse ridges weakly expressed (fig. 33). They are more distinct only in the apical part of egg. Aeropyles small, slightly expressed. In the aeropylar area thickenings are present which sometimes are very distinct. Area by which egg attached to substrate only with rounded cells (fig. 34). All cells sharply pebbled.

Oviposition. Eggs were laid solitary.

Phlogophora meticulosa (Linnaeus, 1758)

Egg subspherical (fig. 35), height 0.45–0.5 mm, diameter 0.7–0.8 mm (n = 3). Egg pale yellow. As egg develops it becomes yellow and then pink-grey. Chorion white, translucent.

Characteristics. Chorion ridged with well expressed longitudinal and transversal ridges. Egg marked on two thirds surfaces. Micropylar rosette elevated, with 10–11 petalled cells. Central portion of rosette like a small round depression with 5 micropylar openings. Secondary cells long, narrow and pointed. Cells of third, fourth and fifth series narrow and long. There are 9–10 of the 29–30 longitudinal, wide ridges radiate from secondary cells. Walls of columnar cells are as wide as ridges (fig. 36). Aeropyles very small, slightly expressed. All egg surface is pitted (fig. 37).

Oviposition. Eggs laid in single-layer tight clusters where they pressed one to another.

Cirrhia icteritia (Hufnagel, 1766)

Egg subspherical, diameter 0.6–0.7 mm (n = 3).

Characteristics. Chorion ridged. Micropylar rosette elevated, with 12–14 petalled cells. Rosette cells deeply folded. Central portion of rosette like a small round depression with 5 micropylar openings. Secondary cells long, narrow and pointed. There are 12–14 of the 31 herringbone-patterned longitudinal ridges radiate from secondary cells (fig. 38). Transversal ridges weakly expressed (fig. 39). Aeropyles weakly expressed at walls junctions.

Conistra rubiginea ([Denis et Schiffermüller], 1775)

Egg subspherical, flattened (fig. 40), diameter 1.0–1.3 mm, height 0.3–0.4 mm (n = 3).

Egg white. Chorion white, translucent.

Characteristics. Chorion ridged. Micropylar rosette with 14 long, narrow, petalled cells. Rosette cells pebbled. Sculpture of secondary cells indistinct, in this area

