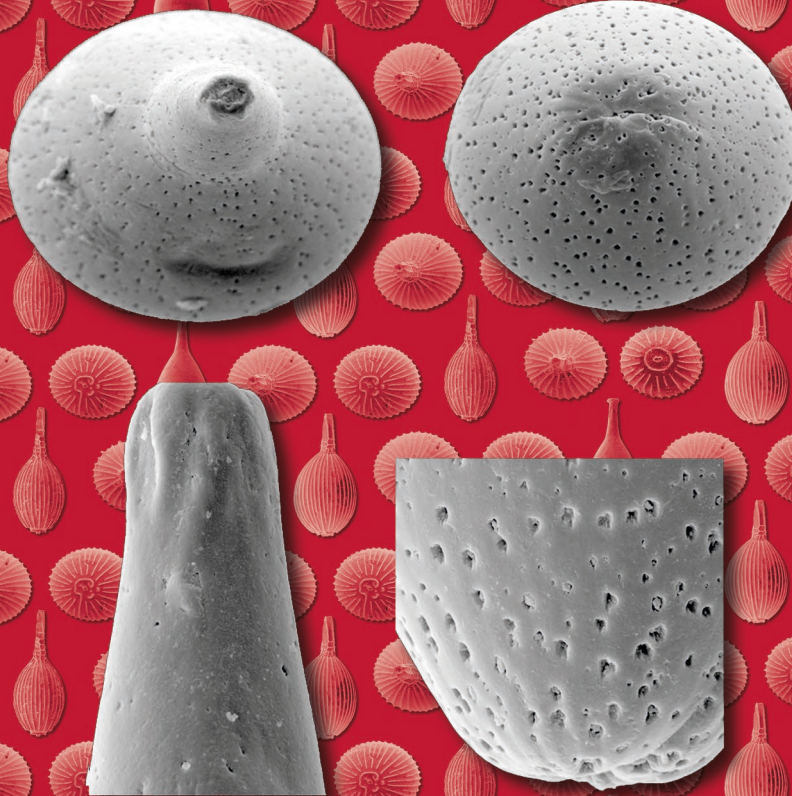


The species of Lageninae Brady, 1881 (Foraminifera)
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France, Fécamp (Seine-Maritime, France)
and St Erth (Cornwall, United Kingdom)

Jean-Pierre MARGEREL



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The species of Lageninae Brady, 1881 (Foraminifera) from the Pliocene-Early Pleistocene of north-western France, Fécamp (Seine-Maritime, France) and St Erth (Cornwall, United Kingdom)

Jean-Pierre MARGEREL

Aix Marseille Univ. CNRS, IRD, INRAE, Coll France, CEREGE, Marseille (France)

jpmargerel@gmail.com

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ABSTRACT

The examination of unilocular tests of foraminifera belonging to the subfamily Lageninae and collected in Plio-Pleistocene littoral deposits from north-western France, and Fécamp (Seine-Maritime, France) as well as from St Erth (Cornwall, United Kingdom), shows a great specific diversity. A diagnosis of the subfamily Lageninae is proposed. The observation shows the perforate character of the wall and the presence of a small aboral opening which corresponds generally to a short internal tube (aboral end structure). Most of the examined specimens being well-preserved, sixty-three species have been described including twenty-one in open nomenclature. They are assigned to the existing genera *Hyalinonetrion*, *Lagena* and *Pygmaeseiron*. Height new genera are proposed: *Deuteralagena* n. gen., *Fususella* n. gen., *Hyalinonetrionella* n. gen., *Laevilagena* n. gen., *Lagunculella* n. gen., *Lanternalagena* n. gen., *Malumella* n. gen. and *Verulagena* n. gen. If the genus *Lagena* had a wide geographical and stratigraphical distribution, the genera *Fususella* and *Hyalinonetrionella* n. gen. are limited to the Early Pliocene of the Ligerian Gulf and the genus *Hyalinonetrion* to the Upper Pliocene from the Carentan Basin. The other genera are essentially present in the Early Pliocene from the Ligerian Gulf. The specimens's collection is housed in MNHN.

RÉSUMÉ

Les espèces de Lageninae Brady, 1881 (foraminifères) du Plio-Pleistocène inférieur du nord-ouest de la France, de Fécamp (Seine-Maritime, France) et de St Erth (Cornwall, Royaume-Uni).

L'examen des tests de foraminifères uniloculaires appartenant à la sous-famille des Lageninae collectés dans les dépôts littoraux du Plio-Pleistocène inférieur du nord-ouest de la France, de Fécamp (Seine-Maritime, France) et de St Erth (Cornouailles, Royaume-Uni) montre une grande diversité spécifique. Une diagnose de la sous-famille des Lageninae (Brady, 1881) est proposée. L'observation montre la nature perforée des tests ainsi que l'existence d'une ouverture aborale correspondant, généralement, à un court tube interne (structure aborale). Les spécimens étudiés étant bien conservés, soixante-trois espèces sont décrites dont vingt-et-une en nomenclature ouverte. Elles sont attribuées aux genres *Hyalinonetrion*, *Lagena* et *Pygmaeseiron*. Huit nouveaux genres sont proposés : *Deuteralagena* n. gen., *Fususella* n. gen. *Hyalinonetrionella* n. gen., *Laevilagena* n. gen., *Lagunculella* n. gen., *Lanternalagena* n. gen., *Malumella* n. gen. et *Verulagena* n. gen. Si le genre *Lagena* a une large répartition géographique et stratigraphique, le genre *Fususella* est limité au Pliocène inférieur du golfe ligérien, le genre *Hyalinonetrionella* n. gen. au Pliocène supérieur de la vallée de l'Élorn et le genre *Hyalinonetrion* au Pliocène supérieur du Cotentin. Les autres genres sont essentiellement présents au Pliocène inférieur dans le golfe ligérien. La collection des spécimens est déposée au MNHN.

KEY WORDS

Lageninae,
Early Pliocene-Early
Pleistocene,
north-western France,
Fécamp,
Seine-Maritime,
France,
St Erth,
Cornwall,
United Kingdom,
Foraminifera,
unilocular,
aboral end structure,
new combinations,
new genera,
new species.

MOTS CLÉS

Lageninae,
Pliocène inférieur-
Pléistocène inférieur,
nord-ouest de la France,
Fécamp,
Seine-Maritime,
France,
St Erth,
Cornouailles,
Royaume-Uni,
foraminifères,
uniloculaire,
structure terminale
aborale,
combinaisons nouvelles,
genres nouveaux,
espèces nouvelles.

INTRODUCTION

In samples collected from boreholes in northwestern France (Cotentin, Finistère, Loire-Atlantique, Ille-et-Vilaine and Maine-et-Loire) and two sections (Fécamp, Seine-Maritime, France and St Erth (Cornwall, United Kingdom)) a variety of unilocular foraminifera have been identified. A systematic study of this group has been carried out. Foraminifera of the subfamily of the Oolininae has been already published in a previous study (Margerel 2016). The present work deals with the Lageninae subfamily and is based on a material comprising 517 specimens collected from various lithologies (clay, marl, sand, “*faluns*”) of Early Pliocene to Early Pleistocene age.

Particular attention has been paid to the choice of morphological criteria in the description of genera. Three major criteria were selected: test shape, perforations or punctuation and aperture.

METHODS

The foraminifera were extracted by separation with carbon tetrachloride after washing and sieving by using a sieve with at 100 µm for St Erth and 60 µm for the other stations. The SEM images have been performed at the Service de microscopie électronique à balayage (Aix-Marseille université, site Saint-Charles, FSCM (Fr 1739), PRATIM, F-13397.

ABBREVIATIONS

Places in France

LRK2	Brest-Le Relecq-Kerhuon;
SSP	Saint-Sauveur-de-Pierrepont;
SSL	Saint-Sulpice-des-Landes;
SGB	Saint-Georges-de-Bohon.

Institution

MNHN.F Muséum national d'Histoire naturelle, Paris, collection de Paléontologie.

STRATIGRAPHICAL SETTING

The Plio-Pleistocene stratigraphy of western France, St Erth (United Kingdom) and Fécamp (Seine-Maritime, France) is based on faunistic and microfaunistic renewals which result from the cooling of marine waters. On the Atlantic coast, if the relatively warm waters of the Ligerian gulf and Vendée are characterized by foraminiferal microfauna assigned to Early Pliocene (“warm Redonian”), the stratigraphic attribution of sediments of Éloron valley and St Erth in Cornwall is more uncertain as a result of the juxtaposition of foraminifera of early Pliocene affinity with latest Pliocene foraminifera. In a study published by NASA GISS (2004) it appears that an episode of global warming occurred between 2.85Ma and 3.15 Ma, which could explain the persistence of relatively “warm”

species in the Éloron valley and at St Erth. The benthic foraminiferal microfauna identified in basins located southwest and southeast of Rennes are enriched with species, such as *Faujasina* spp, which reflect an overall cooling of temperatures (early Upper Pliocene = “cool Redonian”). The foraminiferal microfauna from the Cotentin Sill has recorded continuous changes which likely result from seawater cooling, as typified by the transition from an *Faujasina* association (upper Pliocene) to a *Elphidiella hannai* association (Earliest Pleistocene). Such a transition has been confirmed by the foraminiferal assemblage, assigned to the Lower Pleistocene, identified in the Saint-Sauveur-de-Pierrepont basin. In Fécamp section the crags (“*faluns*”) are characterized by foraminiferal association comprising *Monspeliensina pseudotepida* (Early Pliocene).

STATIONS LOCATION OF STUDIED SPECIMENS

ST ERTH IN CORNWALL (Fig. 1A)

The Vicarage Pit outcrop no longer exposes the fossiliferous blue clay (Mitchell *et al.* 1973) which contain foraminifera, ostracods, gastropods and bivalves.

THE ÉLORN VALLEY (Fig. 1B)

The gray marls from the Brest-LRK2 borehole are rich in foraminifera, ostracoda, bivalves, ascidian sclerites and echinid spines.

THE LIGERIAN GULF (Fig. 1C)

The Ligerian gulf extends from west of Angers to the Atlantic coast and was composed of various basins during the Early Pliocene. In the Candé Basin (Maine-et-Loire), four boreholes (la Bouillonnaie, la Pugle, la Chênelière, la Sautré) have been drilled. The clay is rich in foraminifera, ostracoda, elements of ectoprocts (bryozoans), spicules of porifera and shell remains. In the small Basin Saint-Sulpice-des-Landes (Loire-Atlantique) the marly intervals are rich in foraminifera and ostracoda. South of Rennes (Ille-et-Vilaine) the Groussinière Basin (Margerel *et al.* 1972) exhibits sandy clay with abundant foraminifera, ostracoda, elements of ectoprocts, spicules of porifera and in the Mernel Basin the marly deposits are rich in foraminifera and ostracoda.

THE CARENTAN BASIN (Fig. 1D)

In the Carentan Basin (Dugué 2003) three localities have been studied:

- 1) Saint-Georges-de-Bohon: the shelly marls from SGB3 borehole are rich in foraminifera, ostracoda and echinoid spines.
- 2) Auxais: the T47 borehole displays abundant foraminifera and ostracoda (Le Calvez 1987)
- 3) Rémilly-sur-Lozon: the sands from T17 borehole contain scarce foraminifera.

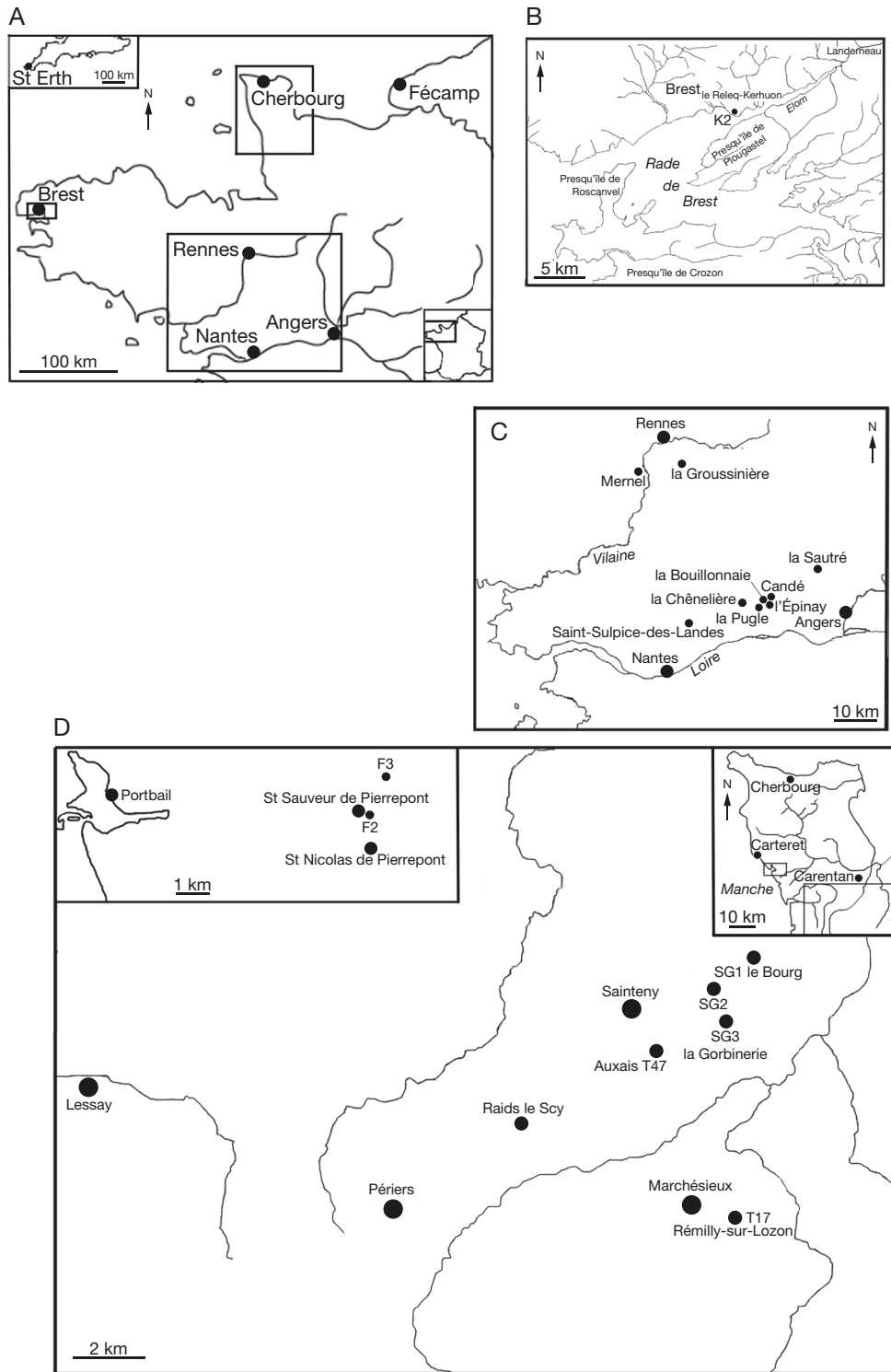


FIG. 1. — Maps of location of the studied samples: **A**, concerned geographical zones and location of the samples from St. Erth and Fécamp; **B**, location of the samples from Elorn channel; **C**, location of the samples from Ligerian channel; **D**, location of the samples from the Carentan basin.

THE WEST COTENTIN (Fig. 1D)

Saint-Nicolas-Saint-Sauveur-de-Pierrepont: two boreholes (F2 and F3) encountered fossiliferous grey marls with foraminifera, bivalves, gastropods and bryozoa (Brébion *et al.* 1973-1974).

SEINE-MARITIME (Fig. 1A)

The Fécamp section (Bassompierre *et al.* 1972; Dugué *et al.* 2012) exhibits crag sediments (« faluns ») with foraminifera, ectoprocts, bivalves, gastropods overlying Messinian deposits.

SYSTEMATICS

Suborder LAGENINA
Delage & Hérouard, 1896
Superfamily NODOSARIACEA Ehrenberg, 1838
Famille LAGENIDAE Reuss, 1862

Subfamily LAGENINAE Brady, 1881

DIAGNOSIS. — Test free, unilocular with a circular cross-section, wall calcareous perforate, and with an aboral opening.

Genus *Deuteralagena* n. gen.

[urn:lsid:zoobank.org:act:2BE87D91-A24C-4B66-A516-2994B59C831B](https://doi.org/10.21203/rs.3.rs-2994831/v1)

DIAGNOSIS. — Test ovoid, neck distinct with lip, ornamented in part with costae and with aboral opening.

TYPE SPECIES. — *Deuteralagena elegans* n. sp.

ETYMOLOGY. — From Latin *deutērius* (second) and *lagena* (bottle).

DESCRIPTION

Test ovoid, aboral end ornamented with costae that more or less extended onto the lateral side; neck distinct; wall hyaline, smooth, finely perforate; aperture rounded with small horizontal striate lip; aboral opening.

Deuteralagena elegans n. gen., n. sp.
(Figs 2A-G; 29M, N)

[urn:lsid:zoobank.org:act:29D8DF97-0900-43EC-AE8F-42328125DD5C](https://doi.org/10.21203/rs.3.rs-2994831/v1)

HOLOTYPE. — Sample: Auxais Sample: T47, 12-14 m (MNHN.F.F67607).

PARATYPE. — Sample: Auxais T47, 12-14 m (MNHN.F.F67608).

DIAGNOSIS. — Test ovoid, neck distinct with lip and with costae at aboral end.

TYPE AGE. — Early Pleistocene.

TYPE LOCALITY. — Auxais (Manche).

ETYMOLOGY. — From Latin *ēlĕgans* (elegant).

OTHER MATERIAL EXAMINED. — Sample: Auxais T47, 12-14 m (MNHN.F.F67730), 2 specimens.

SIZE. — Length = 0.510 mm; diameter = 0.200 mm

OCCURENCE. — Marls from Auxais (Manche).

DESCRIPTION

Test ovoid ornamented with costae (10) at aboral end; neck distinct slightly conical; wall hyaline, smooth, finely perforate; aperture rounded with a small striated lip; aboral end structure.

Deuteralagena laguncula n. gen., n. sp.
(Figs 2H-P; 3A-F; 29O, P; 30A, B)

[urn:lsid:zoobank.org:act:691D8771-82BB-4586-8DB1-7F05D3259139](https://doi.org/10.21203/rs.3.rs-2994831/v1)

HOLOTYPE. — Sample: Auxais T47, 14-17 m (MNHN.F.F67609).

PARATYPES. — Three paratypes: Sample: Auxais T47, 14-17 m (MNHN.F.F67610); Sample: Auxais T47, 14-17 m (MNHN.F.F67611); Sample: LRK2, 30 m (MNHN.F.F67612).

DIAGNOSIS. — Test ovoid, ornamented with costae, neck distinct, subconical with small lip, aboral opening.

TYPE AGE. — Early Pleistocene.

TYPE LOCALITY. — Auxais (Manche).

ETYMOLOGY. — From Latin *lāguncŭla* (small carafe).

OTHER MATERIAL EXAMINED. — Sample: Auxais T47, 14-17 m (MNHN.F.F67731), 2 specimens.

SIZE. — Length = 0.610 mm; diameter = 0.240 mm

OCCURENCE. — Marls from Auxais (Manche) and Brest-LRK2 (Finistère).

DESCRIPTION

Test ovoid, elongated, aboral end ornamented with longitudinal costae (8) extending up to the midheight; neck slightly conical; wall hyaline, smooth, finely perforate; aperture rounded with a small striated lip; aboral end structure.

Deuteralagena sp. A
(Fig. 3G-J)

LOCALITY. — Auxais (Manche).

MATERIAL EXAMINED. — Sample: Auxais T47, 12-14 m (MNHN.F.F67613).

AGE. — Early Pleistocene.

DESCRIPTION

Test ovoid elongated, neck slightly conical; wall hyaline, smooth, finely perforate; aperture rounded with a small striated lip; aboral opening.

Deuteralagena sp. B
(Fig. 3K-N)

LOCALITY. — Auxais (Manche).

MATERIAL EXAMINED. — Sample: Auxais T47, 12-14 m (MNHN.F.F67614).

AGE. — Early Pleistocene.

DESCRIPTION

Test ovoid, aboral end ornamented with costae extending up to midheight; neck conical; wall hyaline, smooth, finely perforate; aperture rounded with a striated lip; small aboral opening.

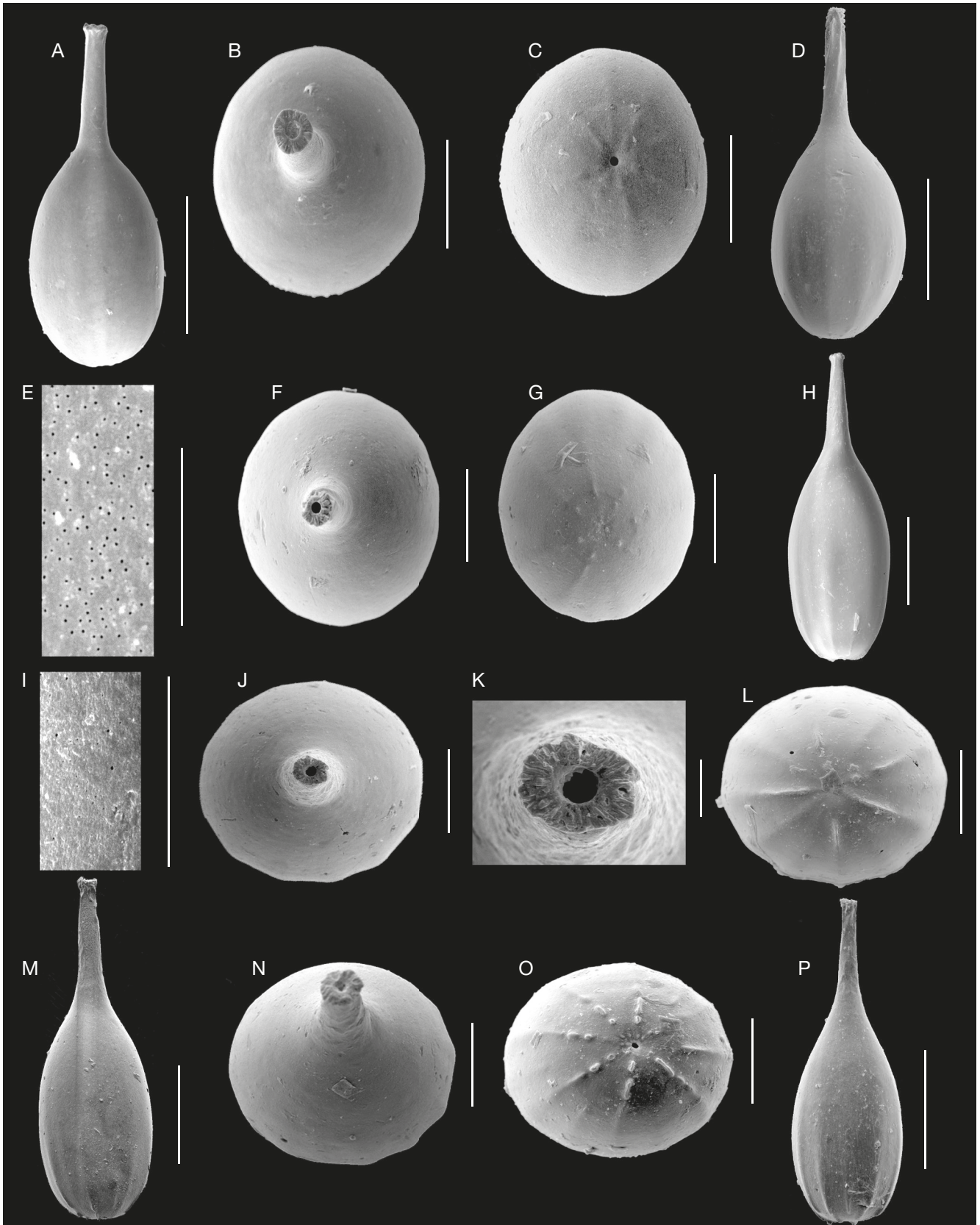


FIG. 2. — **A-G**, *Deuterolagena elegans* n. gen., n. sp., Auxais: **A-C**, holotype in lateral, oral and basal views (MNHN.F.F67607); **D-G**, paratype, Auxais (MNHN.F.F67608); **D**, lateral view; **E**, pores; **F, G**, oral and basal views; **H-P**, *Deuterolagena laguncula* n. gen., n. sp.: **H-L**, holotype, Auxais (MNHN.F.F67609); **H**, lateral view, **I**, pores; **J, K**, oral views; **L**, basal view; **M-O**, paratype, Auxais (MNHN.F.F67610) in lateral, oral and basal views; **P**, paratype, Auxais (MNHN.F.F67611), in lateral view. Scale bars: A, D, H, M, P, 200 µm; B, C, F, G, I, J, L, N, O, 100 µm; I, K, 20 µm; E, 10 µm.

Deuteralagena sp. C
(Figs 3O, P; 4A, B)

LOCALITY. — Fécamp (Seine-Maritime).

MATERIAL EXAMINED. — Sample: Fécamp 2A (MNHN.F.F67615).

AGE. — Early Pliocene.

DESCRIPTION

Test ovoid, aboral end ornamented with costae, neck conical; wall hyaline, smooth, finely perforate; aperture rounded with small striated lip; small aboral opening.

Deuteralagena sp. D
(Fig. 4C-F)

LOCALITY. — Auxais (Manche).

MATERIAL EXAMINED. — Sample: Auxais T47, 12-14 m (MNHN.F.F67616).

AGE. — Early Pleistocene.

DESCRIPTION

Test ovoid, aboral end flat ornamented with costae extend onto the test, short neck with ridges; wall hyaline, smooth, finely perforate; aperture rounded with small striated lip; small aboral opening.

Deuteralagena sp. E
(Fig. 4G-J)

LOCALITY. — La Pugle (Maine-et-Loire).

MATERIAL EXAMINED. — Sample: la Pugle, 13.00 m (MNHN.F.F67617).

AGE. — Early Pliocene.

DESCRIPTION

Test ovoid, aboral end flat with costae, short conical neck with ridges; wall hyaline, smooth, finely perforate; aperture rounded with small striated lip; small aboral opening.

Deuteralagena sp. F
(Fig. 4K-M)

LOCALITY. — SGB3 (Manche).

MATERIAL EXAMINED. — Sample: SGB3, 9.50 m (MNHN.F.F67618).

AGE. — Late Pliocene.

DESCRIPTION

Test ovoid inflated, aboral end with costae, short conical neck with ridges; wall hyaline, smooth, finely perforate; aperture rounded with small striated lip; small aboral opening.

Deuteralagena sp. G
(Fig. 4N-P)

LOCALITY. — La Groussinière (Ille-et-Vilaine).

MATERIAL EXAMINED. — Sample: la Groussinière S6, 17.60-20.30 m (MNHN.F.F67619).

AGE. — Late Pliocene.

DESCRIPTION

Test ovoid inflated, aboral end with acute costae extending along the test, conical neck with ridges; wall hyaline, smooth, finely perforate; aperture rounded with small striated lip; small aboral opening.

Deuteralagena sp. H
(Fig. 5A-C)

LOCALITY. — SGB3 (Manche).

MATERIAL EXAMINED. — Sample: SGB3, 10.60 m (MNHN.F.F67620).

AGE. — Late Pliocene.

DESCRIPTION

Test ovoid elongated, aboral end ornamented with costae extending along the test, cylindrical neck; wall hyaline, smooth; finely perforate; aperture rounded; small aboral opening.

Genus *Fususella* n. gen.

[urn:lsid:zoobank.org:act:2674F386-E041-4EB3-B2A7-5E880FEC569C](https://doi.org/10.26744/2674F386-E041-4EB3-B2A7-5E880FEC569C)

DIAGNOSIS. — Test fusiform; oral end ribbed; wall hyaline, perforate; aboral opening.

TYPE SPECIES. — *Fususella basirotunda* n. sp.

ETYMOLOGY. — From Latin *fusus* (spindle).

DESCRIPTION

Test fusiform with oral end ribbed; wall hyaline, smooth, perforate; aperture rounded; aboral opening.

Fususella basirotunda n. gen., n. sp.
(Figs 5D-P; 30C-F)

[urn:lsid:zoobank.org:act:716CEB84-5DC9-43A7-804C-0CBBBC4F8C0D](https://doi.org/10.26744/716CEB84-5DC9-43A7-804C-0CBBBC4F8C0D)

HOLOTYPE. — Sample: la Pugle, 8.00 m (MNHN.F.F67621).

PARATYPES. — Two paratypes: Sample: la Groussinière S6, 17.60-20.30 m (MNHN.F.F67622, F67623).

DIAGNOSIS. — Test fusiform, hyaline, oral end with ribs, aboral end rounded with opening.

