Masaryk Univerzity in Brno

Faculty of Sciences

Department of Botany a Zoology

Diversity of epilithic cyanobacteria inhabiting a running clear water in Slovakia

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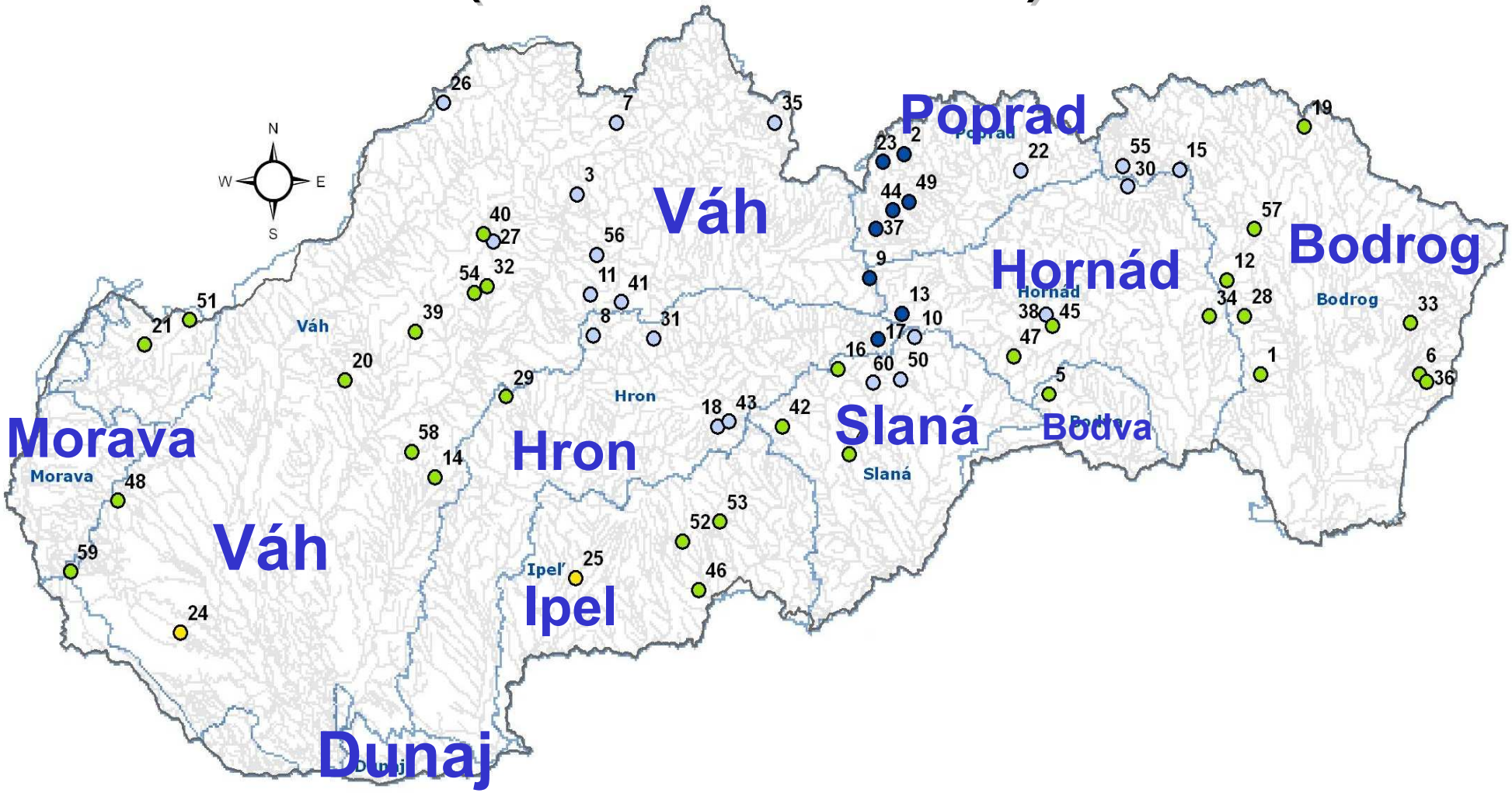
THE AIMS

- To identify epilithic cynobacteria in a running clear water in Slovakia
- To use cyanobacteria for monitoring clear running waters

MATERIALS & METHODS

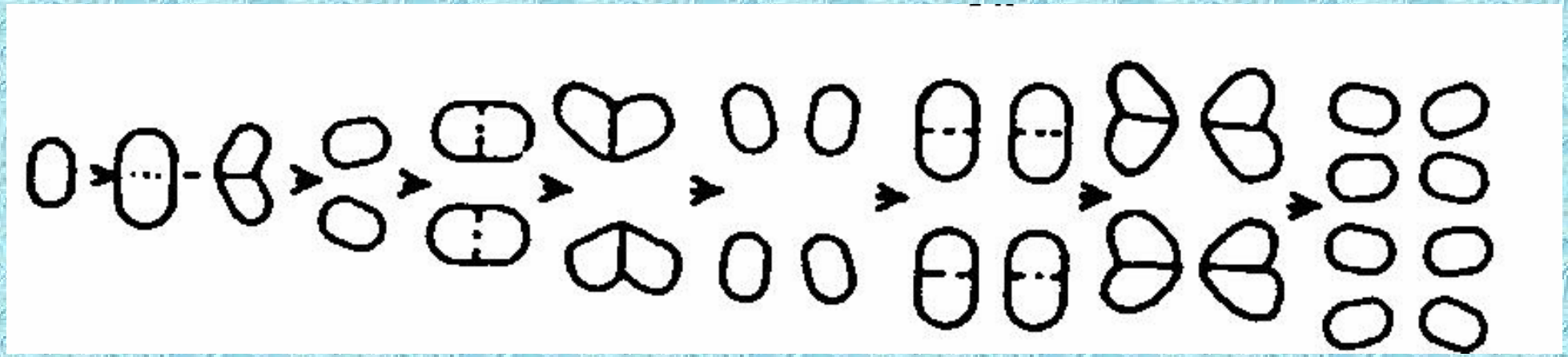
- 36 sampling places in Slovakia
- Scraping from submerged rocky substrata
- Determination *in vivo* (Olympus BX 51)
- Used actual literature for det. of cyanobacteria (Komárek & Anagnostidis 1989, 1998, 2005)

Sampling places in Slovakia (reference sites)



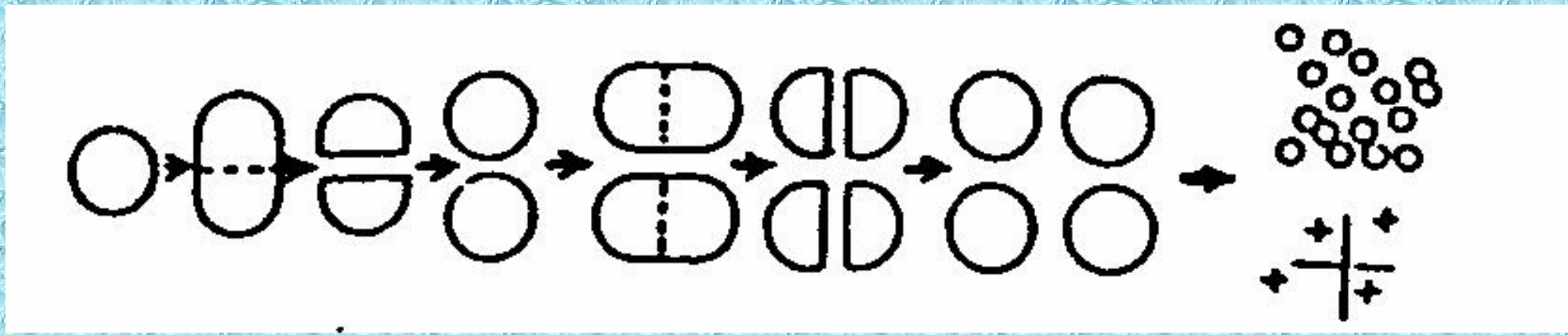
Characterization of cyanobacterial genera and families (diacritical features)

Family Synechococcaceae
Genus *Aphanothece*



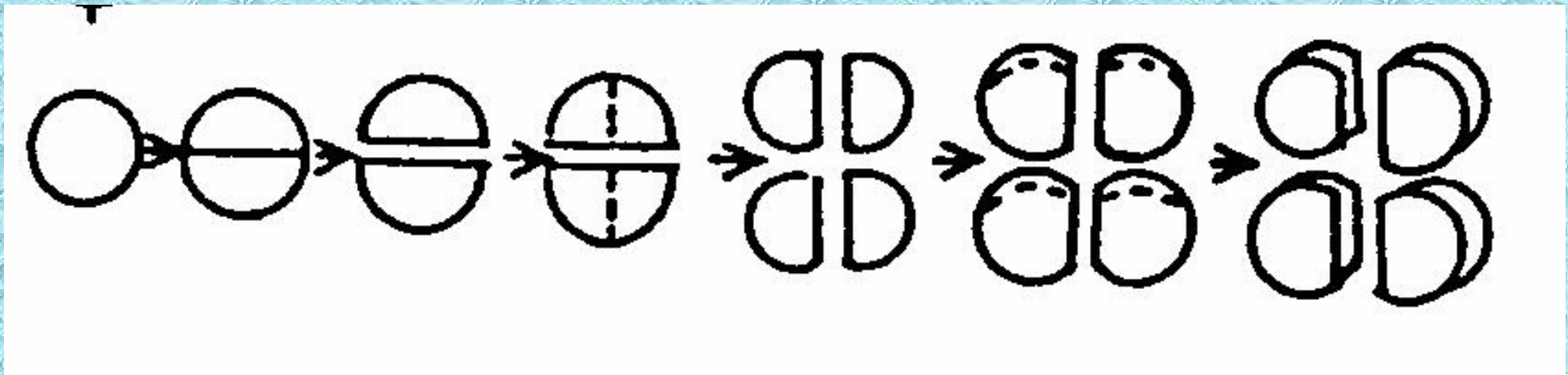
Scheme of cell division

Family Merismopediaceae
Genus *Aphanocapsa*



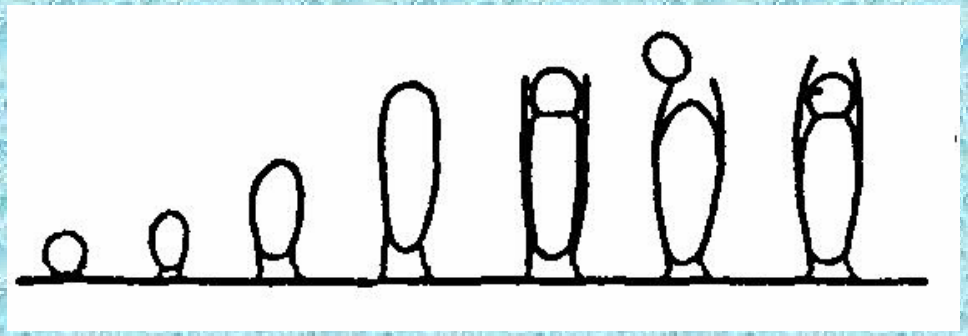
Scheme of cell division

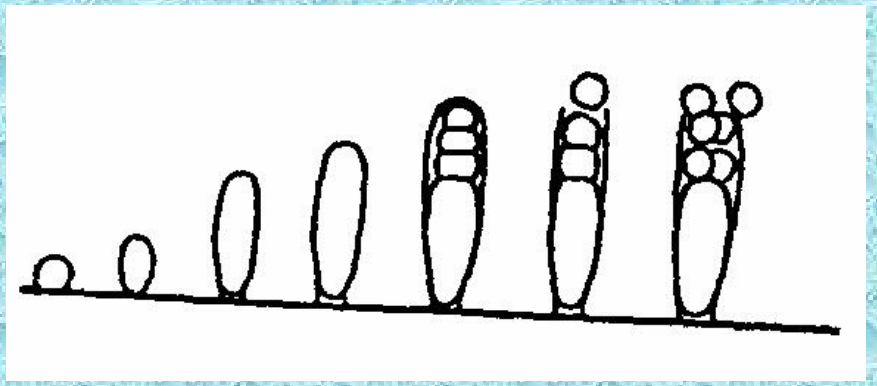
Family Entophysalidaceae
Genus *Chlorogloea*