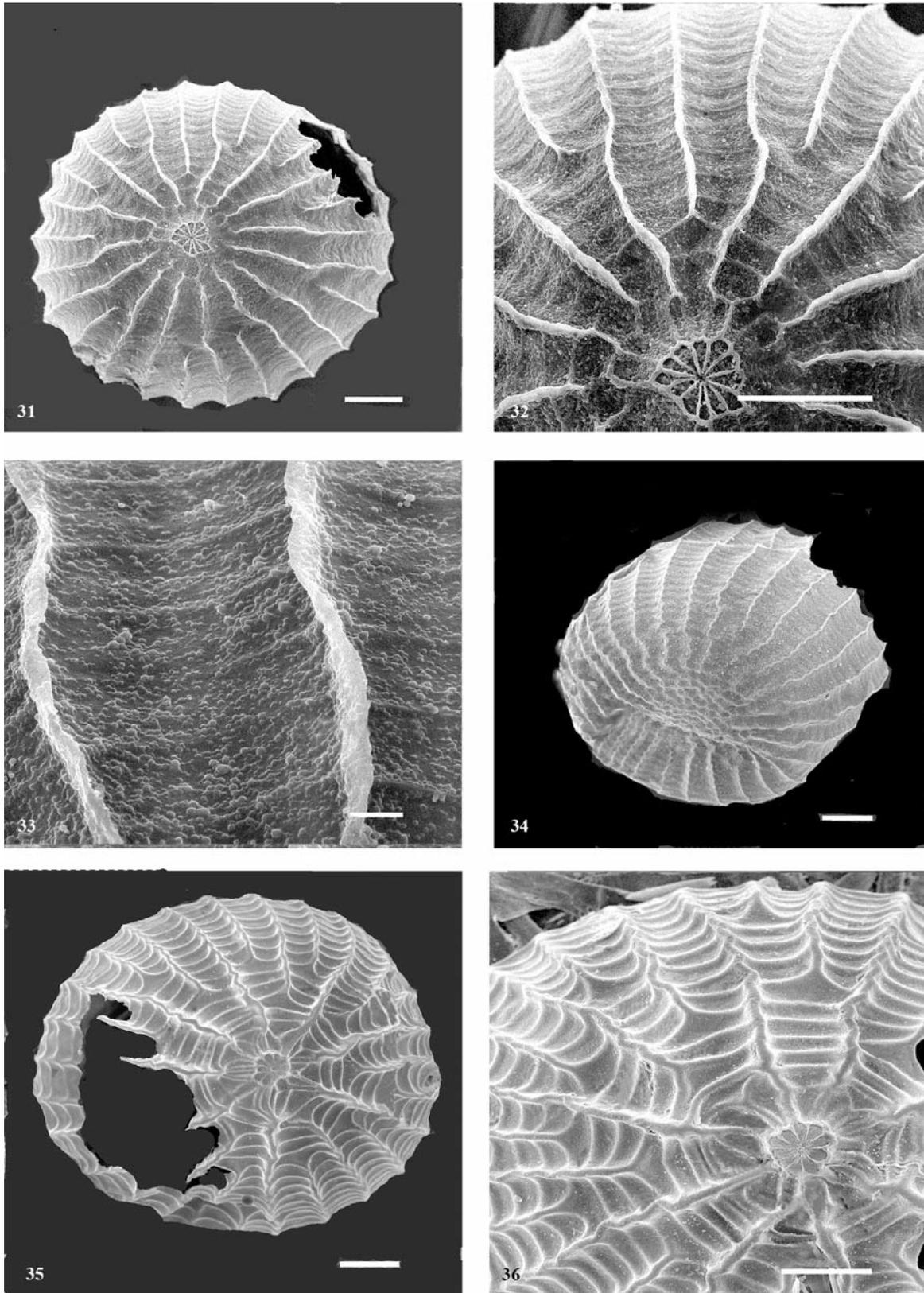


Fig. 31–36. Eggs of Xyleninae: 31— *Thalpophila matura* (x110); 32 — *Thalpophila matura* (x300); 33 — *Thalpophila matura* (x1100); 34 — *Thalpophila matura* (x110); 35 — *Phlogophora meticulosa* (x120); 36 — *Phlogophora meticulosa* (x200). Scale bars: 31, 32, 34–36 — 100 μm ; 33 — 10 μm .

Рис. 31–36. Яйца Хыленинае.