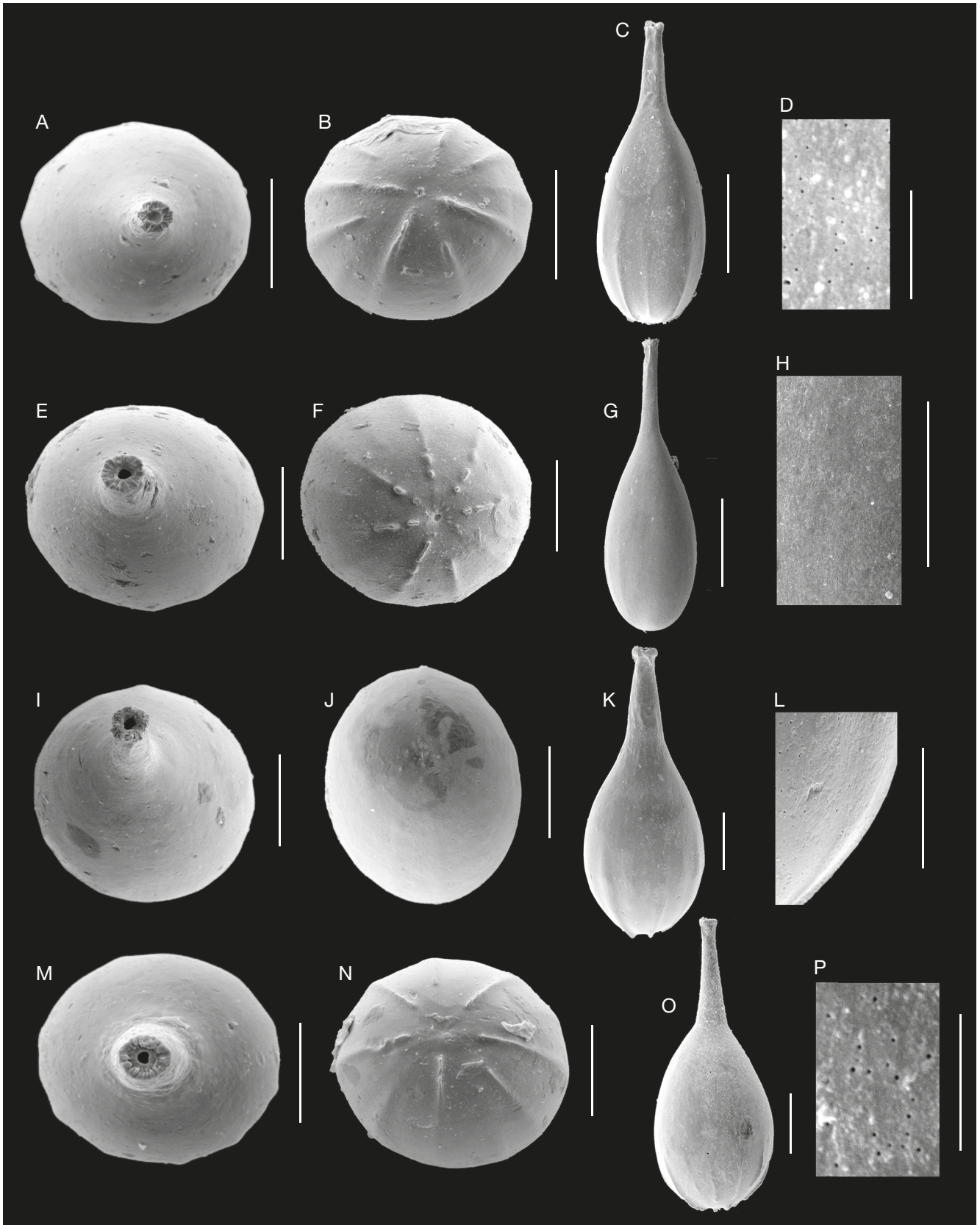


FIG. 3. — **A-F**, *Deuteralagena laguncula* n. gen., n. sp.: **A, B**, Brest-LRK2 (MNHN.F.F67611), paratype in oral and basal views; **C-F**, paratype Auxais (MNHN.F.F67612); **C**, lateral view; **D**, pores; **E, F**, oral and lateral views; **G-J**, *Deuteralagena* sp. A, Auxais (MNHN.F.F67613): **G**, lateral view; **H**, pores; **I, J**, oral and basal views; **K-N**, *Deuteralagena* sp. B, Auxais (MNHN.F.F67614): **K**, lateral view; **L**, pores; **M, N**, oral and basal views; **O, P**, *Deuteralagena* sp. C, Fécamp (MNHN.F.F67615): **O**, lateral view; **P**, pores. Scale bars: A, B, E, F, 100 μ m; C, G, 200 μ m; D, P, 5 μ m; H, L, 50 μ m; I-K, M-O, 100 μ m.

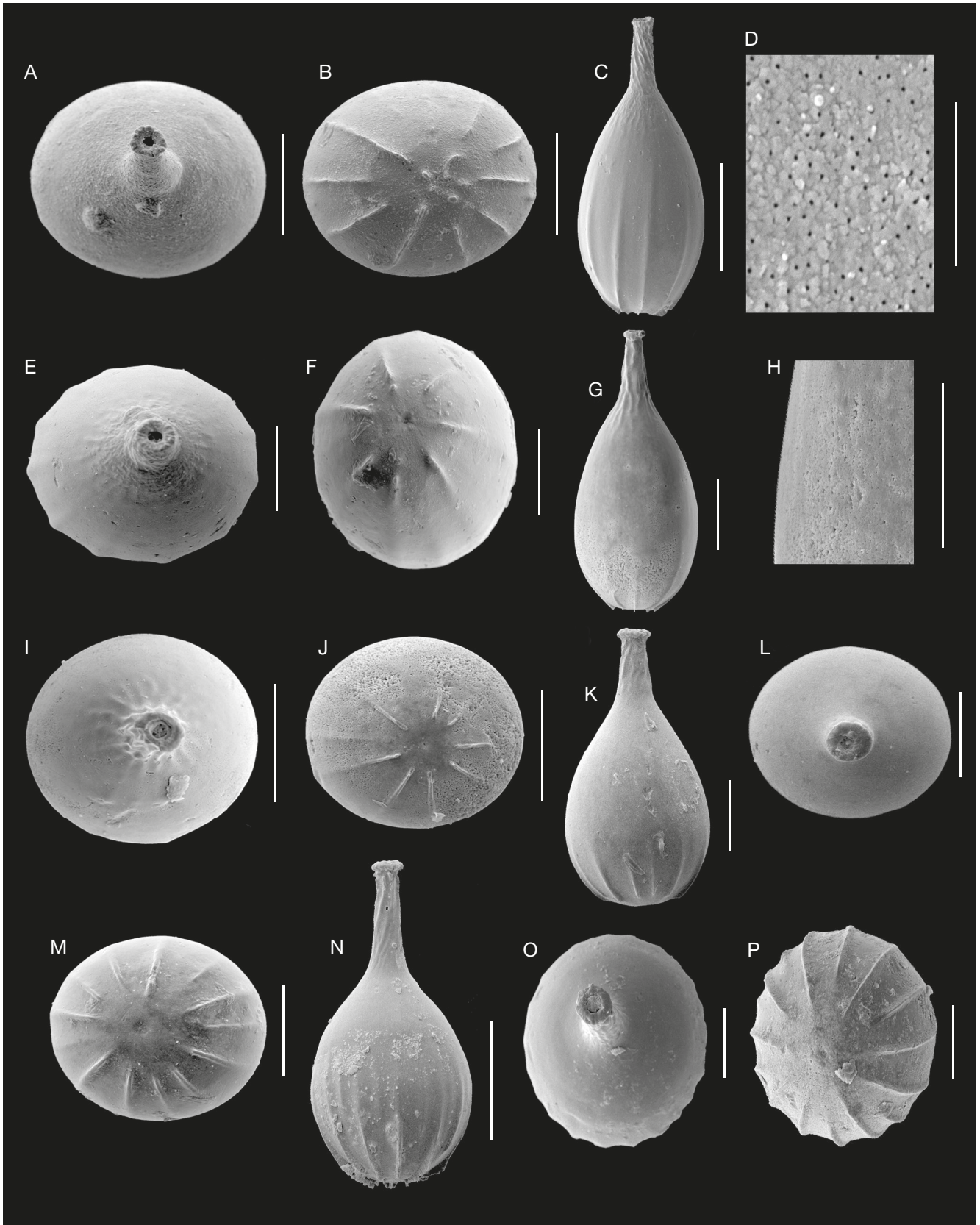


FIG. 4. — **A, B**, *Deuteralagena* sp. C, Fécamp (MNHN.F.F67615), lateral and basal views; **C-F**, *Deuteralagena* sp. D, Auxais (MNHN.F.F67616): **C**, lateral view; **D**, pores; **E, F**, oral and basal views; **G-J**, *Deuteralagena* sp. E, la Pugle (MNHN.F.F67617): **G**, lateral view; **H**, pores; **I, J**, oral and basal views; **K-M**, *Deuteralagena* sp. F, SGB3 (MNHN.F.F67618) in lateral, oral and basal views; **N-P**, *Deuteralagena* sp. G, la Groussinière (MNHN.F.F67619) in lateral, oral and basal views. Scale bars: A, B, E, F, G, I, J, K, L, M, O, P, 100 µm; C, N, 200 µm; D, 5 µm; H, 50 µm.

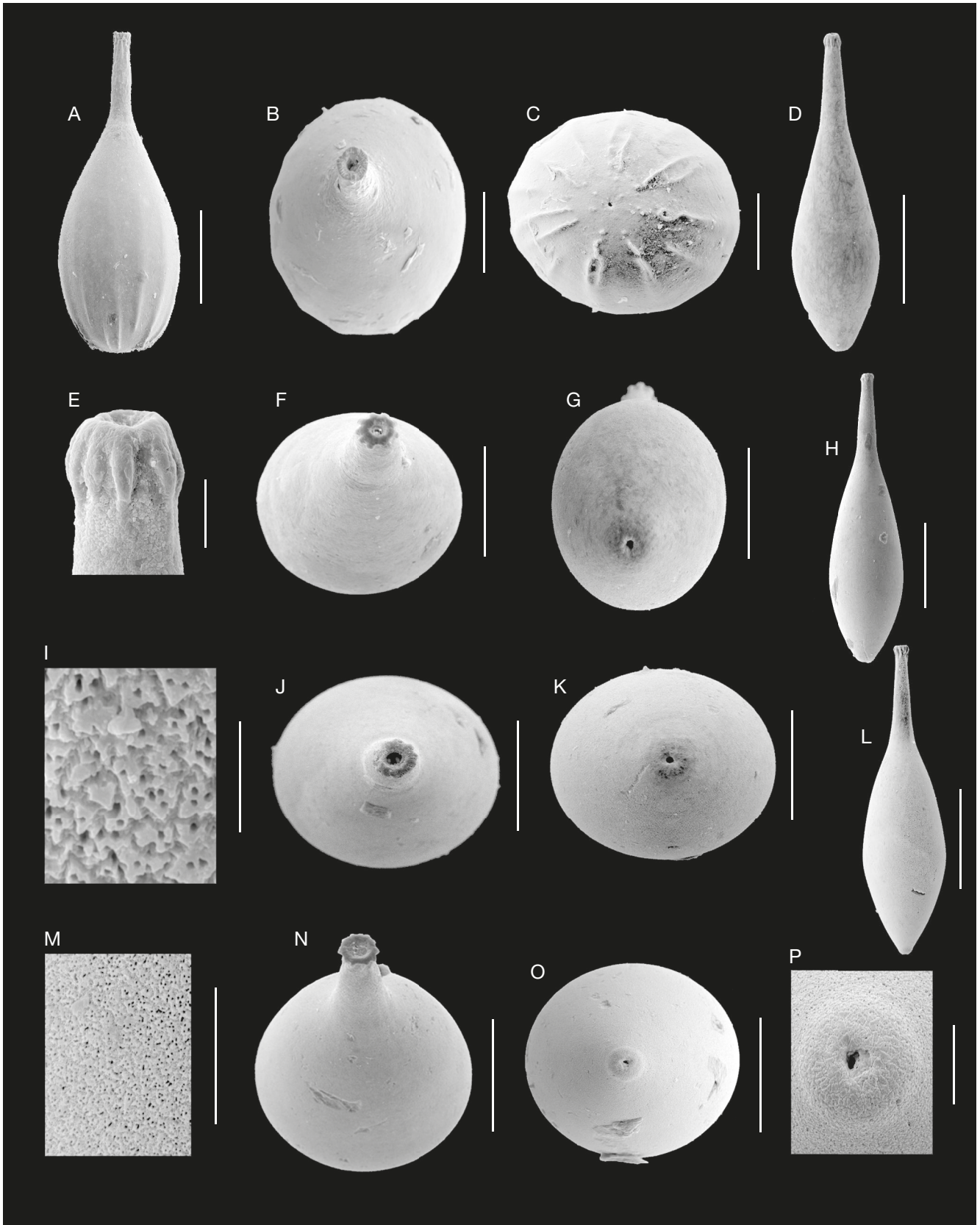


FIG. 5. — **A-C**, *Deuterolagena* sp. H, SGB3 (MNHN.F.F67620) in lateral, oral and basal views; **D-P**, *Fususella basirotunda* n. gen., n. sp.: **D-G**, la Pugle, holotype (MNHN.F.F67621); **D**, lateral view; **E**, oral end; **F, G**, oral and basal views; **H-K**, la Groussinière, paratype (MNHN.F.F67622): **H**, lateral view; **I**, pores; **J, K**, oral and basal views; **L-P**, la Groussinière, paratype (MNHN.F.F67623); **L**, lateral view; **M**, pores; **N, O**, oral and basal views; **P**, basal end. Scale bars: A, D, H, L, 200 µm; B, C, F, G, J, K, N, O, 100 µm; E, M, P, 20 µm; I, 5 µm.

TYPE AGE. — Early Pliocene.

TYPE LOCALITY. — La Pugle (Maine-et-Loire).

ETYMOLOGY. — From Latin *bāsis* (base) and *rōtundus* (round).

MATERIAL EXAMINED. — Sample: la Pugle, 8.00 m (MNHN.F.F67732), 16 specimens; sample: la Bouillonnaie, 12.50 m (MNHN.F.F67733), 2 specimens.

SIZE. — Length: 0.570 mm; diameter = 0.165 mm

OCCURENCE. — Marls from la Pugle and la Bouillonnaie (Maine-et-Loire); sandy marls from la Groussinière (Ille-et-Vilaine).

DESCRIPTION

Test fusiform, oral end covered with ribs, aboral end rounded; wall hyaline, smooth, finely perforate; aperture rounded; aboral end structure.

Fususella basigranulata n. gen., n. sp. (Figs 6A-I; 30G, H)

[urn:lsid:zoobank.org:act:C6DF7706-F0DC-416E-85A4-9DA46B93E629](https://zoobank.org/act:C6DF7706-F0DC-416E-85A4-9DA46B93E629)

HOLOTYPE. — Sample: la Pugle, 13.00 m (MNHN.F.F67624).

PARATYPE. — Sample: la Pugle, 7.00 m (MNHN.F.F67625).

DIAGNOSIS. — Test fusiform, hyaline, oral end with ribs, aboral end granular.

TYPE AGE. — Early Pliocene.

TYPE LOCALITY. — La Pugle (Maine-et-Loire).

ETYMOLOGY. — From Latin *bāsis* (base) and *grānōsus* (grain).

MATERIAL EXAMINED. — Sample: la Pugle, 13.00 m (MNHN.F.F67734), 2 specimens.

SIZE. — Length = 0.577 mm; diameter = 0.166 mm

OCCURENCE. — Marls from la Pugle (Maine-et-Loire).

DESCRIPTION

Test fusiform, oral end covered with ribs, aboral end granular; wall hyaline, smooth, very finely perforate; aperture rounded; aboral end structure.

Fususella clavata (d'Orbigny, 1846), n. comb. (Figs 6J-M; 30I, J)

Oolina clavata d'Orbigny, 1846: 24, pl. 1, fig. 2.

Lagena laevis – Brady 1884: 455, pl. 56, fig. 8 (*non* fig. 9).

Lagena laevis forma *laevis* – Buchner 1940: 418, pl. III, figs 34, 35, *non* fig. 36.

Lagena clavata – Margerel 1968: 57, pl. 9, fig. 12. — Laga 1972: 73, pl. 6, fig. 10. — Papp & Schmid 1985: figs 7-9.

LOCALITIES. — La Groussinière (Ille-et-Vilaine), la Pugle (Maine-et-Loire).

MATERIAL EXAMINED. — Sample: la Groussinière S12, 14.50-16.80 m (MNHN.F.F67626); sample: la Pugle, 7.00 m (MNHN.F.F67735), 1 specimen.

AGE. — Early Pliocene, Late Pliocene.

DESCRIPTION

Test fusiform, inflated in the lower part, tapering at the oral end covered with ribs; wall hyaline, smooth, finely perforate; aperture rounded; aboral end structure.

Fususella setigera (Millett, 1901), n. comb. (Figs 6N-P; 7A-C)

Lagena clavata var. *setigera* Millett, 1901: 491, pl. 8, fig. 9a, b. — Whittaker & Hodgkinson 1979: 43, fig. 35 (*non* figs 29-34, 36, 37)

Lagena cf. *setigera* – McCulloch 1977: 95, pl. 31, fig. 28.

LOCALITY. — La Sautré (Maine-et-Loire).

MATERIAL EXAMINED. — Sample: la Sautré, 15.00 m (MNHN.F.F67627).

AGE. — Early Pliocene.

DESCRIPTION

Test fusiform, inflated in the lower part, oral end covered with ribs, provided at the aboral end with strong spines; wall smooth, hyaline, coarsely perforate; aperture rounded; aboral opening.

Fususella sp. A (Fig. 7D-H)

LOCALITY. — La Groussinière (Ille-et-Vilaine).

MATERIAL EXAMINED. — Sample: la Groussinière S12, 14.50-16.80 m (MNHN.F.F67628).

AGE. — Late Pliocene.

DESCRIPTION

Test fusiform, inflated in the lower part, oral end covered with ribs, aboral end truncated; wall coarsely perforate; aperture rounded; aboral opening.

Fususella sp. B (Fig. 7I-K)

LOCALITY. — Saint-Sulpice-des-Landes (Loire-Atlantique).

MATERIAL EXAMINED. — Sample: SSL S3, 2.30 m (MNHN.F.F67629).

AGE. — Early Pliocene.

DESCRIPTION

Test fusiform, inflated in the lower part, oral end covered with ribs; wall finely perforate; aperture rounded; aboral opening.

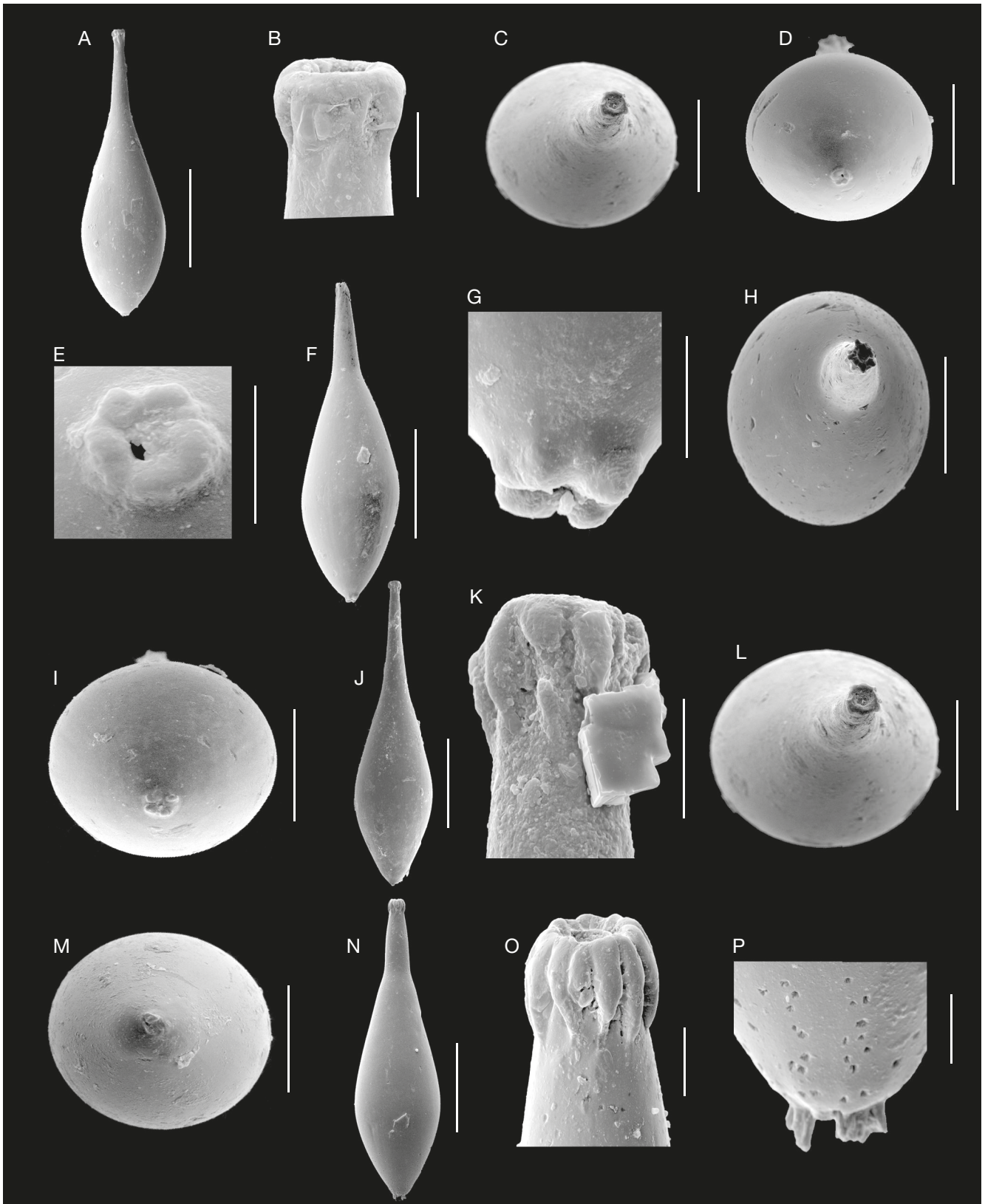


FIG. 6. — **A-I**, *Fususella basigranulata* n. gen., n. sp.: **A-E**, la Pugle, holotype (MNHN.F.F67624); **A**, lateral view; **B**, oral end; **C, D**, oral and basal views; **E**, basal end; **F-I**, la Pugle, paratype (MNHN.F.F67625): **F**, lateral view; **G**, basal end; **H, I**, oral and basal views; **J-M**, *Fususella clavata* (d'Orbigny, 1846), n. comb., la Groussinière (MNHN.F.F67626): **J**, lateral view; **K**, oral end; **L, M**, oral and basal views; **N-P**, *Fususella setigera* (Millett, 1901), n. comb., la Sautré (MNHN.F.F67627): **N**, lateral view; **O**, oral end; **P**, basal end. Scale bars: **A, F, J, N**, 200 µm; **C, D, H, I, L, M**, 100 µm; **E, G, K, O, P**, 20 µm.

Genus *Hyalinonetrion*
Patterson & Richardson, 1988

EMENDED DIAGNOSIS. — Test fusiform; wall hyaline, smooth, finely perforate; aperture rounded with a distinct lip; aboral opening.

Hyalinonetrion aciculum (Reuss, 1861), n. comb.
(Figs 7L-P; 8A-E; 30K)

Lagena acicula Reuss, 1861: 355, pl. 1, fig. 1.

Lagena vulgaris var. *clavata* Williamson, 1858: 5, pl. 1, fig. 6.

Lagena clavata – Cushman 1923: 10, pl. 1, fig. 15. — Goës 1894: 75, pl. 13, figs 725-727. — Buchner 1940: 416, pl. 2, figs 29, 30 (*non* fig. 28). — Cushman & Gray 1946: 18, pl. 3, figs 32, 33 (*non* fig. 31). — Haynes 1973: 81, pl. 12, fig. 1. — Whittaker & Hodgkinson 1979: 43, pl. 8, fig. 3. — Popescu 1981: 1983: 2, pl. 1, figs 13, 14. — Popescu & Crihan 2004: 404, pl. 1, figs 1-5.

Lagena elongata – Laga 1972: 77, pl. 6, fig. 12a (*non* fig. 12b).

Phialinea clavata – Jones 1984: 125, pl. 2, fig. 22 (*non* fig. 23).

LOCALITIES. — Auxais, SGB3 (Manche).

MATERIAL EXAMINED. — Sample: SGB3, 9.50 m (MNHN.FF67630); sample: Auxais T47, 12-14 m (MNHN.FF67631, F67632); sample: Auxais T47, 12-14 m (MNHN.FF67736), 19 specimens; sample: SGB3, 9.50 m (MNHN.FF67737), 3 specimens.

AGE. — Late Pliocene to Early Pleistocene.

DESCRIPTION

Test fusiform, oral end with ribs, aboral end with a partly internal tube; wall hyaline, smooth, finely perforate; aperture rounded with everted lip; aboral opening rounded.

REMARK

This species is often confused with *Fususella clavatum* (d'Orbigny, 1846). The test is more slender, the aboral end is provided with a small tube internal in part and the oral end with a lip.

Hyalinonetrion distomapolitum (Parker & Jones, 1865)
(Fig. 8F-H)

Lagena sulcata var. *distoma-polita* Parker & Jones, 1865: 357, pl. 13, fig. 21, pl. 18, fig. 8.

LOCALITY. — Rémilly-sur-Lozon (Manche).

MATERIAL EXAMINED. — Sample: Rémilly-sur-Lozon, 25.50 m (MNHN.FF67633).

AGE. — Late Pliocene.

DESCRIPTION

Test fusiform, angular, inflated at midpoint, aboral end with a partly internal tube; wall hyaline, smooth, perforate; aperture rounded with a lip ornamented with fine ridges; aboral opening rounded.

Hyalinonetrion distortum (Seguenza, 1862)
(Figs 8I-L; 30L)

Amphorina distorta Seguenza, 1862: 52, pl., fig. 38.

Lagena clavata – Brady 1884: 456, pl. 56, figs 20, 24.

Lagena gracillima – Cushman 1923: 23, pl. 4, fig. 5. — Loeblich & Tappan 1953: 60, pl. 11, figs 1, 3.

LOCALITIES. — Auxais (Manche), St Erth (Cornwall).

MATERIAL EXAMINED. — Sample: Auxais T47, 14-17 m (MNHN.FF67634); sample: St Erth no. 66/14 (MNHN.FF67635); sample: St Erth no. 66/14 (MNHN.FF67738), 4 specimens.

AGE. — Early Pleistocene.

DESCRIPTION

Test fusiform, arched, aboral end with a partly internal conical tube; wall hyaline, smooth, perforate; aperture rounded with everted and radiate striate lip; aboral opening rounded.

Hyalinonetrion gracillimum (Seguenza, 1862)
(Figs 8M-P; 9A, B)

Amphorina gracillima Seguenza, 1862: 51, pl. 1, fig. 37.

Lagena gracillima – Brady 1884: 456, pl. 56, figs 25, 26. — Cushman 1923: 23, pl. 4, fig. 5.

Lagena clavata – Buchner 1940: 416, pl. 2, fig. 28.

Hyalinonetrion gracillimum – Cimerman & Langer 1991: 5, pl. 55, figs 1, 2.

Hyalinonetrion clavatum – Popescu & Crihan 2004: 404, pl. 1, figs 1, 2, 4, 5 (*non* fig. 3).

LOCALITY. — Auxais (Manche).

MATERIAL EXAMINED. — Sample: Auxais T47, 12-14 m (MNHN.FF67636, F67637); sample: Auxais T47, 12-14 m (MNHN.FF67739), 2 specimens.

AGE. — Early Pleistocene.

DESCRIPTION

Test fusiform, inflated at midway part, aboral end with a partly internal tube; wall hyaline, smooth, perforate; aperture rounded with everted and radiate lip; aboral opening rounded.

Genus *Hyalinonetrionella* n. gen.

[urn:lsid:zoobank.org:act:902EB5A7-823D-47B1-A2B5-6FB432041937](https://doi.org/10.21203/rs.3.rs-2120319/v1)

DIAGNOSIS. — Test fusiform, aboral end rounded, aperture with lip, aboral opening.

TYPE SPECIES. — *Hyalinonetrionella sidebottomi* n. sp.

ETYMOLOGY. — From the genus name *Hyalinonetrion*.

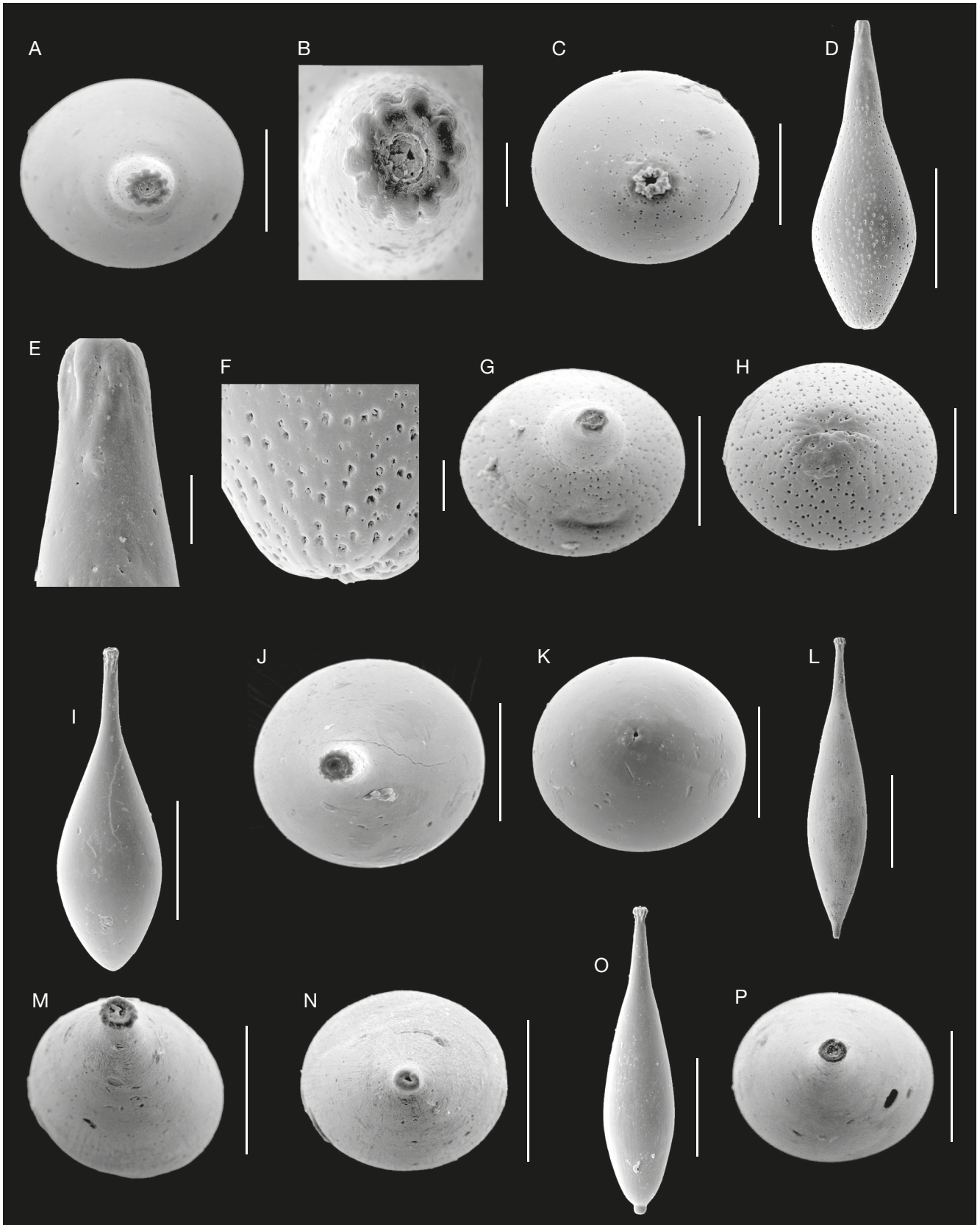


FIG. 7. — **A-C**, *Fususella setigera* (Millett, 1901), n. comb., la Sautré (MNHN.F.F67627): **A**, oral view; **B**, oral end; **C**, basal view; **D-H**, *Fususella* sp. A, SSL (MNHN.F.F67628): **D**, lateral view; **E**, oral end; **F**, basal end; **G, H**, oral and basal views; **I-K**, *Fususella* sp. B, la Pugle (MNHN.F.F67629) in lateral, oral and basal views; **L-P**, *Hyalinonetrion aciculum* (Reuss, 1861), n. comb.; **L-N**, SGB3 (MNHN.F.F67630), lateral, oral and basal views; **O, P**, Auxais (MNHN.F.F67631), lateral and oral views. Scale bars: A, C, F, G, H, J, K, M, N, P, 100 µm; B, E, 20 µm; D, I, L, O, 200 µm.

