

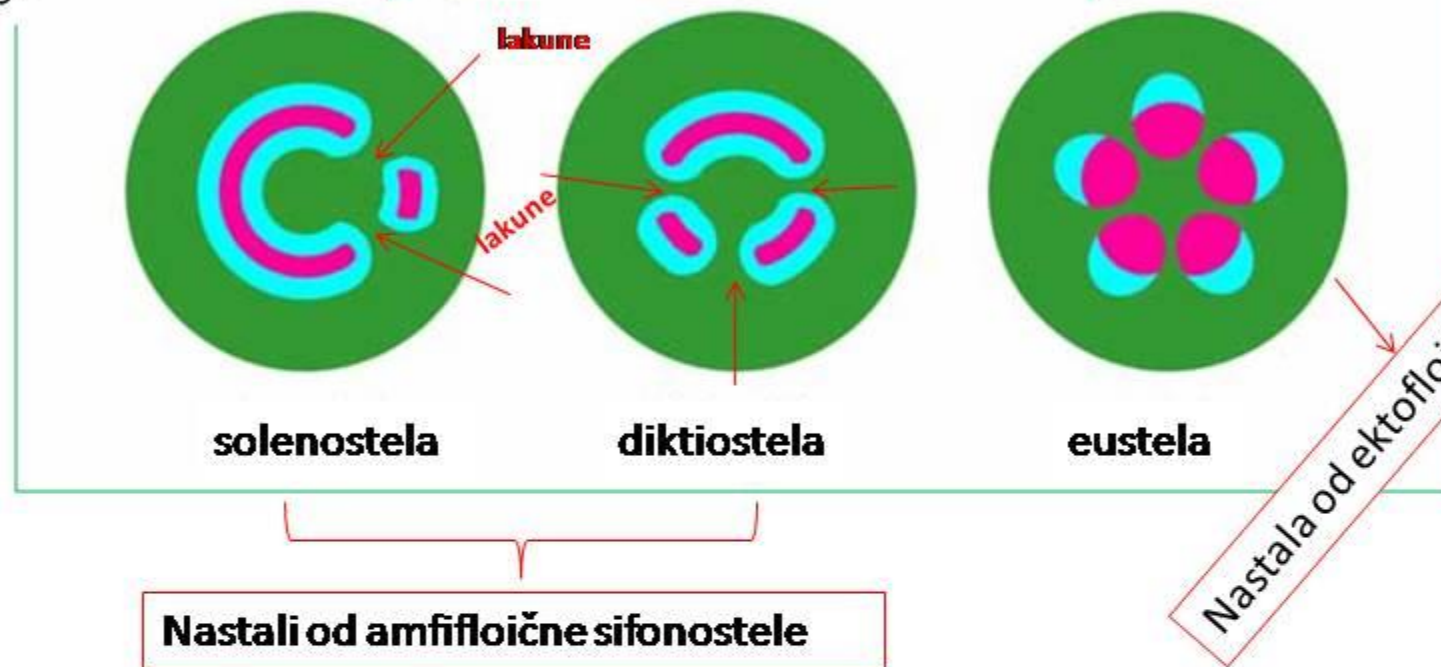
Euphyllophyta

Monilophyta

Spermatophyta

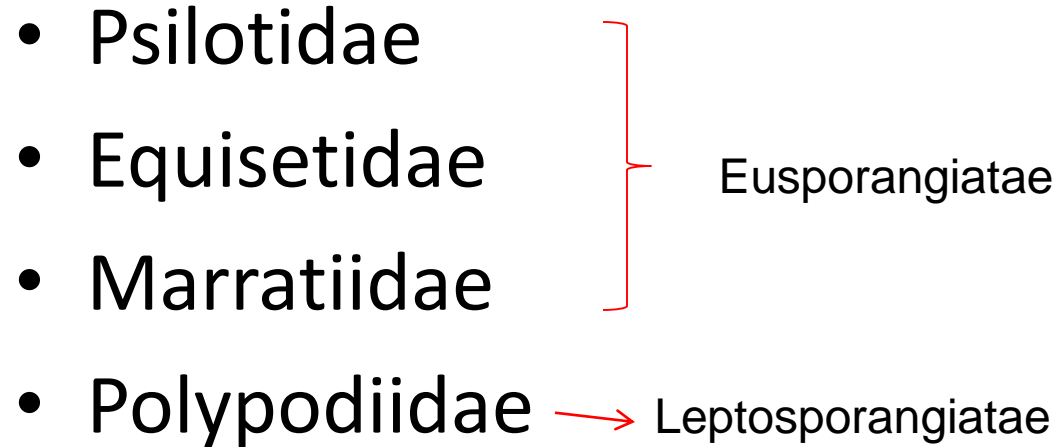
Protostela
Sifonostela

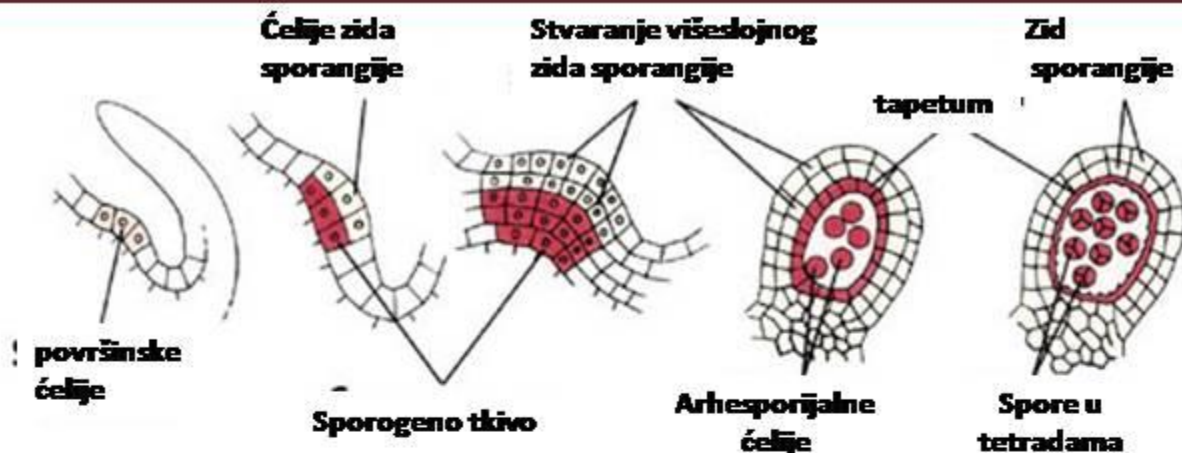
Tipovi sifonostele



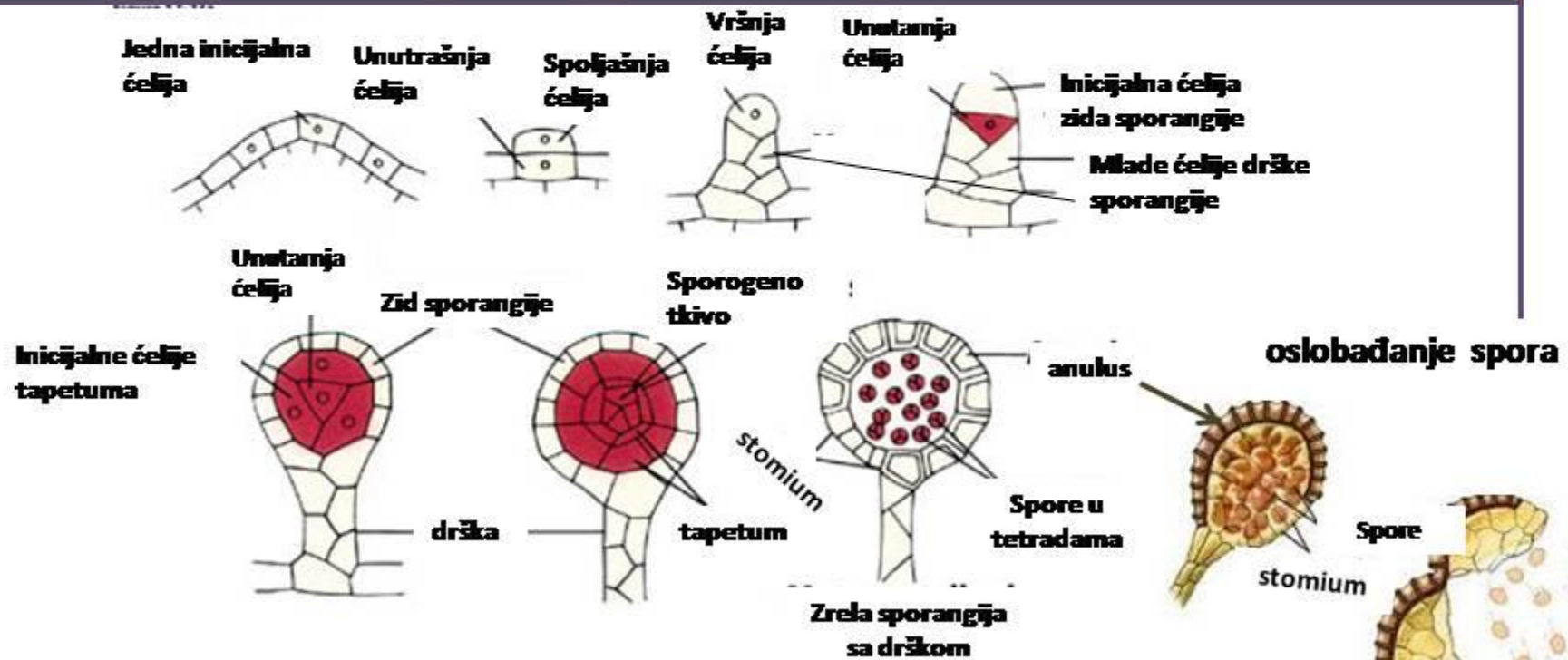
- **solenostela** – najprimitivniji tip sifonostele, u kojoj se javlja srž koja je okružena floemom i ksilemom (tipična za neke primitivne paprati).
- **diktiostela** – slična solenosteli, ali sa više lakuna u prstenu od floema u ksilema, na mjesti kojih se javljaju listovi (sreće se samo kod paprati).
- **eustela** – prsten od floema i ksilema je “razbijen” i diferenciran na provodne snopiće, koji su kružno raspoređeni oko srži (tipičan za biljke sa sjemenom).

Monilophyta

- Psilotidae
 - Equisetidae
 - Marratiidae
 - Polypodiidae
- Eusporangiatae
- Leptosporangiatae
- 



Eusporangični razvoj



Leptosporangični razvoj

Figure 17-23b
Biology of Plants, Seventh Edition
© 2005 W. H. Freeman and Company