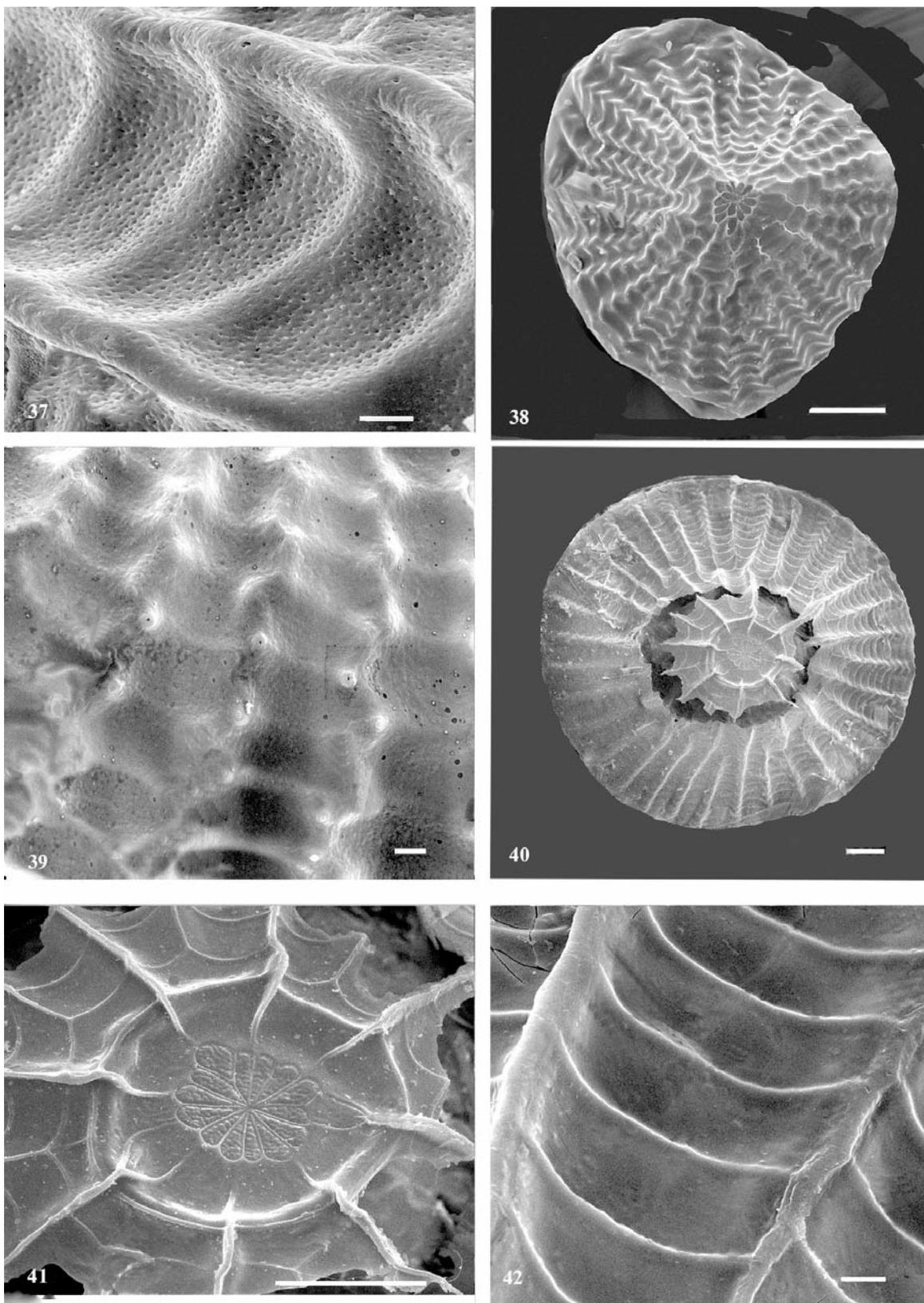


Fig. 37–42. Eggs of Xyleninae: 37 — *Phlogophora meticulosa* (x1100); 38 — *Cirrhia icteritia* (x160); 39 — *Cirrhia icteritia* (x600); 40 — *Conistra rubiginea* (x150); 41 — *Conistra rubiginea* (x580); 42 — *Conistra rubiginea* (x940). Scale bars: 38, 40 — 100 μm ; 37, 39, 41, 42 — 10 μm .

Рис. 37–42. Яйца Хыленинае.