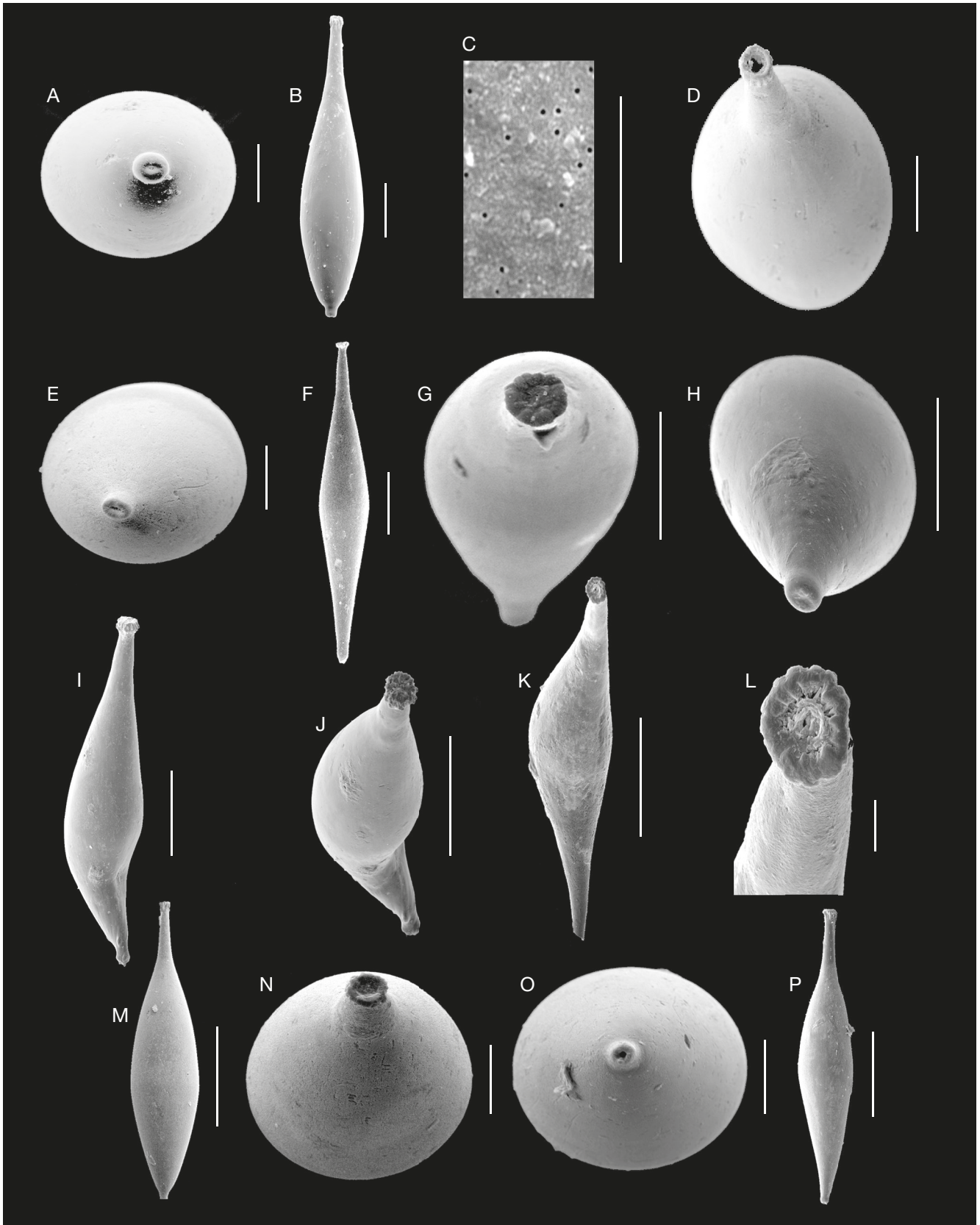


FIG. 8. — **A-E**, *Hyalinonetrion aciculum* (Reuss, 1861), n. comb., Auxais (MNHN.F.F67631): **A**, basal view; **B**, lateral view; **C**, pores; **D, E**, oral and basal view; **F-H**, *Hyalinonetrion distomapolitum* (Parker & Jones, 1865), Rémilly-sur-Lozon (MNHN.F.F67633) in lateral, oral and basal views; **I-L**, *Hyalinonetrion distortum* (Seguenza, 1862): **I, J**, Auxais (MNHN.F.F67634) in lateral and oral views; **K, L**, St. Erth (MNHN.F.F67635) in lateral and oral views; **M-P**, *Hyalinonetrion gracillimum* (Seguenza, 1862), Auxais: **M-O**, MNHN.F.F67636 in lateral, oral and basal views; **P**, MNHN.F.F 67637 in lateral view. Scale bars: F, I-M, P, 200 µm; G, H, 100 µm; A, B, D, E, N, O, 50 µm; C, 5 µm.

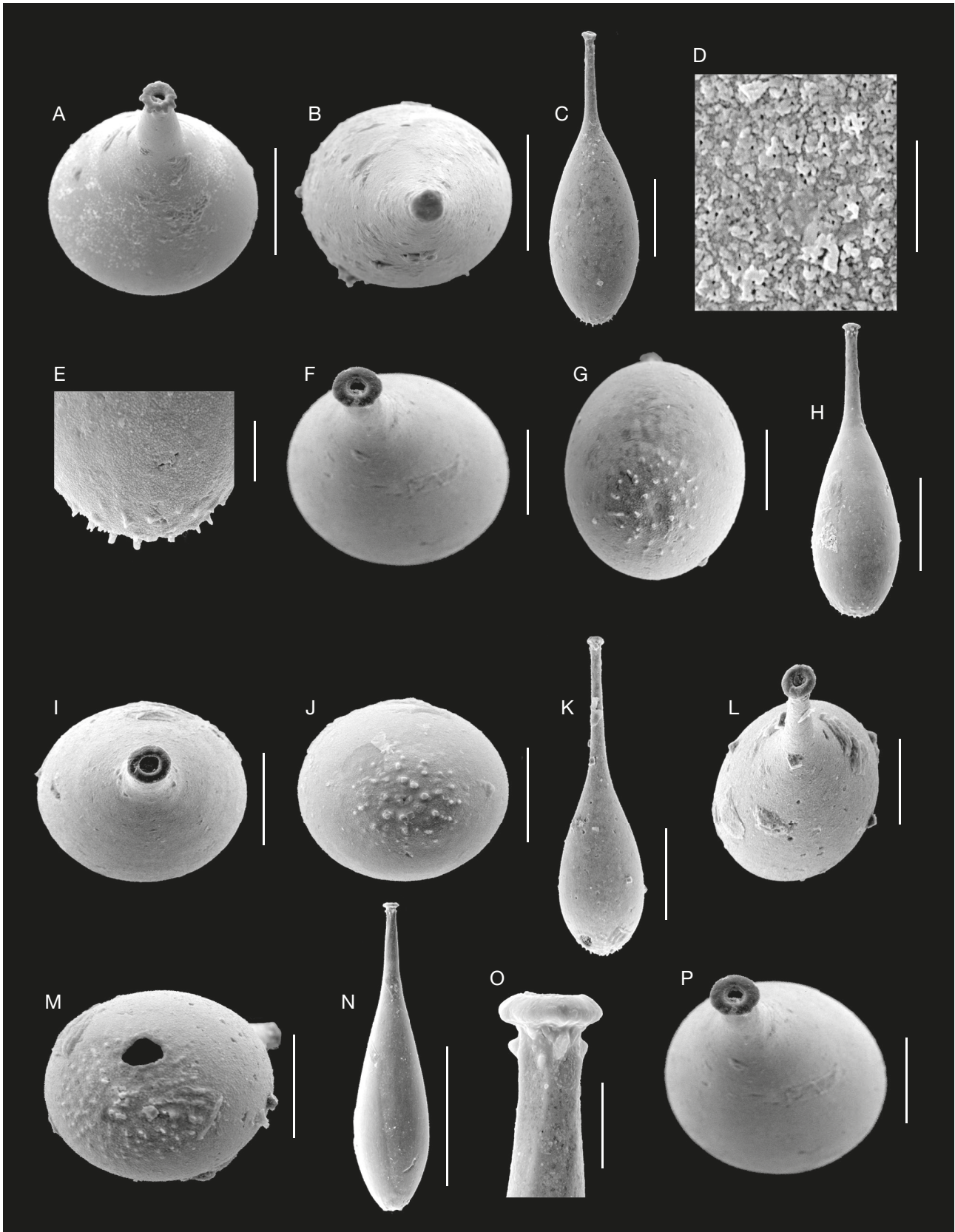


FIG. 9. — **A, B**, *Hyalinonettrion gracillimum* (Seguenza, 1862), Auxais (MNHN.F.F67637), oral and basal views; **C-M**, *Hyalinonettrionella sidebottomi* n. gen., n. sp., Brest-LRK2: **C-G**, holotype (MNHN.F.F67638); **C**, lateral view; **D**, pores; **E**, enlargement base; **F, G**, oral and basal views; **H-J**, paratype (MNHN.F.F67638) in lateral, oral and basal views; **K-M**, paratype (MNHN.F.F67639), lateral, oral and basal views; **N-P**, *Hyalinonettrionella* sp., Brest-LRK2 (MNHN.F.F67640): **N**, lateral view; **O**, enlargement, oral end; **P**, oral view. Scale bars: A-C, H, K, 100 μ m; F, G, I, J, L, M, P, 50 μ m; D, 5 μ m; E, O, 20 μ m; N, 200 μ m.

DESCRIPTION

Test fusiform inflated, aboral end rounded; wall hyaline, smooth, perforate; aperture rounded with distinct lip; aboral end opening.

Hyalinonetrionella sidebottomi n. gen., n. sp.
(Figs 9C-M; 30M, N)

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Lagena semistriata – Sidebottom 1904: 3, pl. 1, fig. 5 (non fig. 4).

Lagena laevis forma laevis – Buchner 1940: 416, pl. 3, figs 34, 35 (non fig. 36).

HOLOTYPE. — Sample: LRK2, 2.20 m (MNHN.FF67638).

PARATYPE. — Sample: LRK2, 2.20 m (MNHN.FF67639).

DIAGNOSIS. — Test fusiform, basal part rounded, aperture rounded with a distinct lip, aboral opening.

TYPE AGE. — Upper Pliocene.

TYPE LOCALITY. — Brest-LRK2 (Finistère).

ETYMOLOGY. — In honour of Henry Sidebottom.

OTHER MATERIAL EXAMINED. — Sample: LRK2, 2.20 m (MNHN.FF67740), 1 specimen.

SIZE. — Length = 0.375 mm; diameter = 0.114 mm.

OCCURENCE. — Marls from Brest-LRK2.

DESCRIPTION

Test fusiform, inflated; aboral end ornamented with spines; oral aperture with everted lip; wall hyaline, smooth, perforate; aperture rounded; aboral end structure.

Hyalinonetrionella sp.
(Figs 9N-P; 10A)

LOCALITY. — Brest-LRK2 (Finistère).

MATERIAL EXAMINED. — Sample: LRK2, 2.30 m (MNHN.FF67640).

AGE. — Late Pliocene.

DESCRIPTION

Test fusiform truncated at the base, neck ornamented with nodules at oral end; wall hyaline, smooth, perforate; aperture rounded with lip; aboral opening.

Genus *Laevilagena* n. gen.

[urn:lsid:zoobank.org:act:C636260C-CEC5-47FE-8745-82188D961BE8](https://doi.org/10.21203/rs.3.rs-10000000/v1)

DIAGNOSIS. — Test pear shape in outline, with longitudinal costae, aperture rounded with small lip, wall hyaline, perforate, aboral opening.

TYPE SPECIES. — *Laevilagena guttaformis* n. sp.

ETYMOLOGY. — From Latin *laevis* (smooth) and *lāgoena* (bottle).

DESCRIPTION

Test pear-shaped in outline, partly ornamented with longitudinal costae; aperture rounded with small lip; wall hyaline, perforate; aboral opening.

Laevilagena guttaformis n. gen., n. sp.
(Figs 10B-I; 30O; 31A)

[urn:lsid:zoobank.org:act:C8C6C524-46A0-4247-B785-7353CC6D294C](https://doi.org/10.21203/rs.3.rs-10000000/v1)

HOLOTYPE. — Sample: la Groussinière S6, 13.60-14.50 m (MNHN.FF67641).

PARATYPE. — Sample: Mernel (MNHN.FF67642).

DIAGNOSIS. — Test pear shape in outline, partly ornamented with costae; wall hyaline, punctate; aperture rounded with lip; aboral opening.

TYPE AGE. — Late Pliocene.

TYPE LOCALITY. — La Groussinière (Ille-et-Vilaine).

ETYMOLOGY. — From Latin *Gutta* (drop) and *forma* (form).

OTHER MATERIAL EXAMINED. — Sample: la Groussinière S15, 47.0-44.50 m (MNHN.FF67741), 7 specimens.

SIZE. — Length = 0.663 mm; diameter = 0.188 mm.

OCCURENCE. — Sandy clay from la Groussinière (Ille-et-Vilaine) and crags from Mernel (Ille-et-Vilaine).

DESCRIPTION

Test pear shape in outline, drop-like, base slightly rounded, partly ornamented with longitudinal costae (10); wall hyaline, perforate; aperture rounded with small striated lip; aboral end structure.

Laevilagena pyriformis n. gen., n. sp.
(Figs 10J-P; 11A-D; 31B, C)

[urn:lsid:zoobank.org:act:5EF65F20-69EE-4882-9DE9-61218DCE0B89](https://doi.org/10.21203/rs.3.rs-10000000/v1)

HOLOTYPE. — Sample: Mernel S212, 5.50 m (MNHN.FF67643).

PARATYPES. — Two paratypes: Sample: Mernel S214, 8.50 m (MNHN.FF67644); Sample: la Groussinière S6, 13.60-14.50 m (MNHN.FF67645).

DIAGNOSIS. — Test pear-shaped in outline; partly ornamented with acute costae; wall hyaline, perforate; aboral opening.

TYPE AGE. — Late Pliocene.

TYPE LOCALITY. — Mernel (Ille-et-Vilaine).

ETYMOLOGY. — From Latin *pyrum* (pear) and *forma* (form).

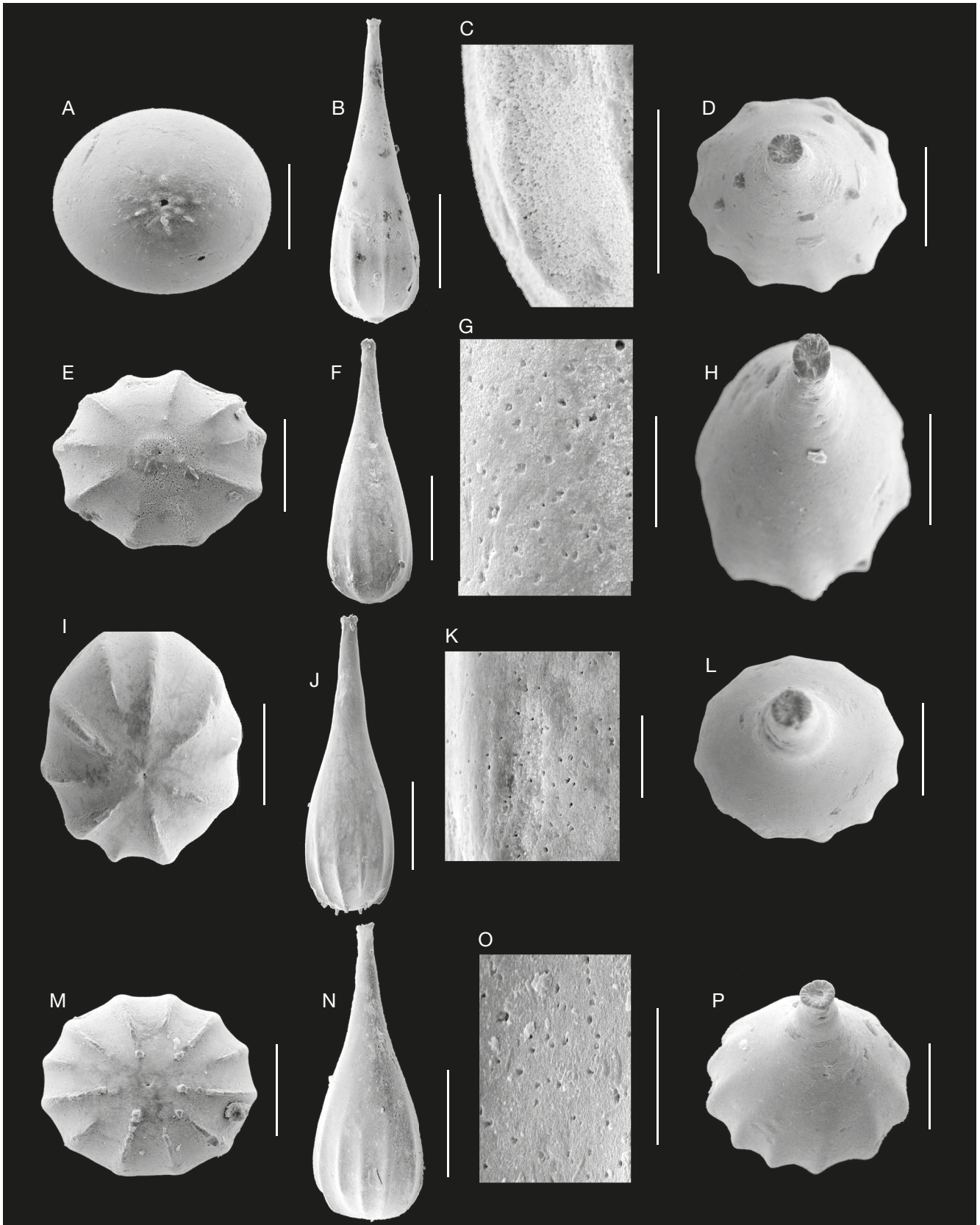


FIG. 10. — **A**, *Hyalinonetrionella* sp., Brest-LRK2 (MNHN.F.F67640); **B-I**, *Laevilagena guttaformis* n. gen., n. sp.: **B-E**, holotype, la Groussinière (MNHN.F.F67641); **B**, lateral view; **C**, pores; **D, E**, oral and basal views; **F-I**, paratype, Mernel (MNHN.F.F67642): **F**, lateral view; **G**, pores; **H, I**, oral and basal views; **J-P**, *Laevilagena pyriformis* n. gen., n. sp., Mernel: **J-M**, holotype (MNHN.F.F67643); **J**, lateral view; **K**, pores; **L, M**, oral and basal views; **N-P**, paratype: **N**, lateral view; **O**, pores; **P**, oral view. Scale bars: A, C, 50 µm; B, F, J, N, 200 µm; D, E, H, I, L, M, P, 100 µm; G, K, O, 20 µm.

MATERIAL EXAMINED. — Sample: Mernel S212, 5.50 m (MNHN.F.F67742), 6 specimens.

SIZE. — Length = 0.663 mm; diameter = 0.188 mm.

OCCURENCE. — Falun from Mernel and sandy clay from la Groussinière (Ille-et-Vilaine).

DESCRIPTION

Test, pear shape in outline, elongated, partly ornamented with longitudinal acute costae (12), base weakly rounded; wall hyaline, perforate; aperture rounded with striated lip; aboral end structure.

Laevilagena sp. (Fig. 11E-H)

LOCALITY. — La Groussinière (Ille-et-Vilaine).

MATERIAL EXAMINED. — Sample: la Groussinière S6, 14.50-16.40 m (MNHN.F.F67646).

AGE. — Basal Late Pliocene.

DESCRIPTION

Test pear shape in outline, ornamented with longitudinal costae (14), base rounded; wall hyaline, punctate; aperture rounded with small striated lip; aboral opening.

Genus *Lagena* Walker & Jacob *in* Kanmacher, 1798

TYPE SPECIES. — *Serpula sulcata* Adams, 1798, by subsequent designation.

EMENDED DIAGNOSIS. — Test globular to ovoid with a neck distinct; wall costate or reticulate, wall perforate; aperture rounded; aboral opening.

Lagena atilai Bertels, 1964 (Figs 11I-P; 31D, E)

Lagena atilai Bertels, 1964: 146, pl. 3, fig. 10.

Favolagena atilai – Malumián *et al.* 1991: 396, pl. 1, figs 3-11.

LOCALITY. — Fécamp (Seine-Maritime).

MATERIAL EXAMINED. — Sample: Fécamp 2A (MNHN.F.F67647-F67650); sample: 2A Fécamp (MNHN.F.F67743), 18 specimens.

AGE. — Early Pliocene.

DESCRIPTION

Test globular with a reticulate ornamentation extend onto distinct conical neck; wall finely perforate; aperture rounded; aboral end structure.

Lagena buchneri n. sp. (Figs 12A-H; 31F, G)

urn:lsid:zoobank.org:act:EF5BA659-33AF-474E-8107-9BDB4E729AF9

HOLOTYPE. — Sample: LRK2, 2.10 m (MNHN.F.F67651).

PARATYPE. — Sample: LRK2, 2.30 m (MNHN.F.F67652).

DIAGNOSIS. — Test ovoid ornamented with fine costae and distinct neck with reticulate ornamentation, apiculate base, aboral opening.

TYPE AGE. — Late Pliocene.

TYPE LOCALITY. — Brest-LRK2 (Finistère).

ETYMOLOGY. — In honour of Paul Buchner.

SIZE. — Length = 0.502 mm; diameter = 0.227 mm.

OCCURENCE. — Marls from Brest-LRK2.

DESCRIPTION

Test ovoid, ornamented with numerous longitudinal fine costae alternating with shorter (44) extend onto neck with reticulate shape; neck distinct consisting of a overlay of hexagonal-based chamberlets externally closed with punctate wall; aboral end with three apiculate rings; wall hyaline, punctate; aperture rounded; aboral end structure.

Lagena digitale Heron-Allen & Earland, 1932 (Figs 12I-O; 13A-D; 31H, I)

Lagena digitale Heron-Allen & Earland, 1932: 374, pl. 10, figs 28-30.

LOCALITIES. — La Chênelière, l'Épinay (Maine-et-Loire), SGB3 (Manche).

MATERIAL EXAMINED. — Sample: la Chênelière, 17.00 m (MNHN.F.F67653); sample: l'Épinay, 6.50 m (MNHN.F.F67654); sample: SGB3, 9.50 m (MNHN.F.F67655); sample: SGB3, 9.50 m (MNHN.F.F67744), 5 specimens.

AGE. — Pliocene.

DESCRIPTION

Test ovoid with reticulate ornamentation extending onto cylindrical neck; aperture rounded; wall punctate; aboral end structure.

Lagena haidingeri (Czjžek, 1848) (Figs 13E-P; 14A-H; 31J, K)

Oolina haidingeri Czjžek, 1848: 138, pl. 9, figs 1,2.

Lagena haidingeri – Popescu 1983: 263, pl. 1, fig. 8. — Popescu & Crihan 2004: 405, pl. 1, fig. 11.

Lagena striata – Buchner 1940: 424, pl. IV, figs 60 (*non* figs 54-59, 61). — Cushman & Gray 1946: 20, pl. 3, fig. 54 (*non* figs 51-53). — Cimerman & Langer 1991: 53, pl. 55, figs 6, 7.

LOCALITIES. — Brest-LRK2 (Finistère), l'Épinay, la Pugle (Maine-et-Loire), St Erth (Cornwall).

MATERIAL EXAMINED. — Sample: Brest-LRK2, 2.20 m (MNHN.F.F67656, F67657); sample: l'Épinay, 6.50 m (MNHN.F.F67658, F67659); sample: St Erth no. 66/14 (MNHN.F.F67660); sample: la Pugle, 9.00 m (MNHN.F.F67661);

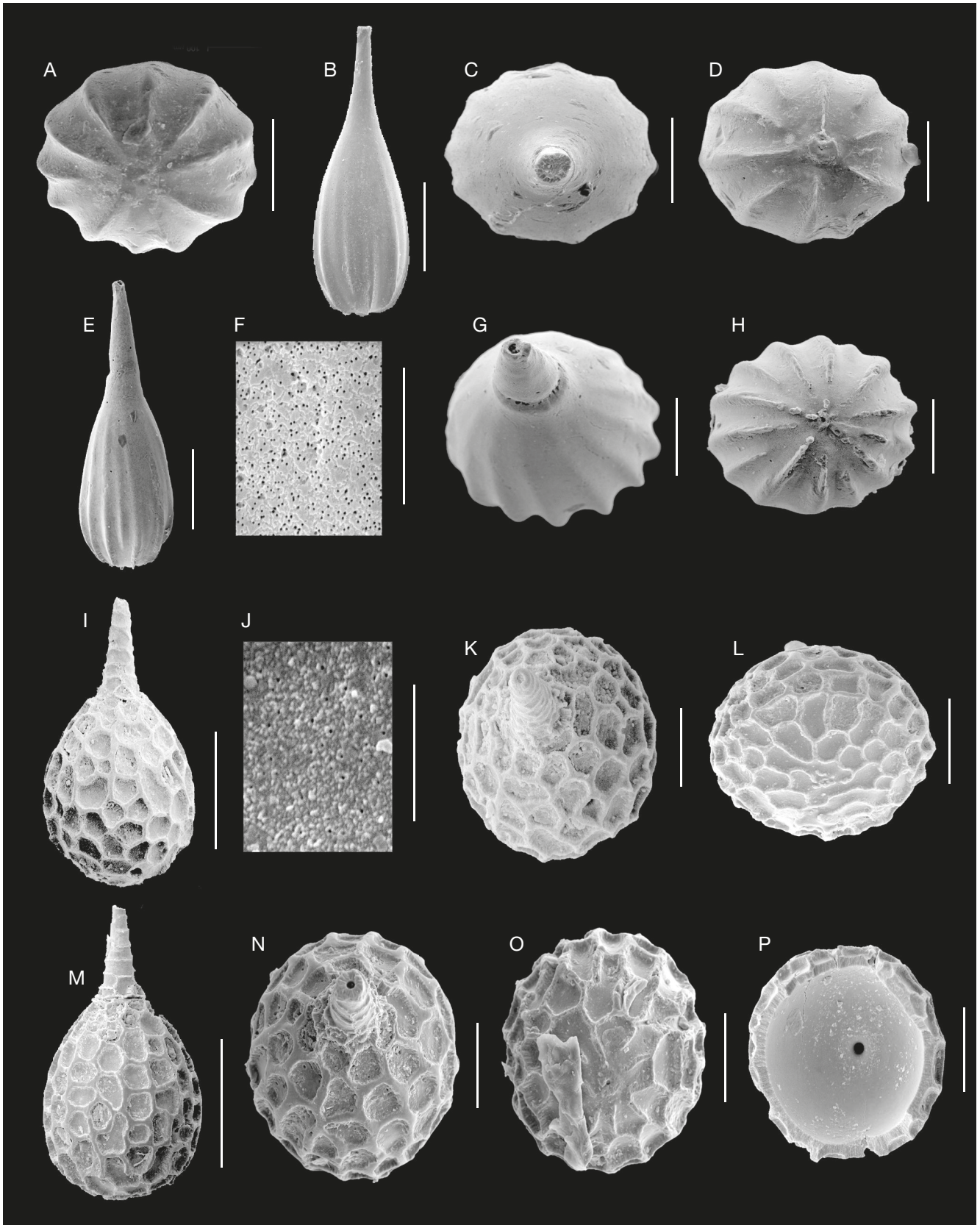


FIG. 11. — **A**, *Laevilagena pyriformis* n. gen., n. sp., Mernel, paratype, Mernel (MNHN.F.F67644), basal view; **B-D**, paratype, la Groussinière (MNHN.F.F67645) lateral, oral and basal views; **E-H**, *Laevilagena* sp., la Groussinière (MNHN.F.F67646): **E**, lateral view; **F**, pores; **G, H**, oral and basal views; **I-P**, *Lagena atilai* Bertels, 1964: **I-L**, Fécamp (MNHN.F.F67647-67650); **I**, lateral view; **J**, pores; **K, L**, oral and basal views; **M-O**, lateral, oral and basal views; **P**, internal oral view. Scale bars: A, C, D, G, H, K-P, 100 µm; B, E, I, 200 µm; F, 20 µm; J, 5 µm.