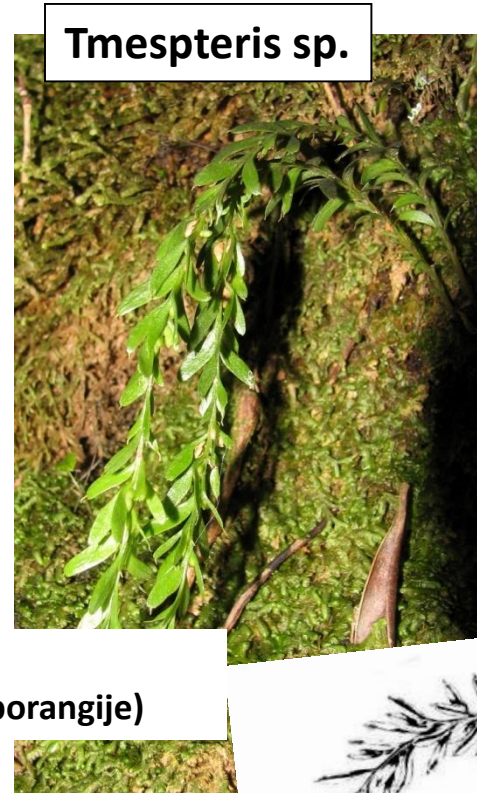
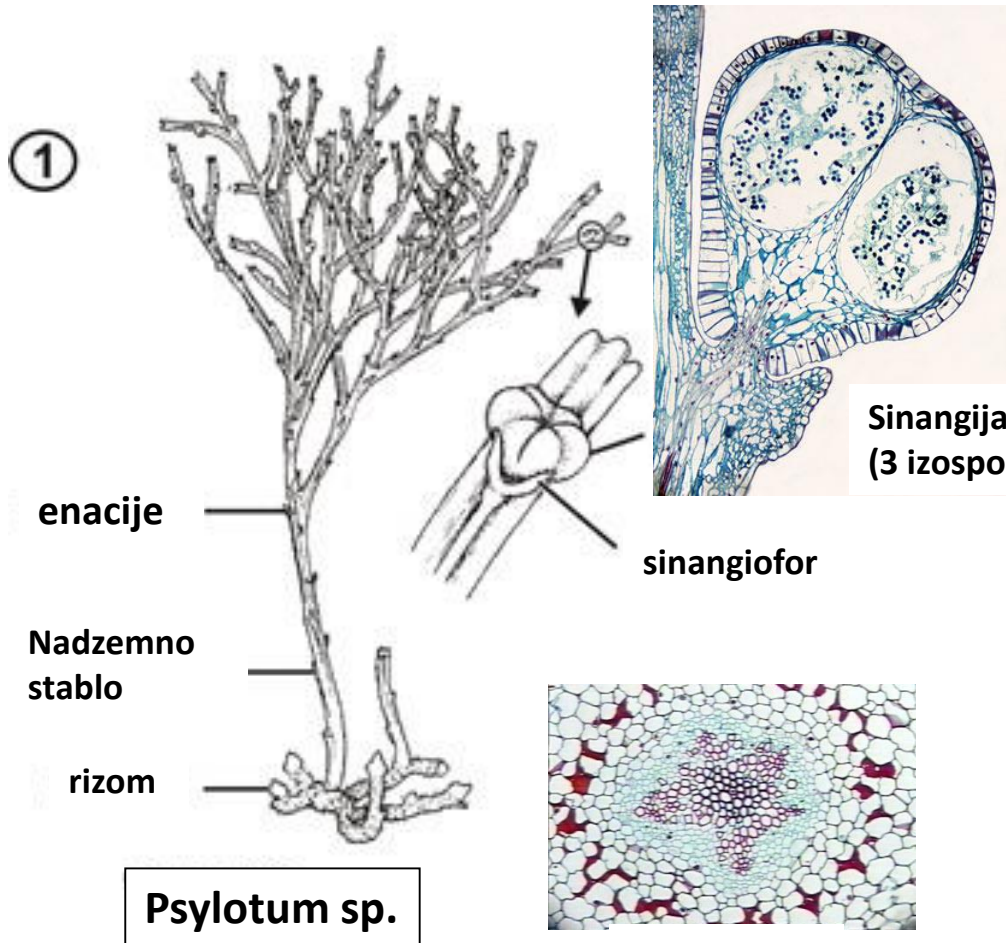
Psilotidae

(Divisio: Psilotophyta)