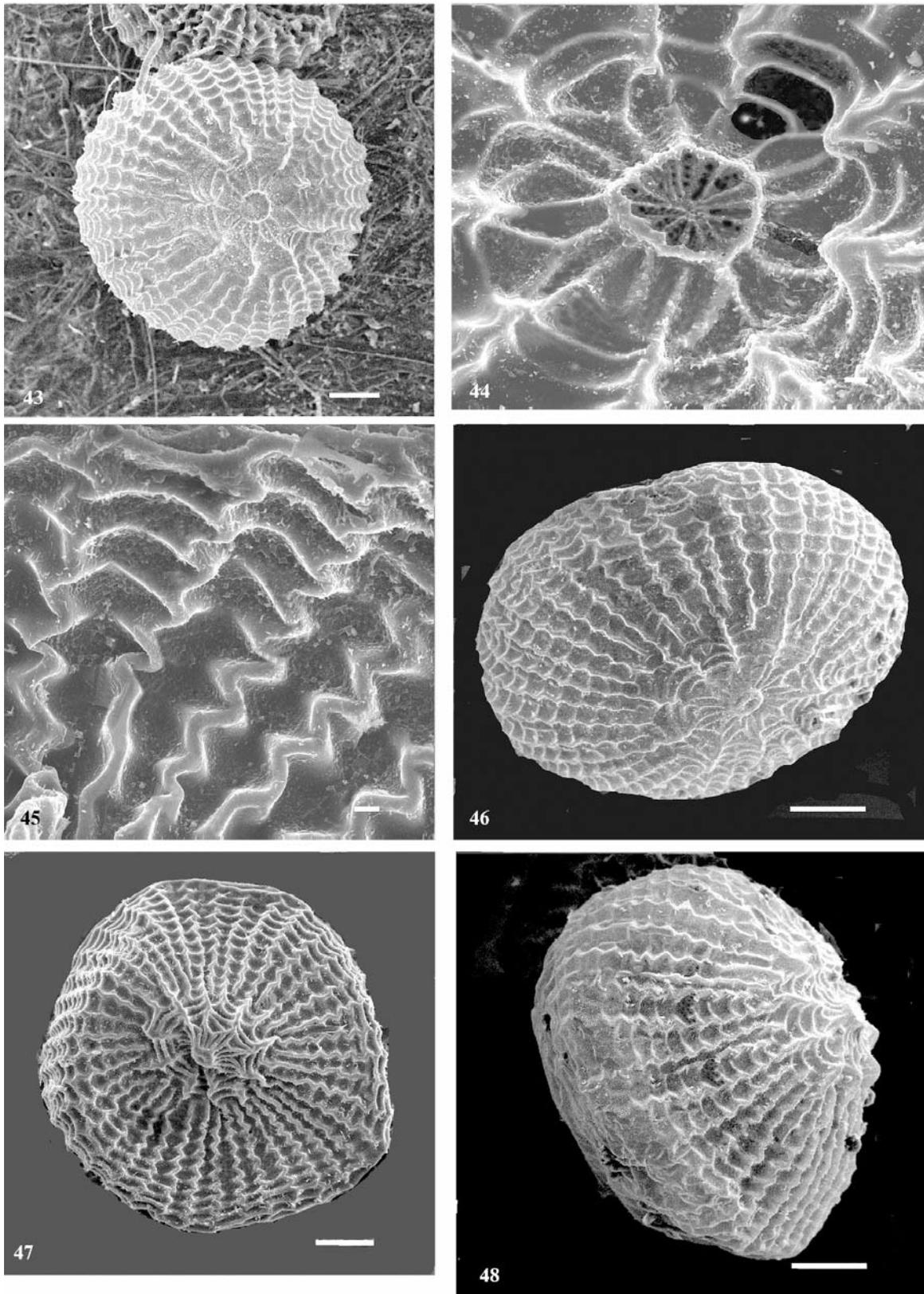


Fig. 43–48. Eggs of Xyleninae: 43 — *Lithophane ornitopus* (x110); 44 — *Lithophane ornitopus* (x440); 45 — *Lithophane ornitopus* (x540); 46 — *Eupsilia transversa* (x150); 47 — *Eupsilia transversa* (x120); 48 — *Eupsilia transversa* (x150). Scale bars: 43, 46–48 — 100 μm ; 44, 45 — 10 μm .