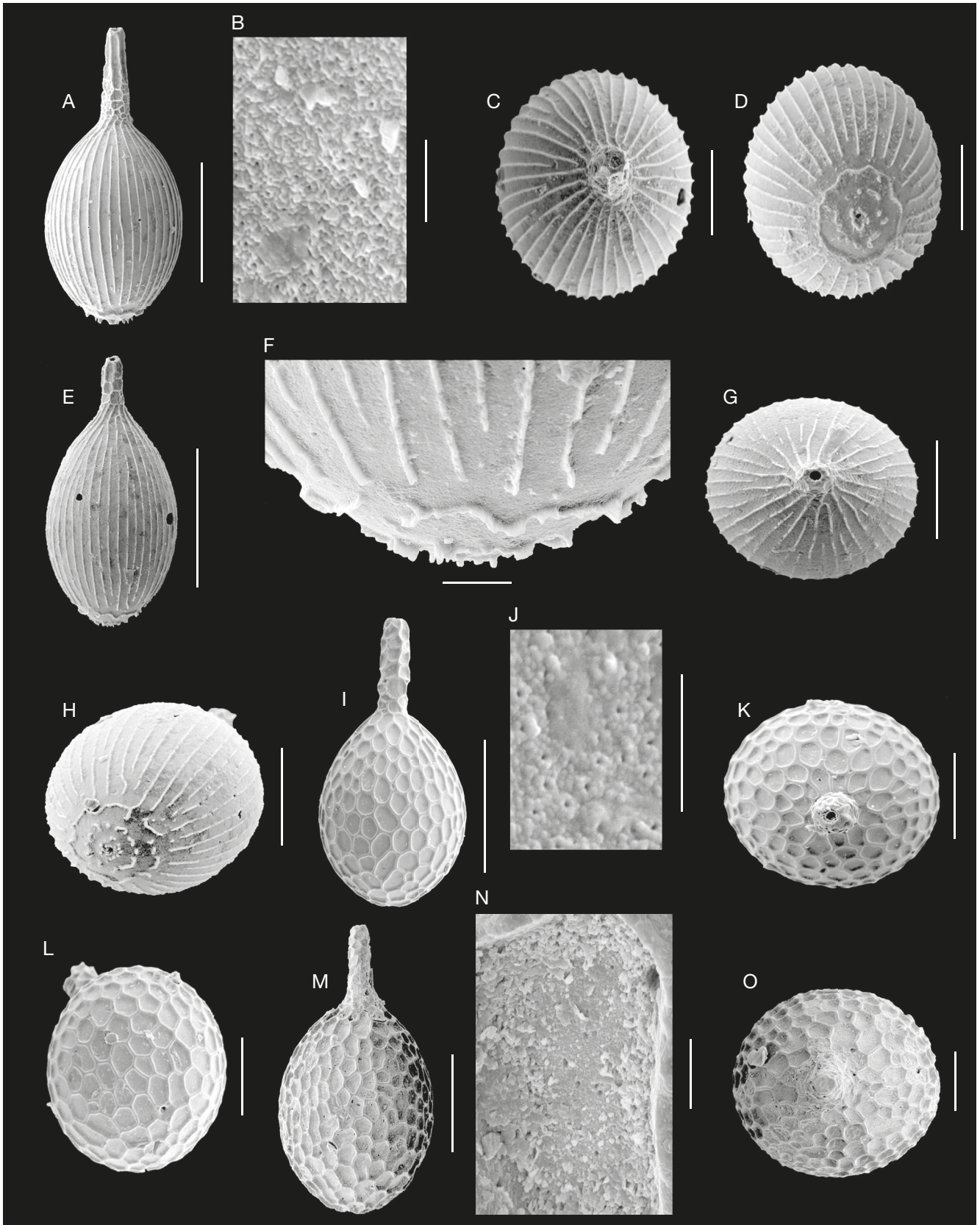


FIG. 12. — **A-H**, *Lagena buchneri* n. sp., Brest-LRK2: **A-D**, holotype (MNHN.F.F67651); **A**, lateral view; **B**, pores; **C, D**, oral and basal views; **E-H**, paratype (MNHN.F.F67652); **E**, lateral view; **F**, enlargement basal view; **G, H**, oral and basal views; **I-O**, *Lagena digitale* Heron-Allen & Earland, 1932: **I-L**, la Chênelière (MNHN.F.F67653); **I**, lateral view; **J**, pores; **K, L**, oral and basal views; **M-O**, l'Épinay (MNHN.F.F67654); **M**, lateral view; **N**, pores; **O**, oral view. Scale bars: A, E, I, M, 200 µm; B, J, 2 µm; C, D, G, H, K, L, O, 100 µm; F, 20 µm; N, 10 µm.

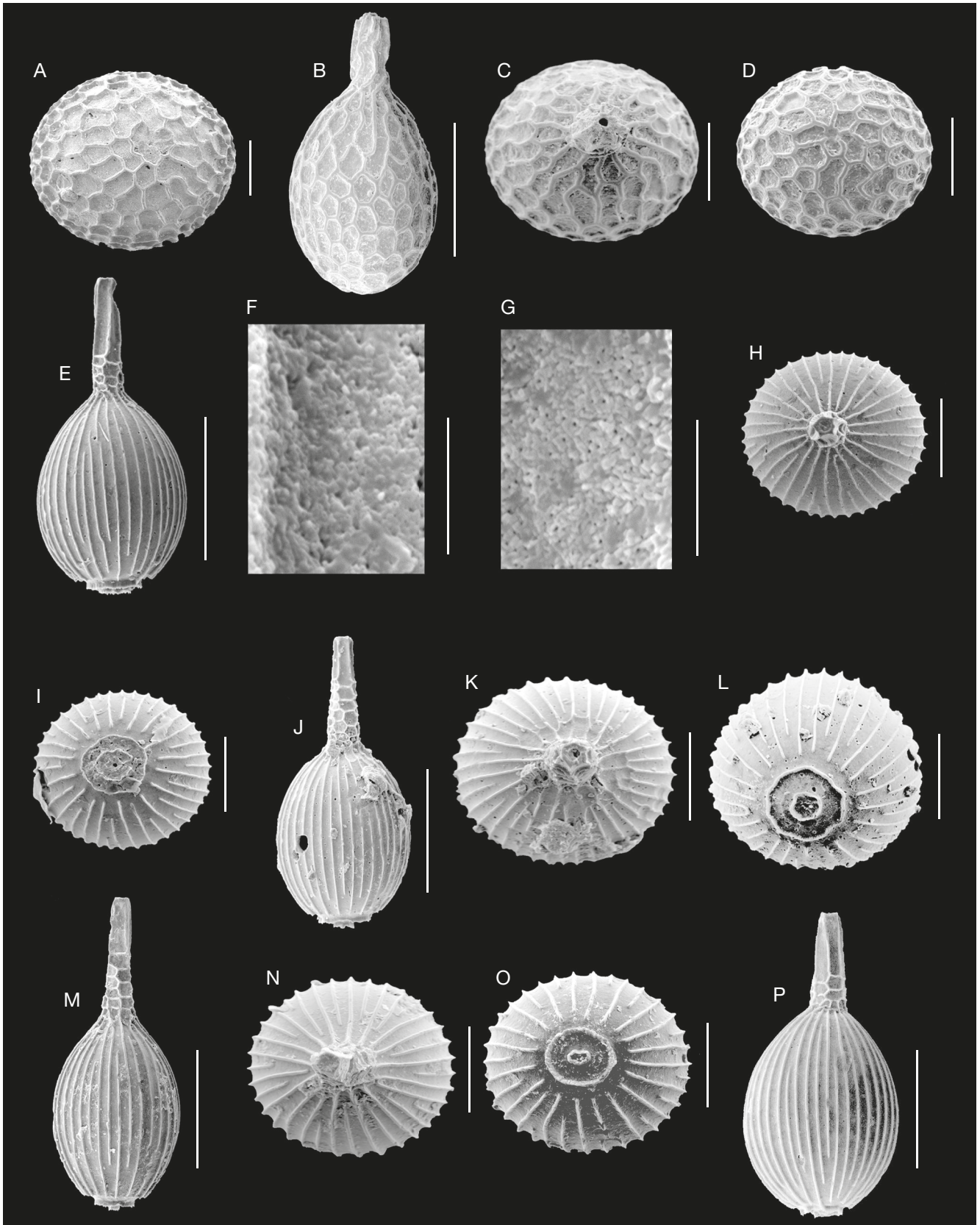


FIG. 13. — **A-D**, *Lagena digitale* Heron-Allen & Earland, 1932: **A**, l'Épinay (MNHN.F.F67654), basal view; **B-D**, SGB3 (MNHN.F.F67655), lateral, oral and basal views; **E-P**, *Lagena haidingeri* (Czjžek, 1848): **E-L**, Brest-LRK2 (MNHN.F.F67656, F67657): **E**, lateral view; **F**, perforated wall; **G**, perforated wall of the neck; **H, I**, oral and basal views; **J-L**, lateral, oral and basal views; **M-O**, l'Épinay (MNHN.F.F67658), lateral, oral and basal views; **P**, lateral view. Scale bars: A, C, D, H, I, K, L, N, O, 100 µm; B, E, J, M, P, 200 µm; F, G, 5 µm.

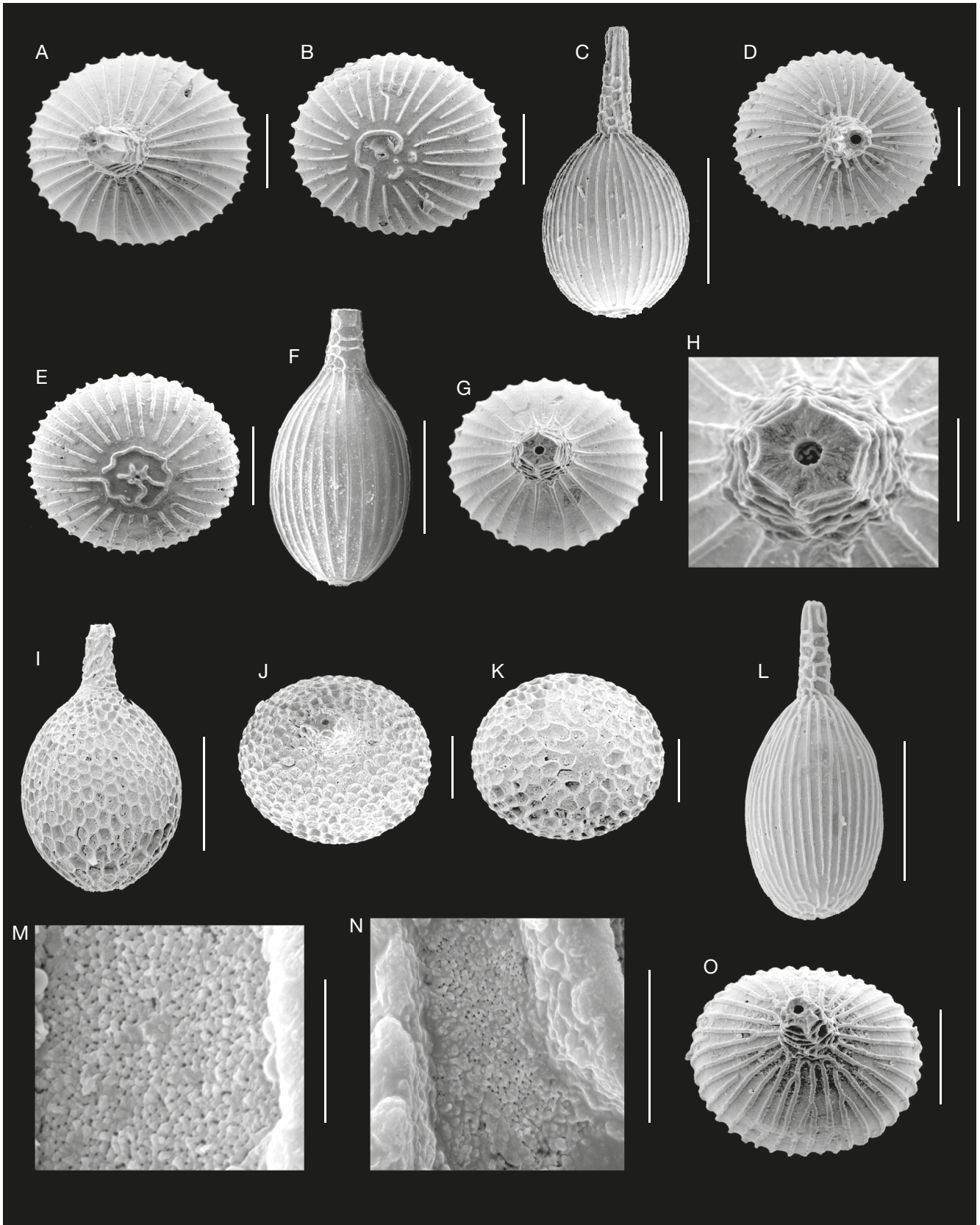


FIG. 14. — **A-H**, *Lagena haidingeri* (Czjzek, 1848): **A, B**, l'Épinay (MNHN.F.F67659); oral and basal views; **C-E**, St. Erth (MNHN.F.F67660), lateral, oral and basal views; **F-H**, la Pugle (MNHN.F.F67661), lateral, oral and basal views of a specimen with broken neck; **H-K**, *Lagena mariae* Karrer, 1877, la Sautré (MNHN.F.F67662) in lateral, oral and basal views; **L-O**, *Lagena ornatocollis* Jones, 1984, n. stat., St. Erth (MNHN.F.F67663): **L**, lateral view; **M**, perforated wall; **N**, perforated wall of the neck. Scale bars: A, B, D, E, G, J, K, O, 100 µm; C, F, I, L, 200 µm; H, 50 µm; M, 5 µm; N, 10 µm.

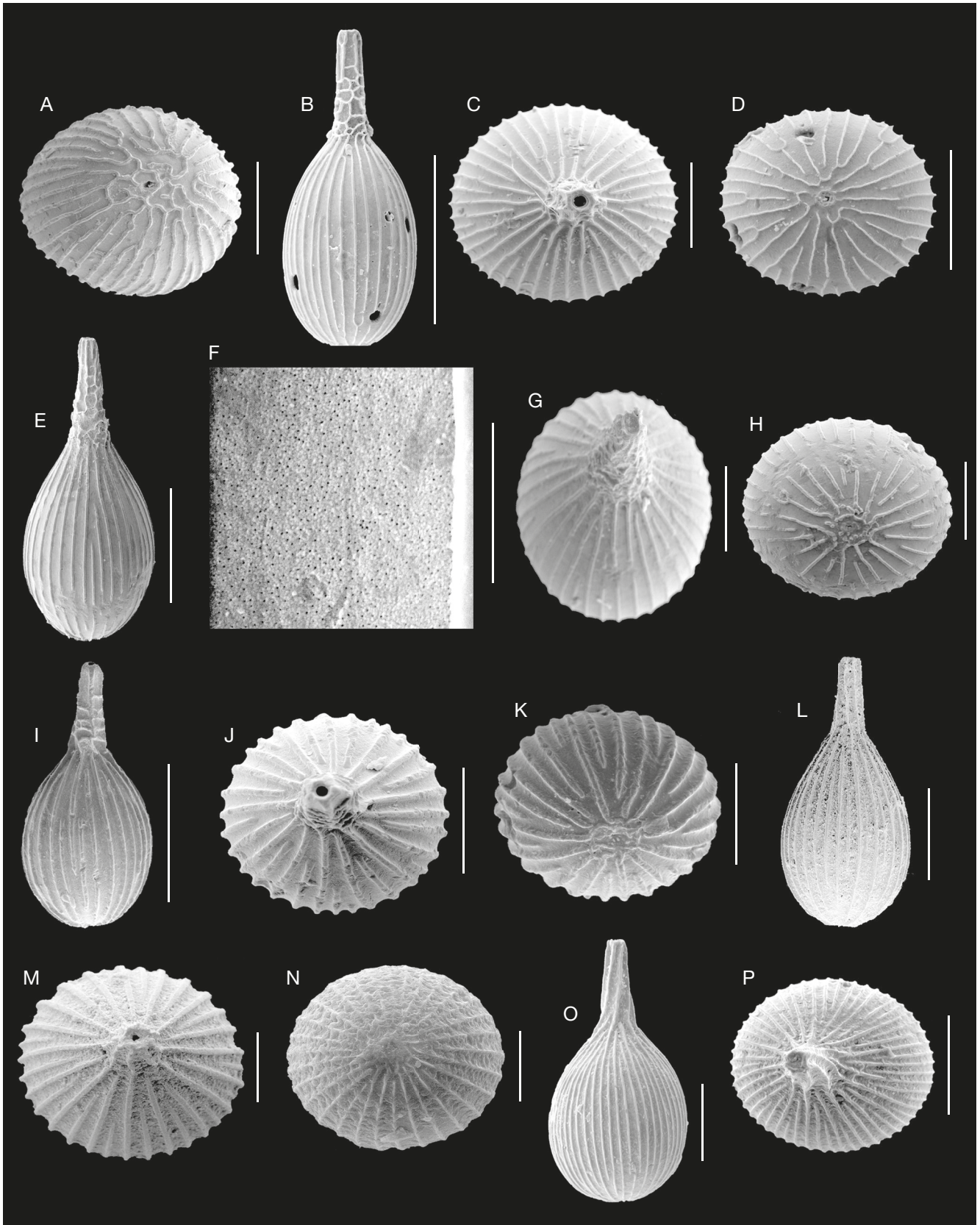


FIG. 15. — **A-N**, *Lagena ornaticollis* Jones, 1984, n. stat.: **A**, St. Erth (MNHN.F.F67664), basal view; **B-D**, Mernel, lateral, oral and basal views; **E-H**, Mernel (MNHN.F.F67665): **E**, lateral view, **F**, perforated wall; **G**, **H**, oral and basal views; **I-K**, Fécamp (MNHN.F.F67666) in lateral, oral and basal views; **L-N**, SNP (MNHN.F.F67667) in lateral, oral and basal views; **O**, **P**, *Lagena striata* (d'Orbigny, 1839), SGB3 (MNHN.F.F67668), lateral and oral views. Scale bars: A, C, D, G, H, J, K, M-P, 100 µm; B, E, I, L, 200 µm; F, 10 µm.

sample: Brest-LRK2, 2.70 m (MNHN.F.F67745), 3 specimens; sample: la Chênelière, 17.00 m (MNHN.F.F67746), 8 specimens; sample: la Sautré, 15.00 m (MNHN.F.F67747), 17 specimens; sample: la Bouillonnaie, 12.50 m (MNHN.F.F67748), 15 specimens; sample: la Pugle, 7.00 m (MNHN.F.F67749), 10 specimens; sample: l'Épinay, 6.50 m (MNHN.F.F67750), 6 specimens.

AGE. — Early Pliocene and Late Pliocene.

DESCRIPTION

Test ovoid, ornamented with fine longitudinal costae alternating with shorter (30 to 50) extending onto the neck with reticulate shape; neck distinct consisting of an overlay of hexagonal-based chamberlets externally closed with punctate wall; aboral end ornamented with a double ring sometimes spiny; neck distinct consisting of an overlay of chamberlets externally closed with punctate wall; wall hyaline, punctate; aperture rounded; aboral end structure.

REMARK

The Figure 14G, H shows the plate corresponding to the floor of chamberlet.

Lagena mariae Karrer, 1877 (Figs 14I-K; 31L, M)

Lagena mariae Karrer, 1877: 378, pl. 16b, fig. 16.

LOCALITIES. — La Sautré and la Pugle (Maine-et-Loire).

MATERIAL EXAMINED. — Sample: la Sautré, 15.00 m (MNHN.F.F67662); sample: la Pugle, 9.00 m (MNHN.F.F67751), 2 specimens.

AGE. — Early Pliocene.

DESCRIPTION

Test ovoid with dense reticulate ornamentation extending onto the neck; wall punctate; aboral end structure.

Lagena ornaticollis Jones, 1984, n. stat. (Figs 14L-O; 15A-N; 31N, O)

Lagena substriata subsp. *ornaticollis* Jones, 1984: 133, pl. 7, fig. 17.

LOCALITIES. — St Erth (Cornwall), Mernel (Loire-Atlantique), la Groussinière (Ille-et-Vilaine), Fécamp (Seine-Maritime), SNP (Manche).

MATERIAL EXAMINED. — Sample: St Erth, 5.20-5.30 m (MNHN.F.F67663, F67664); sample: Mernel S212, 5.50 m (MNHN.F.F67665); sample: Fécamp 2A, (MNHN.F.F67666); sample: SNP-F4, 30.70-32.00 m (MNHN.F.F67667); sample: la Groussinière S17, 22.50-21.70 m (MNHN.F.F67752), 15 specimens.

AGE. — Early Pliocene to Late Pliocene.

DESCRIPTION

Test ovoid, ornamented with longitudinal costae (35) alternating with shorter sometimes connected and extending

onto the neck with reticulate shape; neck distinct consisting of an overlay of hexagonal-based chamberlets externally closed with reticulate punctate wall; wall hyaline, punctate; aperture rounded.

Lagena striata (d'Orbigny, 1839) (Figs 15O-P; 16A-L; 31P; 32A)

Oolina striata d'Orbigny, 1839: 21, pl. 5, fig. 12.

Lagena striata – Heron-Allen & Earland 1932: 366, pl. X, figs 10-12.

LOCALITY. — SGB3 (Manche).

MATERIAL EXAMINED. — Sample: SGB3, 9.50 m (MNHN.F.F67668-F67671); sample: SGB3, 9.50 m (MNHN.F.F67753), 48 specimens.

AGE. — Late Pliocene.

DESCRIPTION

Test globular to ovoid ornamented with longitudinal fine costae alternating with shorter (40), a few extend onto the neck; wall hyaline, finely perforate; aperture rounded; aboral end structure.

Lagena striatareticulata n. sp. (Figs 16M-P; 17A-F)

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HOLOTYPE. — Sample: la Bouillonnaie, 12.50 m (MNHN.F.F67672).

PARATYPES. — Two paratypes: Sample: la Sautré, 15.00 m (MNHN.F.F67673, F67674).

DIAGNOSIS. — Test ovoid elongated ornamented in part with reticulation, reticulate neck.

TYPE AGE. — Early Pliocene.

TYPE LOCALITY. — La Bouillonnaie (Maine-et-Loire).

ETYMOLOGY. — From Latin *striatura* (striae) and *reticulatus* (net).

SIZE. — Length = 0.530 mm; diameter = 0.148 mm.

OCCURENCE. — Marls from la Bouillonnaie and la Sautré (Maine-et-Loire).

DESCRIPTION

Test ovoid, elongated, incompletely ornamented with reticulation; neck distinct consisting of an overlay of hexagonal-based chamberlets externally closed with reticulate punctate wall; wall hyaline, punctate; aperture rounded; aboral end structure.

Lagena substriata Williamson, 1848 (Figs 17G-M; 32B, C)

Lagena vulgaris var. *substriata* Williamson, 1848: 7, fig. 14.

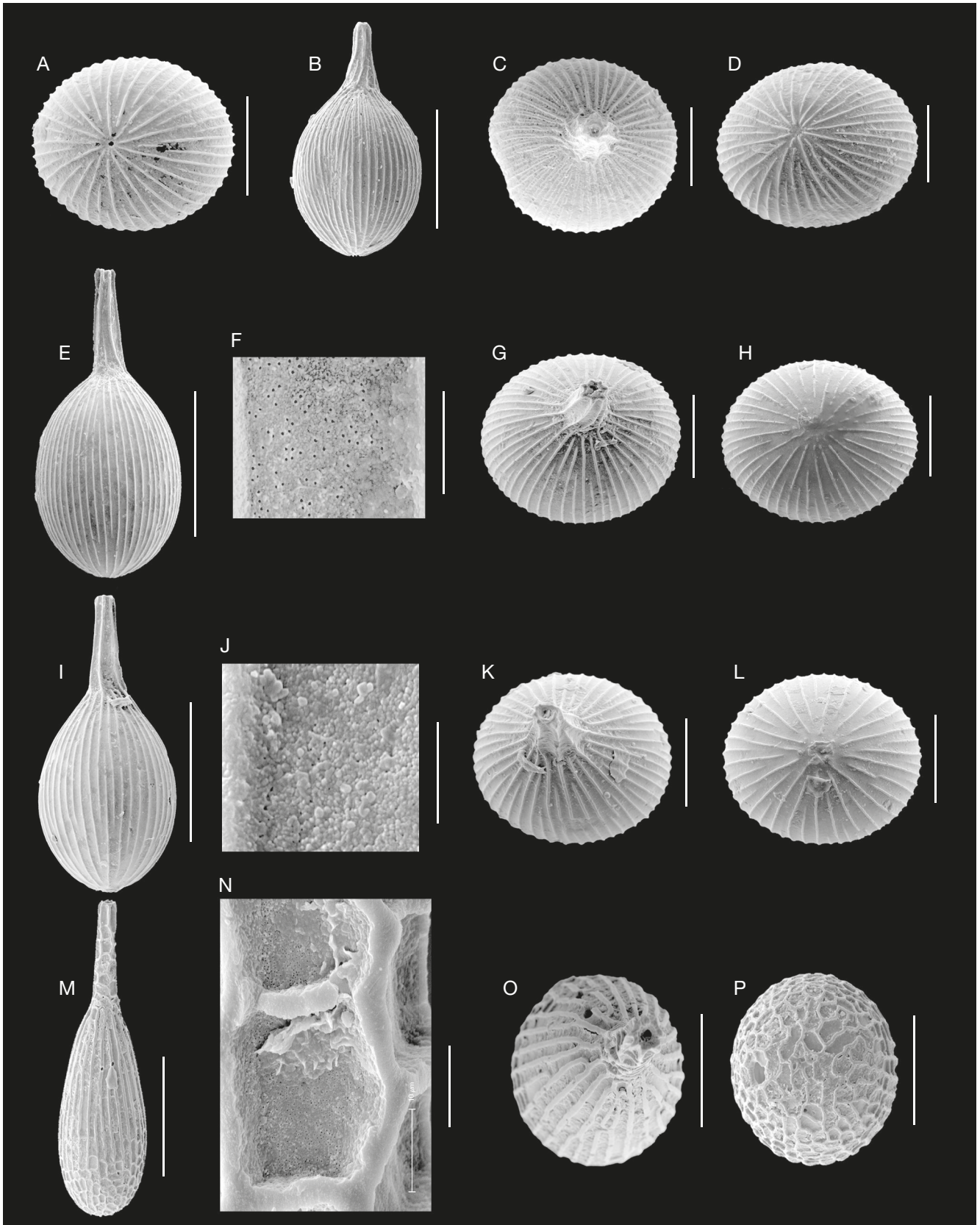


FIG. 16. — **A-L**, *Lagena striata* (d'Orbigny, 1839), SGB3: **A-D**, MNHN.F.F67669; **A**, basal view; **B-D**, lateral, oral and basal views; **E-H**, MNHN.F.F67670; **E**, lateral view; **F**, perforated wall; **G, H**, oral and basal views; **I-L**, MNHN.F.F67671; **I**, lateral view; **J**, perforated wall; **K, L**, oral and basal views; **M-P**, *Lagena striatoreticulata* n. sp.: holotype, la Bouillonnaie (MNHN.F.F67672); **M**, lateral view; **N**, perforated wall; **O, P**, oral and basal views. Scale bars: B, E, I, M, 200 µm; A, C, D, G, H, K, L, O, P, 100 µm; N, 10 µm; F, J, 5 µm.

LOCALITIES. — Brest-LRK2 (Finistère), la Groussinière (Ille-et-Vilaine).

MATERIAL EXAMINED. — Sample: LRK2, 3.30 m (MNHN.F.F67675); sample: la Groussinière S6, 20.30-22.45 m (MNHN.F.F67676); sample: LRK2, 3.30 m (MNHN.F.F67754), 4 specimens; sample: LRK2, 2.40 m (MNHN.F.F67755), 4 specimens.

AGE. — Late Pliocene.

DESCRIPTION

Test ovoid, elongated, ornamented with longitudinal fine costae (27 to 30), a few extend on the neck; wall hyaline, punctate; aperture rounded; aboral end structure.

Lagena sulcata (Walker & Jacob, 1798)
(Figs 17N-Q; 18A-D; 32D, E)

Serpula (*Lagena*) *sulcata* Boys & Walker in Adams & Kanmacher, 1798: 634, pl. 14, fig. 5. — Wright 1876-1877: 103, pl. 4, fig. 10.

LOCALITY. — SGB3 (Manche).

MATERIAL EXAMINED. — Sample: SGB3, 9.50 m (MNHN.F.67677, 67678); sample: SGB3, 9.50 m (MNHN.F.F67756), 22 specimens.

AGE. — Late Pliocene.

DESCRIPTION

Test ovoid, furrowed, ornamented with longitudinal costae (17 to 21), neck distinct; wall smooth, perforate; aperture rounded; aboral end structure.

Lagena torquiformis Haynes, 1973
(Fig. 18E-G)

Lagena sulcata subsp. *torquiformis* Haynes, 1973: 93, pl. 12, fig. 14, pl. 14, figs. 9, 12.

LOCALITY. — SGB3 (Manche).

MATERIAL EXAMINED. — Sample: SGB3, 2.50 m (MNHN.F.F67679).

AGE. — Late Pliocene.

DESCRIPTION

Test ovoid ornamented with fine longitudinal costae alternating with shorter (43), a few extend in spiral onto the neck; wall hyaline, punctate; aperture rounded; aboral opening.

Lagena variokoreana n. sp.
(Figs 18H-P; 32F, G)

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Lagena sp. F – Margerel 2009: 584, fig. 5S-U.

HOLOTYPE. — Sample: LRK2, 2.20 m (MNHN.F.F67680).

PARATYPE. — Sample: LRK2, 2.20 m (MNHN.F.F67681).

DIAGNOSIS. — Test ovoid ornamented with longitudinal costae, distinct neck ornamented with ridges connecting the costae, aperture rounded, aboral opening.

TYPE AGE. — Late Pliocene.

TYPE LOCALITY. — Brest-LRK2 (Finistère).

ETYMOLOGY. — From Latin *váriē* (variety) and *koreana* (*Lagena* cf. *koreana* McCulloch, 1977).

OTHER MATERIAL EXAMINED. — Sample: LRK2, 2.20 m (MNHN.F.F67682, F67683); sample: LRK2, 2.20 m (MNHN.F.F67757), 27 specimens.

SIZE. — Length = 0.260 mm; diameter = 0.160 mm.

DESCRIPTION

Test ovoid ornamented with longitudinal costae alternating with shorter (30) extend onto the neck; distinct neck surrounding by plates delimiting chamberlets externally closed with trapezoidal walls; wall punctate; aperture rounded; aboral end structure.

REMARK

This species is near of *Lagena* cf. *koreana* (McCulloch, 1977: 92, pl. 35, fig. 1). It is differing by a number most large of costae.

Lagena sp. A
(Fig. 19A-D)

LOCALITY. — Auxais (Manche).

MATERIAL EXAMINED. — Sample: Auxais T47, 14-17 m (MNHN.F.F67684).

AGE. — Early Pleistocene.

DESCRIPTION

Test ovoid, truncated at the base, ornamented with longitudinal costae a few continuing on a short neck; wall hyaline, punctate; aperture rounded; aboral opening.

Lagena sp. B
(Fig. 19E-G)

LOCALITY. — Fécamp (Seine-Maritime).

MATERIAL EXAMINED. — Sample: Fécamp 2A (MNHN.F.F67685).

AGE. — Early Pliocene.

DESCRIPTION

Test elliptical, elongated, ornamented with numerous longitudinal costae alternating with shorter (44) and extending onto the neck with reticular shape; distinct neck consisting of an overlay of hexagonal-based chamberlets externally closed with reticulate punctate wall and ornamented with reticular ornamentation; wall hyaline, punctate; aperture rounded; aboral opening.