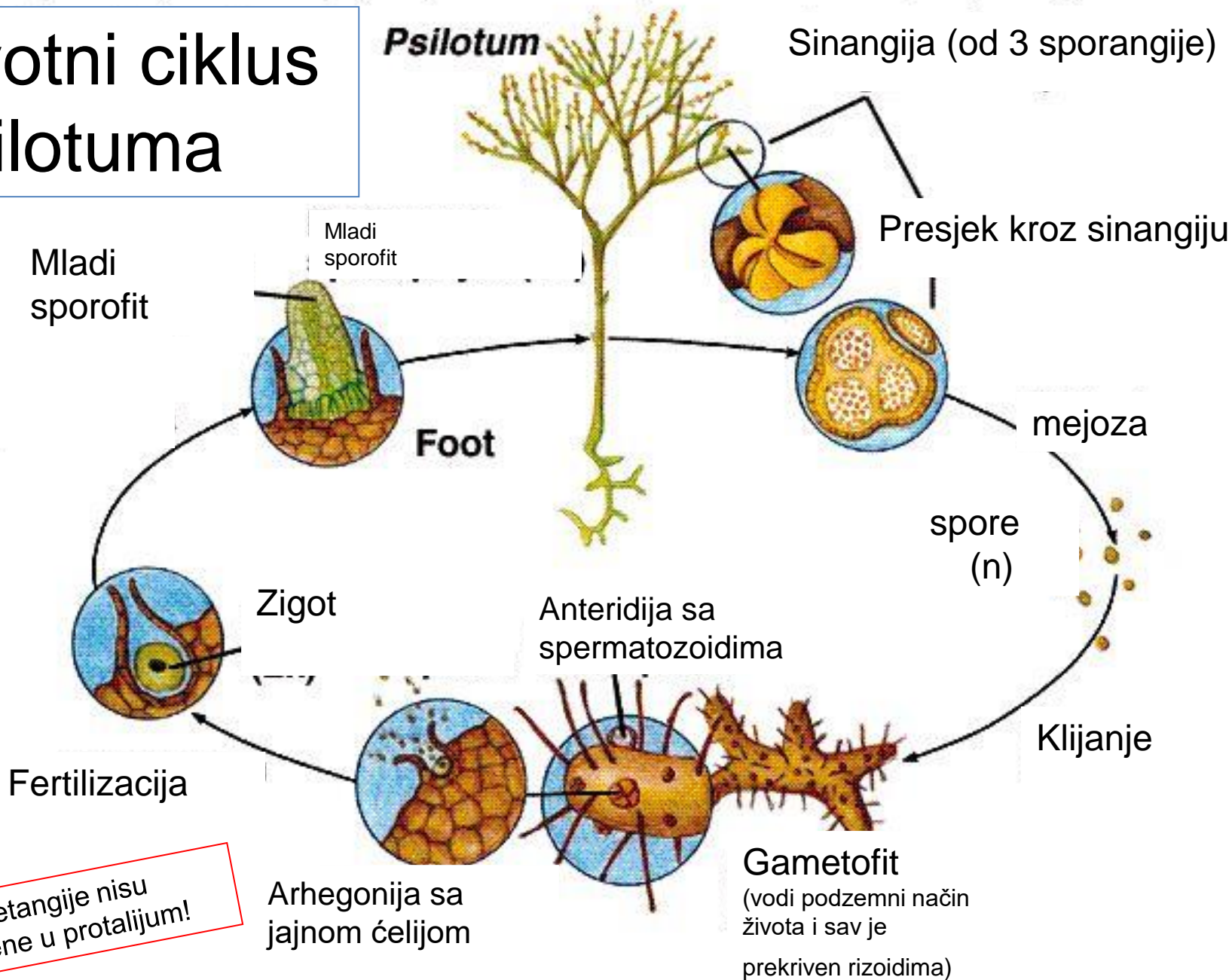
- Psilotales
- Ophioglossales

Psilotales

Potpuno odsustvo korjena!!!