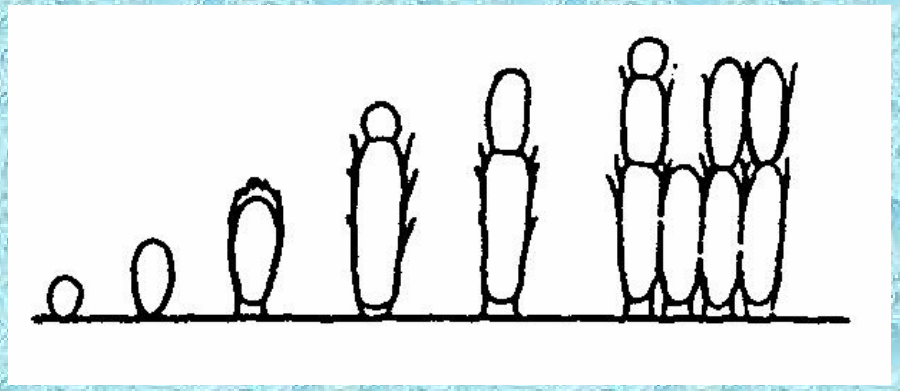


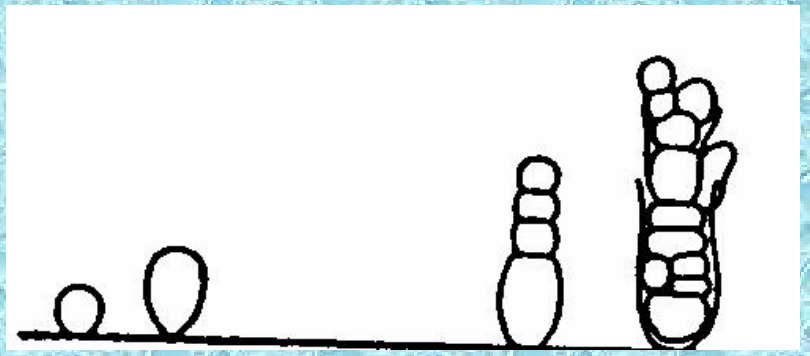
Scheme of cell division

Family Chamaesiphonaceae
Genus *Chamaesiphon*

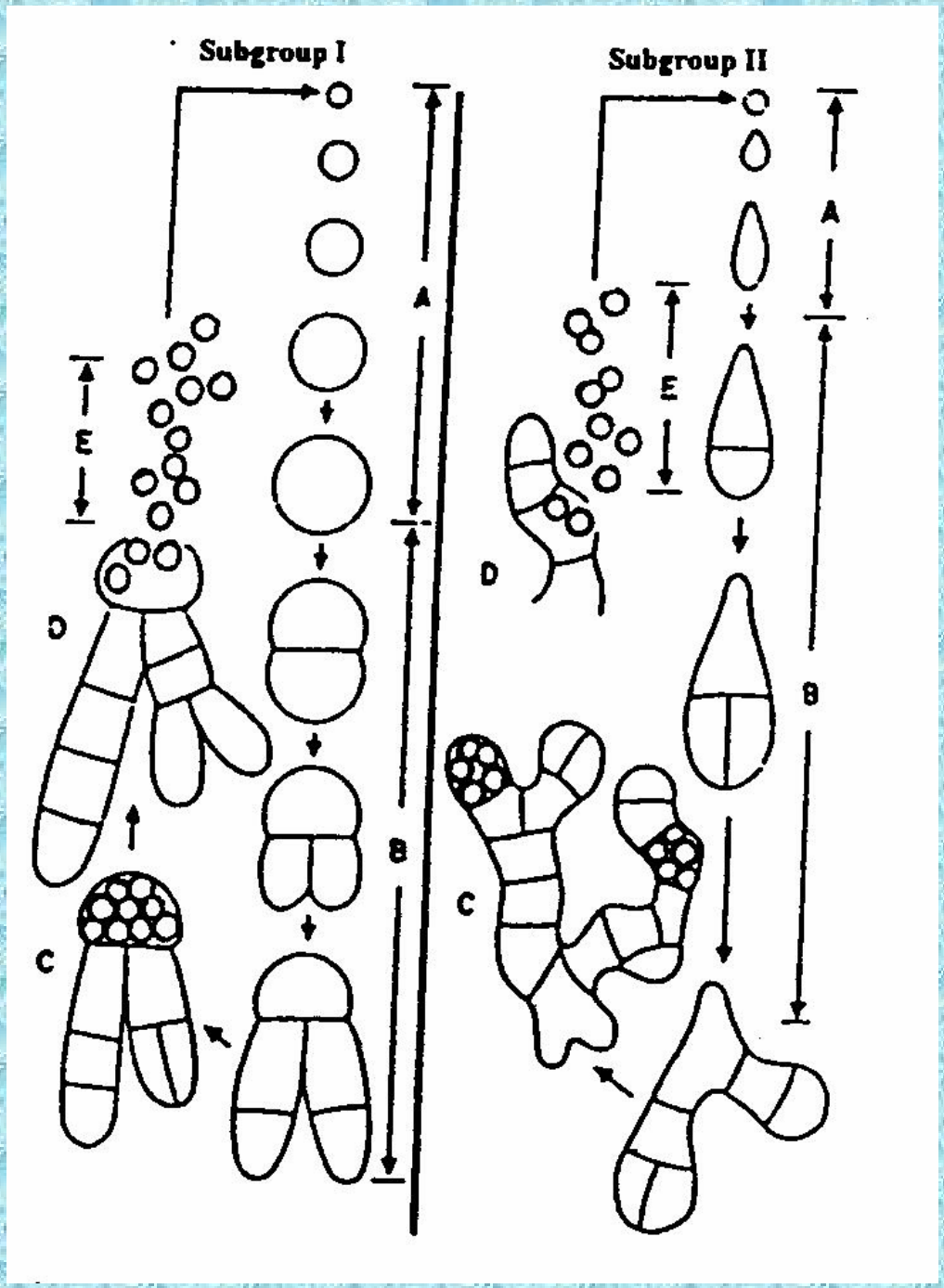








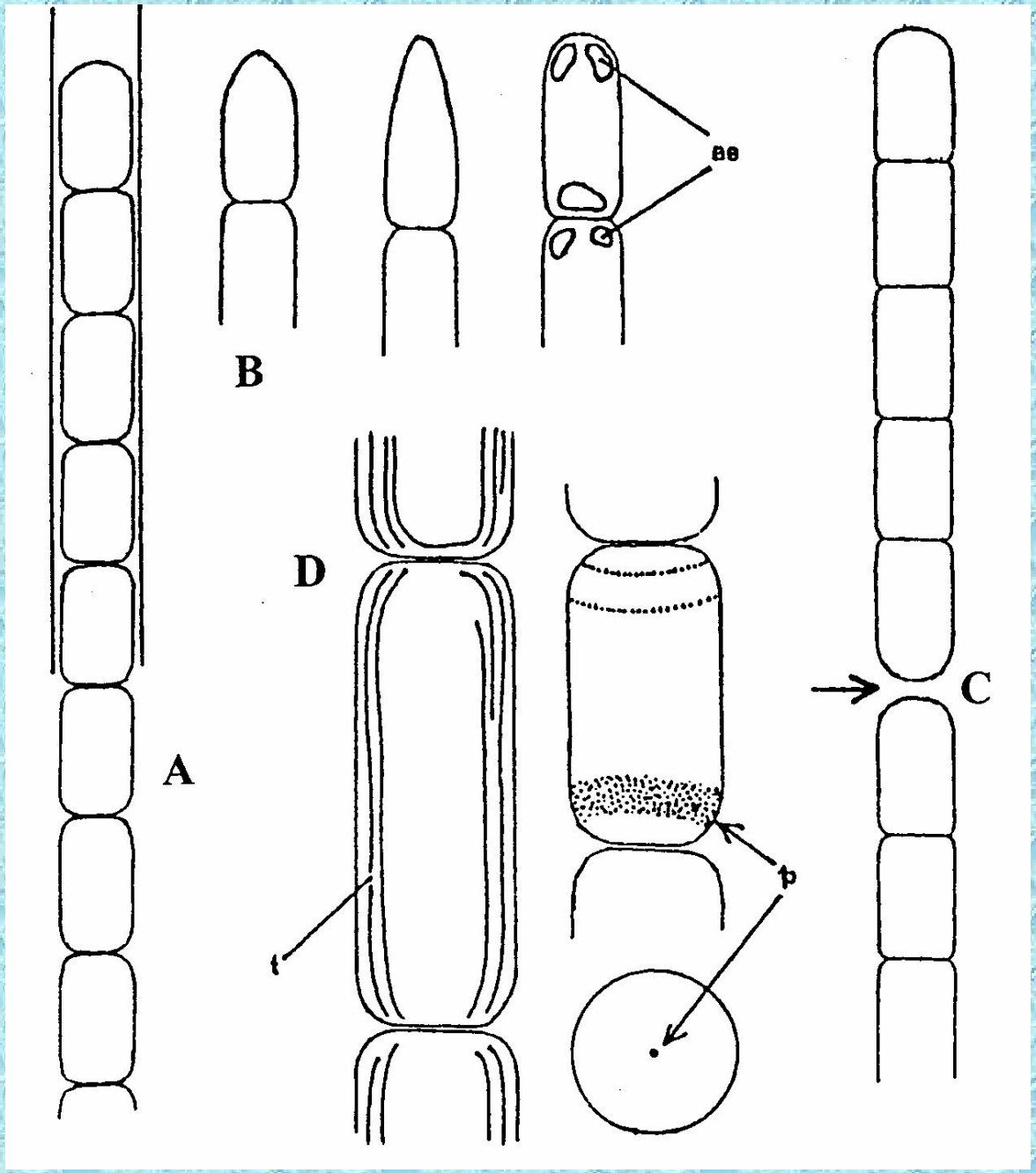
Scheme of cell division

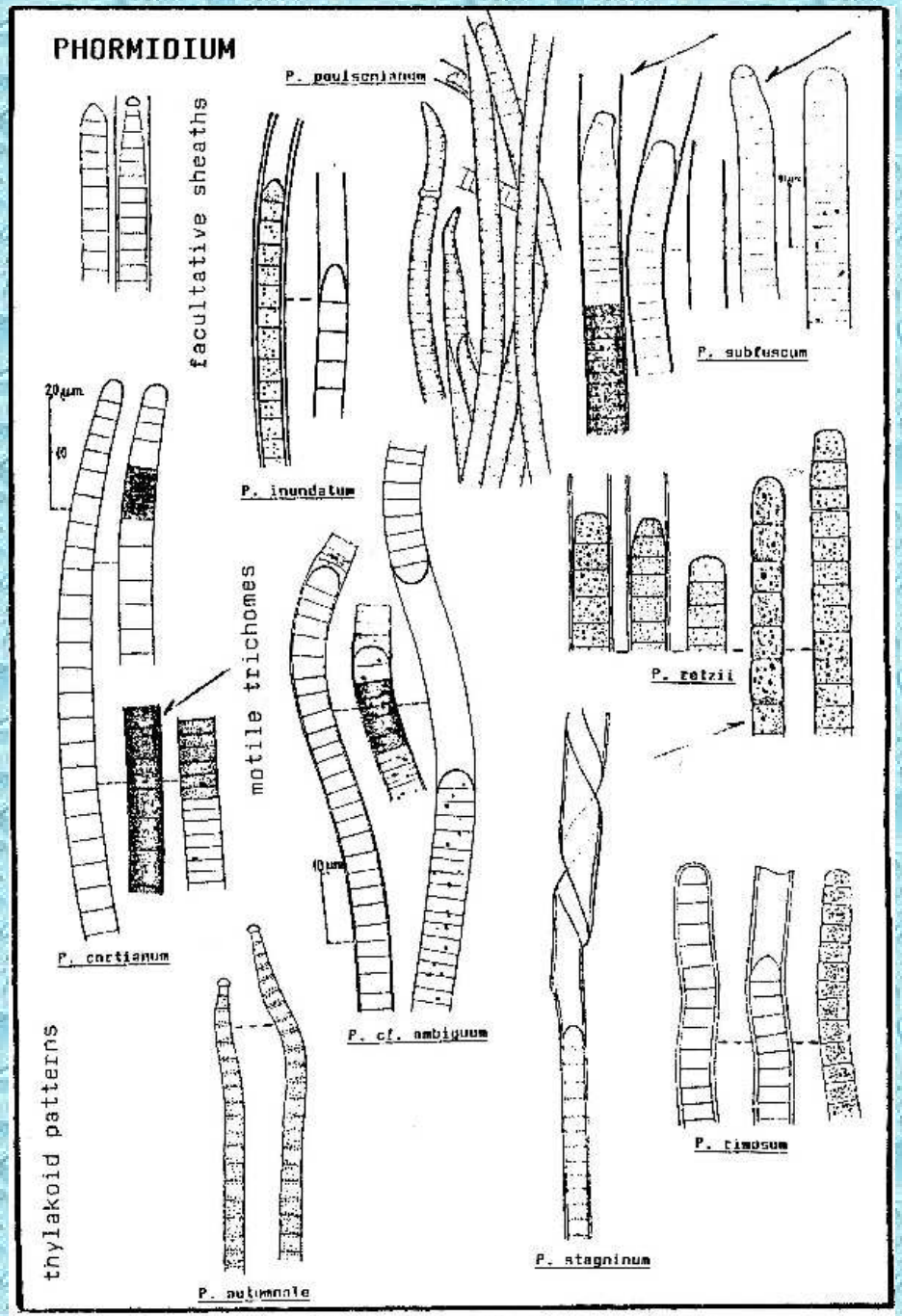


Family *Hyellaceae* *Genus* *Pleurocapsa*

Scheme of cell division

Family Pseudanabaenaceae





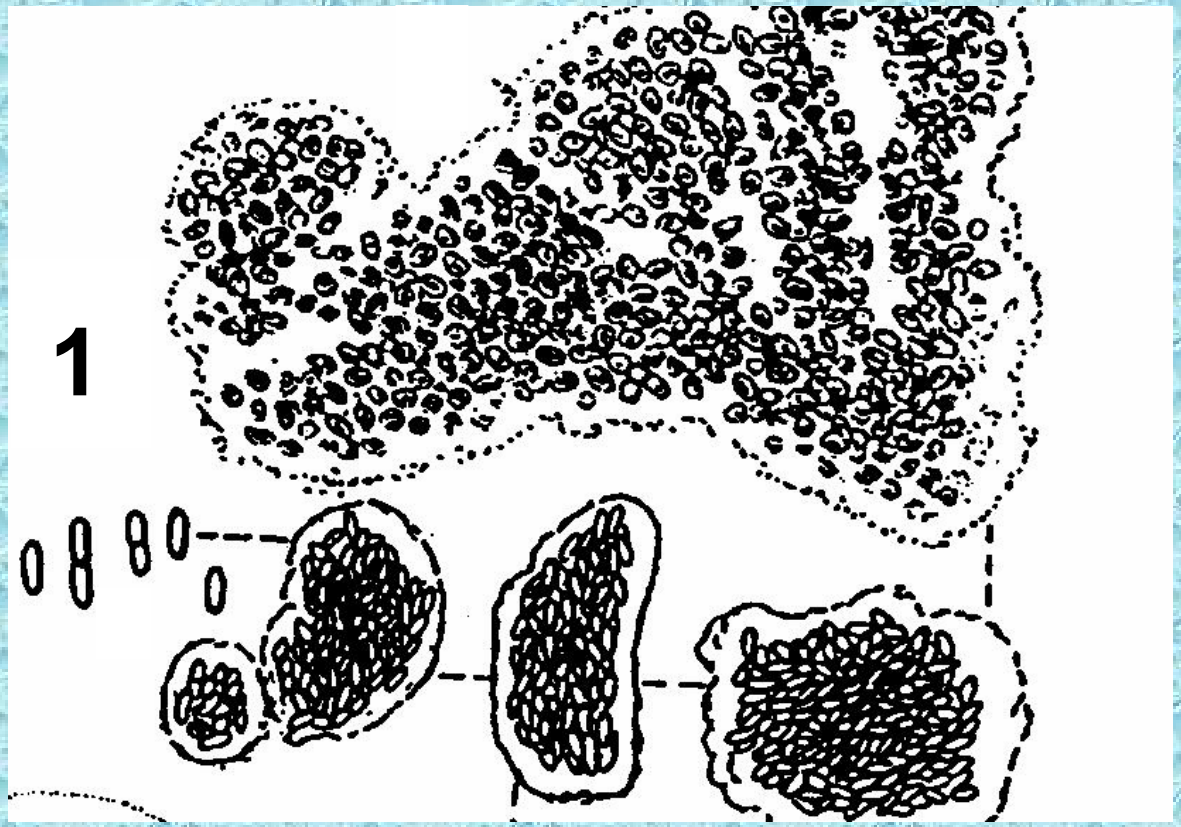
From Skuja ex Geitler (1932), different authors ex Kondrateva (1968) and Starmach (1966), Komárek (1956, 1975).