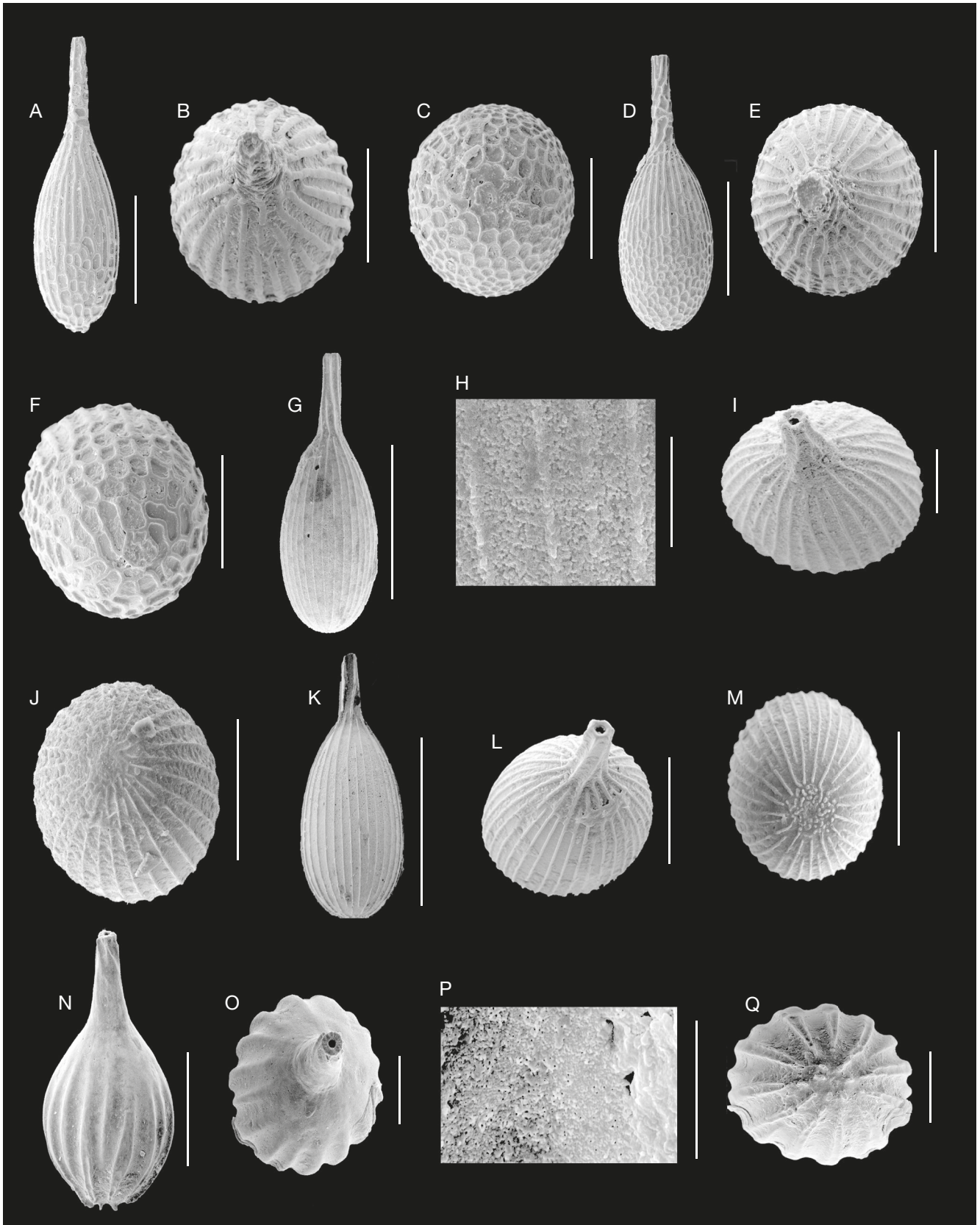


FIG. 17. — **A-F**, *Lagena striatareticulata* n. sp., la Sautré, paratypes: **A-C**, MNHN.F.F67672 in lateral, oral and basal views; **D-F**, MNHN.F.F67673 in lateral, oral and basal views; **G-M**, *Lagena substriata* Williamson, 1848: **G-J**, Brest-LRK2 (MNHN.F.F67674): **G**, lateral view; **H**, perforated wall; **I, J**, oral and basal views; **K-M**, la Groussinière (MNHN.F.F67676) in lateral, oral and basal views; **N-Q**, *Lagena sulcata* (Walker & Jacob, 1798), SGB3 (MNHN.F.F67677): **N, O**, lateral and oral views; **P**, perforated wall; **Q**, basal view. Scale bars: A, D, G, K, N, 200 µm; B, C, E, F, I, J, L, M, O, Q, 100 µm; H, 20 µm; P, 10 µm.

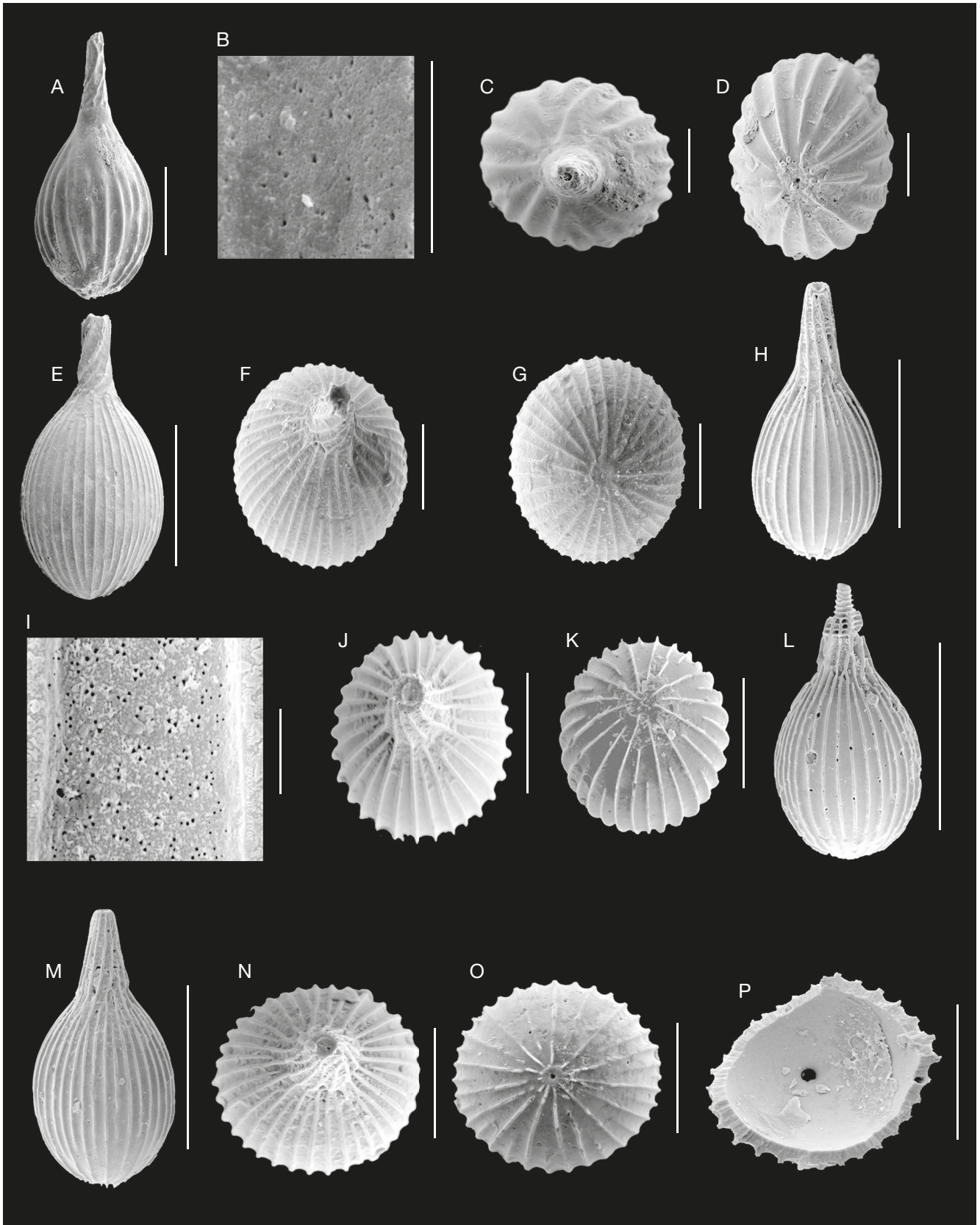


FIG. 18. — **A-D**, *Lagena sulcata* (Walker & Jacob, 1798), SGB3 (MNHN.F.67678): **A**, lateral view; **B**, perforated wall; **C, D**, oral and basal views; **E-G**, *Lagena torquiformis* Haynes, 1973, SGB3 (MNHN.F.67679) in lateral, oral and basal views; **H-P**, *Lagena variokoreana* n. sp., Brest-LRK2: **H-K**, holotype (MNHN.F.67680): **H**, lateral view; **I**, perforated wall; **J, K**, oral and basal views; **L**, specimen with broken neck; **M-O**, paratype (MNHN.F.67681), lateral, oral and basal views; **P**, internal view. Scale bars: A, E, H, L, M, 200 µm; B, 20 µm; C, D, F, G, J, K, N-P, 100 µm; I, 5 µm.

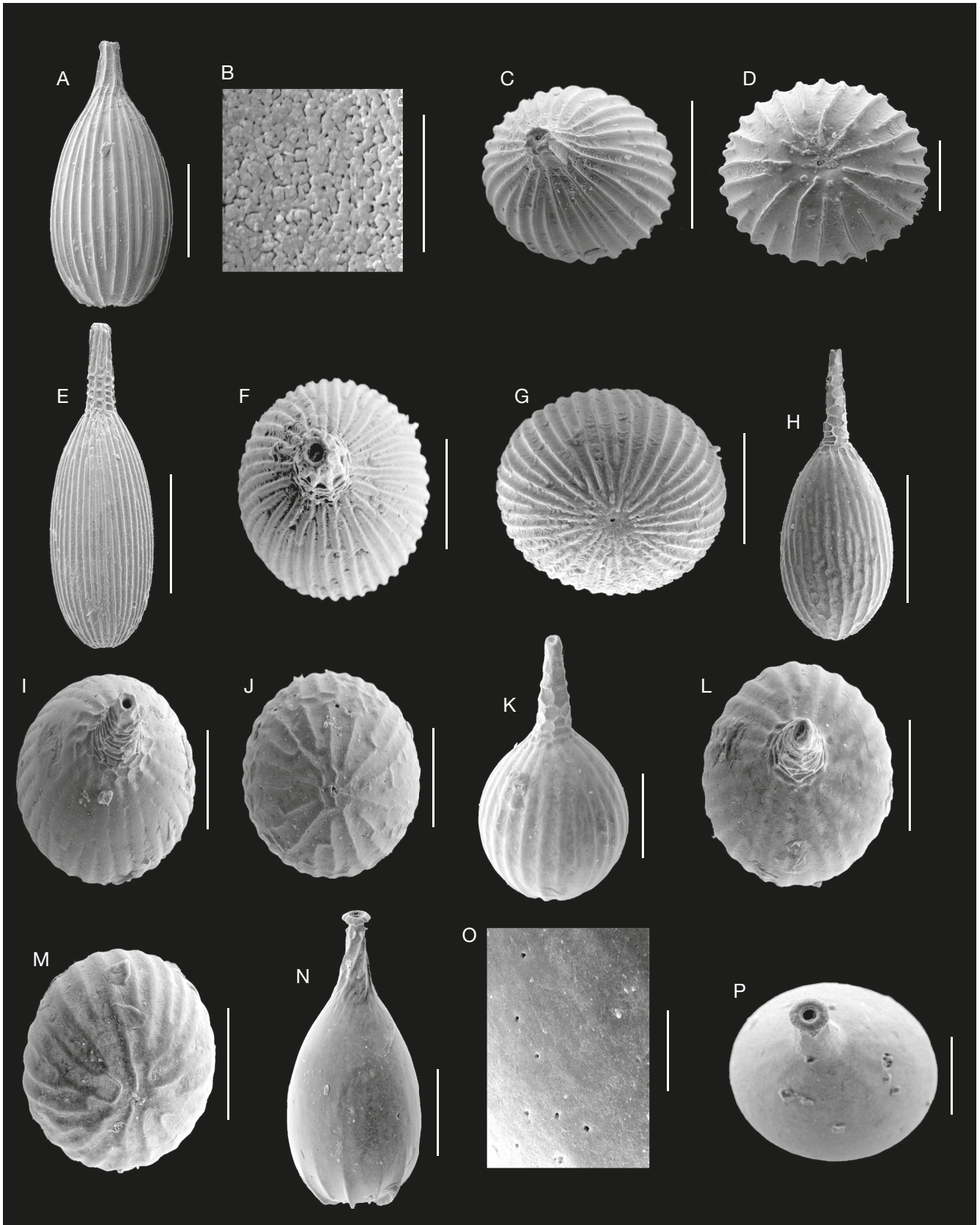


FIG. 19. — **A-D**, *Lagenina* sp. A, Auxais (MNHN.F.F67684): **A**, lateral view; **B**, perforated wall; **C, D**, oral and basal views; **E-G**, *Lagenina* sp. B, Fécamp (MNHN.F.F67685), lateral, oral and basal views; **H-M**, *Lagenina* sp. C: **H-J**, la Sautré (MNHN.F.F67686) in lateral, oral and basal views; **K-M**, Mernel (MNHN.F.F67687) in lateral, oral and basal views; **N-P**, *Lagunculella grayi* n. gen., n. sp., Brest-LRK2, holotype (MNHN.F.F67688): **N**, lateral view; **O**, perforated wall; **P**, oral view. Scale bars: A, E, H, 200 µm; B, 5 µm; C, D, F, G, I-N, 100 µm; P, 50 µm; O, 20 µm.

Lagena sp. C
(Fig. 19H-M)

LOCALITIES. — La Sautré (Maine-et-Loire), Mernel (Ille-et-Vilaine).

MATERIAL EXAMINED. — Sample: la Sautré, 15.00 m (MNHN.F.F67686); sample: Mernel (MNHN.F.F67687).

AGE. — Early Pliocene to Late Pliocene.

DESCRIPTION

Test globular to ovoid, ornamented with longitudinal costae (31) a few extend onto a conical neck with reticular shape; distinct neck consisting of an overlay of hexagonal-based chamberlets externally closed with reticulate punctate wall; wall hyaline, punctate; aperture rounded; aboral opening.

Genus *Lagunculella* n. gen.

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DIAGNOSIS. — Test ovoid, distinct neck provided with a deversed lip, base ornamented with costae, aboral opening.

TYPE SPECIES. — *Lagunculella grayi* n. sp.

ETYMOLOGY. — From Latin *lāguncūla* (carafon).

DESCRIPTION

Test ovoid more or less elongated, truncated at the base, ornamented generally partly with costae; wall hyaline, punctate; aperture rounded provided with a deversed lip; aboral opening.

Lagunculella grayi n. gen., n. sp.
(Figs 19N-P; 20A-D; 32H, I)

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HOLOTYPE. — Sample: LRK2, 2.30 m (MNHN.F.F67688).

PARATYPE. — Sample: SSL S3, 2.30 m (MNHN.F.F67689).

DIAGNOSIS. — Test ovoid truncated at the base ornamented with costae and tapering to a short neck, aperture provided with a deversed lip, aboral opening.

TYPE AGE. — Late Pliocene.

TYPE LOCALITY. — Brest-LRK2 (Finistère).

ETYMOLOGY. — In honour of Howard Burk Gray.

OTHER MATERIAL EXAMINED. — Sample: LRK2, 3.30 m (MNHN.F.F67758), 2 specimens.

SIZE. — Length = 0.345 mm; diameter = 0.158 mm.

OCCURENCE. — Clay from Brest-LRK2 and falun from Saint-Sulpice-des-Landes (Loire-Atlantique).

DESCRIPTION

Test ovoid tapering to a short neck with spirally ridges, aboral end ornamented with acute costae (11); wall smooth, hyaline, finely perforate; aperture rounded with deversed lip; aboral end structure.

Lagunculella baggi (Cushman & Gray, 1946), n. comb.
(Figs 20E-K; 32J-M)

Lagena laevis var. *baggi* Cushman & Gray, 1946: 18, pl. 3, figs 26,27.

LOCALITY. — SGB3 (Manche).

MATERIAL EXAMINED. — Sample: SGB3, 9.50 m (MNHN.F.F67690, F67691); sample: SGB3, 9.50 m (MNHN.F.F67759), 14 specimens.

AGE. — Late Pliocene.

DESCRIPTION

Test ovoid tapering to a short neck, aboral end ornamented with discreet ridges; wall smooth, finely perforate; aperture rounded; aboral end structure.

Lagunculella doveyensis (Haynes, 1973), n. comb.
(Figs 20L-N; 32N)

Lagena doveyensis Haynes, 1973: 82, pl. 12, fig. 7, 8.

Lagena vulgaris var. *perlucida* Williamson, 1848: 5, fig. 7 (*non* fig. 8).

LOCALITY. — Fécamp (Seine-Maritime).

MATERIAL EXAMINED. — Sample: Fécamp 2A (MNHN.F.F67692).

AGE. — Early Pliocene.

DESCRIPTION

Test ovoid, elongated, aboral end ornamented with costae; wall smooth, hyaline, finely perforate; aperture rounded with everted lip; aboral opening.

Lagunculella flexa (Cushman & Gray, 1946), n. comb.
(Figs 20O, P; 21A-M; 32O, P; 33A, B)

Lagena flexa Cushman & Gray, 1946: 22, pl. 4, figs 16-19.

Lagena implicata Cushman & McCulloch, 1950: 340, pl. 45, figs 5-7.

Lagena implicatiformis MacCulloch, 1977: 37, pl. 50, fig. 16.

Procerolagena flexa – Margerel 2009: 584, figs 5S-U.

LOCALITIES. — SSL (Loire-Atlantique), la Chênellerie, la Sautré, la Pugle (Maine-et-Loire).

MATERIAL EXAMINED. — Sample: SSL S3, 2.30 m (MNHN.F.F67693); sample: la Chênellerie, 16.00 m (MNHN.F.F67694); sample: la Sautré, 15.00 m (MNHN.F.F67695); sample: la Pugle, 7.00 m (MNHN.F.F67696); sample: Fécamp 2A (MNHN.F.F6760), 2 specimens.

AGE. — Early Pliocene.

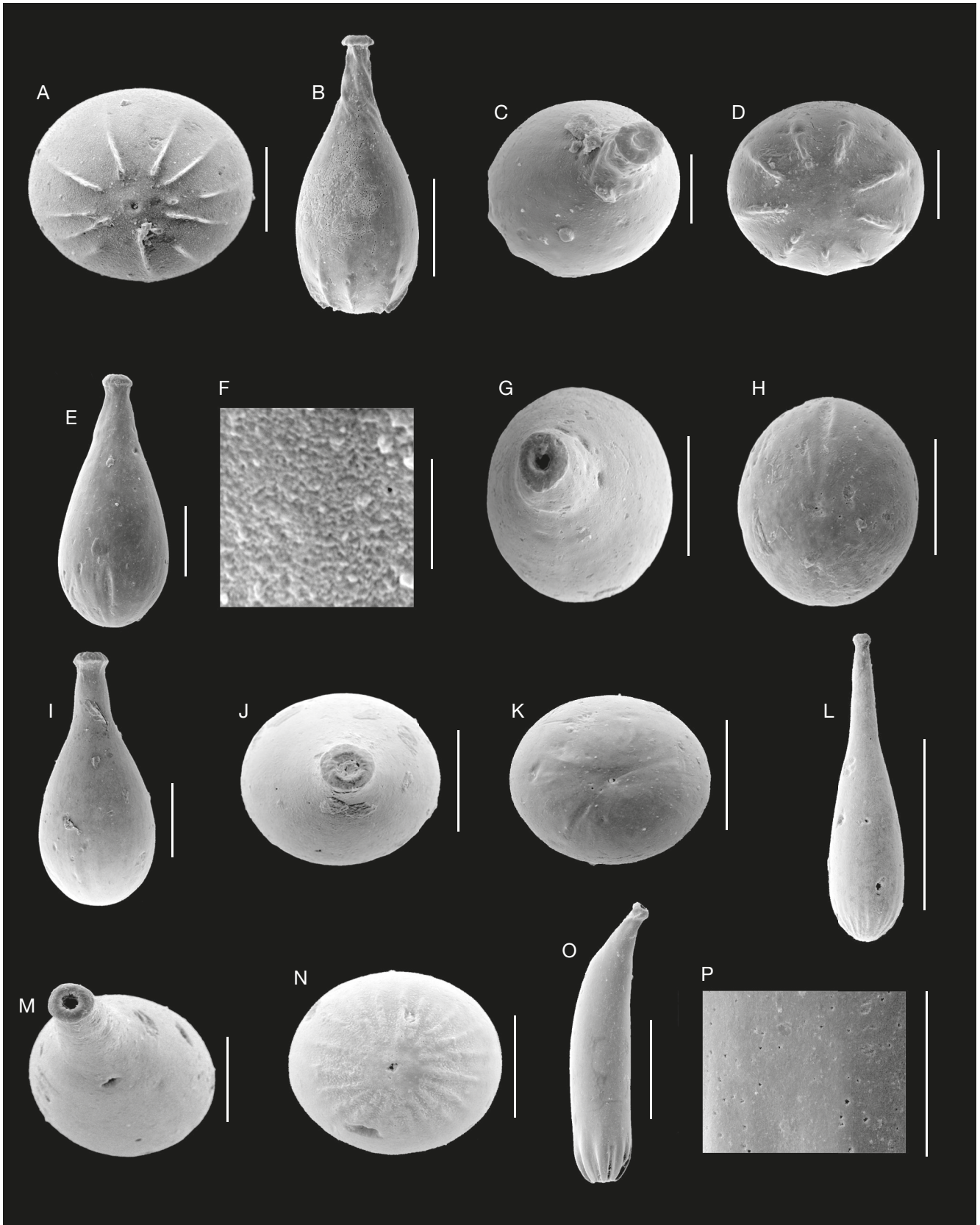


FIG. 20. — **A-D**, *Lagenulella grayi* n. gen., n. sp.: **A**, Brest-LRK2, holotype (MNHN.F.F67688), basal view; **B-D**, paratype SSL (MNHN.F.F67689) in lateral, oral and basal views; **E-K**, *Lagenulella baggi* (Cushman & Gray, 1946), n. comb., SGB3: **E-H**, MNHN.F.F67690: **E**, lateral view; **F**, perforated wall; **G, H**, oral and basal views; **I-K**, MNHN.F.F67691 in lateral, oral and basal views; **L-N**, *Lagenulella doveyensis* (Haynes, 1973), n. comb., Fécamp (MNHN.F.F67692), in lateral, oral and basal views; **O, P**, *Lagenulella flexa* (Cushman & Gray, 1946), n. comb., SSL (MNHN.F.F67693): **O**, lateral view; **P**, perforated wall. Scale bars: A, C, D, M, N, P, 50 µm; B, E, G, H, I, J, K, 100 µm; F, 5 µm; L, O, 200 µm.

DESCRIPTION

Test elongated, tubular, generally curved and tapering to oral end, sometimes straight, base truncated or rounded furrowed and ornamented with short strong or fine costae, sometimes extending onto the oral end; wall smooth, hyaline; finely perforate; aperture rounded with everted lip; aboral end structure.

Lagunculella ovoidea n. gen., n. sp.
(Figs 21N-P; 22A-C; 33C, D)

[urn:lsid:zoobank.org:act:0A2B98EC-7D72-4AC1-B671-E900D0067BE0](https://zoobank.org/act:0A2B98EC-7D72-4AC1-B671-E900D0067BE0)

HOLOTYPE. — Sample: la Pugle, 13.00 m (MNHN.F.F67697).

PARATYPE. — Sample: LRK2, 3.30 m (MNHN.F.F67698).

DIAGNOSIS. — Test ovoid tapering to oral end, aboral end ornamented with costae, aperture with everted lip.

TYPE AGE. — Early to Late Pliocene.

TYPE LOCALITY. — La Pugle (Maine-et-Loire).

ETYMOLOGY. — From Latin *ovum* (ovoid form).

OTHER MATERIAL EXAMINED. — Sample: la Pugle, 13.00 m (MNHN.F.F67761), 3 specimens.

SIZE. — Length = 0.316 mm; diameter = 0.127 mm.

OCCURENCE. — Marls from la Pugle (Maine-et-Loire) and Brest-LRK2 (Finistère).

DESCRIPTION

Test ovoid tapering to oral end, aboral end ornamented with acute costae (9); wall smooth, hyaline, finely perforate; aperture rounded provided with deversed lip; aboral end structure.

Lagunculella redonensis n. gen., n. sp.
(Figs 22D-J; 33E, F)

[urn:lsid:zoobank.org:act:62AD443B-DAA2-4F8F-B7A8-419B1344290E](https://zoobank.org/act:62AD443B-DAA2-4F8F-B7A8-419B1344290E)

HOLOTYPE. — Sample: la Groussinière S6, 16.40-16.90 m (MNHN.F.F67699).

PARATYPE. — Sample: la Groussinière S6, 16.40-16.90 m (MNHN.F.F67700).

DIAGNOSIS. — Test globular, aboral end ornamented with acute costae, aperture with deversed lip.

TYPE AGE. — Early Upper Pliocene.

TYPE LOCALITY. — La Groussinière (Ille-et-Vilaine).

ETYMOLOGY. — From Latin *Condātē redonum* (Rennes).

MATERIAL EXAMINED. — Sample: la Groussinière S17, 21.70-19.20 m (MNHN.F.F67762), 9 specimens; sample: la Groussinière S6, 16.40-16.90 m (MNHN.F.F67763), 6 specimens.

SIZE. — Length = 0.360 mm; diameter = 0.180 mm.

OCCURENCE. — Sandy marls from la Groussinière (Ille-et-Vilaine).

DESCRIPTION

Test globular tapering to a more or less elongated neck, aboral end ornamented with acute costae (10, 11); wall smooth, hyaline, finely perforate; aperture rounded provided with deversed lip; aboral end structure.

Lagunculella semistriata
(Williamson, 1848), n. comb.
(Fig. 22K-M)

Lagena striata var. β *semistriata* Williamson, 1848: 14, pl. 1, figs 9, 10.

Lagena semistriata – Haynes 1973: 87, pl. 12, fig. 6, pl. 13, fig. 4.

LOCALITY. — La Pugle (Maine-et-Loire).

MATERIAL EXAMINED. — Sample: la Pugle, 9.00 m (MNHN.F.F67701).

AGE. — Early Pliocene.

DESCRIPTION

Test ovoid tapering to a long neck, aboral end ornamented with fine costae (11); wall smooth, hyaline, finely perforate; aperture rounded with deversed lip; aboral opening.

Lagunculella sp.
(Fig. 22N-P, G, H)

Lagena perlucida – Cushman & Gray 1946: 18, pl. 3, fig. 17 (non figs 18-20).

LOCALITY. — La Pugle (Maine-et-Loire).

MATERIAL EXAMINED. — Sample: la Pugle, 7.00 m (MNHN.F.F67702).

AGE. — Early Pliocene.

DESCRIPTION

Test pyriform, tapering to a neck, aboral end ornamented with acute costae; wall smooth, hyaline, finely perforate; aperture rounded provided with deversed lip; aboral opening.

Genus *Lanternalagena* n. gen.

[urn:lsid:zoobank.org:act:D6120679-A43A-4401-BC47-A99CCB9D93A2](https://zoobank.org/act:D6120679-A43A-4401-BC47-A99CCB9D93A2)

DIAGNOSIS. — Test ovoid ornamented with costae, neck reticulate, aboral opening.

TYPE SPECIES. — *Lanternalagena crassicarinata* n. sp.

ETYMOLOGY. — From Latin *lanterna* (lantern) and *lāgoena* (bottle).

DESCRIPTION

Test ovoid tapering to a reticulate neck; wall perforate, ornamented with longitudinal costae; aperture rounded; aboral opening.

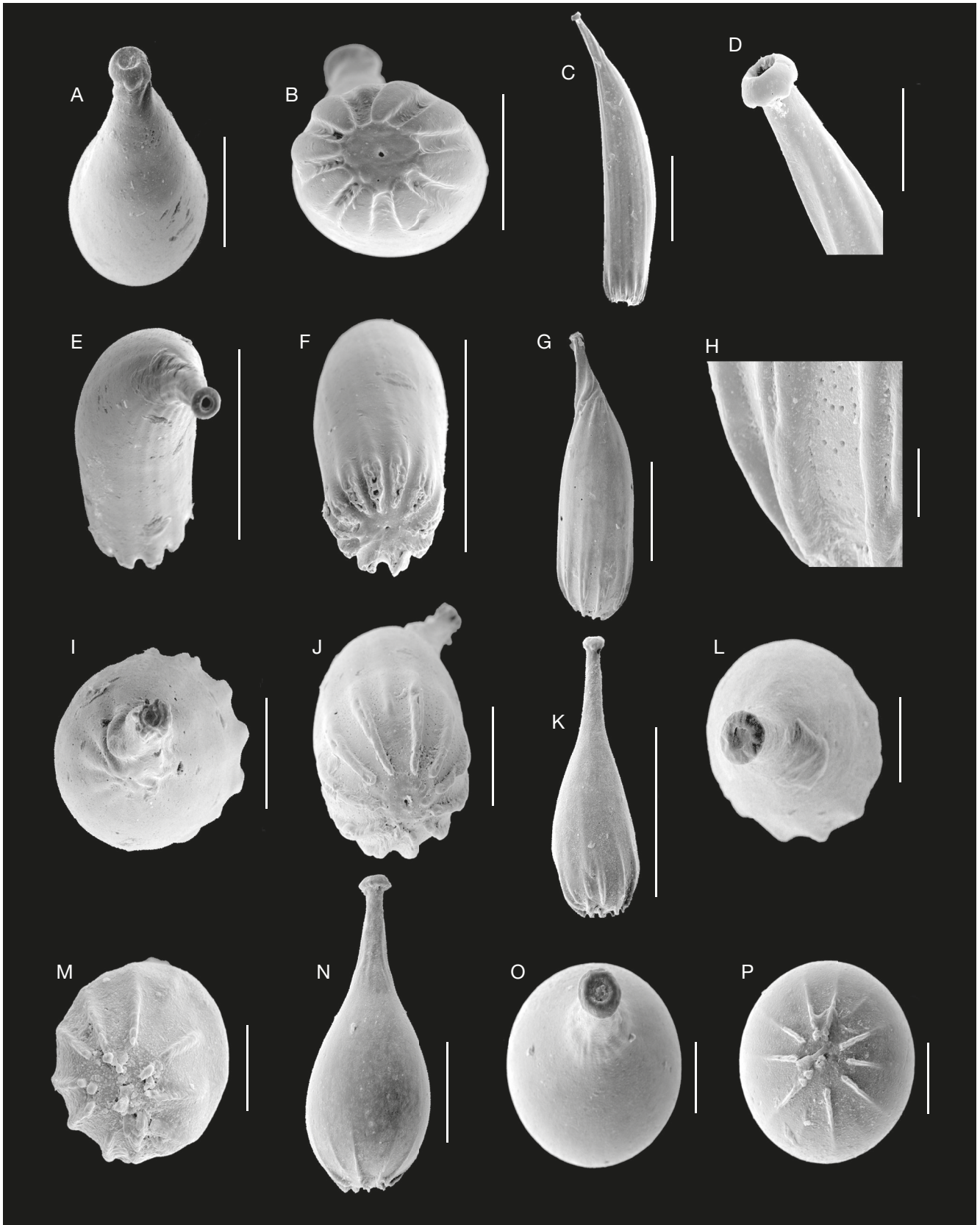


FIG. 21. — **A-M**, *Lagunculella flexa* (Cushman & Gray, 1946), n. comb.: **A**, SSL (MNHN.F.F67693), basal view; **C-F**, la Chênelière (MNHN.F.F67694): **C**, lateral, **D**, enlargement neck; **E, F**, oral and basal views; **G-J**, la Sautré (MNHN.F.F67695): **G**, lateral view; **H**, perforated wall; **I, J**, oral and basal views; **K-M**, la Pugle (MNHN.F.F67696) in lateral, oral and basal views; **N-P**, *Lagunculella ovoidea* n. gen., n. sp., la Pugle, holotype (MNHN.F.F67697) in lateral, oral and basal views. Scale bars: A, B, I, J, N, O, P, 100 µm; C, E, F, G, K, 200 µm; D, L, M, 50 µm; H, 20 µm.