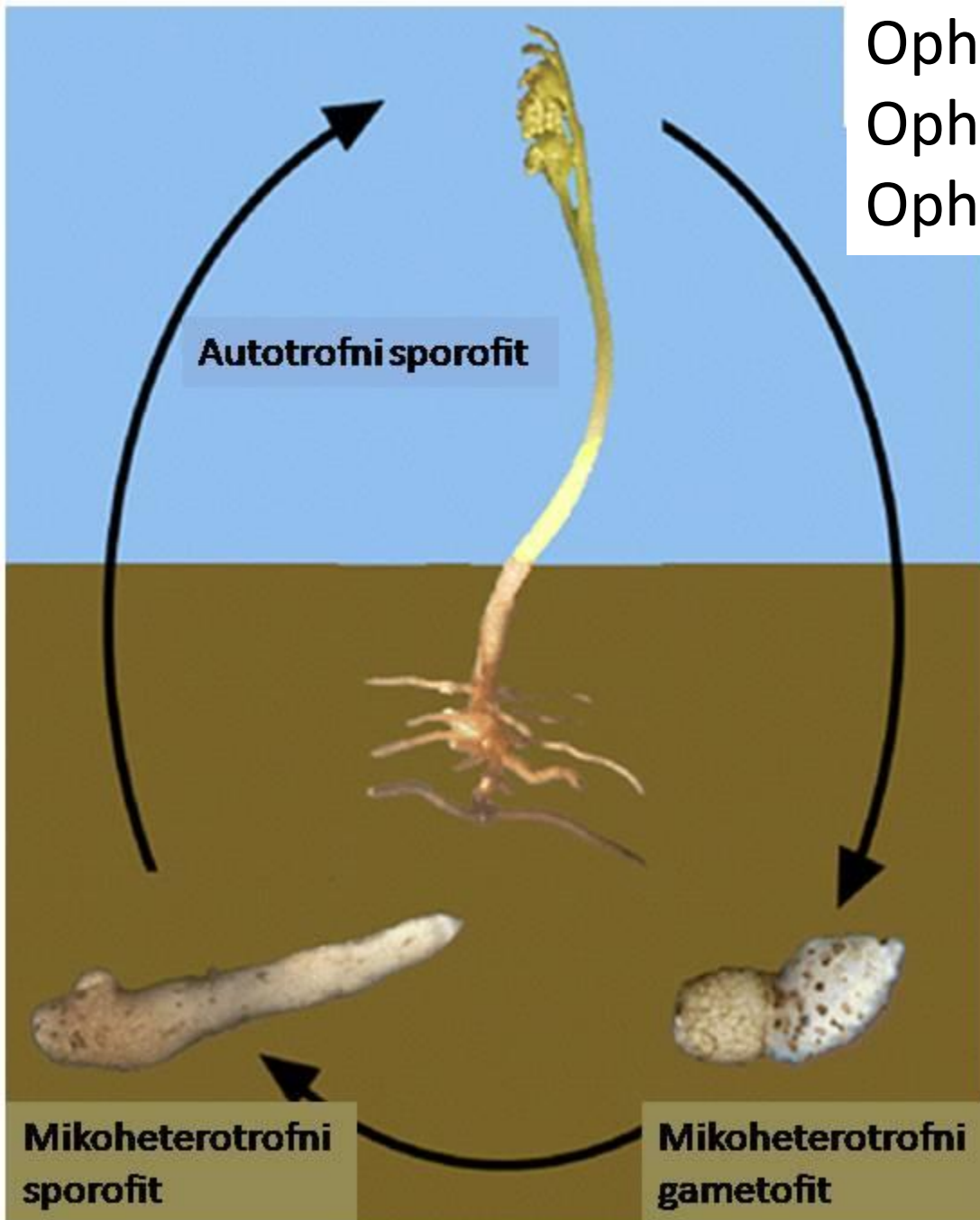


Životni ciklus Psilotuma



*Gametangije nisu uvučene u protalijum!

Ophioglossales
Ophioglossaceae
Ophioglossum vulgatum



Fam. Ophioglossaceae



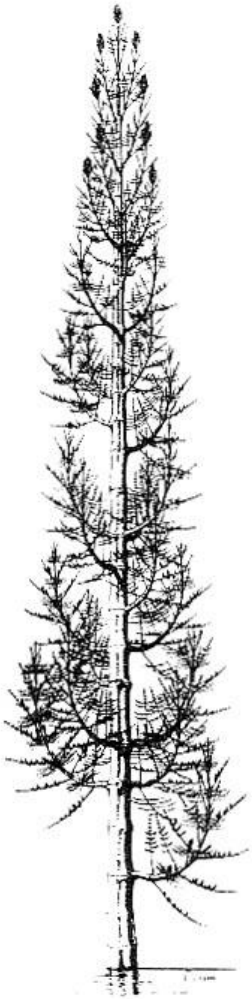
Ophioglossum ssp.
Sporofil i trofofil jednostavni!