Family Phormidiaceae

- **Trichomes 4-14 µm wide**
- **Facultative sheaths**
- **Hormogonia by necridic cells**
- **Cells grow in original size before next division**
- **Radial position of thylakoids**

RESULTS & DISCUSSION

1. *Aphanothece floccosa* (Zalessky) Cronberg et Komárek



Description:

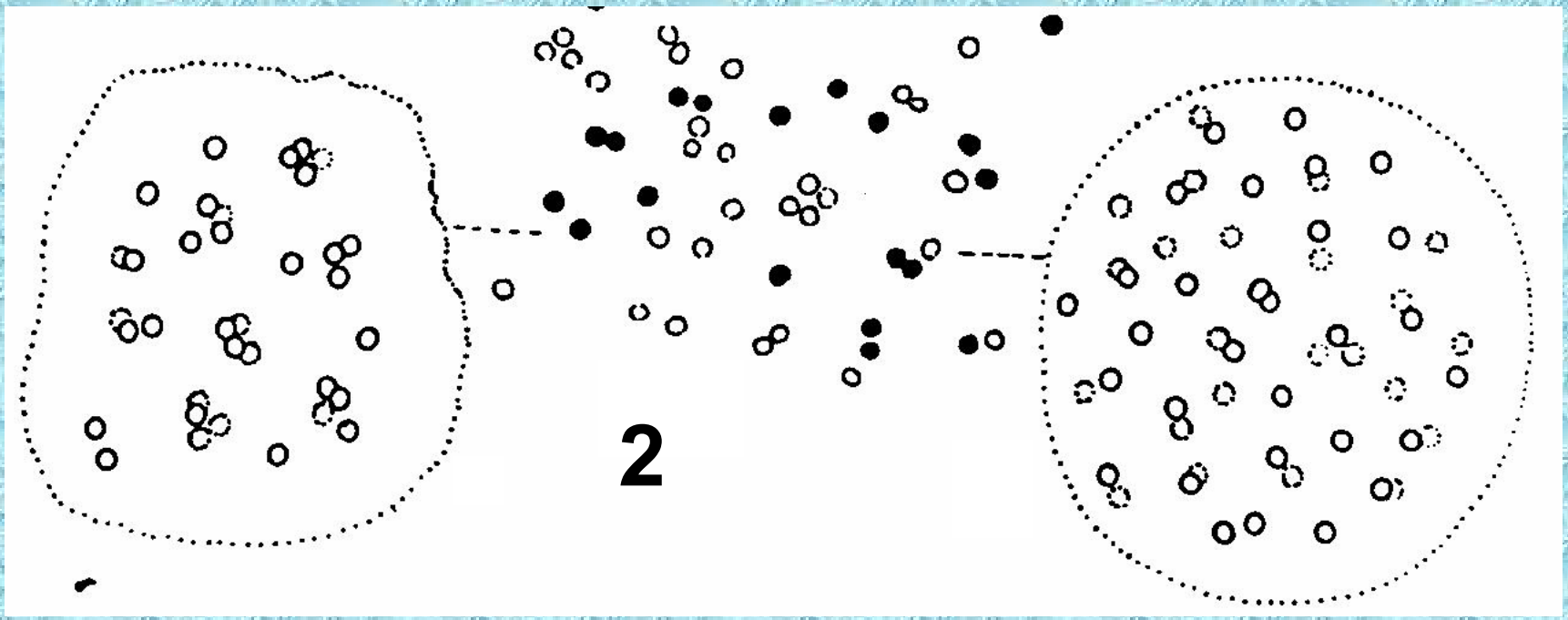
Clearly visible limited slime, not structured

Cells very densely aggregated in microscopic colonies

Cells thin, rod-shaped, (2)3-5 x 1-1.5 μm (l × w)

Locality: 22

2. *Aphanocapsa fonticola* Hansgirg

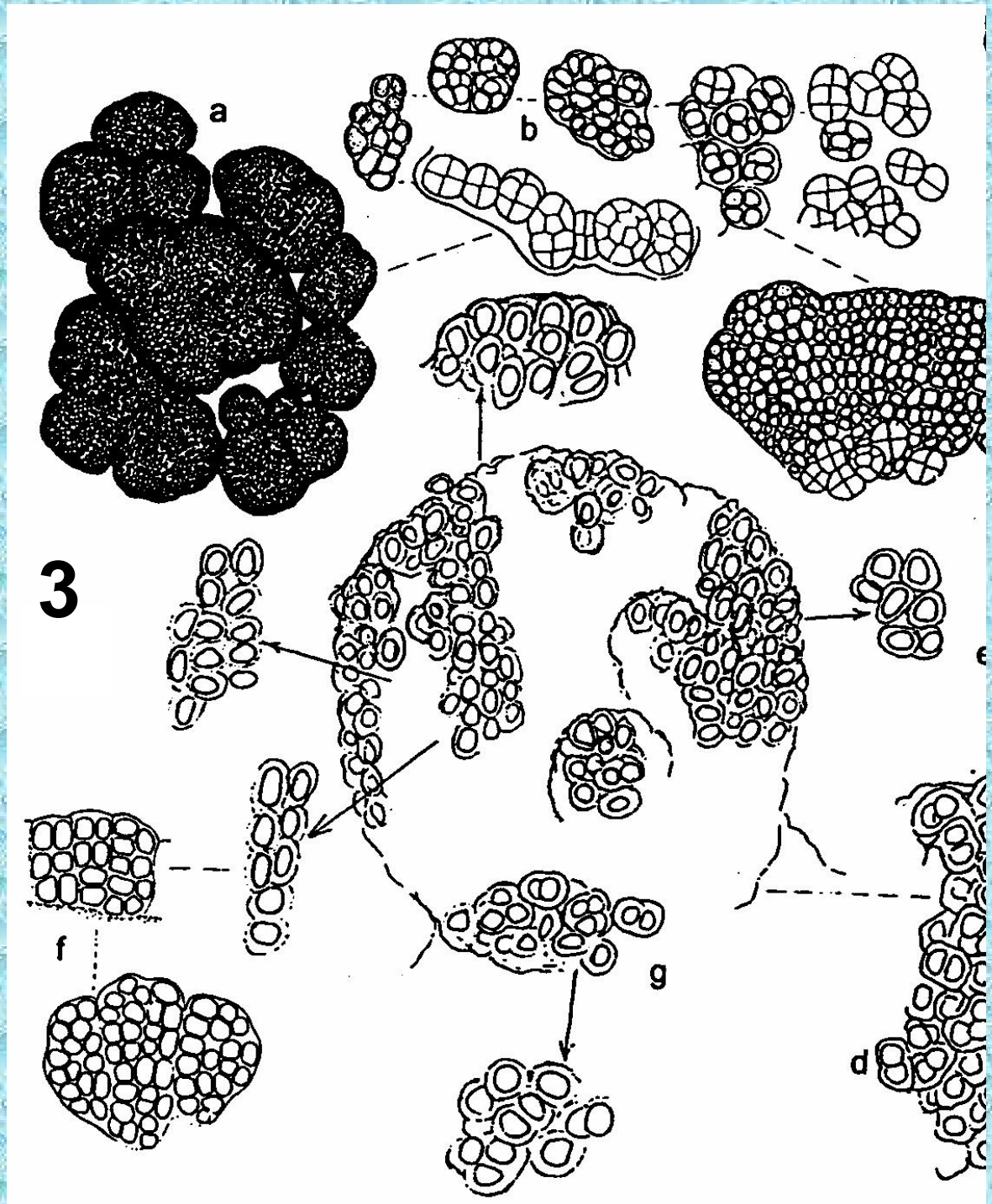


Description:

Microscopic colonies with delimited mucilage

Cells spherical, elongate before division, blue-green, 2.5 - 3 μm in diameter

Locality: 16



3. *Chlorogloea microcystoides* Geitler

Description:

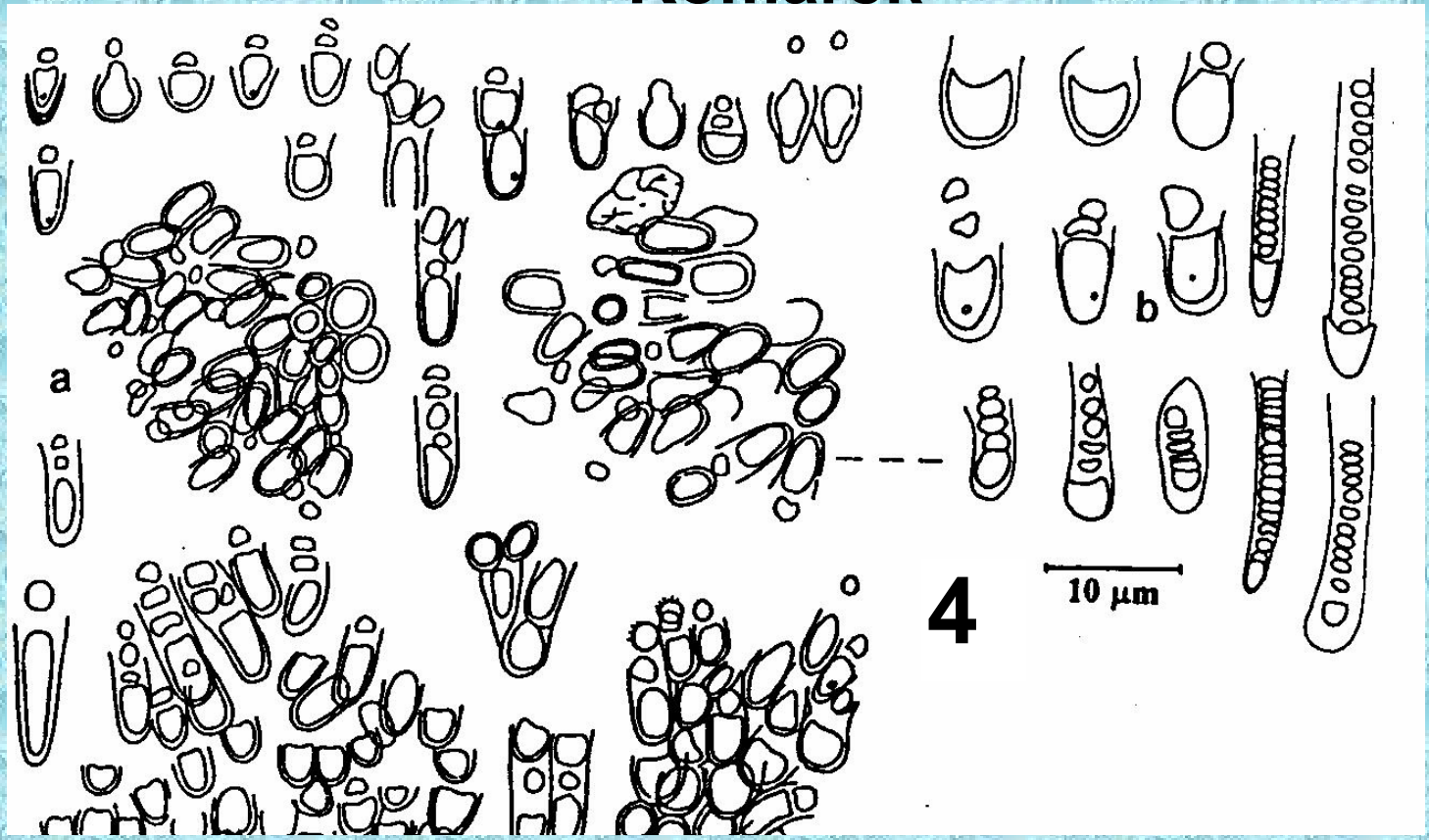
Clearly limited structured mucilage

Macroscopic clolonies with densely arranged cells

Cells spherical, ellipsoidal, polygonal, 2.5 - 4 μm in diameter

Locality: 35

4. *Stichosiphon pseudopolymorphus* (Fritsch) Komárek



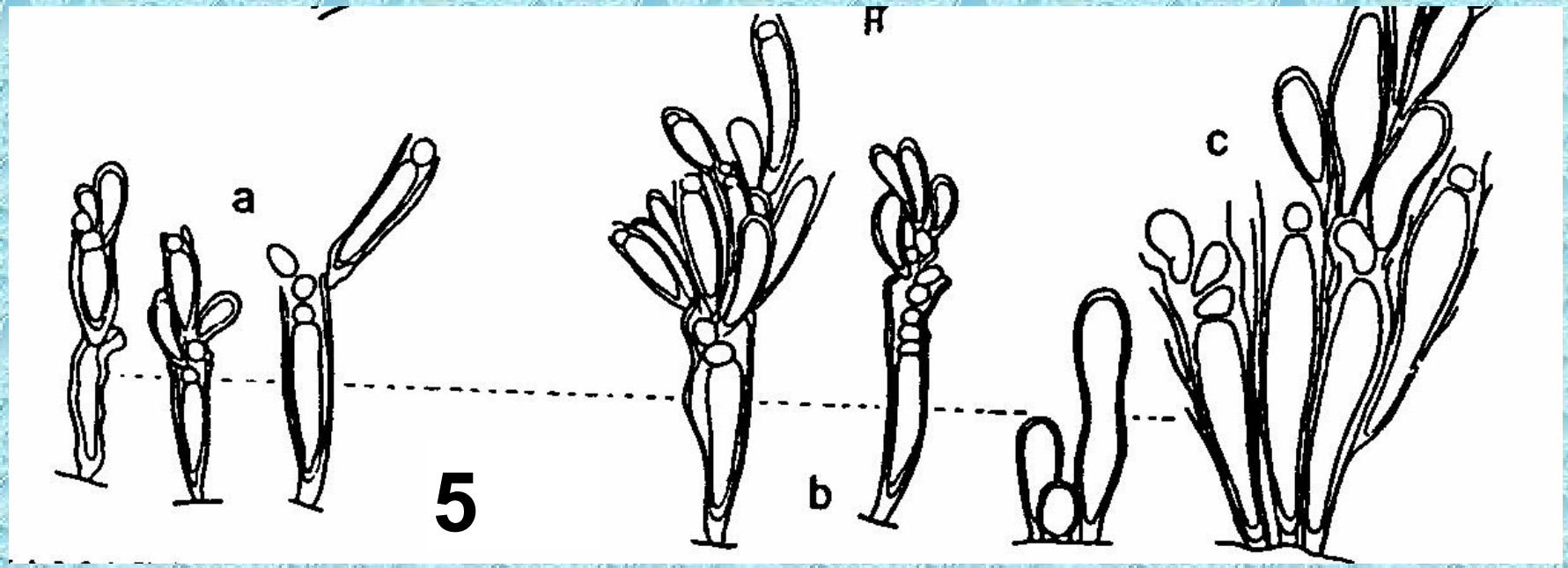
Description:

Micro- or macroscopic colonies visible as brownish spots on the surface

Cells individual or in short rows, basal cells ellipsoidal, exocytes spherical, subspherical, (5)8-10 × (2.5)5-8 µm

Locality: 33

5. *Chamaesiphon carpaticus* Starmach



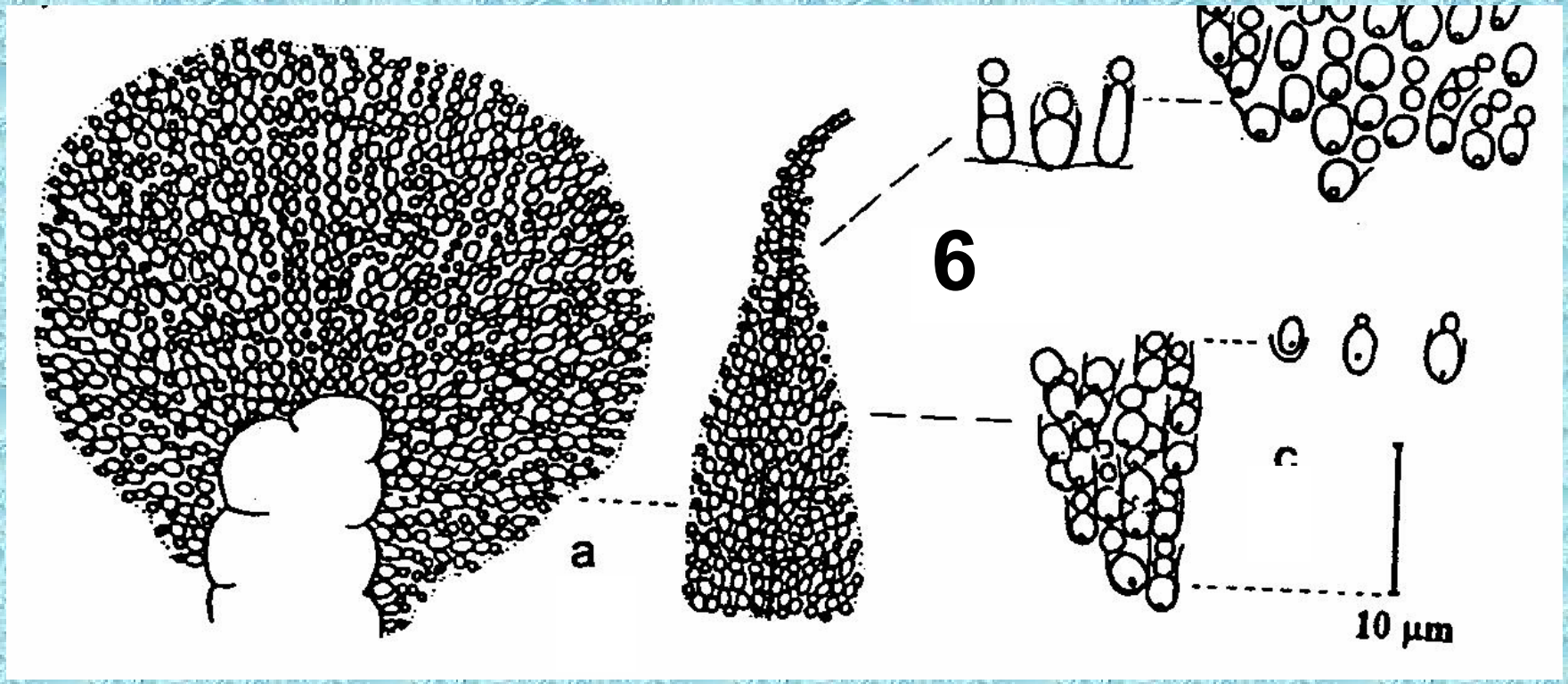
Description:

Microscopic shrub-like colonies

Cells narrow club-shaped, straight, narrowed at the base, 10-25 × (2.5)3-5(6) μm

Locality: 36

6. *Chamaesiphon oncobyrsoides* Geitler



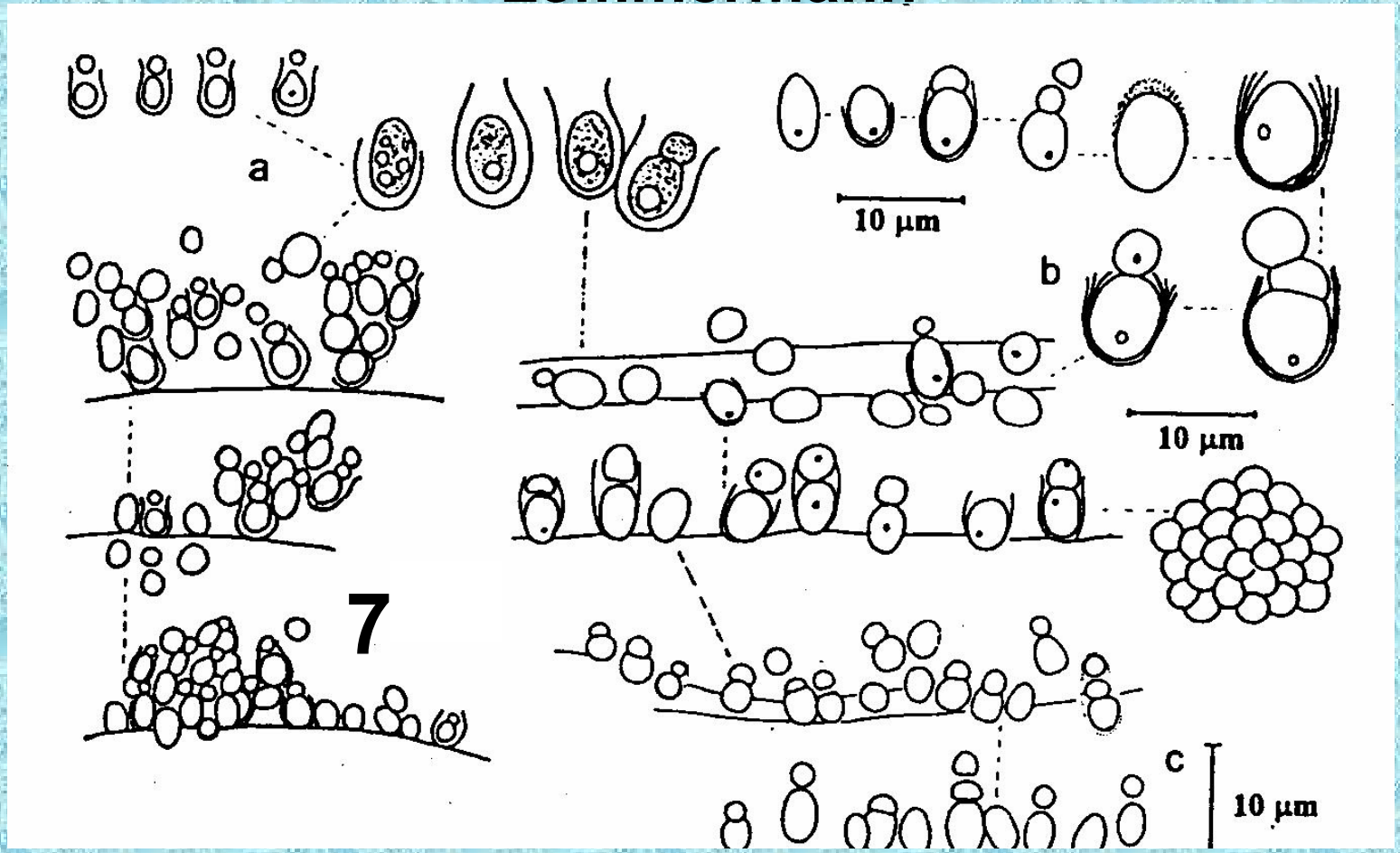
Description:

Microscopic clonies spherical or hemispherical, sincolor

Cells oval, ellipsoidal, paralelly arranged in rows, 2.5-5 x 2-3(3.5) µm

Localities: 34, 24, 12, 31

7. *Chamaesiphon subglobosus* (Rostafinski) Lemmermann



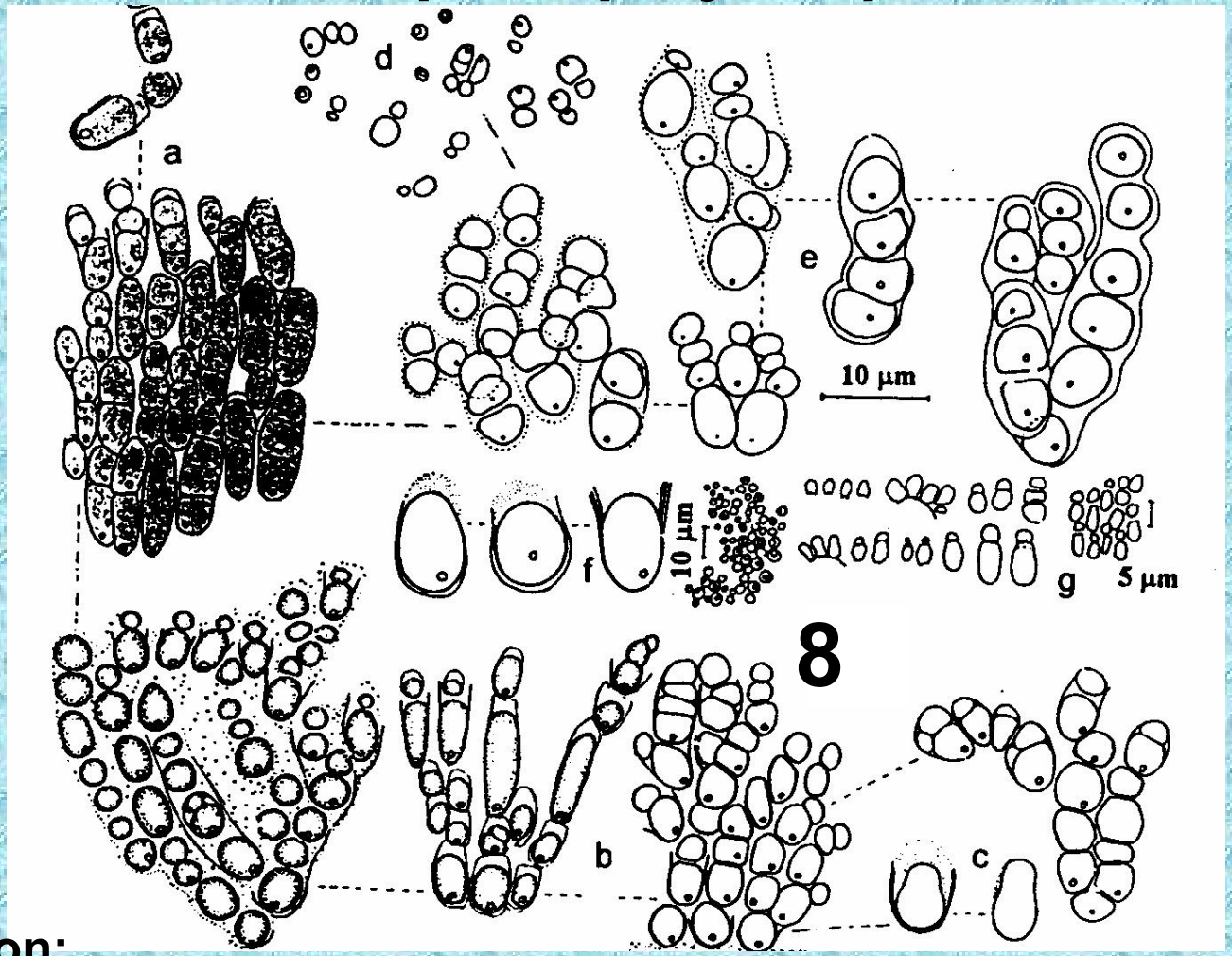
Description:

Mikroskopic colonies later 3- or more-layered

Cells spherical,ovoid to oval, (2)3-7.5 × 2-3.5(4) µm

Localities: 25, 21

8. *Chamaesiphon polymorphus* Geitler



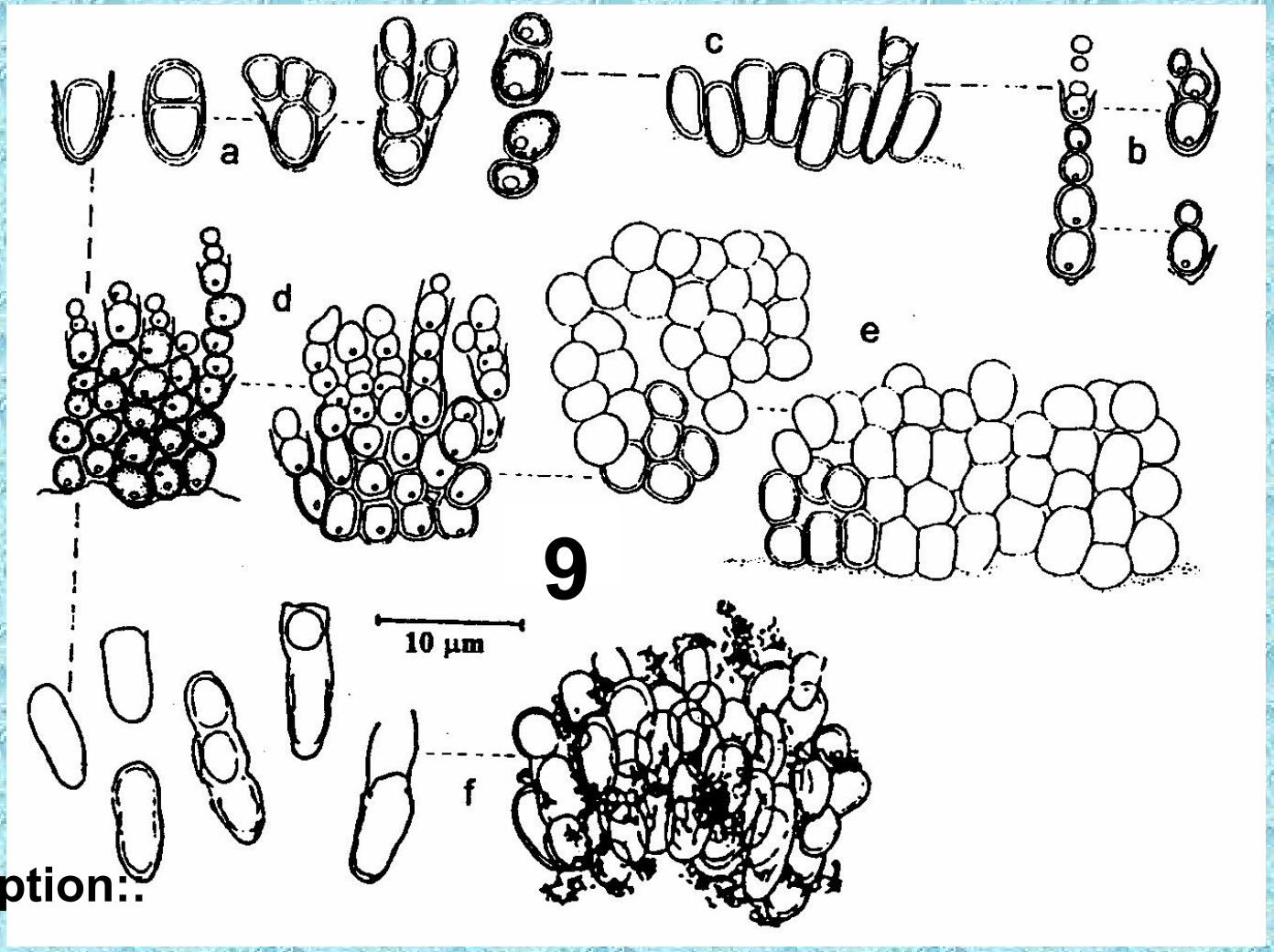
Description:

Micro- or macroscopic colonies visieble as violet spots

Cells oval, ellipsoidal, pear-shaped to cylindrical, 2.5-7.5(8) × 3-5 µm

Localities: 13, 20, 18

9. *Chamaesiphon polonicus* (Rostafinski) Hansgirg



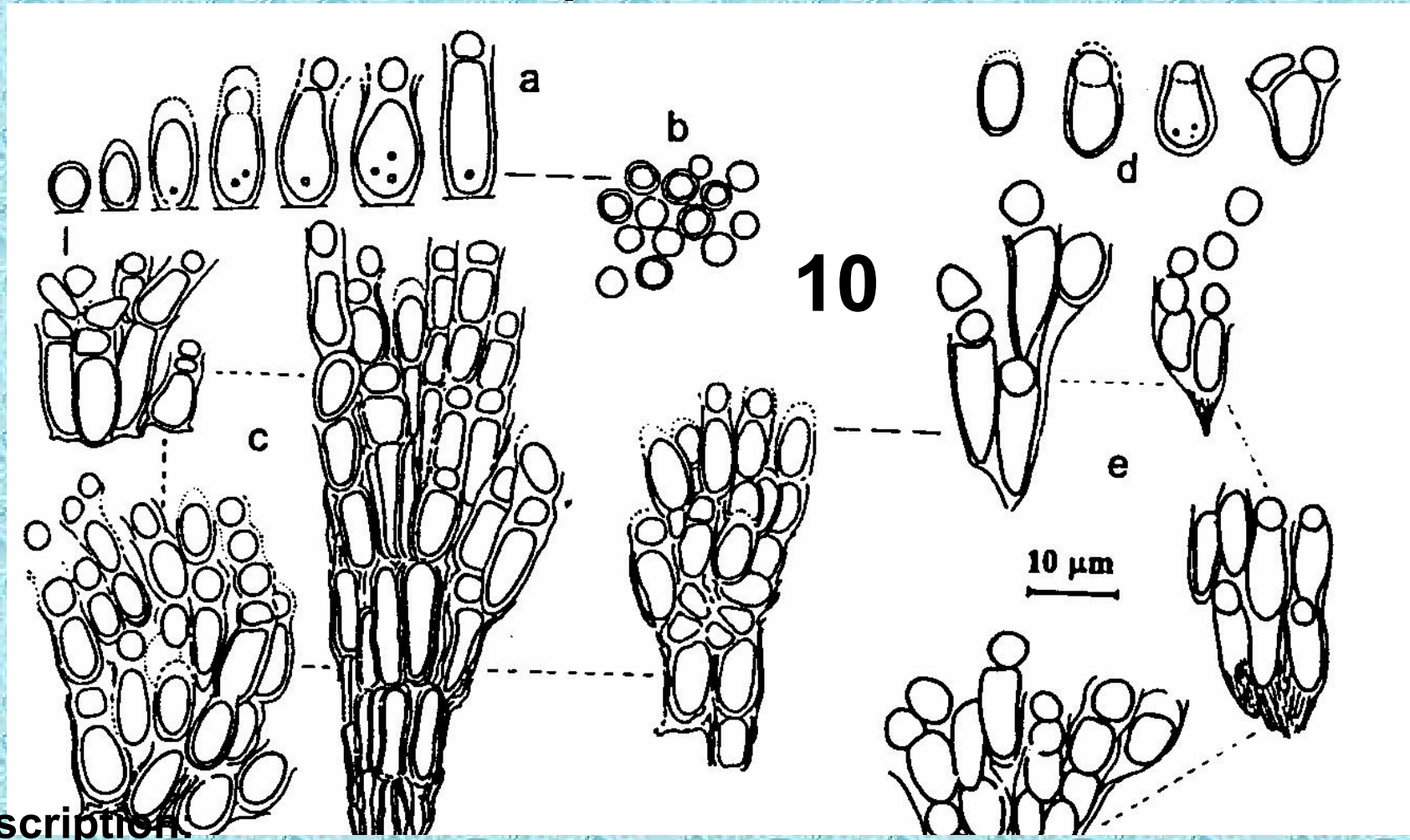
Description::