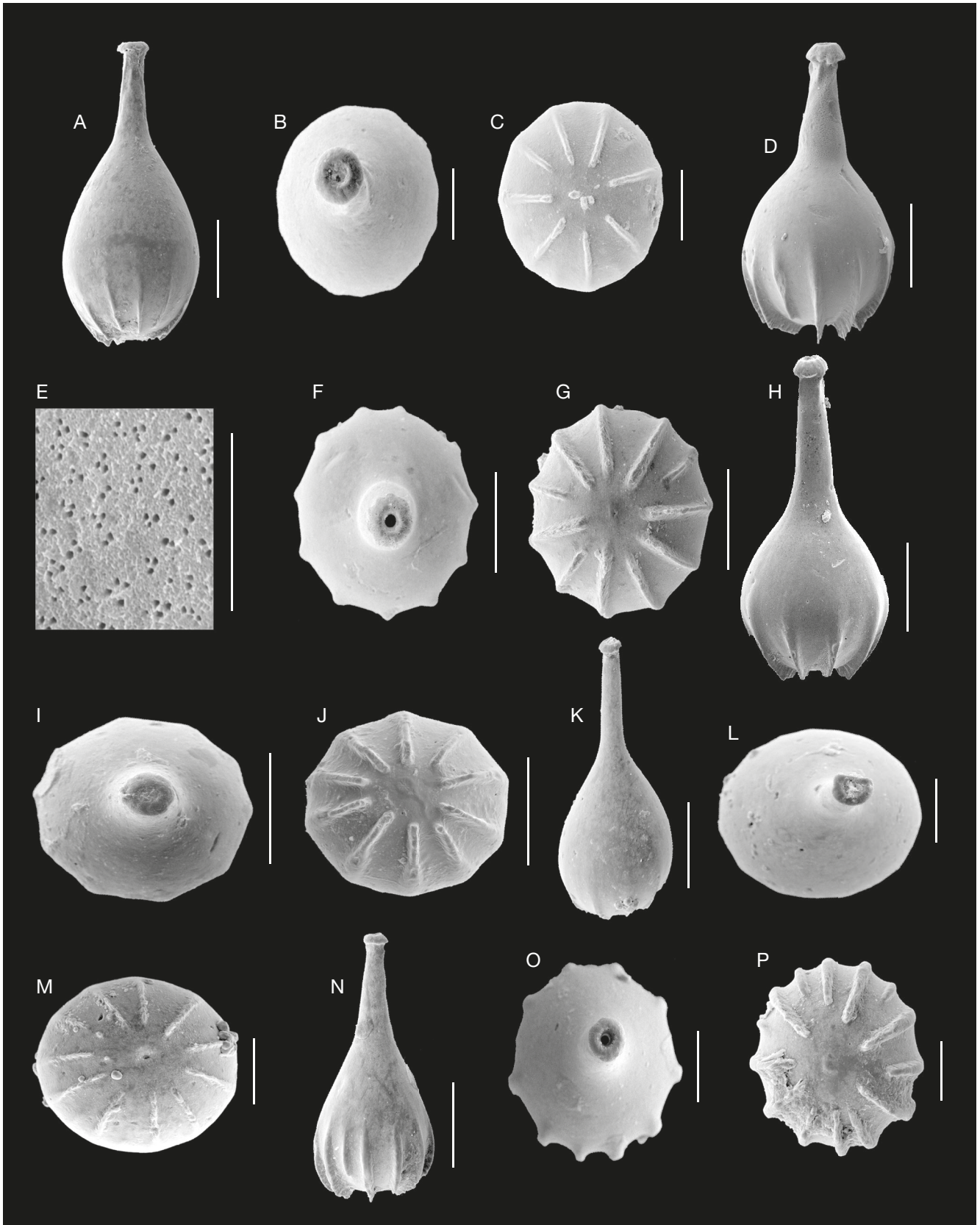


FIG. 22. — **A-C**, *Lagunculella ovoidea* n. gen., n. sp., paratype Brest-LRK2 (MNHN.F.F67698) in lateral, oral and basal views; **D-J**, *Lagunculella redonensis* n. gen., n. sp.: **D-G**, la Groussinière, holotype (MNHN.F.F67699); **D**, lateral view; **E**, perforates wall; **F, G**, oral and basal views; **H-J**, la Groussinière, paratype (MNHN.F.F67700) in lateral, oral and basal views; **K-M**, *Lagunculella semistriata* (Williamson, 1848), n. comb., la Pugle (MNHN.F.F67701) in lateral, oral and basal views; **N-P**, *Lagunculella* sp., la Pugle (MNHN.F.F67702) in lateral, oral and basal views. Scale bars: A-D, F-K, N, 100 µm; B, L, M, O, P, 50 µm; E, 10 µm.

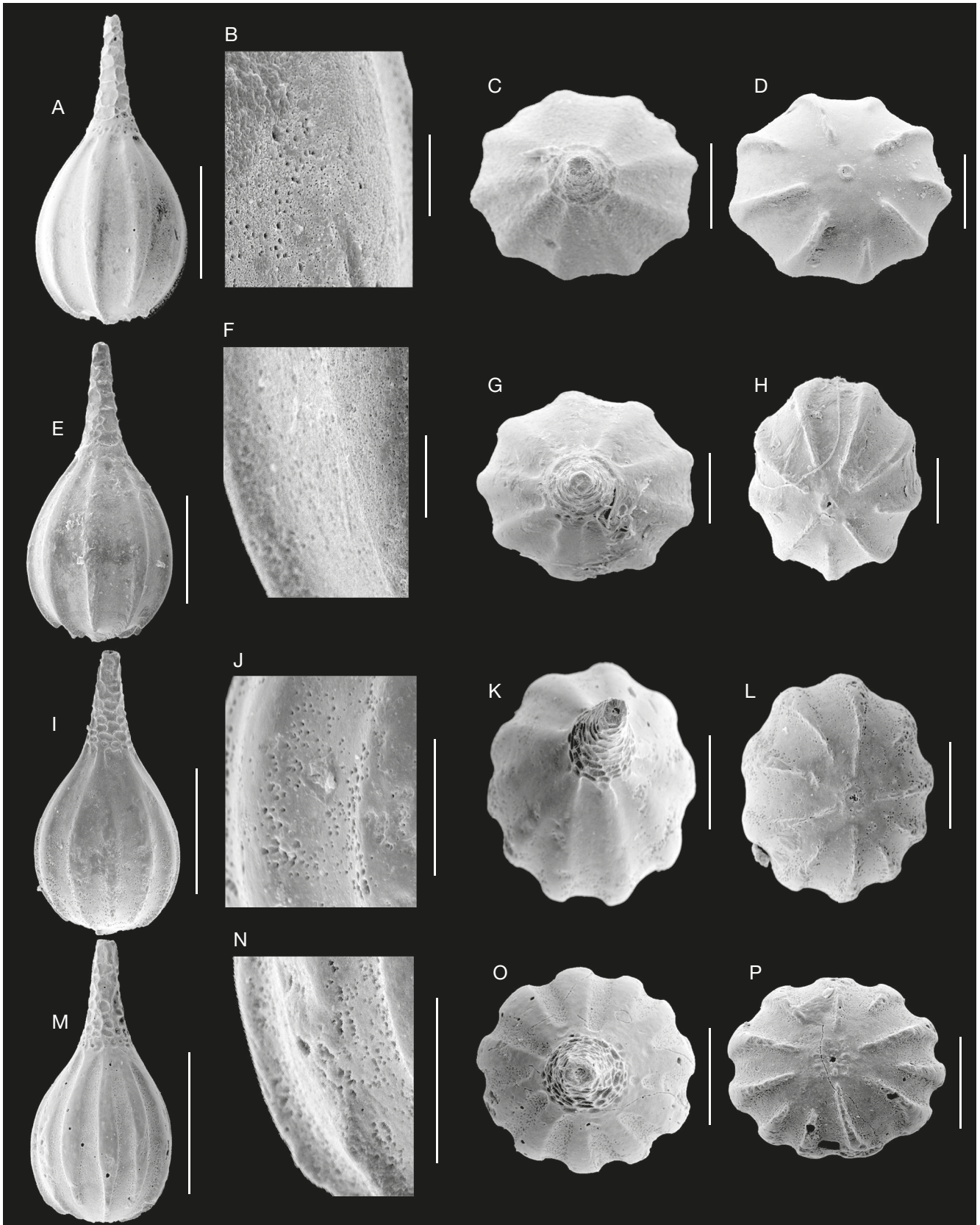


FIG. 23. — **A-H**, *Lanternalagena crassicarinata* n. gen., n. sp.: **A-D**, la Groussinière, holotype (MNHN.F.F67703); **A**, lateral view; **B**, perforated wall; **C, D**, oral and basal views; **E-H**, la Sautré, paratype (MNHN.F.F67704); **E**, lateral view; **F**, perforated wall; **G, H**, oral and basal views; **I-P**, *Lanternalagena novocrassicarinata* n. gen., n. sp.: **I-L**, la Sautré, holotype (MNHN.F.F67705); **I**, lateral view; **J**, perforated wall; **K, L**, oral and basal views; **M-P**, Fécamp, paratype (MNHN.F.F67706); **M**, lateral view; **N**, perforated wall; **O, P**, oral and basal views. Scale bars: A, E, I, M, 200 µm; B, F, 20 µm; C, D, G, H, K, L, O, P, 100 µm; J, N, 50 µm.

Lanternalagena crassicarinata n. gen., n. sp.
(Figs 23A-H; 33E, F)

[urn:lsid:zoobank.org:act:D3D68553-C0FE-40B9-93DB-EA2C9293B2C3](https://zoobank.org/act:D3D68553-C0FE-40B9-93DB-EA2C9293B2C3)

HOLOTYPE. — Sample: la Groussinière S6, 16.40-16.90 m (MNHN.F.F67703).

PARATYPE. — Sample: la Sautré, 15.00 m (MNHN.F.F67704).

DIAGNOSIS. — Test ovoid ornamented with large costae, conical reticulate neck, aboral opening.

TYPE AGE. — Early to basal Late Pliocene.

TYPE LOCALITY. — La Groussinière (Ille-et-Vilaine).

ETYMOLOGY. — From Latin *crassus cārīna* (hull shape).

OTHER MATERIAL EXAMINED. — Sample: la Groussinière S6, 16.40-16.90 m (MNHN.F.F67764), 4 specimens.

SIZE. — Length = 0.541 mm; diameter = 0.263 mm.

OCCURENCE. — Sandy marls from la Groussinière (Ille-et-Vilaine) and marls from la Sautré (Maine-et-Loire).

DESCRIPTION

Test ovoid ornamented with longitudinal large costae (9); neck conical surrounded with chamberlets closed with punctate walls and polygonal ornamentation; wall hyaline, perforate particularly adjacent to the costae; aperture rounded with striated rim; aboral end structure.

Lanternalagena novocrassicarinata n. gen., n. sp.
(Figs 23I-P; 24A-C; 33I, J)

[urn:lsid:zoobank.org:act:59DC43BD-3403-4950-AC6A-DB695E0BD1AE](https://zoobank.org/act:59DC43BD-3403-4950-AC6A-DB695E0BD1AE)

HOLOTYPE. — Sample: la Sautré, 5.00 m (MNHN.F.F67705).

PARATYPES. — Two paratypes: Sample: Fécamp 2A (MNHN.F.F67706); sample: la Groussinière S6, 16.40-16.90 m (MNHN.F.F67707).

DIAGNOSIS. — Test ovoid ornamented with large costae, conical reticulate neck, aboral opening.

TYPE AGE. — Early Pliocene.

TYPE LOCALITY. — La Sautré (Maine-et-Loire).

ETYMOLOGY. — From Latin *novus* (new), *crassus* (thick) and *cārīna* (hull shape).

OTHER MATERIAL EXAMINED. — Sample: la Sautré S6, 16.40-16.90 m (MNHN.F.F67765), 6 specimens.

SIZE. — Length = 0.460 mm; diameter = 0.259 mm.

OCCURENCE. — Marls from la Sautré (Maine-et-Loire), sandy marls from la Groussinière and crags (faluns) from Fécamp (Seine-Maritime).

DESCRIPTION

Test ovoid ornamented with large longitudinal costae (10); neck conical surrounded with chamberlets closed with punctate

wall and polygonal ornamentation; wall hyaline, perforate; aperture rounded with striated rim; aboral end structure.

Lanternalagena sp. A
(Fig. 24D-G)

LOCALITY. — SSL (Loire-Atlantique).

MATERIAL EXAMINED. — Sample: SSL S3, 2.30 m (MNHN.F.F67708).

AGE. — Early Pliocene.

DESCRIPTION

Test ovoid ornamented with longitudinal costae (12); neck conical surrounded with chamberlets closed with perforate wall and polygonal ornamentation; wall perforate; aperture rounded with small striated rim; aboral opening.

Lanternalagena sp. B
(Fig. 24H-L)

LOCALITY. — Mernel (Loire-Atlantique).

MATERIAL EXAMINED. — Sample: Mernel S214, 8.50 m (MNHN.F.F67709).

AGE. — Late Pliocene.

DESCRIPTION

Test ovoid ornamented with longitudinal costae (12); conical neck surrounded with chamberlets closed with punctate wall and polygonal ornamentation; wall perforate; aperture rounded with striated rim; aboral opening.

Lanternalagena sp. C
(Fig. 24M-O)

LOCALITY. — La Chênellerie (Maine-et-Loire).

MATERIAL EXAMINED. — Sample: la Chênellerie, 17.00 m (MNHN.F.F67710).

AGE. — Early Pliocene.

DESCRIPTION

This specimen partially cracked point out the thickness of the neck and the radial structure of the plates surrounding the neck.

Genus *Malumella* n. gen.

[urn:lsid:zoobank.org:act:2C75BC92-2A3E-48C3-8349-5D923BC60B3D](https://zoobank.org/act:2C75BC92-2A3E-48C3-8349-5D923BC60B3D)

DIAGNOSIS. — Test ovoid ornamented with costae, conical neck with reticular ornamentation, aperture rounded with lip, aboral opening.

TYPE SPECIES. — *Malumella oblonga* n. sp.

ETYMOLOGY. — From Latin *mālum* (lemon).

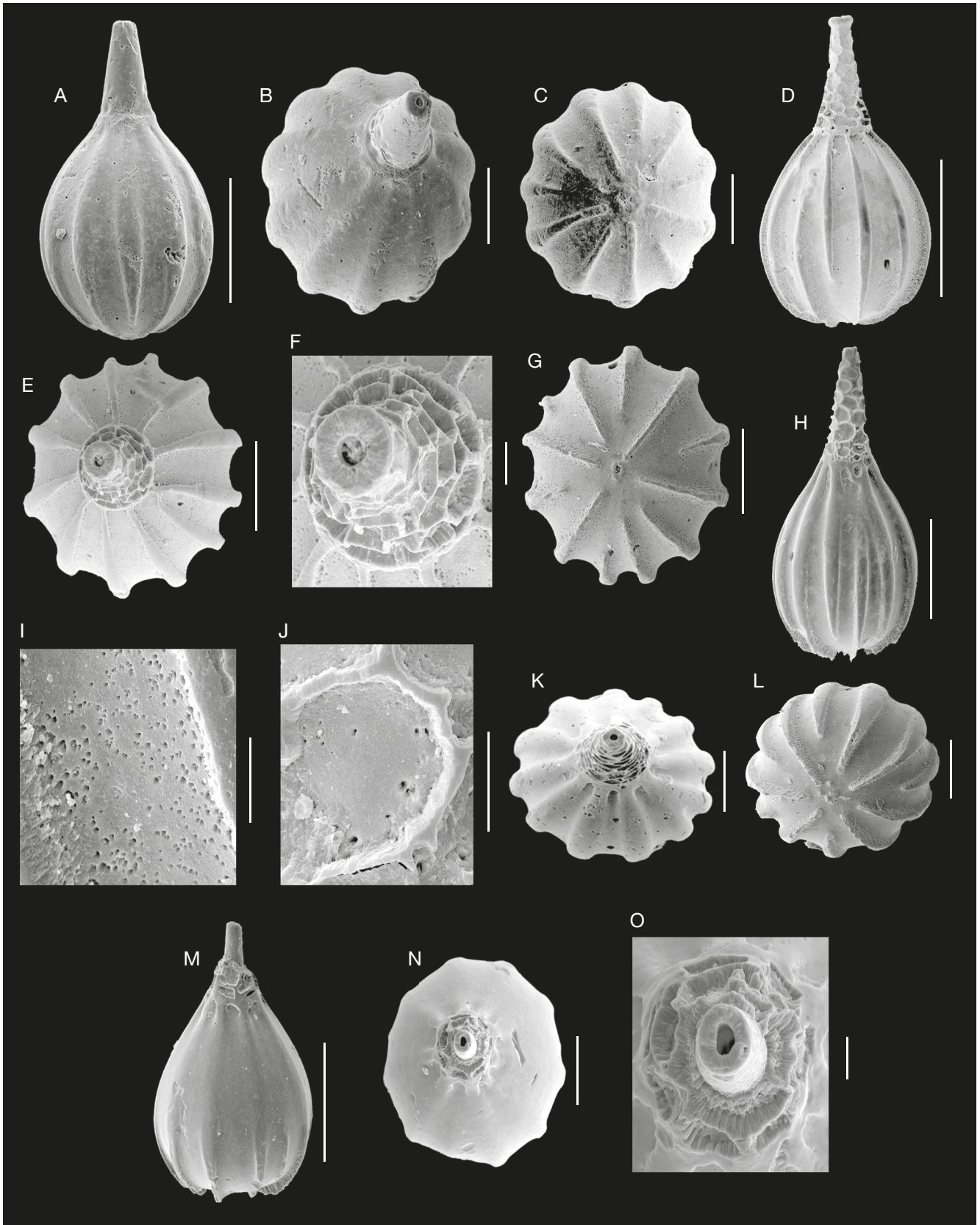


FIG. 24. — **A-C**, *Lanternalagena novocrassicarinata* n. gen., n. sp., la Groussinière, paratype (MNHN.F.F67707) in lateral view with neck without ornamentation, oral and basal views; **D-G**, *Lanternalagena* sp. A, SSL (MNHN.F.F67708): **D**, lateral view; **E, F**, oral view and enlargement; **G**, basal view; **H-L**, *Lanternalagena* sp. B, Mernel (MNHN.F.F67709): **H**, lateral view; **I**, perforated wall; **J**, perforated wall on the neck; **K, L**, oral and basal views; **M-O**, *Lanternalagena* sp. C, la Chênelière (MNHN.F.F67710) in lateral, oral and basal views with cracked neck. Scale bars: A, E, J, K, N, 200 μ m; B, D, H, I, L, O, P, 100 μ m; C, F, G, M, 20 μ m.

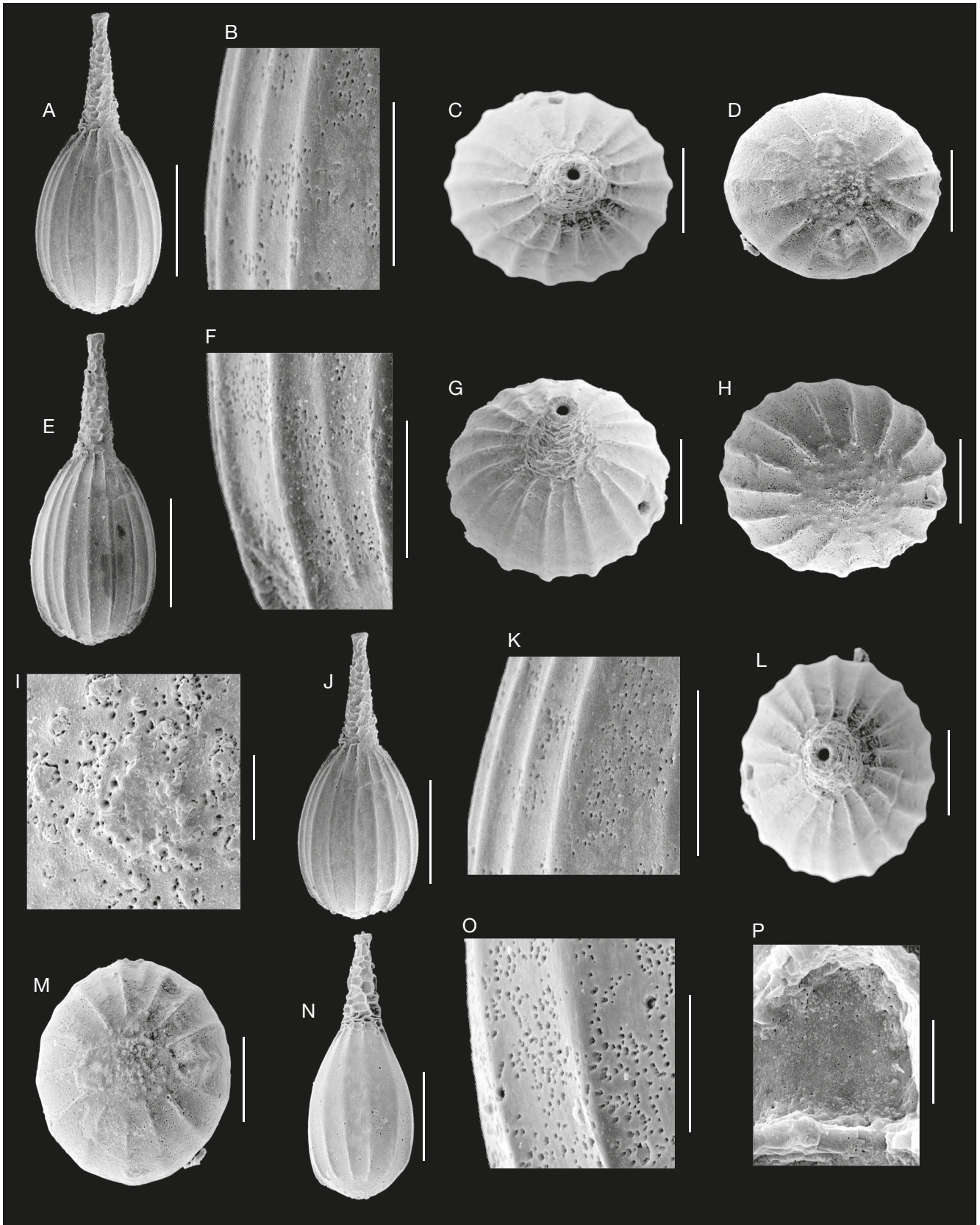


FIG. 25. — **A-M**, *Malumella oblonga* n. gen., n. sp.: **A-D**, holotype, Mernel (MNHN.F.F67711); **A**, lateral view; **B**, perforated wall; **C, D**, oral and basal views; **E-I**, paratype, Auxais (MNHN.F.F67712); **E**, lateral view; **F**, perforated wall; **G, H**, oral and basal views; **I**, enlargement basal views; **N-P**, *Malumella suboblonga* n. gen., n. sp., la Bouillonnaie, holotype (MNHN.F.F67714): **N**, lateral view; **O**, perforated wall; **P**, perforated wall on the neck. Scale bars: A, E, J, L, N, 200 µm; B, F, K, M, O, 50 µm; C, D, G, H, 100 µm; I, 20 µm; P, 10 µm.

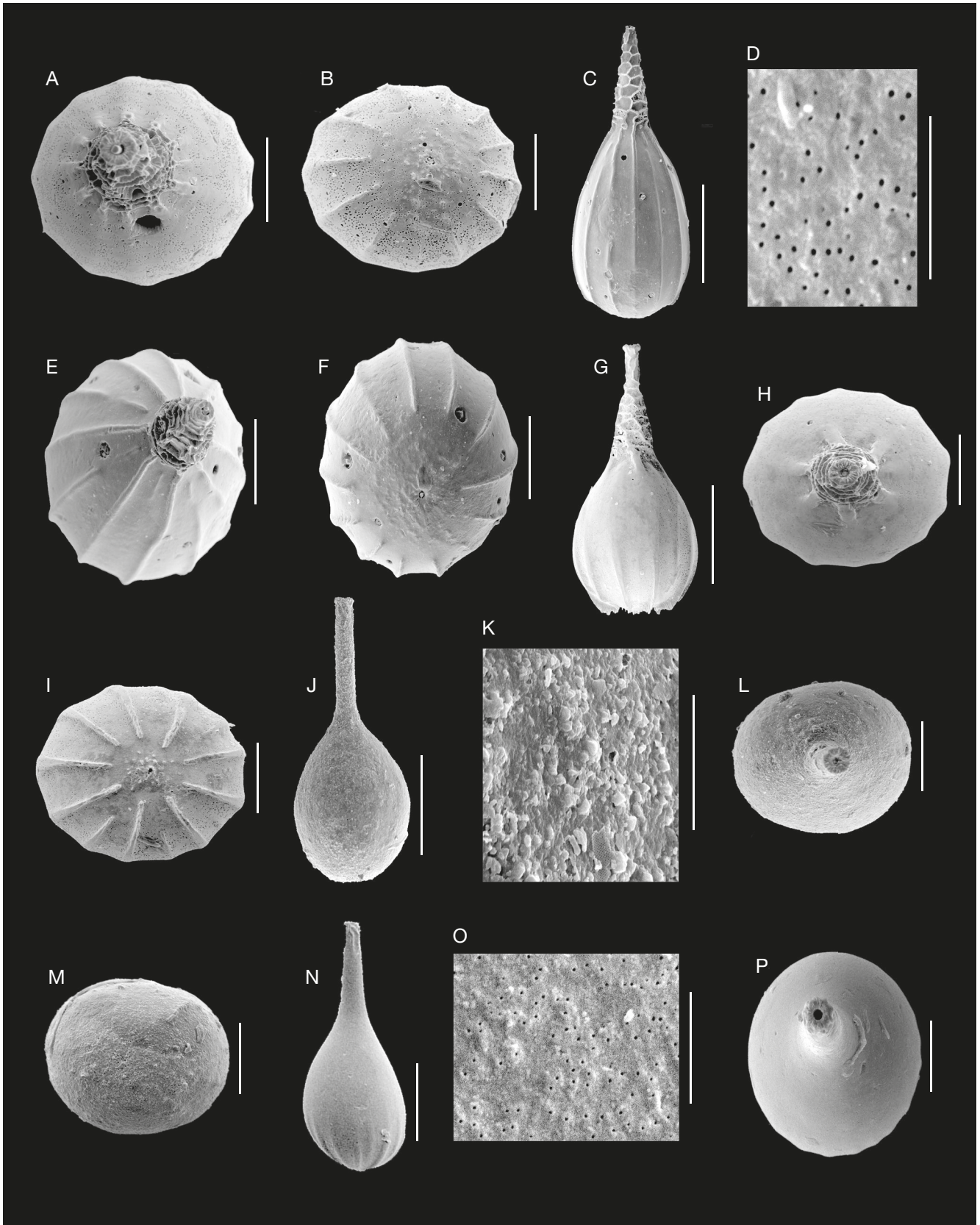


FIG. 26. — **A-F**, *Malumella suboblonga* n. gen., n. sp., holotype, la Bouillonnaie (MNHN.F.F67714), oral and basal views; **C-F**, paratype, la Bouillonnaie (MNHN.F.F67715): **C**, lateral view; **D**, perforated wall; **E, F**, oral and basal views; **G-I**, *Malumella* sp., SSL (MNHN.F.F67716), lateral, oral and basal views; **J-M**, *Pygmaeoseistron hispidulum* (Cushman, 1913), Fécamp (MNHN.F.F67717) in lateral, oral and basal views; **N-P**, *Verulagena similis* (McCulloch, 1977), n. comb., La Bouillonnaie (MNHN.F.F67718): **N**, lateral view; **O**, perforated wall; **P**, oral view. Scale bars: A, B, E, F, H, I, L, M, P, 100 µm; C, G, J, N, 200 µm; D, O, 5 µm; K, 20 µm.

DESCRIPTION

Test ovoid ornamented with costae, aboral end granulate; neck conical with reticular ornamentation; aperture rounded with small lip; aboral opening.

Malumella oblonga n. gen., n. sp.
(Figs 25A-M; 33K, L)

[urn:lsid:zoobank.org:act:3319974D-713F-4671-8D37-41DCCE036731](https://doi.org/10.3897/zoobank.org/act:3319974D-713F-4671-8D37-41DCCE036731)

HOLOTYPE. — Sample: Mernel S212, 5.50 m (MNHN.FF67711).

PARATYPES. — Two paratypes: Sample: Auxais T47, 12-14 m (MNHN.FF67712); sample: Mernel S212, 5.50 m (MNHN.FF67713).

DIAGNOSIS. — Test ovoid ornamented with numerous costae, aboral end granular; conical reticulate neck.

TYPE AGE. — Late Pliocene to Early Pleistocene.

TYPE LOCALITY. — Mernel (Ille-et-Vilaine).

ETYMOLOGY. — From Latin *oblongus* (oblong).

OTHER MATERIAL EXAMINED. — Sample: la Groussinière S17, 21.70-19.20 m (MNHN.FF6766), 6 specimens.

SIZE. — Length = 0.545 mm; diameter = 0.225 mm.

OCCURENCE. — Falun from Mernel (Ille-et-Vilaine) and marls from Auxais (Manche).

DESCRIPTION

Test ovoid ornamented with costae (19), aboral end granular; neck conical surrounded with chamberlets closed with perforate wall and hexagonal ornamentation; wall hyaline, densely perforate; aperture rounded with a small radiate lip; aboral end structure.

Malumella suboblonga n. gen., n. sp.
(Figs 25N-P; 26A-F)

[urn:lsid:zoobank.org:act:E452B601-878B-4B1F-887B-87984379BFE7](https://doi.org/10.3897/zoobank.org/act:E452B601-878B-4B1F-887B-87984379BFE7)

HOLOTYPE. — Sample: la Bouillonnaie, 12.50 m (MNHN.FF67714).