Рис. 43–48. Яйца Хыленинае.

surface smooth. Rosette and smooth area secondary cells rounded by raised ring (fig. 41). There are 8 of the 32 slightly wavy longitudinal ridges radiate from rosette cells. Walls of columnar cells are slightly narrower than ridges. Aeropyles weakly expressed at walls junctions. All cells smooth (fig. 42).

Oviposition. Eggs laid in single-layer tight clusters where they pressed one to another.

Lithophane ornitopus (Hufnagel, 1766)

Egg subspherical (fig. 43), height 0.6 mm, diameter 0.7–0.8 mm (n = 3). Egg pale yellow. As egg develops it becomes brown.

Chorion white, translucent.

Characteristics. Chorion ridged. Egg marked on two thirds surfaces. Micropylar rosette elevated, with 13–14 long, narrow, petalled cells. Secondary cells long, narrow and pointed (fig. 44). Cells of third, fourth, fifth and sixth series mainly concave, narrow and long with clearly expressed walls. Cell walls of 7 — 9–10 rows ulterior. Cell walls clearly expressed from 10–11 rows. There are 9 of the 34–36 zig-zag longitudinal elevated ridges radiate from secondary cells (fig. 45). Aeropyles very small, slightly expressed.

Oviposition. Eggs laid in single-layered, clusters on 26, 15, 18 eggs.

Eupsilia transversa (Hufnagel, 1766)

Egg subspherical (fig. 46, 47, 48). height 0.5–0.6 mm, diameter 0.7–0.9 mm (n = 3).

Characteristics. Chorion ridged. Egg marked on two thirds surfaces. Micropylar rosette elevated, with 14–15 long, narrow, petalled cells. Secondary cells long, narrow and pointed. Cells of third, fourth, fifth and sixth series mainly concave, narrow and long with clearly expressed walls (fig. 49). Cell walls of 7 — 9–10 rows ulterior (fig. 50). Cell walls clearly expressed from 10–11 rows (fig. 51). There are 11 of the 38–40 zig-zag longitudinal elevated ridges radiate from secondary cells. Aeropyles very small, slightly expressed.

Mniotype satura ([Denis et Schiffermüller], 1775)

Egg subspherical (fig. 52, 53), height 0.8–0.9 mm, diameter 0.95–1.1 mm (n = 3). Chorion yellowish-white with deep-brown micropylar area and the same fuzziness stripe on perimeter lateral part of egg.