Macroscopic colonies, flat, thin, rusty, yellow-orange spots

Cells spherical, later ellipsoidal or oval, (5)6-8(10.5) × 3-7(8) µm

Locality: 16

10. *Chamaesiphon starmachii* Kann



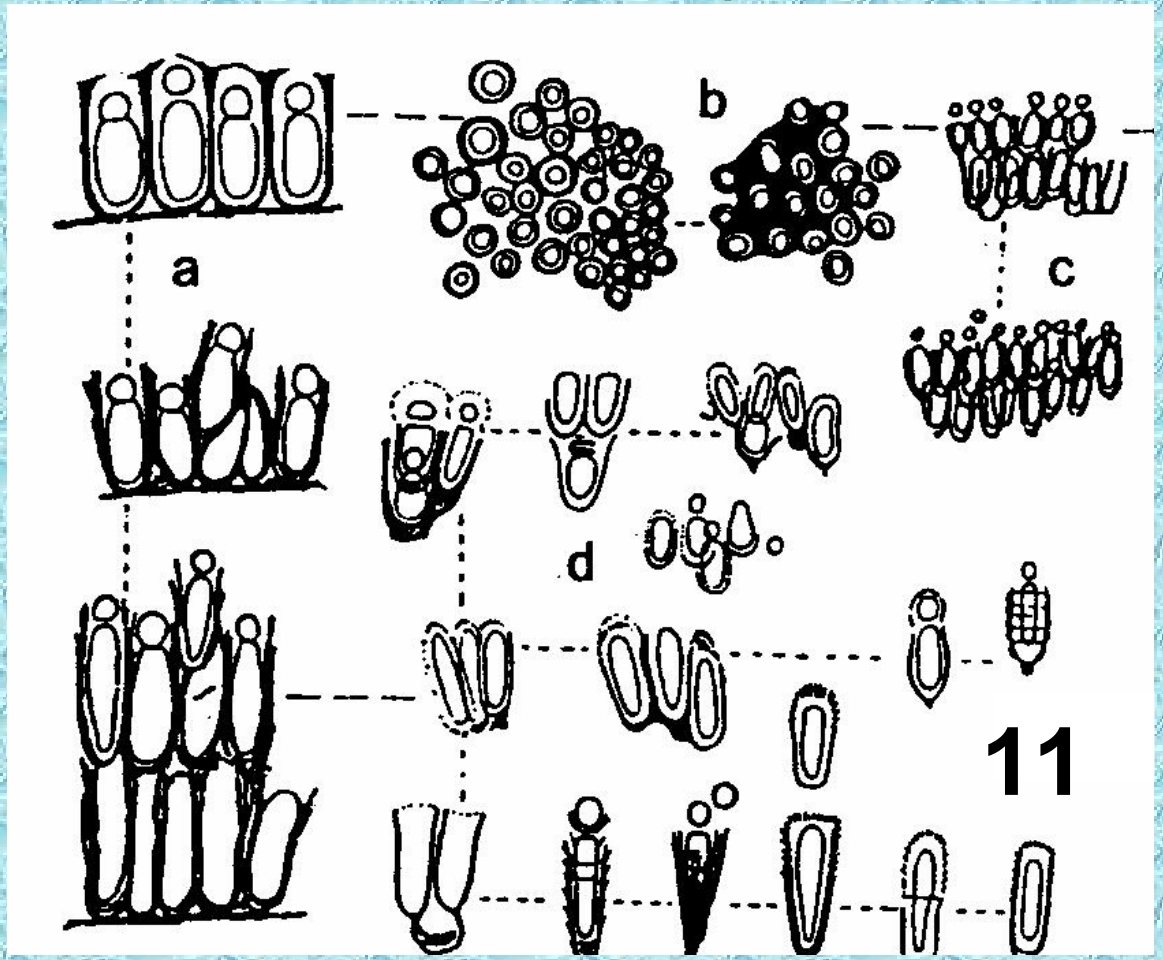
Description:

Makroscopic colonies forming dark-brown spots on stones

Cells ellipsoidal, ovate, pear-shaped in 2-12 layers, 5-15 × 4-7.5 µm

Locality: 30

11. *Chamaesiphon fuscus* (Rostafinski) Hansgirg



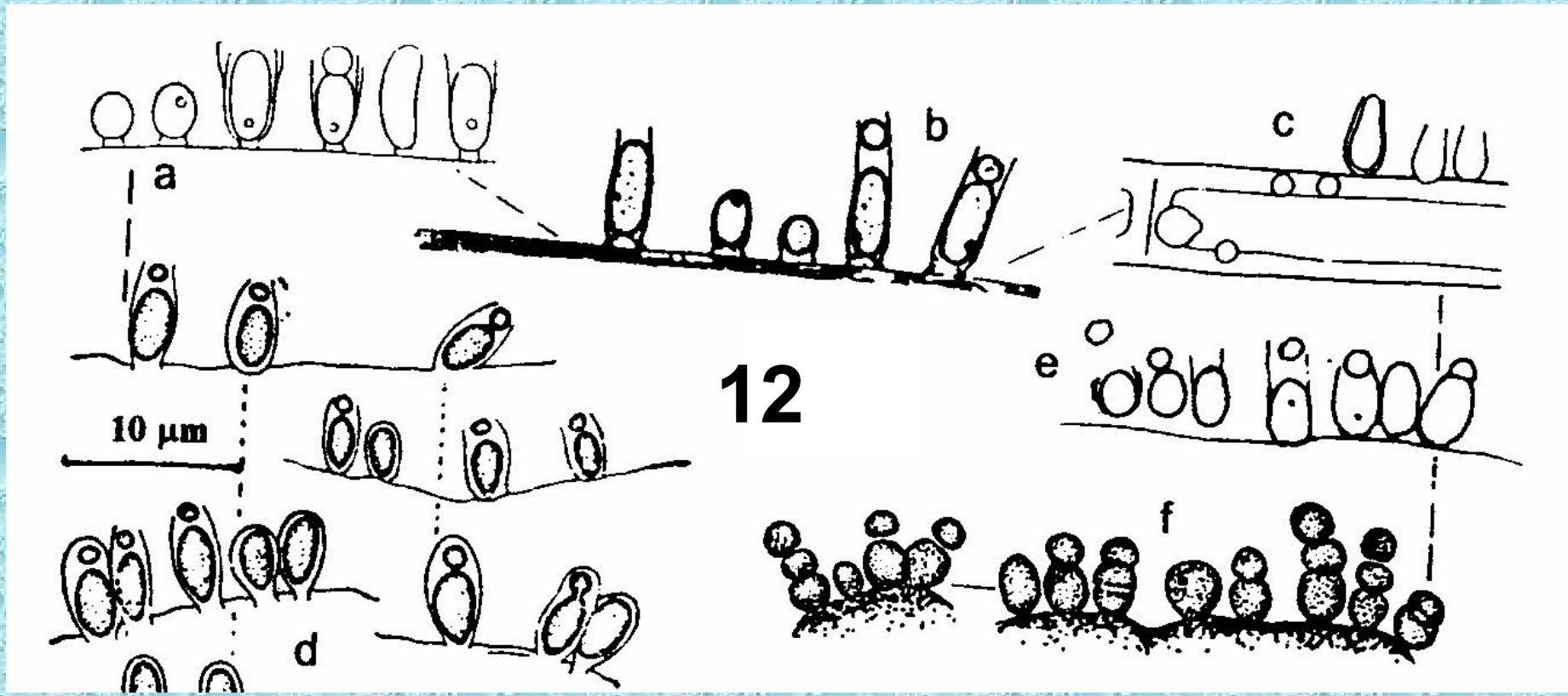
Description:

Macroscopic colonies, irregular in outline black spots on stones

Cells club-shaped, rarely oval, 5-12.5 × (2.5)3-7.5 μm

Locality: 5

12. *Chamaesiphon minutus* (Rostafinski) Lemmermann

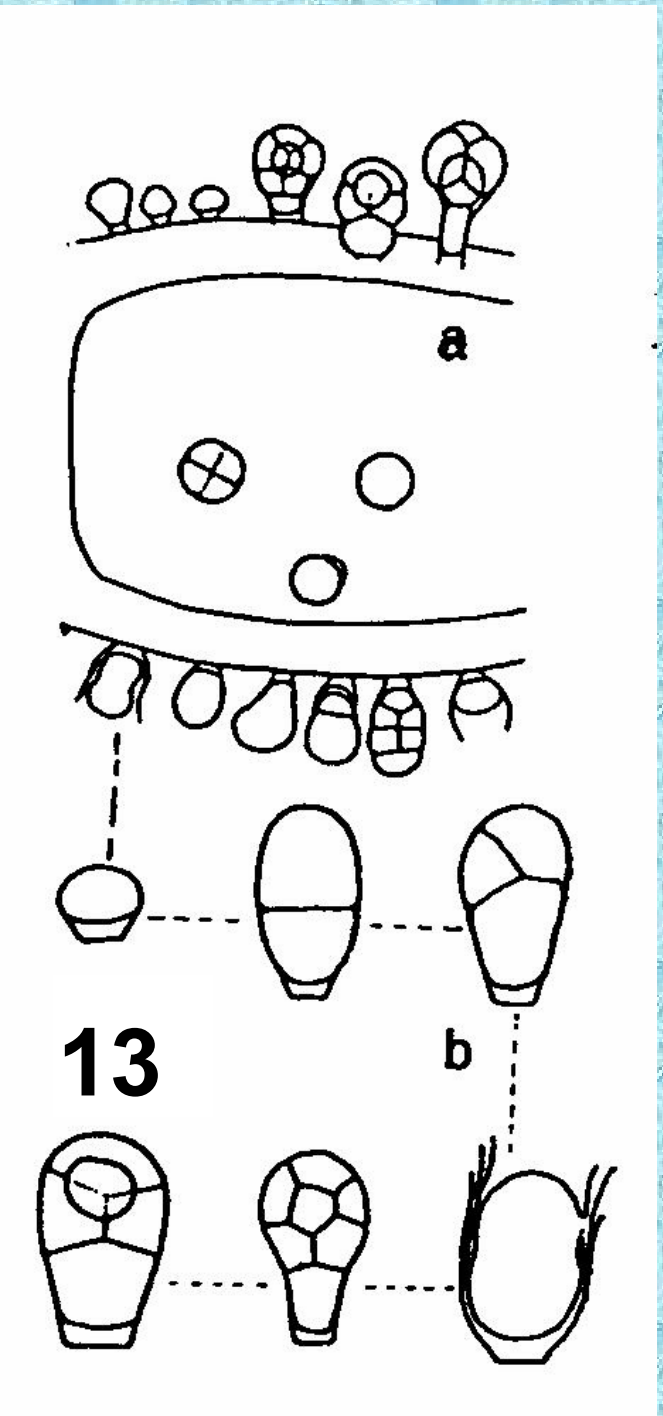


Description:

Microscopic clononies, all attached separately to the substrate

Cells ovate, oval, 3-6.5(7.5) × 1.5-3(4) μm

Localities: 29, 11, 9, 4



13. *Chamaecalyx chamaesiphonoides* (Geitler) Komárek et Anagnostidis

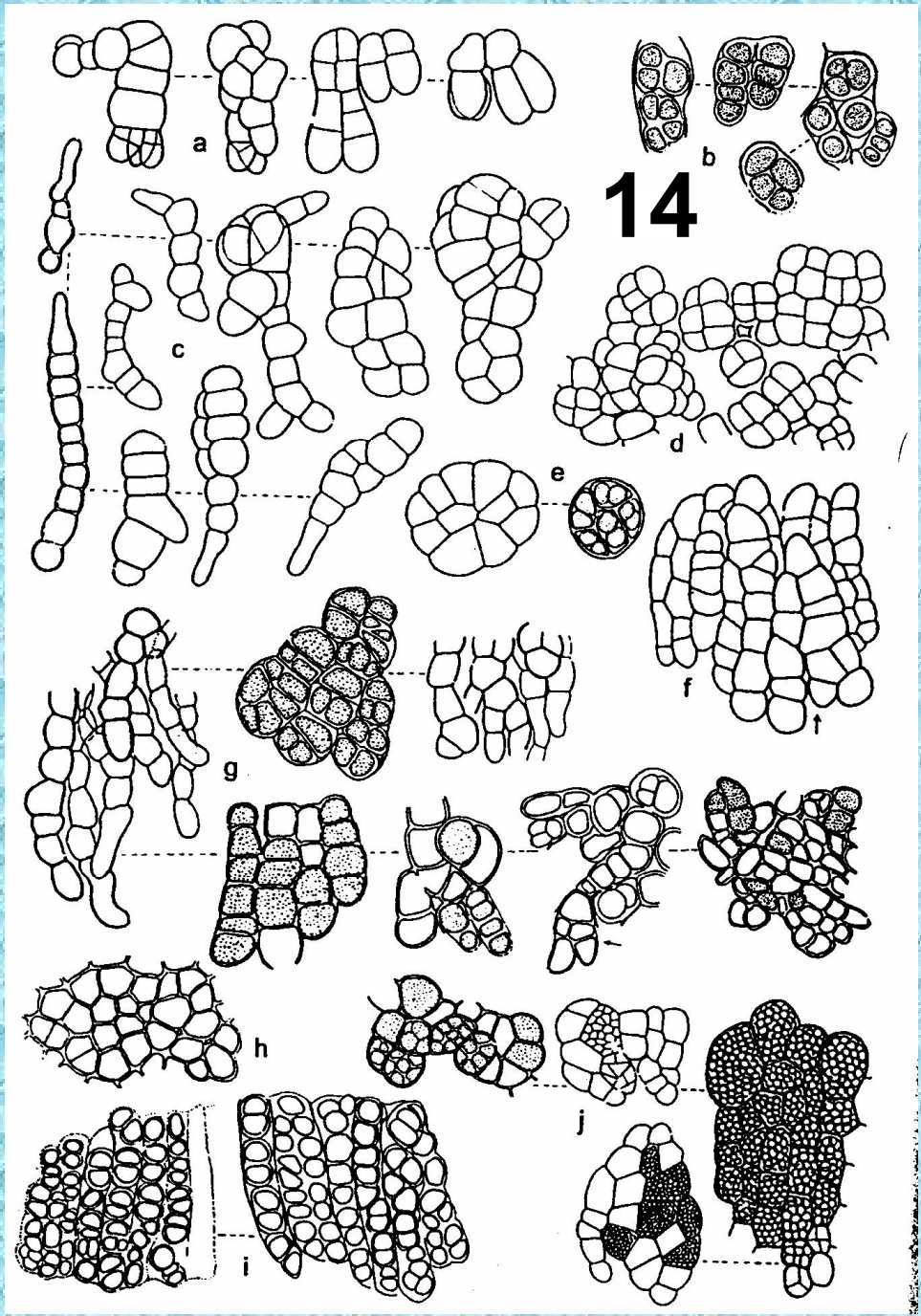
Description:

Miktosvopic colonies, all attached separately to the substrata

Cells heteropolar, attached to the substrate by the narrower part solitary, 5-10.5 × 7-8 μm

Baeocytes 6-8 numbered, differentiate from the upper, spherical part of the cell

Locality: 1



14. *Pleurocapsa minor* Hansgirg

Description:

Microscopic colonies forming flat aggregations or parenchymatous layers

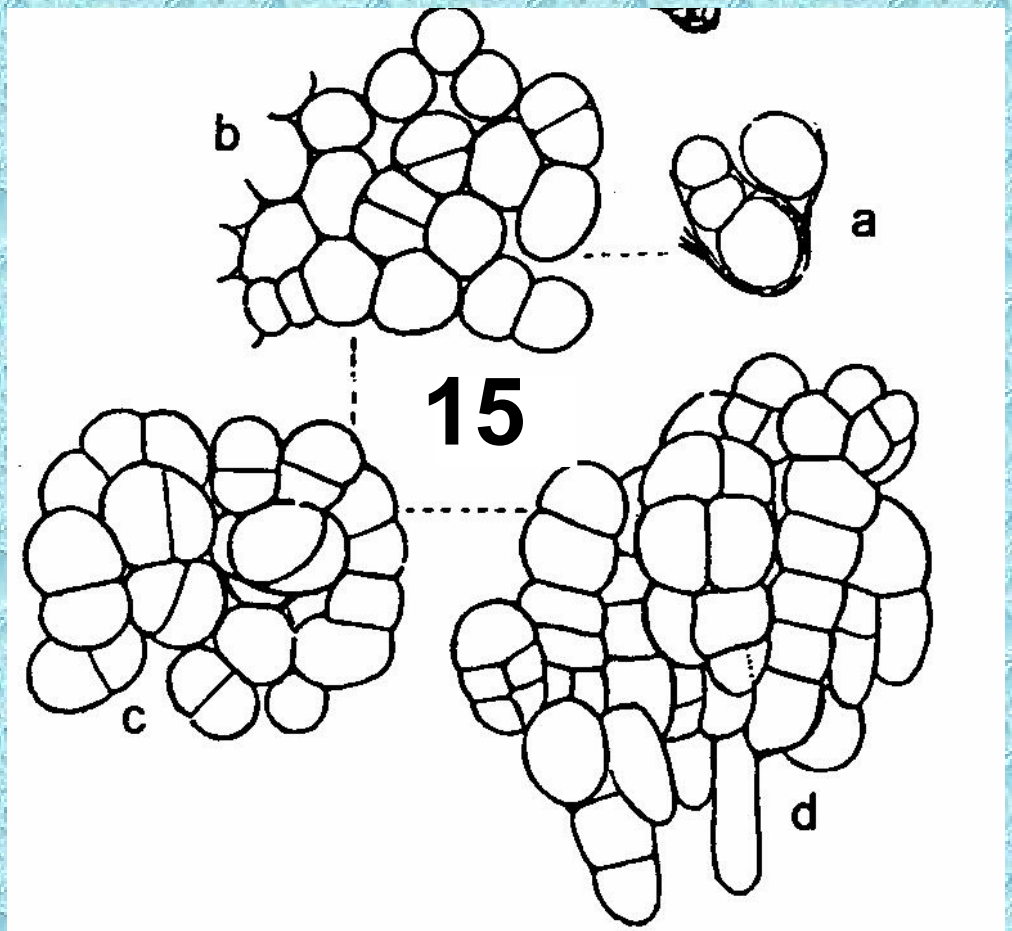
Pseudofilaments 3-10 μm wide

Cells barrel-shaped to polygonal rounded, 2.5-12.5 μm in diameter

Sheaths firm, thin, colourless

Localities: 36, 17, 7, 33, 4

15. *Pleurocapsa aurantiaca* Geitler



Description:

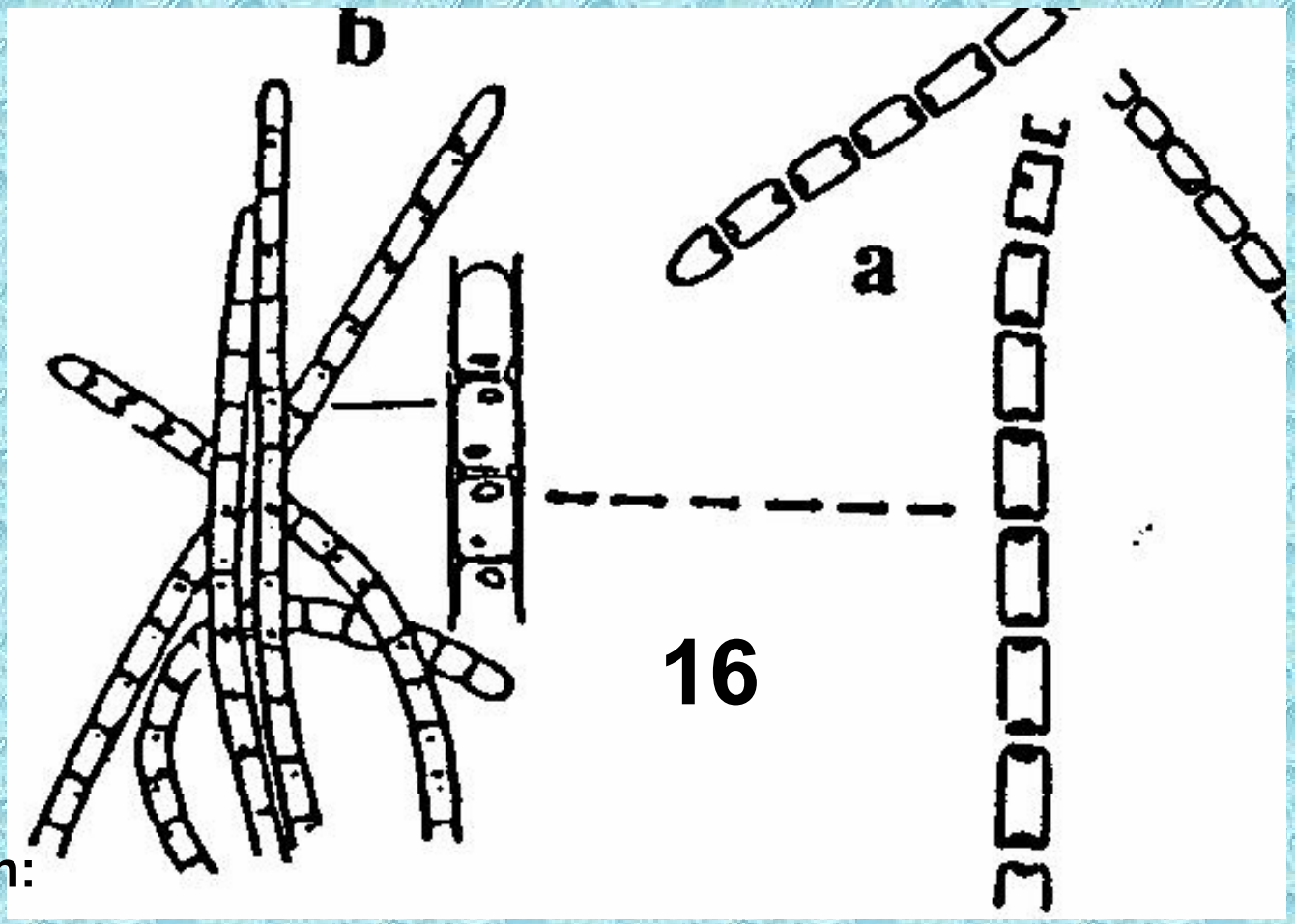
Macroscopic, flat colonies, forming reddish brown or yellow-brown crustose spots on stones, 30-80 μm thick

Cells spherical, barrel-shaped to polygonal, 5-10 μ m in diameter

Sheaths thin or thick, orrange-yellow to reddish brown

Locality: 28

16. *Pseudanabaena frigida* (Fritsch) Anagnostidis



Description:

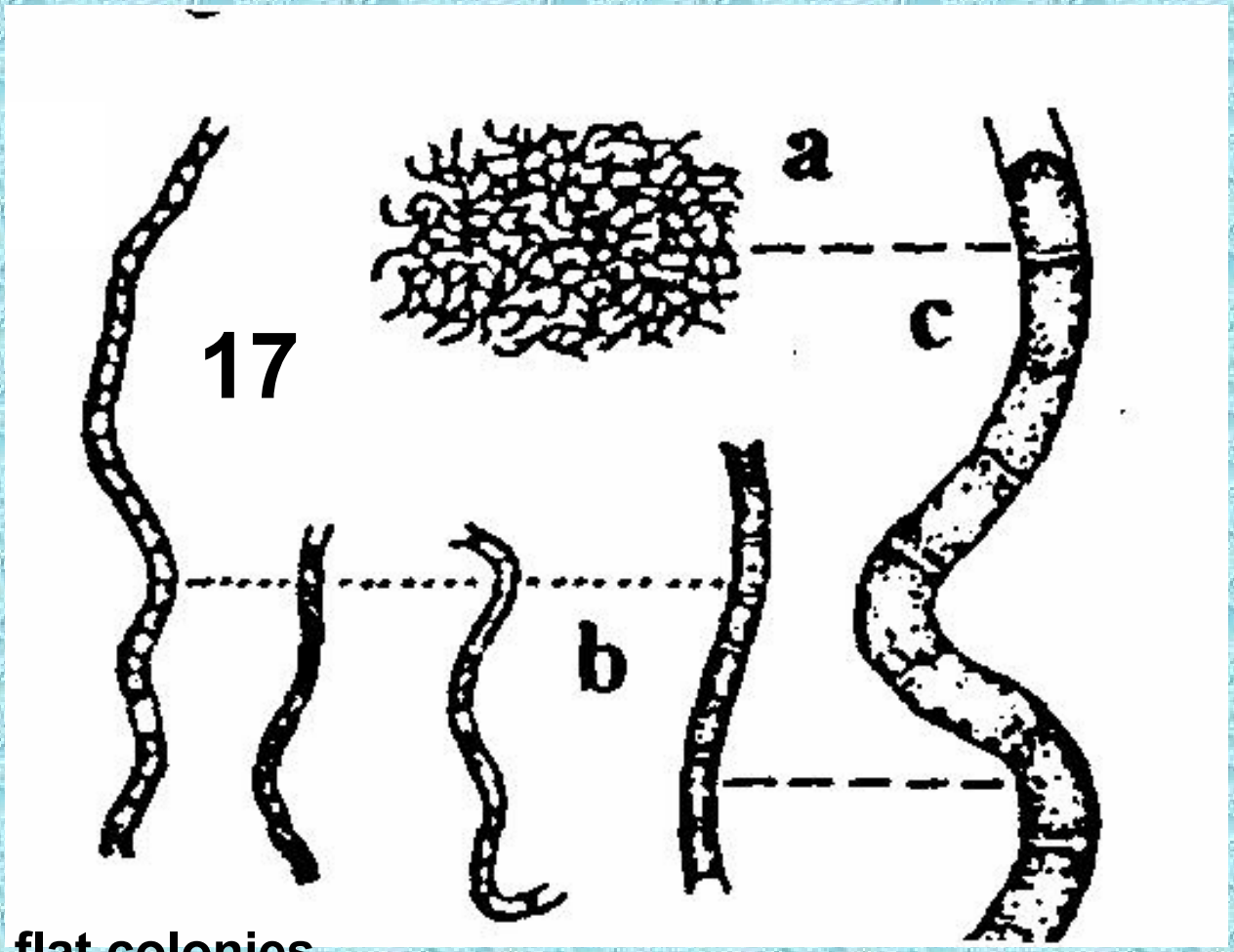
Macroscopic, flat, brittle colonies

Trichomes waved, sometimes paralelly formed, 1-1.5 μm wide, with slimy sheath, by cross-walls constricted

Cells ovate, apical cell conical withouth caltyptra

Locality: 4

17. *Leptolyngbya undosa* (Čado) Anagnostidis et Komárek



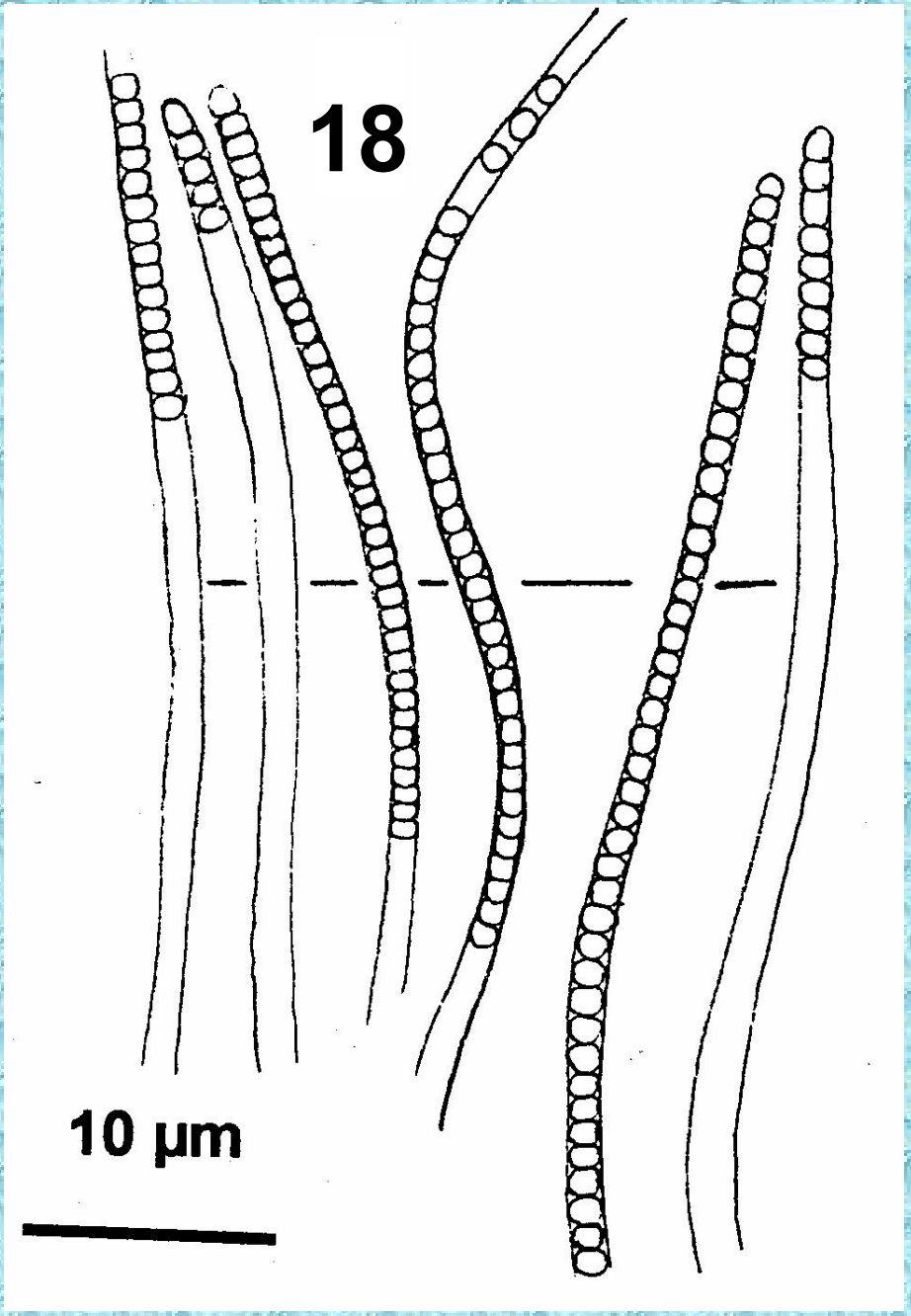
Description:

Microscopic flat colonies

Trichomes waved, entangled, 2.5 μ m wide, with thin sheath, by cross-walls not constricted

Cells ±3 μ m long, cylindrical, apical cell rounded without calyptra

Locality: 6



18. *Leptolyngbya olivacea* (Kützing ex Hansgirg) Anagnostidis

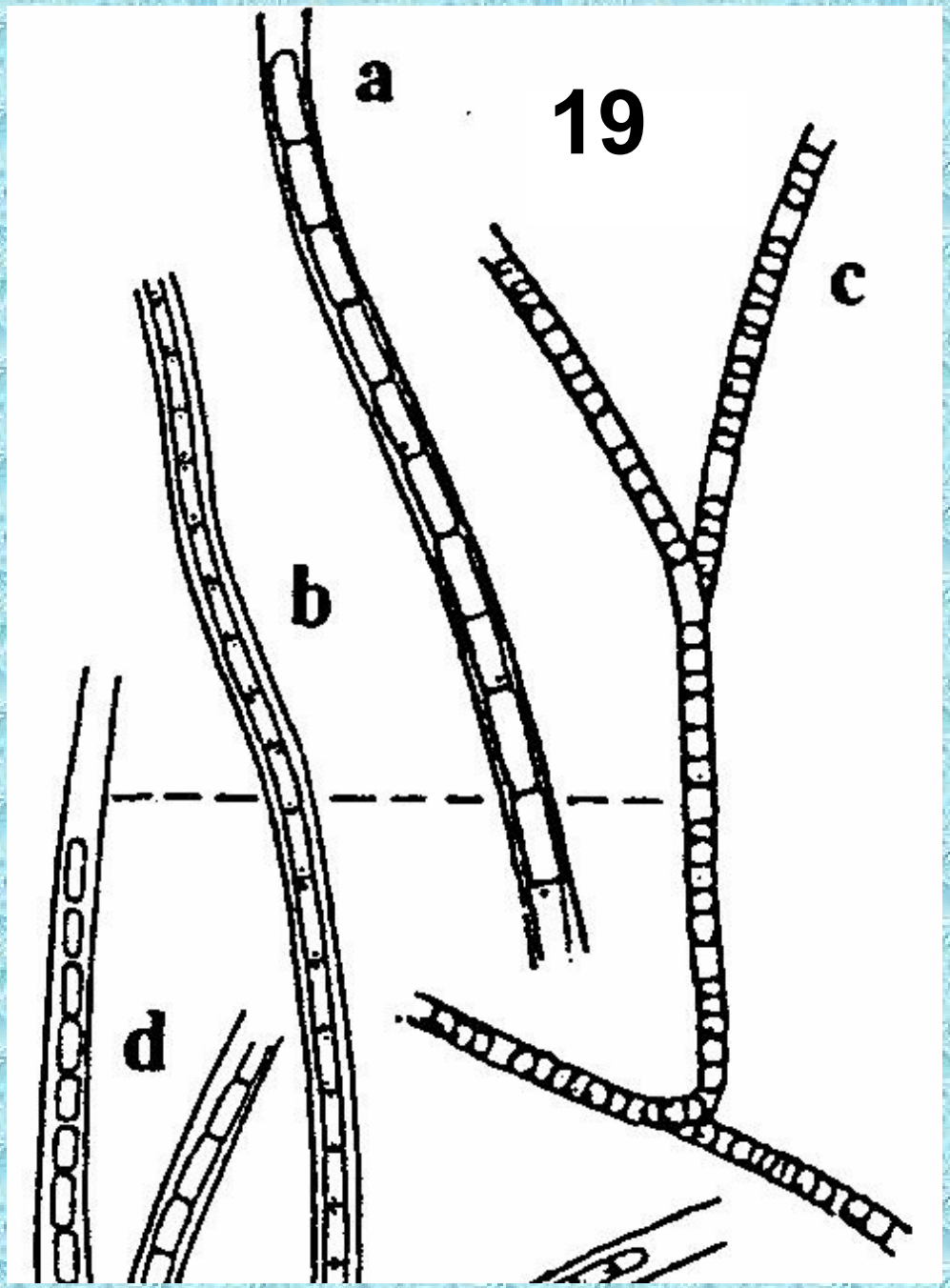
Description:

Macroscopic, brittle, flat colonies forming biofilms

Trichomes entangled, 1-2 µm wide, with thin sheath, by cross-walls not constricted

Cells isodiametric, apical cell rounded without calyptra

Localities: 15, 2, 19, 23, 26



19. *Leptolyngbya notata* (Schmidle) Anagnostidis

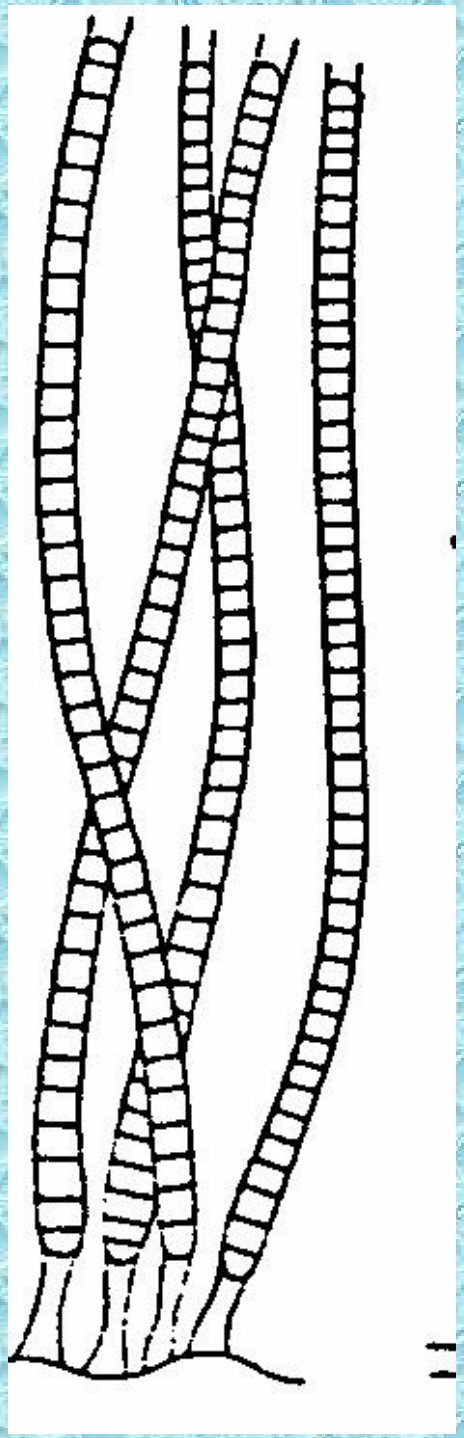
Description:

Microscopic colonies

Trichomes entangled, rarely pseudo-branched, 1.5-2 μ m wide, with thin colorless sheath, by cross-walls not constricted with 1-2 granules in protoplast

Cells cylindrical, 2-3-times longer than wide, apical cell rounded without calyptra

Localities: 8, 27, 3



20. *Heteroleibleinia fontana* (Hansgirg) Anagnostidis et Komárek

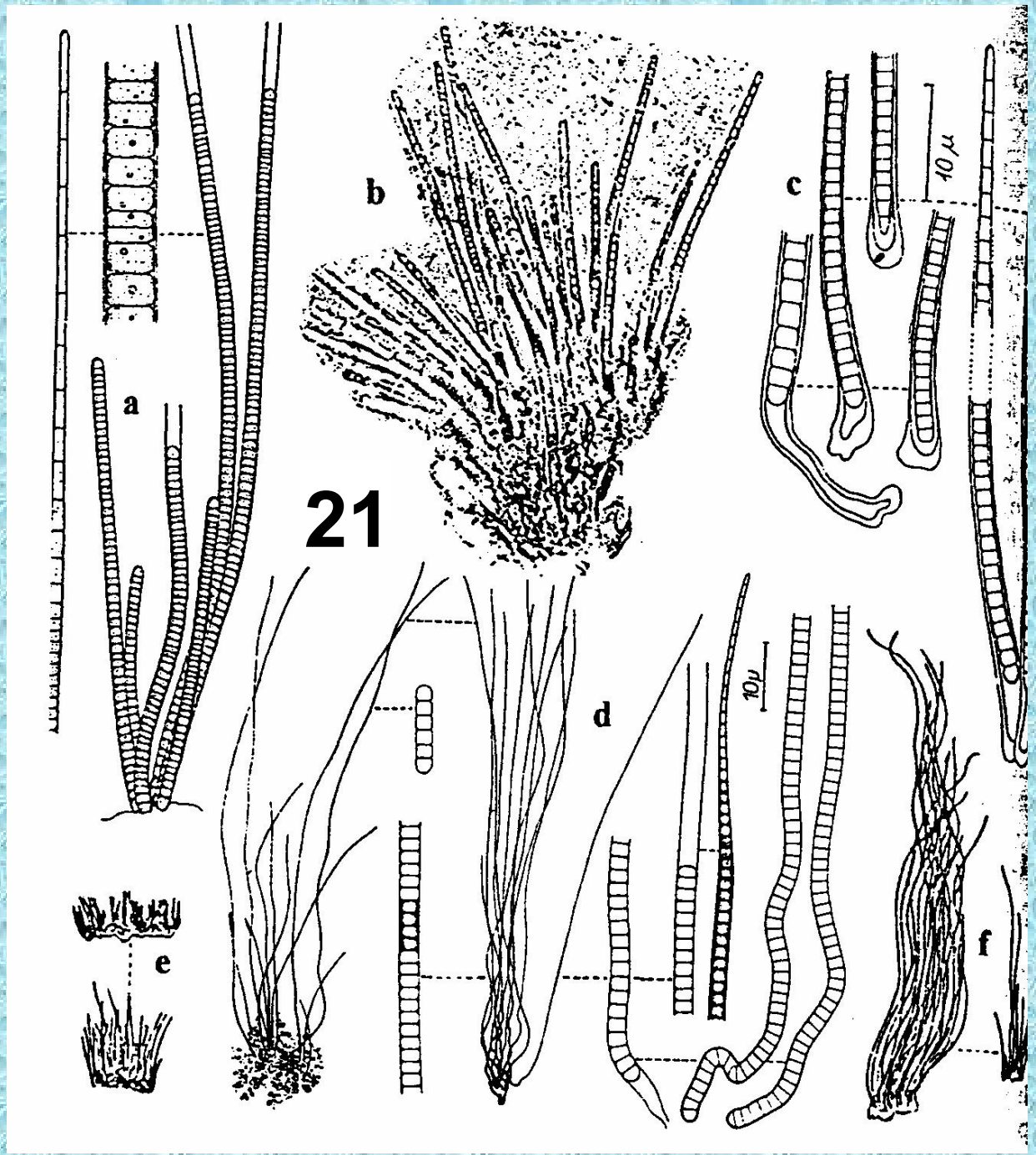
Description:

Filmaments attached by narrowed end to the substrate

Trichomes 2.5-3 μm wide, with thin sheath, by cross-walls not constricted

Cells isodiametric, apical cell rounded without calyptra

Locality: 1



21. *Homoeothrix varians* Geitler

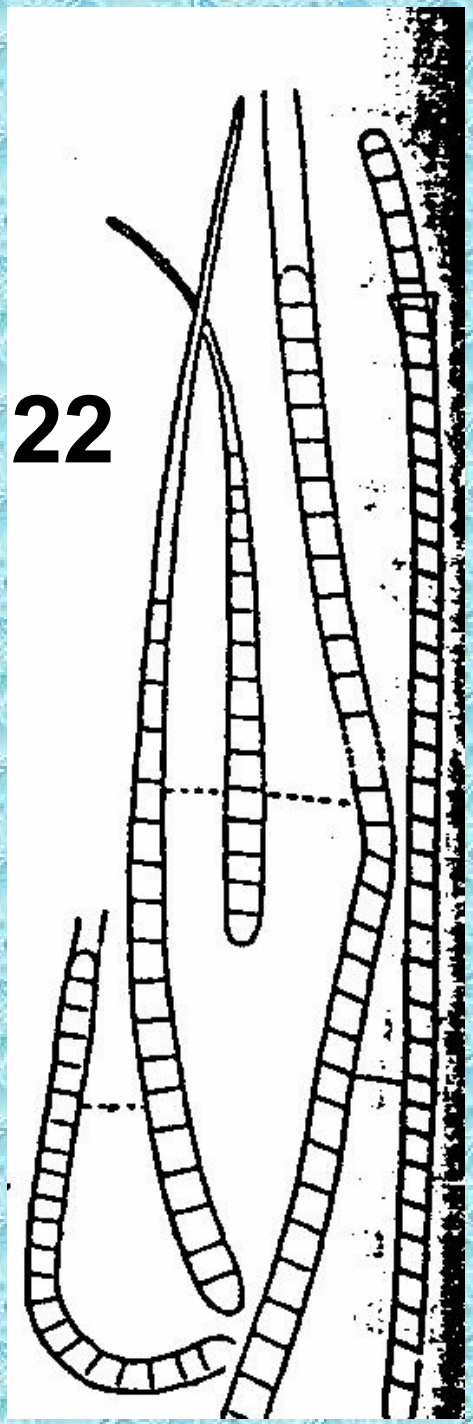
Description:

Filaments in aggregates and tufts, forming mucilaginous thallus up to 3 mm in diameter