PARATYPE. — Sample: la Bouillonnaie, 6.00 m (MNHN.FF67715).

DIAGNOSIS. — Test ovoid ornamented with costae, base granulate; reticulate conical neck.

TYPE AGE. — Early Pliocene.

TYPE LOCALITY. — La Bouillonnaie (Maine-et-Loire).

ETYMOLOGY. — From Latin *sub* (minor) and *oblongus* (oblong).

MATERIAL EXAMINED. — Sample: la Bouillonnaie, 12.50 m (MNHN.FF67767), 3 specimens.

SIZE. — Length = 0.593 mm; diameter = 0.269 mm.

OCCURENCE. — Marls from la Bouillonnaie (Maine-et-Loire).

DESCRIPTION

Test ovoid ornamented with fine costae (12), base little granular; neck conical surrounded with chamberlets closed with perforate wall and hexagonal ornamentation; wall hyaline, densely perforate; aperture rounded with small radiate lip; aboral opening.

Malumella sp.
(Fig. 26G-I)

LOCALITY. — SSL (Loire-Atlantique).

MATERIAL EXAMINED. — Sample: SSL S3, 2.30 m (MNHN.FF67716).

AGE. — Early Pliocene.

DESCRIPTION

Test ovoid ornamented with acute costae (12), aboral end granular; elongated neck conical; wall hyaline, perforate; aperture rounded with small radiate lip; aboral opening.

Genus *Pygmaeoseistron*
Patterson & Richardson, 1987

Pygmaeoseistron hispidulum
(Cushman, 1913)
(Fig. 26J-M)

Lagena hispidula Cushman, 1913: 14, pl. 5, figs 2, 3.

Pygmaeoseistron hispidulum – Debenay 2013: 161.

Lagena laevis – Brady 1884: pl. 56, figs 10, 11.

LOCALITY. — Fécamp (Seine-Maritime).

MATERIAL EXAMINED. — Sample: Fécamp 2A (MNHN.FF67717).

AGE. — Early Pliocene.

DESCRIPTION

Test ovoid with long cylindrical neck; wall finely granular with rare pores; aperture rounded with small radiate lip.

Genus *Verulagena* n. gen.

[urn:lsid:zoobank.org:act:0EB4AB0D-32DD-47D7-83DC-BB75473509AC](https://doi.org/10.3897/zoobank.org/act:0EB4AB0D-32DD-47D7-83DC-BB75473509AC)

DIAGNOSIS. — Test ovoid, neck with ridges at oral end, aboral opening.

TYPE SPECIES. — *Lagena similis* McCulloch, 1977.

ETYMOLOGY. — From Latin *verus* (true) and *lāgoena* (bottle).

DESCRIPTION

Test ovoid; neck with ridges at oral end; wall hyaline, perforate; aperture rounded; aboral opening.

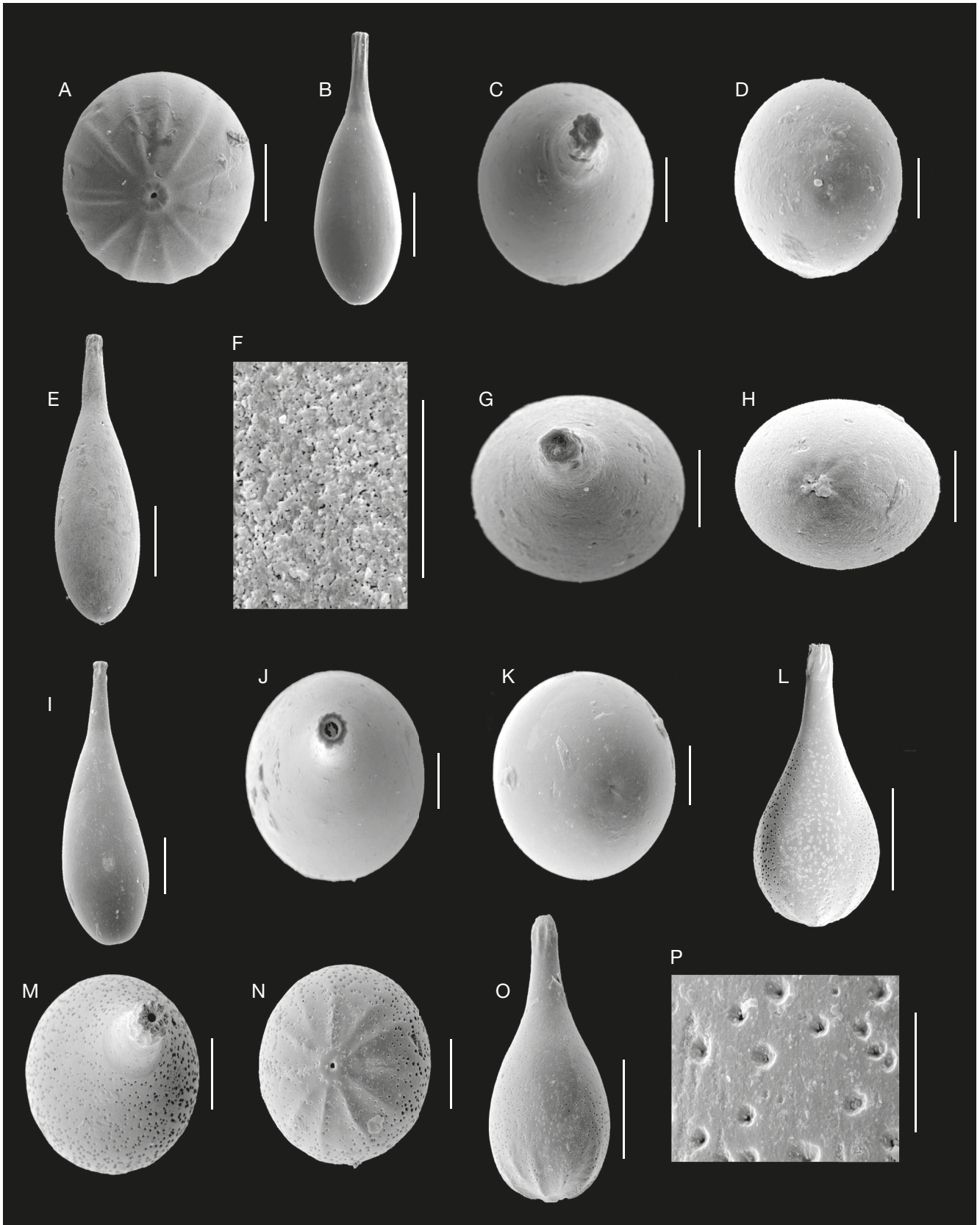


FIG. 27. — **A**, *Verulagena similis* (McCulloch, 1977), n. comb., La Bouillonnaie (MNHN.F.F67718), basal view; **B-K**, *Verulagena laevis* (Montagu, 1803), n. comb.: **B-D**, St. Erth (MNHN.F.F67719), lateral, oral and basal views; **E-H**, St. Erth (MNHN.F.F67720); **E**, lateral view; **F**, perforated wall; **G, H**, oral and basal views; **I-K**, la Groussinière (MNHN.F.F67721) in lateral, oral and basal views; **L-P**, *Verulagena maximaperforata* n. gen., n. sp., l'Épinay, holotype (MNHN.F.F67722): **L-N**, lateral, oral and basal views; **O, P**, lateral and perforated wall. Scale bars: A, B, E, I, M, N, 100 µm; C, D, H, J, K, 50 µm; F, 10 µm; G, 5 µm; L, O, 200 µm; P, 20 µm.

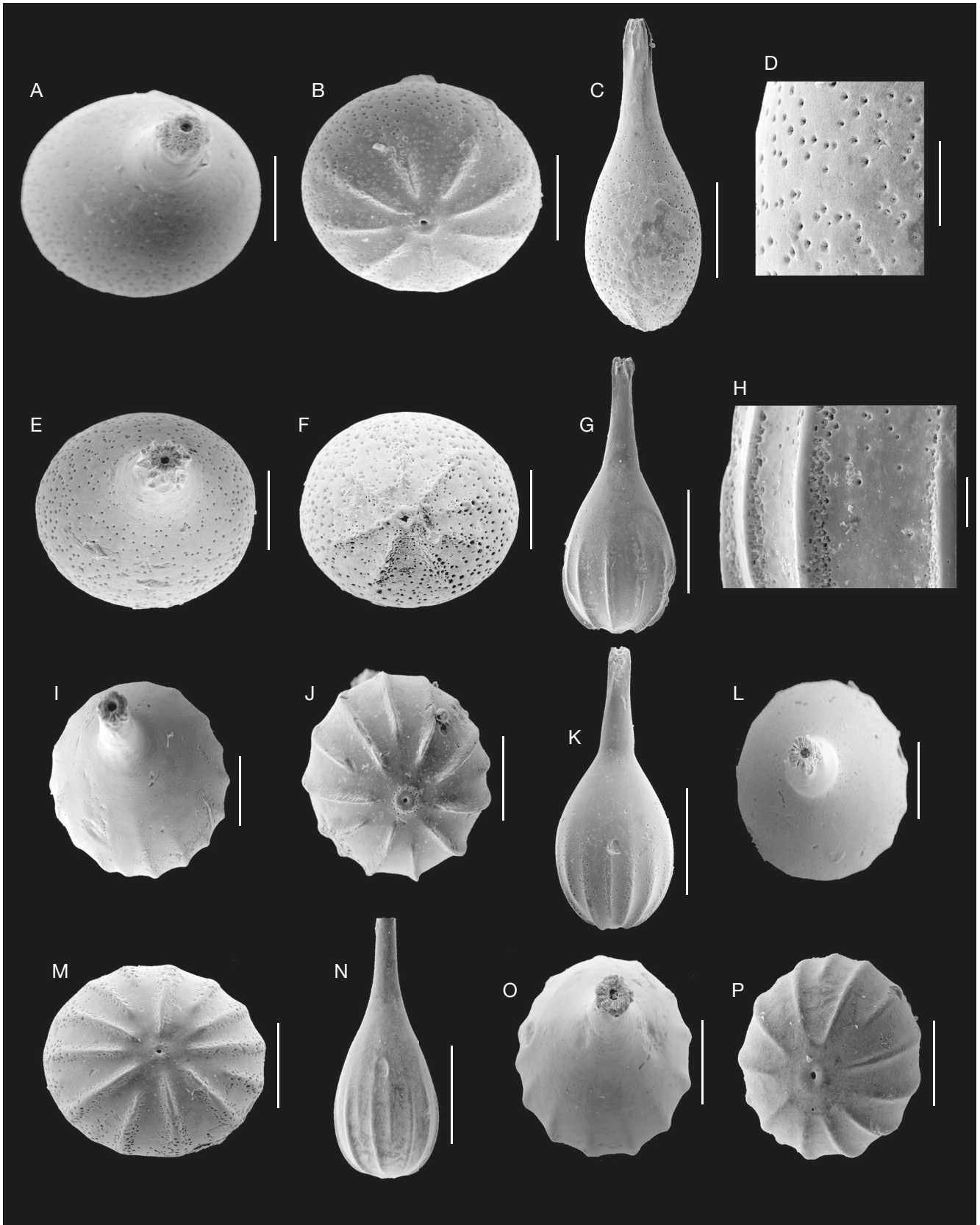


FIG. 28. — **A-F**, *Verulagena maximaperforata* n. sp.: **A, B**, paratype (MNHN.F.F67723) in oral and basal views; **C-F**, paratype, MNHN.F.F67724: **C**, lateral view, **D**, perforated wall; **E, F**, oral and basal views; **G-P**, *Verulagena partecostata* n. gen., n. sp.: **G-J**, holotype, SSL (MNHN.F.F67725): **G**, lateral view; **H**, perforated wall; **I, J**, oral and basal views; **K-M**, paratype, SSL (MNHN.F.F67726) in lateral, oral and basal views; **N-P**, paratype, SSL (MNHN.F.F67727) in lateral, oral and basal views. Scale bars: A, B, E, F, I, J, L, M, O, P, 100 µm; C, G, K, N, 200 µm; D, 50 µm; H, 5 µm.

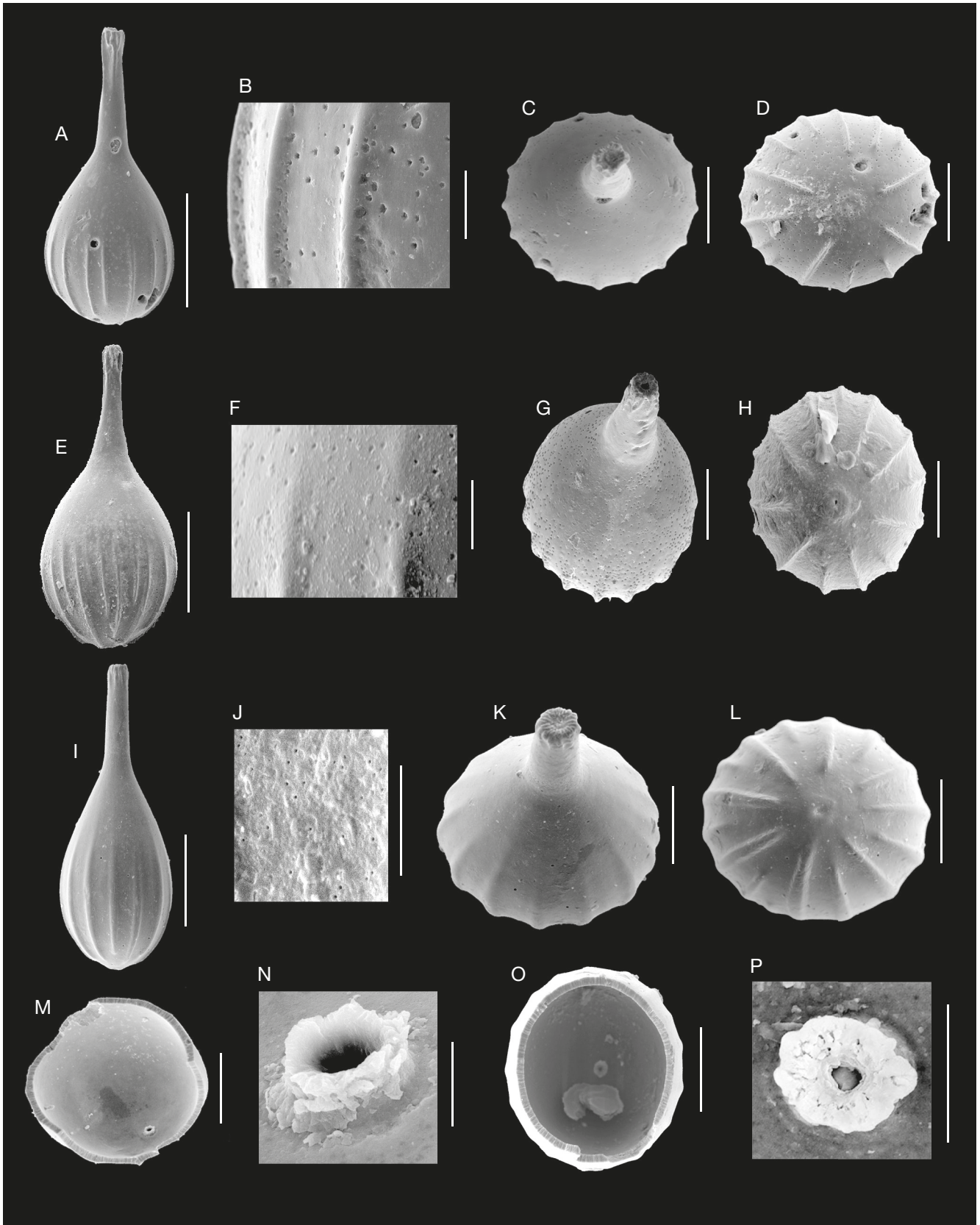


FIG. 29. — **A-H**, *Verulagena turgida* n. gen., n. sp.: **A-D**, la Sautré, holotype (MNHN.F.F67728): **A**, lateral view; **B**, perforated wall; **C, D**, oral and basal views; **E-H**, l'Épinay, paratype (MNHN.F.F67729): **E**, lateral view; **F**, perforated wall; **G, H**, oral and basal views; **I-L**, *Verulagena* sp., la Pugle (MNHN.F.F67730): **I**, lateral view; **J**, perforated wall; **K, L**, oral and basal views; **M, N**, *Deuteralagena elegans* n. gen., n. sp., Auxais: **M**, basal internal view; **N**, enlargement of the aboral tube; **O, P**, *Deuteralagena laguncula* n. gen., n. sp., Auxais: **O**, basal internal view; **P**, enlargement of the aboral tube. Scale bars: A, E, I, 200 µm; B, F, J, P, 20 µm; C, D, G, H, K, L, M, O, 100 µm; N, 10 µm.

Verulagena similis (McCulloch, 1977), n. comb.
(Figs 26N-P; 27A; 33M, N)

Lagena similis McCulloch, 1977: 95, pl. 32, fig. 22 (*non* fig. 24).

LOCALITY. — La Bouillonnaie (Maine-et-Loire).

MATERIAL EXAMINED. — Sample: la Bouillonnaie, 14.50 m (MNHN.F.F67718); sample: la Bouillonnaie, 14.50 m (MNHN.F.F67768), 2 specimens.

AGE. — Early Pliocene.

DESCRIPTION

Test ovoid ornamented with costae (12) in lower part and tapering to oral end ornamented with short ridges, flat ring at aboral end; wall smooth finely perforate; aperture rounded; aboral end structure.

Verulagena laevis (Montagu, 1803), n. comb.
(Figs 27B-K; 33O, P; 34A)

Vermiculum laeve Montagu, 1803: 3, pl. 1, fig. 9.

Lagena vulgaris – Williamson 1848: pl. 4, figs 5, 5a.

Lagena laevis – Buchner 1940: 418, pl. 3, fig. 36 (*non* figs 34, 35).

LOCALITIES. — St Erth (Cornwall), la Groussinière (Ille-et-Vilaine).

MATERIAL EXAMINED. — Sample: St. Erth no. 66/15 (MNHN.F.F67719, F67720); sample: la Groussinière S12, 14.50-16.80 m (MNHN.F.F67721); sample: St Erth no. 66/10 (MNHN.F.F67769), 3 specimens.

AGE. — Basal Late Pliocene.

DESCRIPTION

Test ovoid tapering to oral end ornamented with vertical ridges; wall smooth, hyaline, finely perforate; aperture rounded; aboral end structure.

Verulagena maximaperforata n. gen., n. sp.
(Figs 27L-P; 28A-F; 34B, C)

[urn:lsid:zoobank.org:act:3673219A-4C91-46C4-8232-0A6DB71F6397](https://zoobank.org/act:3673219A-4C91-46C4-8232-0A6DB71F6397)

HOLOTYPE. — Sample: l'Épinay, 6.50 m (MNHN.F.F67722).

PARATYPES. — Two paratypes: Sample: la Groussinière S6, 16.40-15.90 m (MNHN.F.F67723); sample: SSL S3, 2.30 m (MNHN.F.F67724).

DIAGNOSIS. — Test fusiform, base ornamented with costae, perforate, aboral opening.

TYPE AGE. — Early Pliocene to Late Pliocene.

TYPE LOCALITY. — L'Épinay (Maine-et-Loire).

ETYMOLOGY. — From Latin *maximē* (very) and *perforāre* (perforate).

OTHER MATERIAL EXAMINED. — Sample: la Bouillonnaie (MNHN.F.F67770), 6 specimens; sample: l'Épinay (MNHN.F.F67771), 8 specimens.

SIZE. — Length = 0.275 mm; diameter = 0.317 mm.

OCCURENCE. — Marls from l'Épinay and la Bouillonnaie (Maine-et-Loire), sandy clay from la Groussinière (Ille-et-Vilaine) and falun from Saint-Sulpice-des-Landes (Loire-Atlantique).

DESCRIPTION

Test ovoid, base ornamented with costae (11) tapering to oral end ornamented with ridges, flat ring at aboral end; wall hyaline, densely perforate; aperture rounded; aboral end structure.

Verulagena partecostata n. gen., n. sp.
(Figs 28G-P; 34D, G)

[urn:lsid:zoobank.org:act:2C682922-51FD-429C-9849-53B3128DC706](https://zoobank.org/act:2C682922-51FD-429C-9849-53B3128DC706)

HOLOTYPE. — Sample: SSL S3, 2.30 m (MNHN.F.F67725).

PARATYPES. — Two paratypes: sample: SSL S3, 2.30 m (MNHN.F.F67726, F67727).

DIAGNOSIS. — Test ovoid ornamented in part with costae, neck ornamented at oral end with ridges.

TYPE AGE. — Early Pliocene.

TYPE LOCALITY. — Saint-Sulpice-des-Landes (Loire-Atlantique).

ETYMOLOGY. — From Latin *partim* (in part) and *costa* (costae).

OTHER MATERIAL EXAMINED. — Sample: la Pugle, 9.00 m (MNHN.F.F67772), 13 specimens; sample: la Chênelière, 17.00 m (MNHN.F.F67773), 13 specimens.

SIZE. — Length = 0.550 mm; diameter = 0.230 mm.

OCCURENCE. — Marls from la Pugle and la Chênelière (Maine-et-Loire) and marls from SSL (Loire-Atlantique).

DESCRIPTION

Test ovoid ornamented with costae (14) below midpoint, tapering to oral end ornamented with short ridges, flat ring at aboral end; wall hyaline, perforate particularly adjacent to costae; aperture rounded; aboral end structure.

Verulagena turgida n. gen., n. sp.
(Figs 29A-H; 34H-K)

[urn:lsid:zoobank.org:act:1B3A98CE-8C38-4064-8EAF-05F24B204E81](https://zoobank.org/act:1B3A98CE-8C38-4064-8EAF-05F24B204E81)

HOLOTYPE. — Sample: la Sautré 15.00 m (MNHN.F.F67728).

PARATYPE. — Sample: l'Épinay 11.50 m (MNHN.F.F67729).

DIAGNOSIS. — Test ovoid inflated ornamented in part with costae, neck ornamented at oral end with ribs.

TYPE AGE. — Early Pliocene.

TYPE LOCALITY. — La Sautré (Maine-et-Loire).

ETYMOLOGY. — From Latin *turgidus* (inflated).

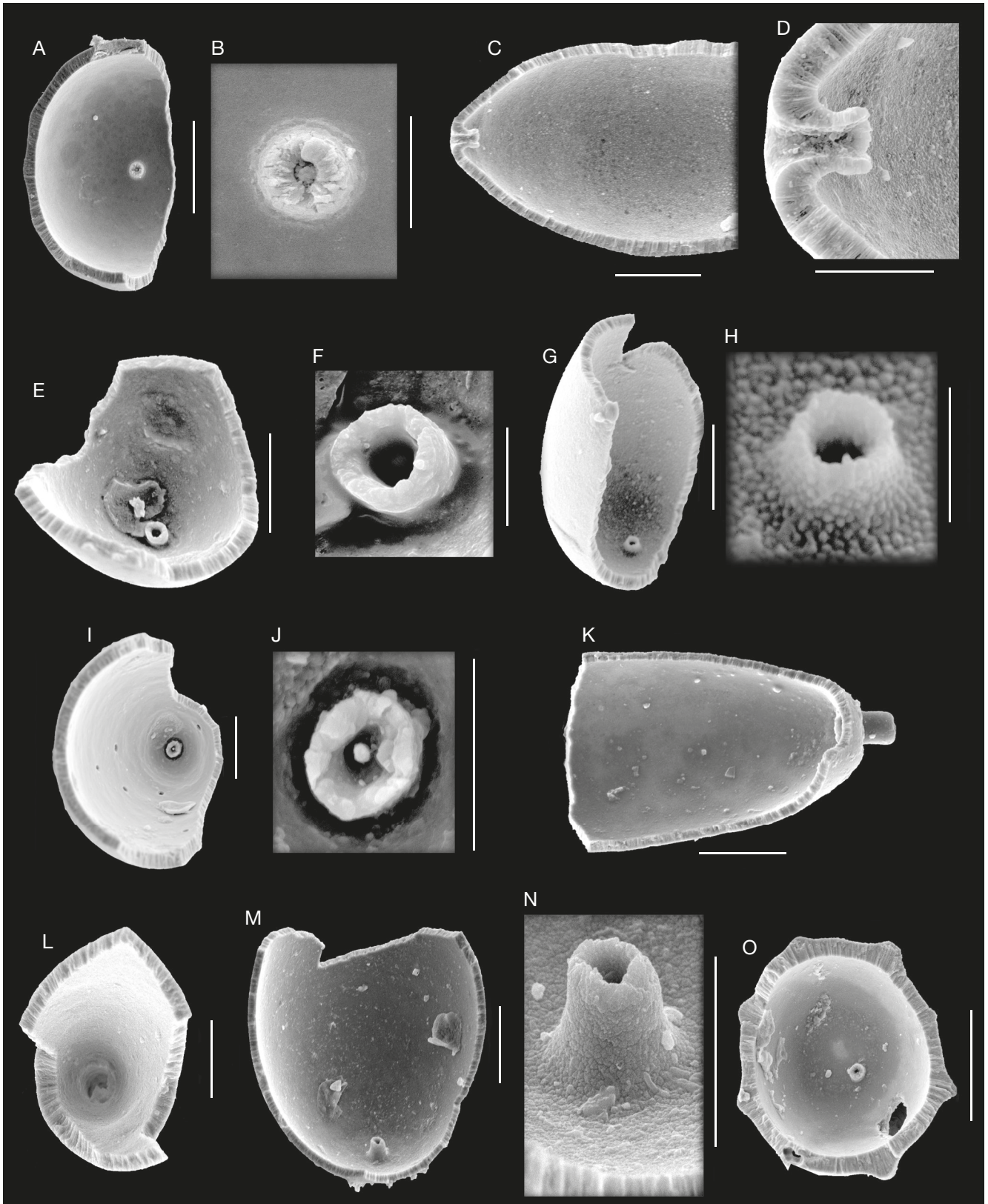


FIG. 30. — **A, B**, *Deuteralagena laguncula* n. gen., n. sp., Auxais: **A**, basal internal view; **C, F**, *Fususella basirotunda* n. gen., n. sp.: **C, D**, la Pugle, holotype (MNHN.F.67621), longitudinal section showing the aboral tube; **E, F**, la Groussinière: **E**, basal internal view; **F**, enlargement of the aboral tube; **G, H**, *Fususella basigranulata* n. gen., n. sp., la Pugle: **G**, basal internal view; **H**, enlargement of the aboral tube; **I, J**, *Fususella clavata* (d'Orbigny, 1846), n. comb., la Pugle (MNHN.F.67735): **I**, internal view; **J**, enlargement of the aboral tube; **K**, *Hyalinonetrion aciculum* (Reuss, 1861), n. comb., Auxais, longitudinal section showing the aboral tube; **L**, *Hyalinonetrion distortum* (Seguenza, 1862), St. Erth, internal view showing the aboral tube; **M, N**, *Hyalinonetrionella sidebottomi* n. gen., n. sp., LRK2, longitudinal section showing the aboral tube; **O**, *Laevilagena guttaformis* n. gen., n. sp., la Bouillonnaie, basal internal view. Scale bars: A, C, O, 100 µm; B, D, J, K, L, M, 20 µm; E, G, I, K, L, M, 50 µm; F, H, 10 µm.

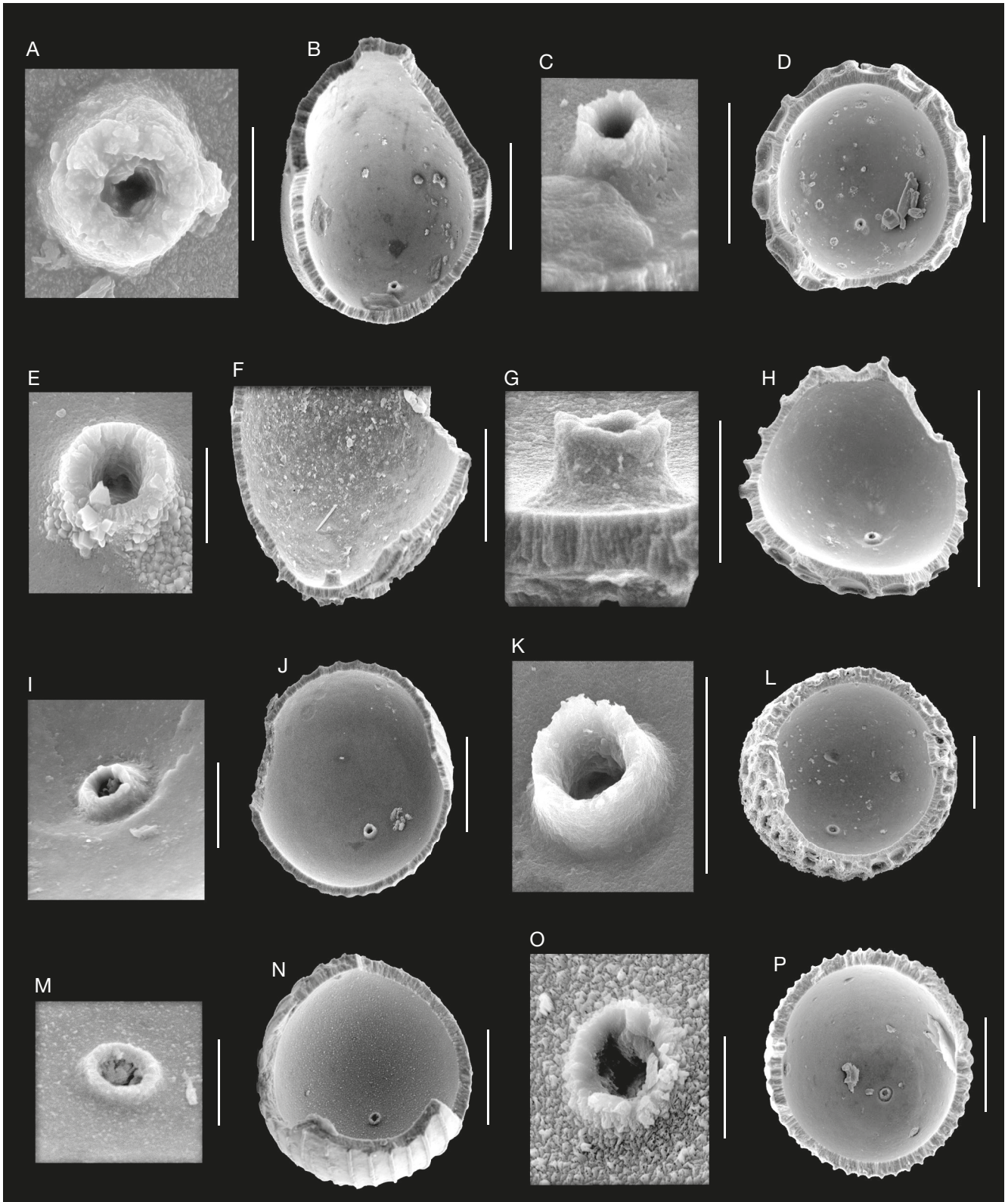


FIG. 31. — **A**, *Laevilagena guttaformis* n. gen., n. sp., la Groussinière, enlargement of the aboral tube; **B, C**, *Laevilagena pyriformis* n. gen., n. sp., la Groussinière (MNHN.F.F67645): **B**, basal internal view; **C**, enlargement of the aboral tube; **D, E**, *Lagena atilai* Bertels, 1964, Fécamp: **D**, basal internal view; **E**, enlargement of the aboral tube; **F, G**, *Lagena buchneri* n. sp., LRK2: **F**, longitudinal section showing the aboral tube; **G**, enlargement of the aboral tube; **H, I**, *Lagena digitale* (Heron-Allen & Earland, 1932), la Chênelière (MNHN.F.F67653): **H**, basal internal view; **I**, enlargement of the the aboral tube; **J, K**, *Lagena haidingeri* (Czjžek, 1848), la Bouillonnaie (MNHN.F.F67748): **J**, basal internal view; **K**, enlargement of the aboral tube; **L, M**, *Lagena mariae* Karrer, 1877, la Pugle (MNHN.F.F67751): **L**, basal internal view; **M**, enlargement of the aboral tube; **N, O**, *Lagena oraticollis* Jones, 1984, n. stat., la Groussinière (MNHN.F.F67752): **N**, basal internal view; **O**, enlargement of the aboral tube; **P**, *Lagena striata* (d'Orbigny, 1839), SGB3, basal internal view. Scale bars: A, E, O, 10 µm; B, D, J, L, N, P, 100 µm; C, G, I, K, M, 20 µm.