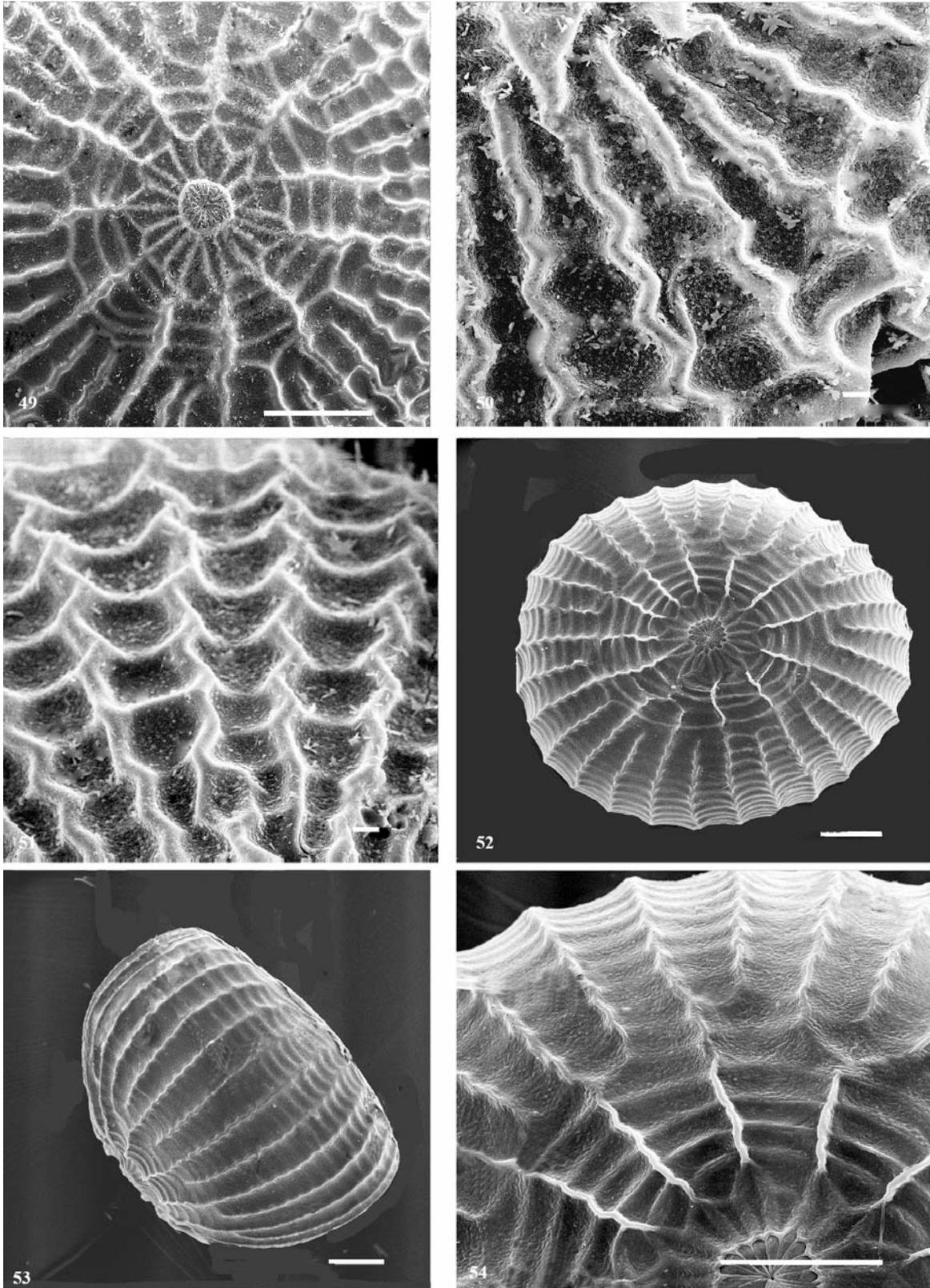
Characteristics. Chorion ridged. Egg marked on two thirds surfaces. Micropylar rosette elevated, with 16 long, narrow, petalled cells. Central portion of rosette like a small round depression. Secondary cells long, narrow and pointed. Cells of third, fourth, fifth and sixth series mainly tetragonal, narrow and long with very sharply expressed slightly wavy longitudinal ridges and clearly expressed transverse walls (fig. 54). There are 12 of the 30 longitudinal elevated ridges radiate from secondary cells. The rest longitudinal ridges herringbone-patterned and weakly expressed transversal ridges. Aeropyles small, moderately expressed. All cells pebbled.

Discussion

Chorion sculpture in subfamily Xyleninae as well as in subfamily Noctuinae (Dolinskaya, Geryak, 2010) is of two types — cellular and ridged.

Cellular sculpture is characteristic only for *Dicycla oo*.

Ridged sculpture is typical for other studied species — *Paradrina clavipalpis*, *Hoplodrina blanda*, *Hoplodrina ambigua*, *Rusina ferruginea*, *Charanyca trigrammica*, *Cosmia trapezina*, *Trachea atriplicis*, *Polyphaenis viridis*, *Thalpophila matura*, *Phlogophora*



Figs 49–54. Eggs of Xyleninae: 49 — *Eupsilia transversa* (x240); 50 — *Eupsilia transversa* (x540); 51 — *Eupsilia transversa* (x540); 52 — *Mniotype satura* (x120); 53 — *Mniotype satura* (x120); 54 — *Mniotype satura* (x220). Scale bars: 49, 52–54 — 100 μm ; 50, 51 — 10 μm .