Trichomes up to 3 μm wide, with thin sheath, by cross-walls not constricted

Cells disc-shaped, by the end of trichome prolonged and colorless

Locality: 10



22. *Homoeothrix rivularis* (Hansgirg) Komárek et Kann

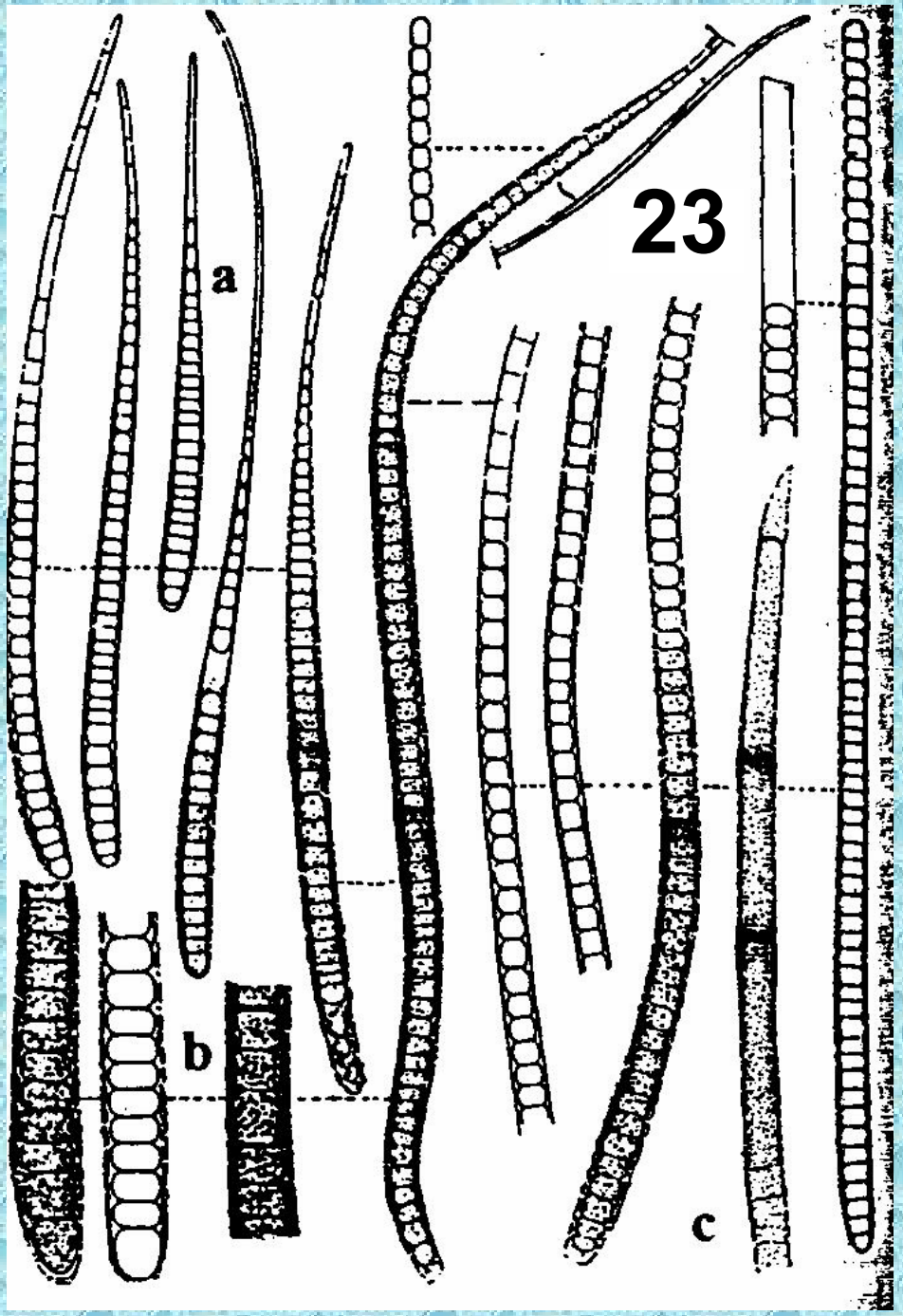
Description:

Filaments forming small colonies, sometimes tufts, black when dried

Trichomes short up to 20 μm long a 4,5 μm in diameter, with thin sheath, by cross-walls not constricted

Cells isodiametric, at the end of trichome prolonged and colorless

Locality: 22



23. *Homoeothrix gracilis* (Hansgirg) Komárek et Kováčik

Description:

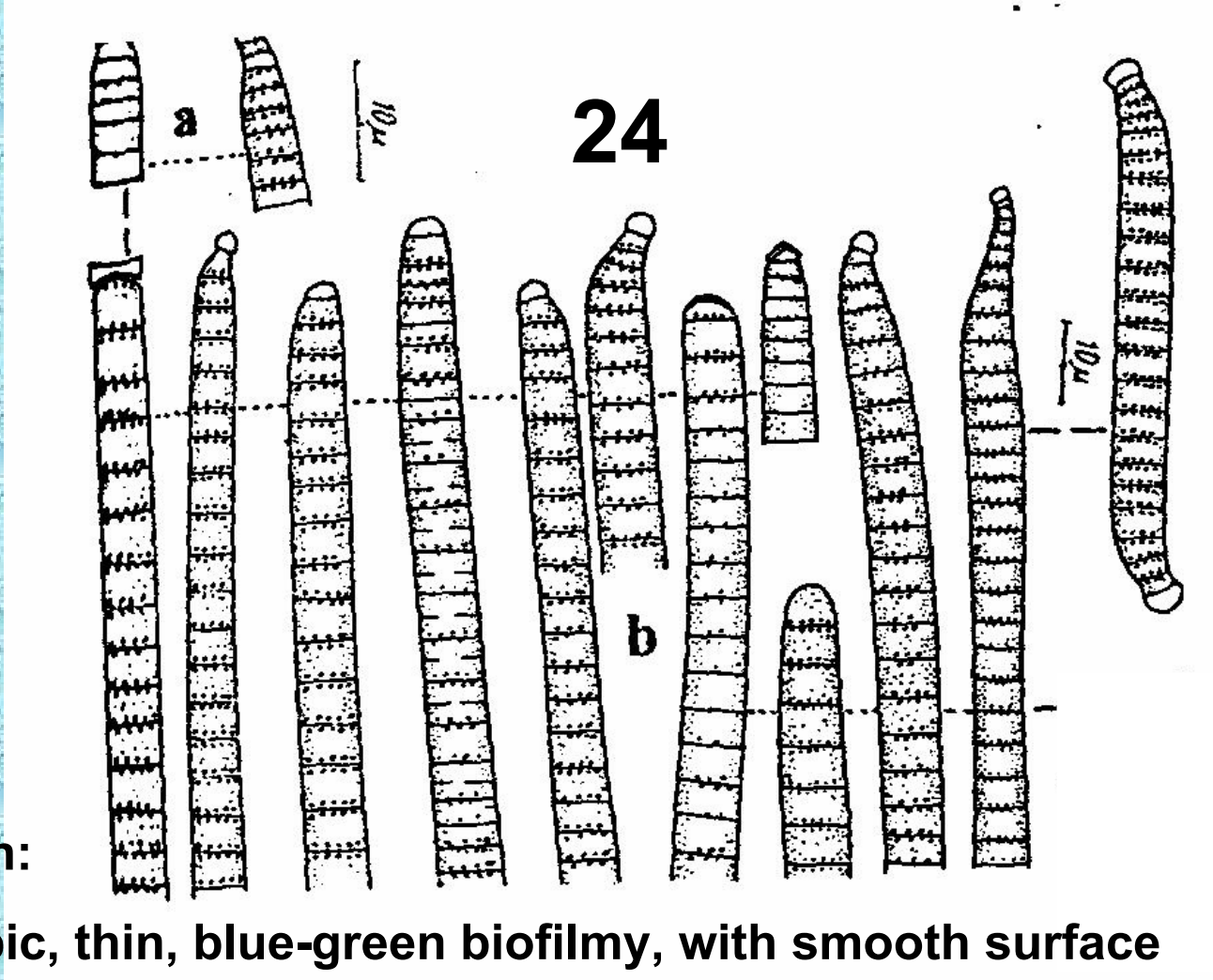
Trichomes bunched, forming macroscopic brownish, crustose, up to 0.5 mm thick layers

Trichomes 3-6 μm wide, with thin brownish sheath, by cross-walls constricted

Cells isodiametric, at the and of trichome prolonged and colorless

Locality: 13

24. *Phormidium fonticolum* Kützing ex Gomont



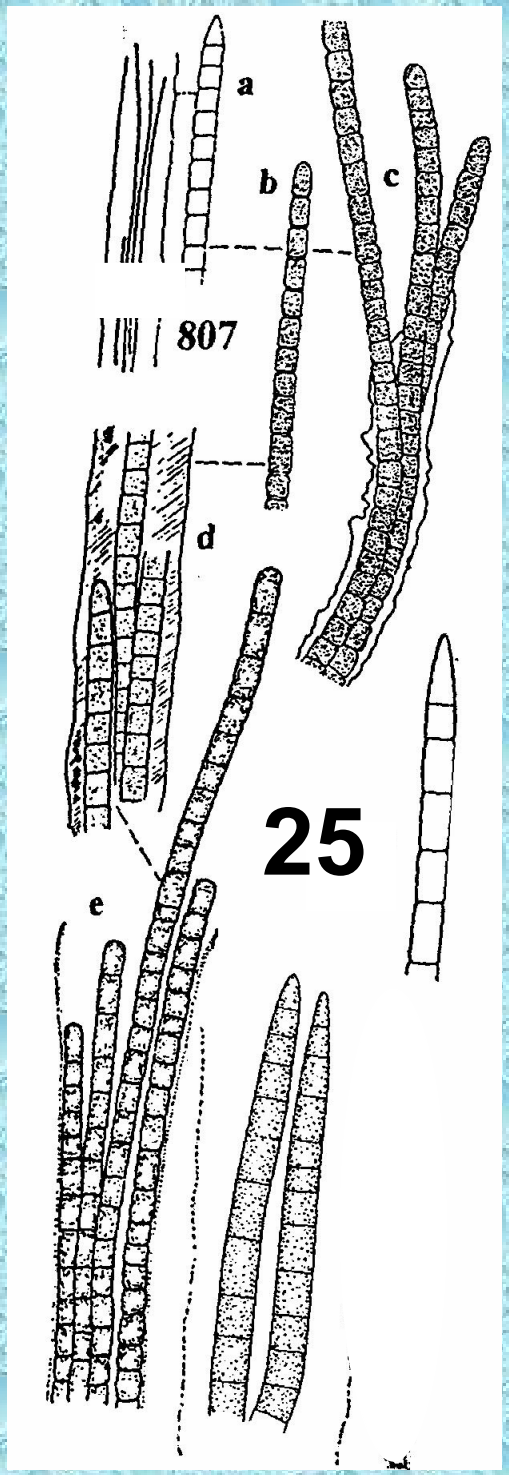
Description:

Macroscopic, thin, blue-green biofilmy, with smooth surface

Trichomes 4.5-6.5(7) μm wide, without sheath, by cross-walls not constricted

Cells isodiametric, apical cells thiner with calyptra

Localities: 13, 15, 36



25. *Microcoleus subtorulosus* Gomont ex Gomont

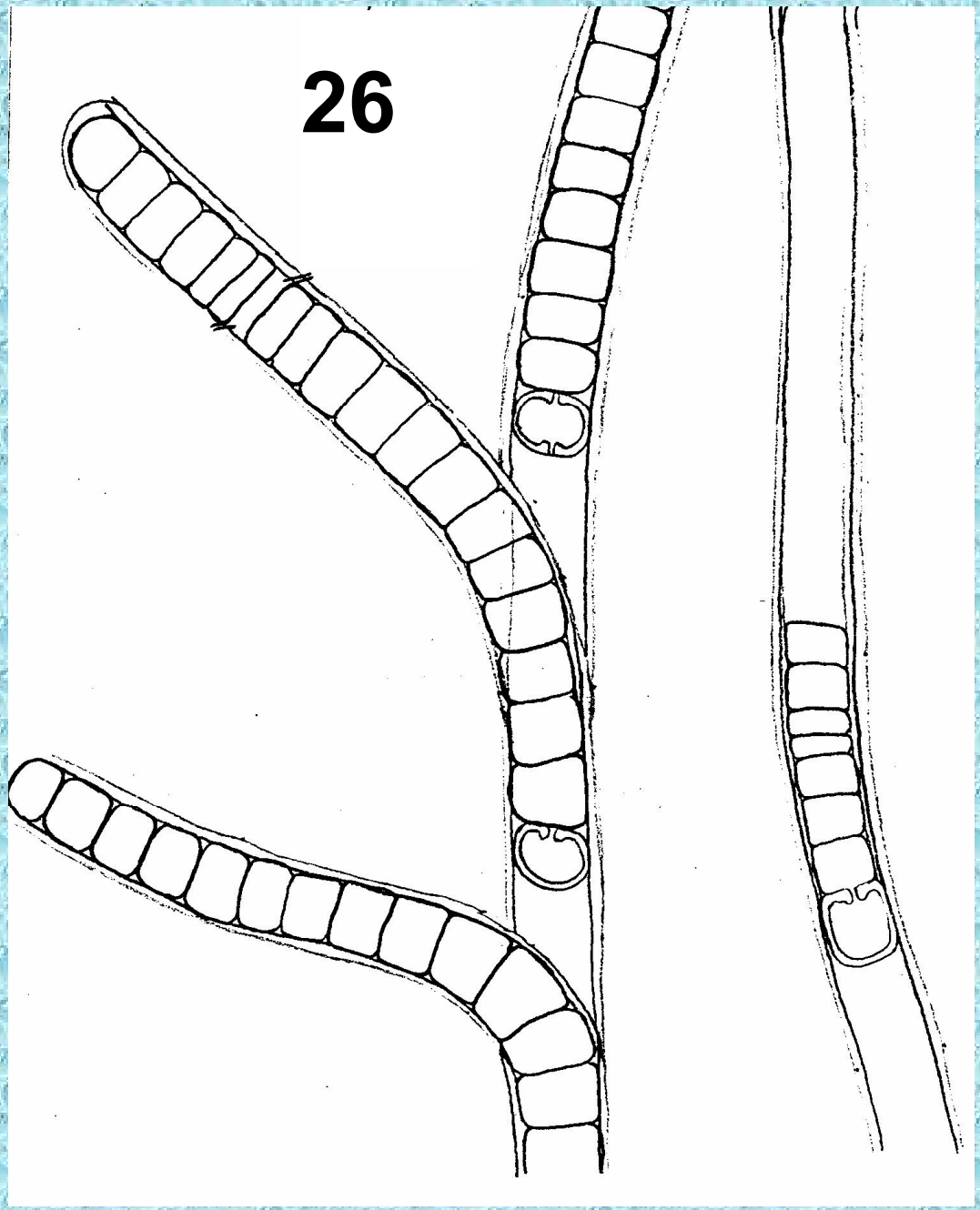
Description:

Macroscopic, large, brownish biofilms

Trichomes blue-green, 6-10 μm wide, friable, sheaths mucilaginous

Cells barrel-shaped, apical cells conical without calyptra

Locality: 14



26. *Tolypothrix distorta* f. *penicillata* (Agardh) Kossinskaja

Description:

Macroscopic heteropolar, bushy, dark green colonies

Trichomes blue-green, 6-12 μm wide, sheaths thin, colorless to yellowish

Cells shorter than wide, barrel-shaped, 3.5-5 μm long

Heterocytes spherical or subspherical, up to 15 μm in diameter

Locality: 32

CONCLUSIONS

- In total, 26 epilithic cyanobacteria
- The most frequent species (36 sites):
  Chamaesiphon oncobyrsoides
  C. minutus
  Pleurocapsa minor
  Leptolyngbya olivacea
- The highest species diversity – genus *Chamaesiphon*
- All determined species are kown only from unpolluted, clear streams and rivers
- Further investigations are necessary

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