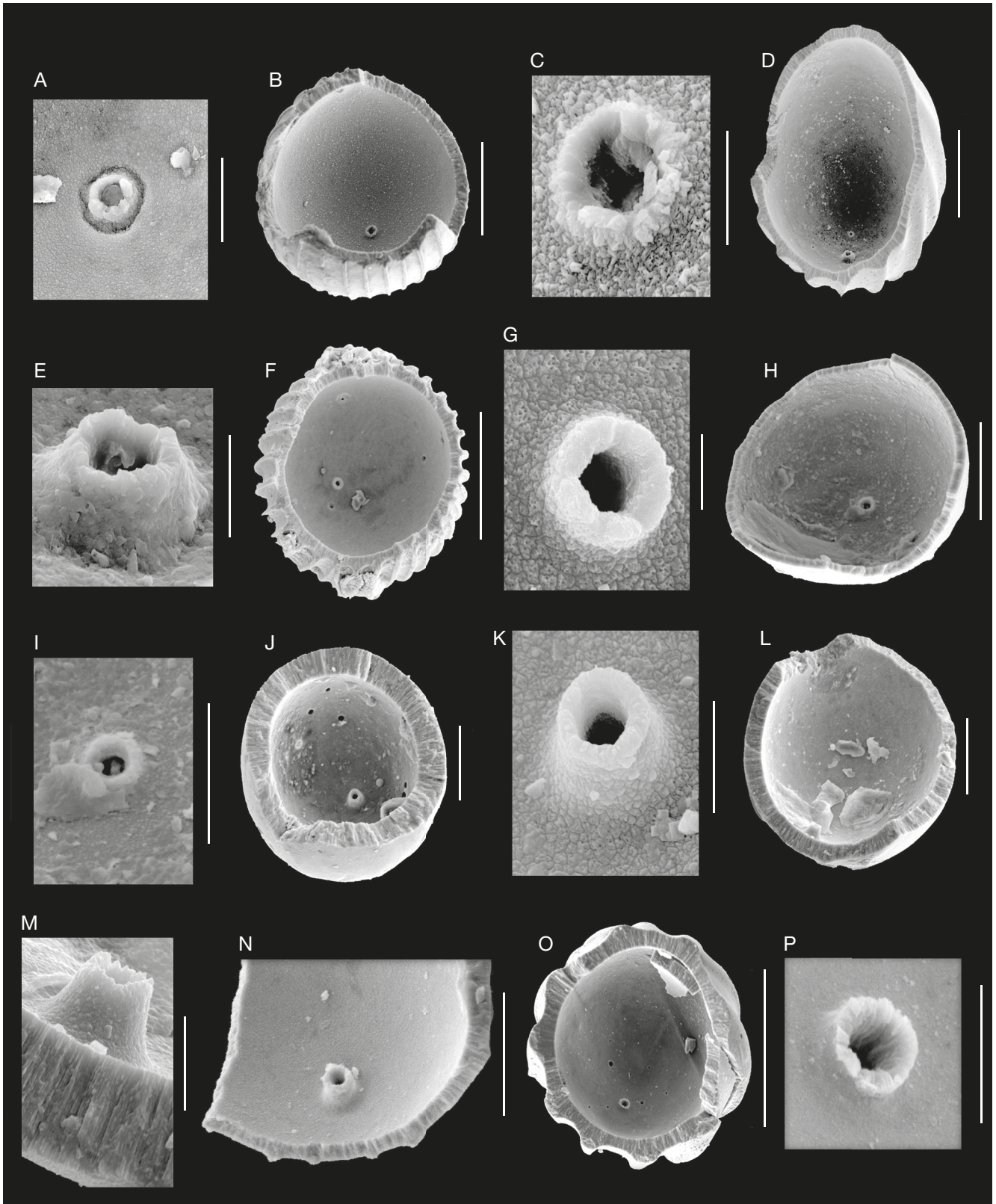


FIG. 32. — **A**, *Lagena striata* (d'Orbigny, 1839), SGB3, enlargement of the aboral tube; **B**, **C**, *Lagena substriata* Williamson, 1848, LRK2: **B**, basal internal view; **C**, enlargement of the aboral tube; **D**, **E**, *Lagena sulcata* (Walker & Jacob, 1798), SGB3: **D**, longitudinal section; **E**, enlargement of the aboral tube; **F**, **G**, *Lagena variokoreana* n. sp., LRK2: **F**, basal internal view; **G**, enlargement of the aboral view; **H**, **I**, *Lagunculella grayi* n. gen., n. sp., LRK2 (MNHN.F.F67688): **H**, basal internal view; **I**, enlargement of the aboral tube; **J**–**M**, *Lagunculella baggi* (Cushman & Gray, 1946), n. comb., SGB3: **J**, basal internal views; **K**, enlargement of the aboral tube; **L**, longitudinal section; **M**, enlargement of the aboral tube; **N**, *Lagunculella doveyensis* (Haynes, 1973), n. comb., Fécamp (MNHN.F.F67692), basal internal view; **O**, **P**, *Lagunculella flexa* (Cushman & Gray, 1946), n. comb., la Sautré (MNHN.F.F67695): **O**, basal internal view; **P**, enlargement of the aboral tube. Scale bars: A, I, P, 20 µm; B, D, F, 100 µm; C, E, K, M, 10 µm; G, 5 µm; H, J, L, N, 50 µm; O, 200 µm.

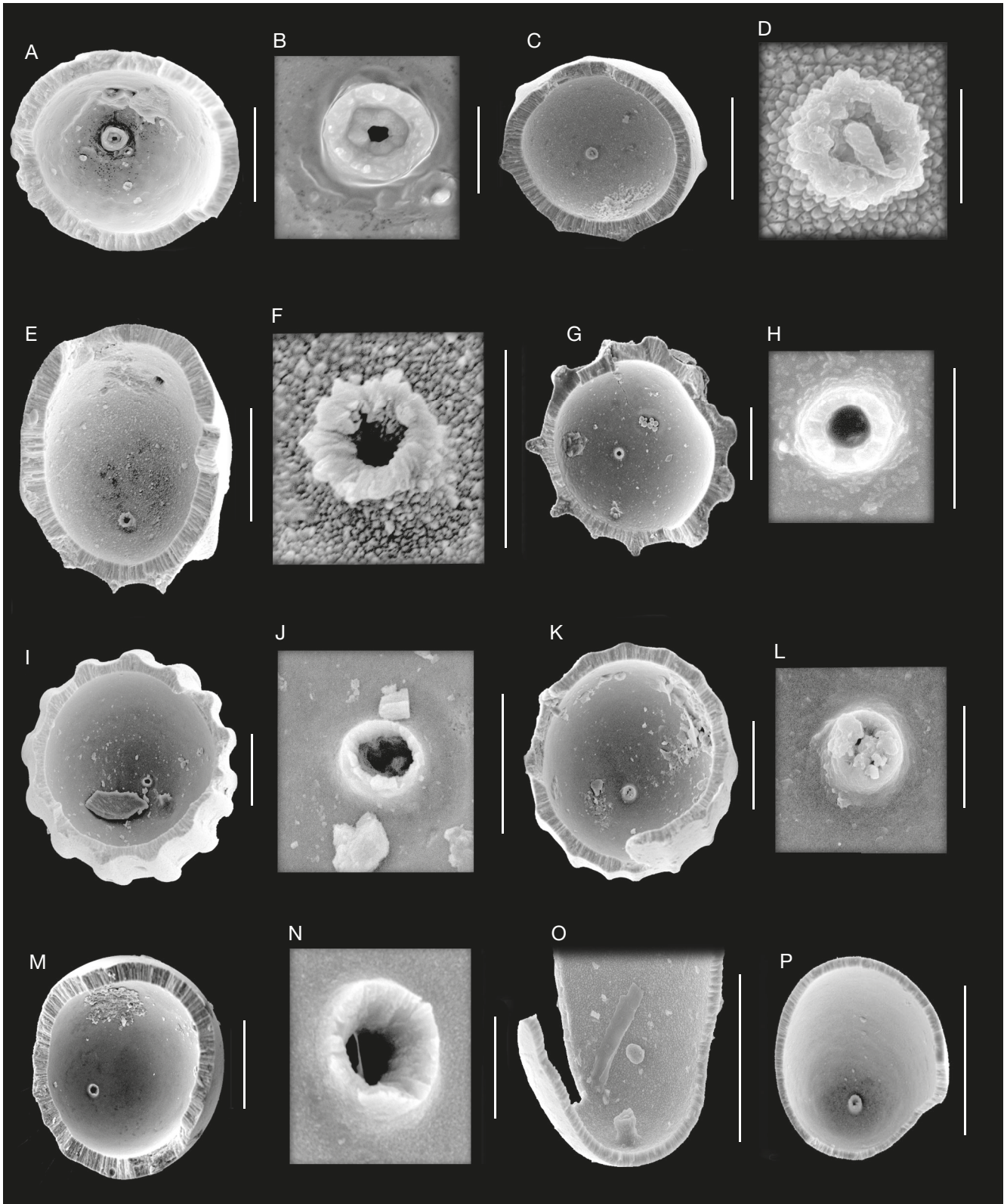


FIG. 33. — **A, B**, *Lagunculella flexa* (Cushman & Gray, 1946), n. comb., Fécamp (MNHN.F.F6760): **A**, internal basal view; **B**, enlargement of the aboral view; **C, D**, *Lagunculella ovoidea* n. gen., n. sp., la Pugle; **C**, internal basal view; **D**, enlargement of the aboral view; **E, F**, *Lagunculella redonensis* n. gen., n. sp., la Groussinière: **E**, internal basal view; **F**, enlargement of the aboral tube; **G, H**, *Lanterna crassicarinata* n. gen., n. sp., la Groussinière: **G**, internal basal view; **H**, enlargement of the aboral tube; **I, J**, *Lanterna novocrassicarinata* n. gen., n. sp., la Groussinière (MNHN.F.F67707): **I**, internal basal view; **J**, enlargement of the aboral tube; **K, L**, *Malumella oblonga* n. gen., n. sp., la Groussinière: **K**, internal basal view; **L**, enlargement of the aboral tube; **M, N**, *Verulagena similis* (McCulloch, 1977), n. comb., la Bouillonnaie: **M**, internal basal view; **N**, enlargement of the aboral view; **O, P**, *Verulagena laevis* (Montagu, 1803), n. comb., St. Erth: **O**, longitudinal section showing the aboral tube; **P**, internal basal view. Scale bars: A, O, 50 µm; B, D, N, 10 µm; C, E, G, I, K, M, P, 100 µm; F, H, J, L, 20 µm.

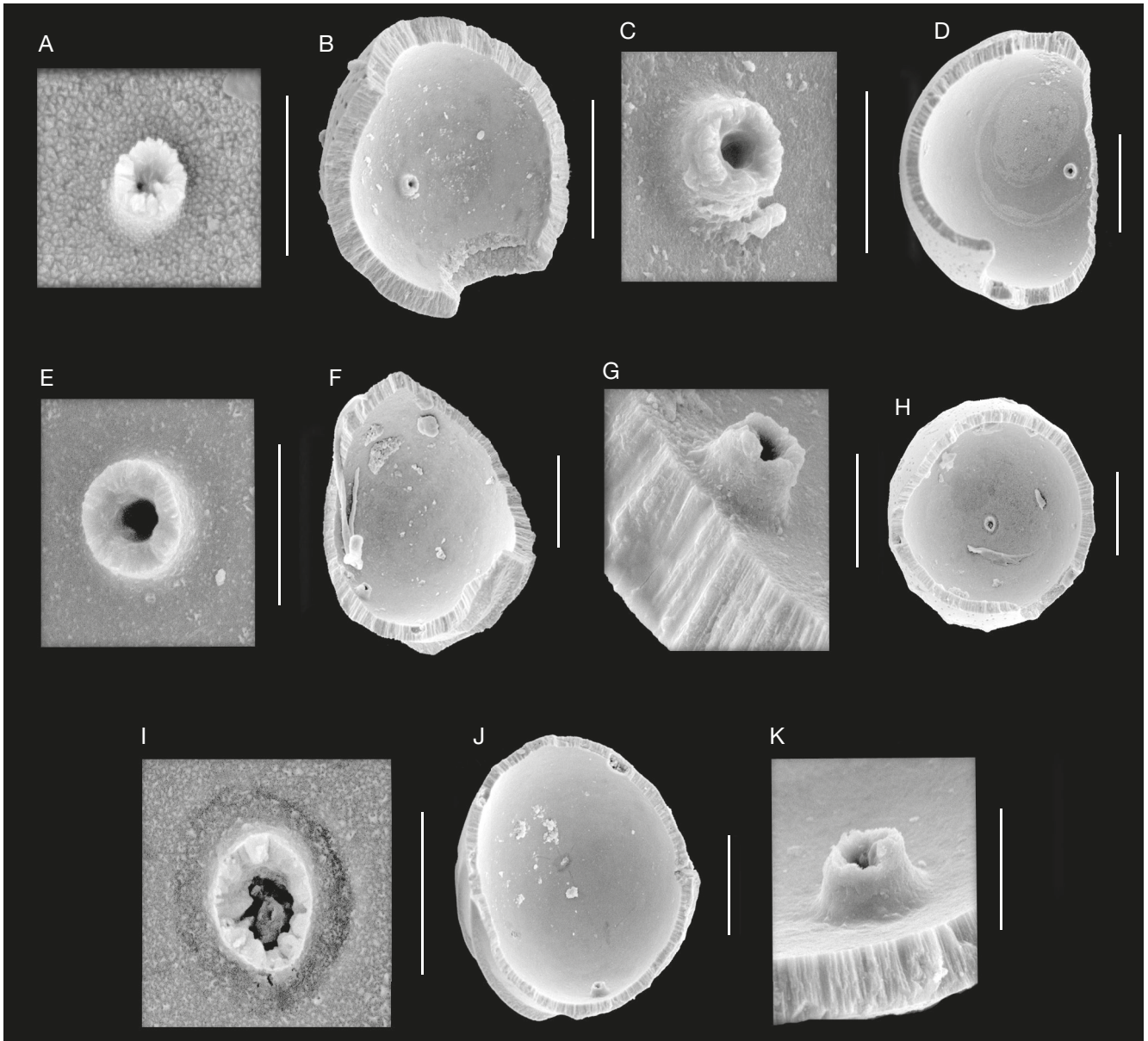


FIG. 34. — **A**, *Verulagena laevis* (Montagu, 1803), n. comb., St. Erth, enlargement of the aboral tube; **B, C**, *Verulagena maximaperforata* n. gen., n. sp., la Bouillonnie (MNHN.F.F67770): **B**, internal basal view; **C**, enlargement of the aboral tube; **D-E**, *Verulagena partecostata* n. gen., n. sp.: **D, E**, la Pugle; **D**, internal basal view; **E**, enlargement of the aboral tube; **F, G**, la Chênellerie (MNHN.F.F67773): **F**, longitudinal section showing the aboral tube; **G**, enlargement of the aboral tube; **H-K**, *Verulagena turgida* n. gen., n. sp.: **H, I**, la Pugle; **H**, internal basal view; **I**, enlargement of the aboral tube; **J, K**, la Sautré: **J**, longitudinal section showing the aboral tube; **K**, enlargement of the aboral tube. Scale bars: B, D, F, H, J, 100 µm; A, C, E, G, I, K, 20 µm.

OTHER MATERIAL EXAMINED. — Sample: la Sautré, 15.00 m (MNHN.F.F67774, 4 specimens).

SIZE. — Length = 0.57 mm; diameter = 0.237 mm.

OCCURENCE. — Marls from la Sautré and l'Épinay (Maine-et-Loire).

DESCRIPTION

Test ovoid ornamented with costae (17) below midpoint, tapering to oral end ornamented with short ridges, flat ring at aboral end; wall hyaline perforate; aperture rounded with radiate rim; aboral end structure.

Verulagena sp.
(Fig. 29I-L)

LOCALITY. — La Pugle (Maine-et-Loire).

MATERIAL EXAMINED. — Sample: la Pugle, 13.00 m (MNHN.F.F67730).

AGE. — Early Pliocene.

DESCRIPTION

Test ovoid elongated, ornamented on two-third part with costae (15), tapering to oral end ornamented with short ridges, flat ring at aboral end; wall hyaline finely perforate; aperture rounded; aboral opening.

TABLE 1. — Stratigraphical location of the species.

Species	Early Pliocene	Late Pliocene- Early Pleistocene
<i>Deuteralagena elegans</i> n. gen., n. sp.	—	×
<i>Deuteralagena laguncula</i> n. gen., n. sp.	—	×
<i>Deuteralagena</i> sp. A	—	×
<i>Deuteralagena</i> sp. B	—	×
<i>Deuteralagena</i> sp. C	×	—
<i>Deuteralagena</i> sp. D	—	×
<i>Deuteralagena</i> sp. E	×	—
<i>Deuteralagena</i> sp. F	—	×
<i>Deuteralagena</i> sp. G	×	—
<i>Deuteralagena</i> sp. H	—	×
<i>Fususella basirotunda</i> n. gen., n. sp.	×	—
<i>Fususella basigranulata</i> n. gen., n. sp.	×	—
<i>Fususella clavata</i> n. comb.	×	—
<i>Fususella setigera</i> n. comb.	×	—
<i>Fususella</i> sp. A	×	—
<i>Fususella</i> sp. B	×	—
<i>Hyalinonetrion aciculum</i> (Reuss, 1861), n. comb.	—	×
<i>Hyalinonetrion distomapolitum</i> (Parker & Jones, 1865)	—	×
<i>Hyalinonetrion distortum</i> (Seguenza, 1862)	—	×
<i>Hyalinonetrion gracillimum</i> (Seguenza, 1862)	—	×
<i>Hyalinonetrionella sidebottomi</i> n. gen., n. sp.	×	—
<i>Hyalinonetrionella</i> sp.	×	—
<i>Laevilagena guttaformis</i> n. gen., n. sp.	×	—
<i>Laevilagena pyriformis</i> n. gen., n. sp.	×	—
<i>Laevilagena</i> sp.	×	—
<i>Lagena atilai</i> Bertels, 1964	×	—
<i>Lagena buchneri</i> n. sp.	×	—
<i>Lagena digitale</i>	×	×
<i>Lagena haidingeri</i> (Czjžek, 1848)	×	×
<i>Lagena mariae</i> Karrer, 1877	×	—
<i>Lagena ornatocollis</i> Jones, 1984, n. stat.	×	×
<i>Lagena striata</i> (d'Orbigny, 1839)	—	×
<i>Lagena striatareticulata</i> n. sp.	×	—
<i>Lagena substriata</i> Williamson, 1848	×	—
<i>Lagena sulcata</i> (Walker & Jacob, 1798)	—	×
<i>Lagena torquiformis</i> Haynes, 1973	—	×
<i>Lagena variokoreana</i> n. sp.	×	—
<i>Lagena</i> sp. A	—	×
<i>Lagena</i> sp. B	×	—
<i>Lagena</i> sp. C	×	—
<i>Lagunculella grayi</i> n. gen., n. sp.	×	—
<i>Lagunculella baggi</i> n. comb.	—	×
<i>Lagunculella doveyensis</i> n. comb.	×	—
<i>Lagunculella flexa</i> n. comb.	×	—
<i>Lagunculella ovoidea</i> n. gen., n. sp.	×	—
<i>Lagunculella redonensis</i> n. gen., n. sp.	×	—
<i>Lagunculella semistriata</i> n. comb.	×	—
<i>Lagunculella</i> sp.	×	—
<i>Lanternalagena crassicarinata</i> n. gen., n. sp.	×	—
<i>Lanternalagena novocrassicarinata</i> n. gen., n. sp.	×	—
<i>Lanternalagena</i> sp. A	×	—
<i>Lanternalagena</i> sp. B	×	—
<i>Lanternalagena</i> sp. C	×	—
<i>Malumella oblonga</i> n. gen., n. sp.	×	×
<i>Malumella suboblonga</i> n. gen., n. sp.	×	—
<i>Malumella</i> sp.	×	—
<i>Pygmaeoseistrion hispidulum</i> (Cushman, 1913)	×	—
<i>Verulagena similis</i> n. comb.	×	—
<i>Verulagena laevis</i> n. comb.	×	×
<i>Verulagena maximaperforata</i> n. gen., n. sp.	×	—
<i>Verulagena partecostata</i> n. gen., n. sp.	×	—
<i>Verulagena turgida</i> n. gen., n. sp.	×	—
<i>Verulagena</i> sp.	×	—

TABLE 2. — Geographical location of the species.

Species	St. Erh	Brest-LRK2	Bassin de Carentan				Bassin de Rennes		Bassin de Candé					SSL	Fécamp
			SGB3	Auxais	Rém/Lozon	SNP	Mernel	la Groussinière	la Sautré	la Chêneière	la Pugle	la Bouillonnaie	l'Épinay		
<i>Deuteralagena elegans</i> n. gen., n. sp.	-	-	-	x	-	-	-	-	-	-	-	-	-	-	-
<i>Deuteralagena laguncula</i> n. gen., n. sp.	x	-	-	x	-	-	-	-	-	-	-	-	-	-	-
<i>Deuteralagena</i> sp. A	-	x	-	x	-	-	-	-	-	-	-	-	-	-	-
<i>Deuteralagena</i> sp. B	-	-	-	x	-	-	-	-	-	-	-	-	-	-	-
<i>Deuteralagena</i> sp. C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x
<i>Deuteralagena</i> sp. D	-	-	-	x	-	-	-	-	-	-	-	-	-	-	x
<i>Deuteralagena</i> sp. E	-	-	-	-	-	-	-	-	-	x	-	-	-	-	-
<i>Deuteralagena</i> sp. F	-	-	x	-	-	-	-	-	-	-	-	-	-	-	-
<i>Deuteralagena</i> sp. G	-	-	-	-	-	-	-	x	-	-	-	-	-	-	-
<i>Deuteralagena</i> sp. H	-	-	-	-	-	-	-	x	-	-	-	-	-	-	-
<i>Fususella basirotunda</i> n. gen., n. sp.	-	-	-	-	-	-	-	x	-	-	x	x	-	-	-
<i>Fususella basigranulata</i> n. gen., n. sp.	-	-	-	-	-	-	-	-	-	-	x	-	-	-	-
<i>Fususella clavata</i> n. comb.	-	-	-	-	-	-	-	x	-	-	-	-	-	-	-
<i>Fususella setigera</i> n. comb.	-	-	-	-	-	-	-	-	x	-	x	-	-	-	-
<i>Fususella</i> sp. A	-	-	-	-	-	-	-	x	-	-	-	-	-	-	-
<i>Fususella</i> sp. B	-	-	-	-	-	-	-	-	-	-	-	-	-	x	-
<i>Hyalinonetrion aciculum</i> (Reuss, 1861), n. comb.	-	-	x	x	-	-	-	-	-	-	-	-	-	-	-
<i>Hyalinonetrion distomapolitum</i> (Parker & Jones, 1865)	-	-	-	-	x	-	-	-	-	-	-	-	-	-	-
<i>Hyalinonetrion distortum</i> (Seguenza, 1862)	x	-	-	x	-	-	-	-	-	-	-	-	-	-	-
<i>Hyalinonetrion gracillimum</i> (Seguenza, 1862)	-	-	-	x	-	-	-	-	-	-	-	-	-	-	-
<i>Hyalinonetrionella sidebottomi</i> n. gen., n. sp.	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Hyalinonetrionella</i> sp.	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Laevilagena guttaformis</i> n. gen., n. sp.	-	-	-	-	-	-	-	x	x	-	-	x	-	-	-
<i>Laevilagena pyriformis</i> n. gen., n. sp.	-	-	-	-	-	-	-	x	x	-	-	-	-	-	-
<i>Laevilagena</i> sp.	-	-	-	-	-	-	-	-	x	-	-	-	-	-	-
<i>Lagena atilai</i> Bertels, 1964	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x
<i>Lagena buchneri</i> n. sp.	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Lagena digitale</i> Heron-Allen & Earland, 1932	-	-	x	-	-	-	-	-	-	x	-	-	x	-	-
<i>Lagena haidingeri</i> (Czjžek, 1848)	x	x	-	-	-	-	-	-	-	x	x	-	x	-	-
<i>Lagena mariae</i> Karrer, 1877	-	-	-	-	-	-	-	-	-	x	-	x	-	-	-
<i>Lagena ornaticollis</i> Jones, 1984, n. stat.	x	-	-	-	-	-	-	x	x	-	-	-	-	-	x
<i>Lagena striata</i> (d'Orbigny, 1839)	-	-	x	-	-	-	-	-	-	-	-	-	-	-	-
<i>Lagena striatoreticulata</i> n. sp.	-	-	-	-	-	-	-	-	-	x	-	x	-	-	-
<i>Lagena substriata</i> Williamson, 1848	-	x	-	-	-	-	-	-	x	-	-	-	-	-	-
<i>Lagena sulcata</i> (Walker & Jacob, 1798)	-	-	x	-	-	-	-	-	-	-	-	-	-	-	-
<i>Lagena torquiformis</i> Haynes, 1973	-	-	x	-	-	-	-	-	-	-	-	-	-	-	-
<i>Lagena variokoreana</i> n. sp.	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Lagena</i> sp. A	-	-	-	x	-	-	-	-	-	-	-	-	-	-	-
<i>Lagena</i> sp. B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x
<i>Lagena</i> sp. C	-	-	-	-	-	-	-	x	-	x	-	-	-	-	-
<i>Lagunculella grayi</i> n. gen., n. sp.	-	x	-	-	-	-	-	x	-	-	-	-	-	-	-
<i>Lagunculella baggi</i> n. comb.	-	-	x	-	-	-	-	-	-	-	-	-	-	-	-
<i>Lagunculella doveyensis</i> n. comb.	-	-	-	-	-	-	-	-	-	x	-	-	-	-	x
<i>Lagunculella flexa</i> n. comb.	-	-	-	-	-	-	-	-	-	x	x	x	-	-	x
<i>Lagunculella ovoidea</i> n. gen., n. sp.	-	x	-	-	-	-	-	-	-	-	x	-	-	-	-
<i>Lagunculella redonensis</i> n. gen., n. sp.	-	-	-	-	-	-	-	-	x	-	-	-	-	-	-
<i>Lagunculella semistriata</i> n. comb.	-	-	-	-	-	-	-	-	-	-	x	-	-	-	-
<i>Lagunculella</i> sp.	-	-	-	-	-	-	-	-	-	-	x	-	-	-	-
<i>Lanternalagena crassicarinata</i> n. gen., n. sp.	-	-	-	-	-	-	-	-	x	x	-	-	-	-	-
<i>Lanternalagena novocrassicarinata</i> n. gen., n. sp.	-	-	-	-	-	-	-	-	x	x	-	-	-	x	x
<i>Lanternalagena</i> sp. A	-	-	-	-	-	-	-	-	-	-	-	-	-	x	-
<i>Lanternalagena</i> sp. B	-	-	-	-	-	-	-	x	-	-	-	-	-	-	-
<i>Lanternalagena</i> sp. C	-	-	-	-	-	-	-	-	-	-	x	-	-	-	-
<i>Malumella oblonga</i> n. gen., n. sp.	-	-	-	x	-	-	-	x	x	-	x	-	-	-	-
<i>Malumella suboblonga</i> n. gen., n. sp.	-	-	-	-	-	-	-	-	-	-	-	x	-	-	-
<i>Malumella</i> sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	x	-
<i>Pygmaeseistrion hispidulum</i> (Cushman, 1913)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x
<i>Verulagena similis</i> n. comb.	-	-	-	-	-	-	-	-	-	-	-	x	-	-	-
<i>Verulagena laevis</i> n. comb.	x	-	-	-	-	-	-	x	-	-	-	-	-	-	-
<i>Verulagena maximaperforata</i> n. gen., n. sp.	-	-	-	-	-	-	-	-	x	-	-	x	x	-	-
<i>Verulagena partecostata</i> n. gen., n. sp.	-	-	-	-	-	-	-	-	-	-	x	x	-	x	-
<i>Verulagena turgida</i> n. gen., n. sp.	-	-	-	-	-	-	-	-	-	x	-	x	-	x	-
<i>Verulagena</i> sp.	-	-	-	-	-	-	-	-	-	-	x	-	-	-	-

DISCUSSION

SYSTEMATICS

The genus Hyalinonetrion Patterson & Richardson, 1988

The aboral structure is different from that of other Lageninae genera. It consists of a short tube in part internal (Buchner 1940; Popescu & Crihan 2005).

This character is found in the genus *Procerolagena* Puri, 1944. These two genera could represent a new subfamily.

The genus Lagena Walker & Jacob in Kanmacher, 1798

Serpula (Lagena) sulcata Walker & Jacob in Kanmacher, 1798 has been designated by Parker & Jones (1859) as type species of the genus *Lagena*. The original description indicates a test “round, striated and furrowed, flask worm-shell”. These morphological characters are not reflected in the description of the many species assigned to this genus. It seems necessary to redefine the systematics of these species.

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