Рис. 49–54. Яйца Хыленинае.

meticulosa, *Cirrhia icteritia*, *Conistra rubiginea*, *Lithophane ornitopus*, *Eupsilia transversa*, *Mniotype satura*.

Ridges forming ribbed sculpture either straight or variously wavy. As in the subfamily Noctuinae longest ridges are often with high comb, especially in anterior portions of egg (*Hoplodrina blanda*, *H. ambigua*, *Thalpophila matura*, *Trachea atriplicis*, *Paradrina clavipalpis*, *Charanyca trigrammica*).

Straight ridges are typical for next species — *Paradrina clavipalpis*, *Hoplodrina blanda*, *Hoplodrina ambigua*, *Charanyca trigrammica*, *Trachea atriplicis*, *Thalpophila matura*, *Phlogophora meticulosa*, *Conistra rubiginea*.

For *Paradrina clavipalpis* clear distinguishing characters are undisclosed. Longitudinal ridges are wider than transverse ridges.

For *Hoplodrina* — clear distinguishing characters of the genus are also undisclosed. Longitudinal ridges are slightly wider than transversal ridges.

In *Hoplodrina blanda* rosette is with 9–10 petalled cells. Longitudinal ridges radiate from tertiary cells.

In *Hoplodrina ambigua* rosette is with 11–13 cells. Longitudinal ridges radiate from secondary cells.

Charanyca trigrammica micropylar and secondary cells are deeply folded. The rest of surface is smooth.

Trachea atriplicis and *Thalpophila matura* possess by rosette with elevated walls. Secondary cells are slightly expressed. Area by which egg attached to substrate is cellular.

In *Trachea atriplicis* longitudinal ridges are wide with sharply expressed aeropyles. Transverse ridges are clearly expressed.

In *Thalpophila matura* longitudinal ridges are narrow. Transverse ridges are weakly expressed. Aeropyles are slightly expressed.

In *Phlogophora meticulosa* cells of 3–5 series typical — narrow and long. All egg surface is pitted.

In *Conistra rubiginea* rosette and smooth area of secondary cells rounded by sharply raised ring. The species has 8 of the 32 slightly wavy longitudinal ridges radiate from rosette cells.

Wavy ridges are typical for *Rusina ferruginea*, *Cosmia trapezina*, *Polyphaenis viridis*, *Cirrhia icteritia*, *Lithophane ornitopus*, *Eupsilia transversa*, *Mniotype satura*.

In *Rusina ferruginea* longitudinal ridges are narrow, wavy with clearly expressed aeropyles.

In *Cosmia trapezina* longitudinal ridges are interrupted. Sculpture is expressed only in apical part of egg, very sharply pebbled.

In *Polyphaenis viridis* longitudinal ridges are wide, nonuniformly waved, rosette is sharply expressed with 4 rows of cells.

In *Cirrhia icteritia* longitudinal ridges are herringbone-pattened. Rosette is deeply folded.

In *Lithophane ornitopus*, *Eupsilia transversa* longitudinal ridges are sharply zig-zag expressed.

In *Mniotype satura* longitudinal ridges are slightly herringbone-pattened. Longitudinal ridges and 1–4 series of cells are very sharply expressed.

Also I found out that the eggs of some species (*Hoplodrina octogenaria*, *Tiliacea citrigo*) being withdrawn from the female abdomen are spherical, but after laying eggs by female the area where the eggs are attached to substrate becomes flat. Eggs get hemispherical shape. In addition in the majority of species the base of eggs is without sculpture. Perhaps it is caused by the fact that flat base of the egg having no sculpture is adapted for more durable joint with substrate. Moreover, micropylar rosette of many species (*Eupsilia transversa*, *Lithophane ornitopus*, *Trachea atriplicis*, and others) risen above the egg surface probably in order to relieve the penetration of spermatozoa.

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