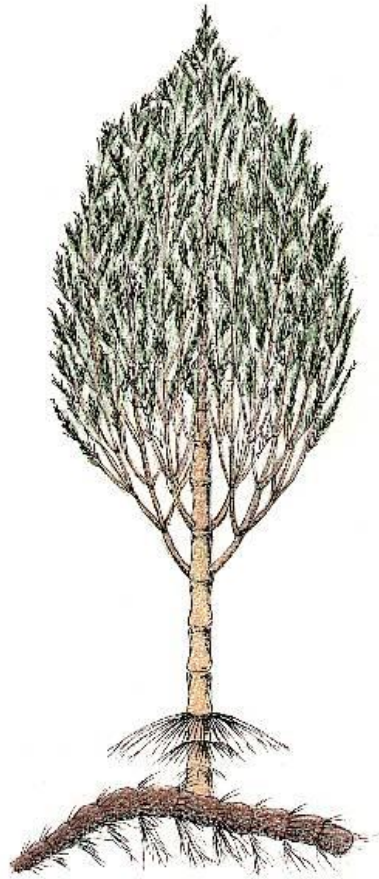
Botrychium lunaria
Sporofil i trofofil granati!

Equisetidae

(Div. Equisetophyta)



Pseudobornia ursina



Calamites spp.



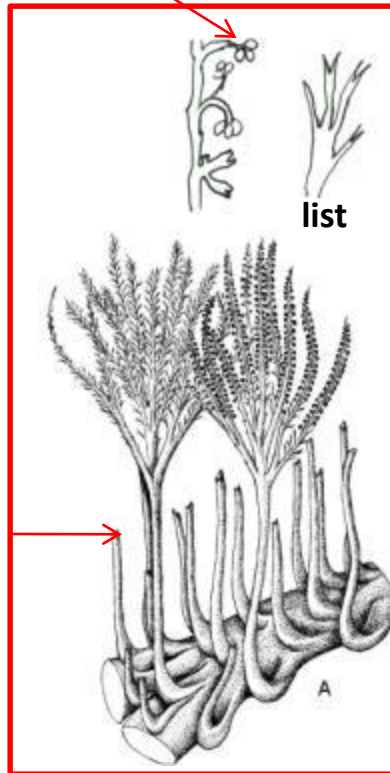
Equisetum arvense

Podjela na redove

- Hyeniales (†)
- Sphenophyllales (†)
- Calamitales (†)
- Equisetales

o. Hyeniales fam. Hyeniaceae

Tri sporangije na
dihotomo granatom
sporangioforu



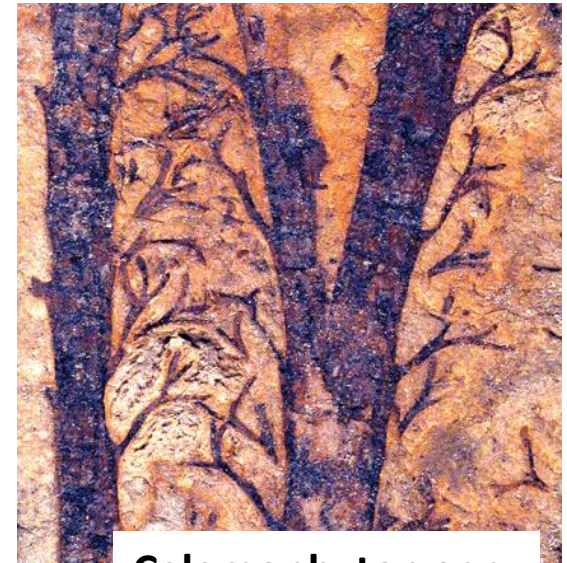
Hyenia spp.

Člankovitost
stabla nije
izrazena

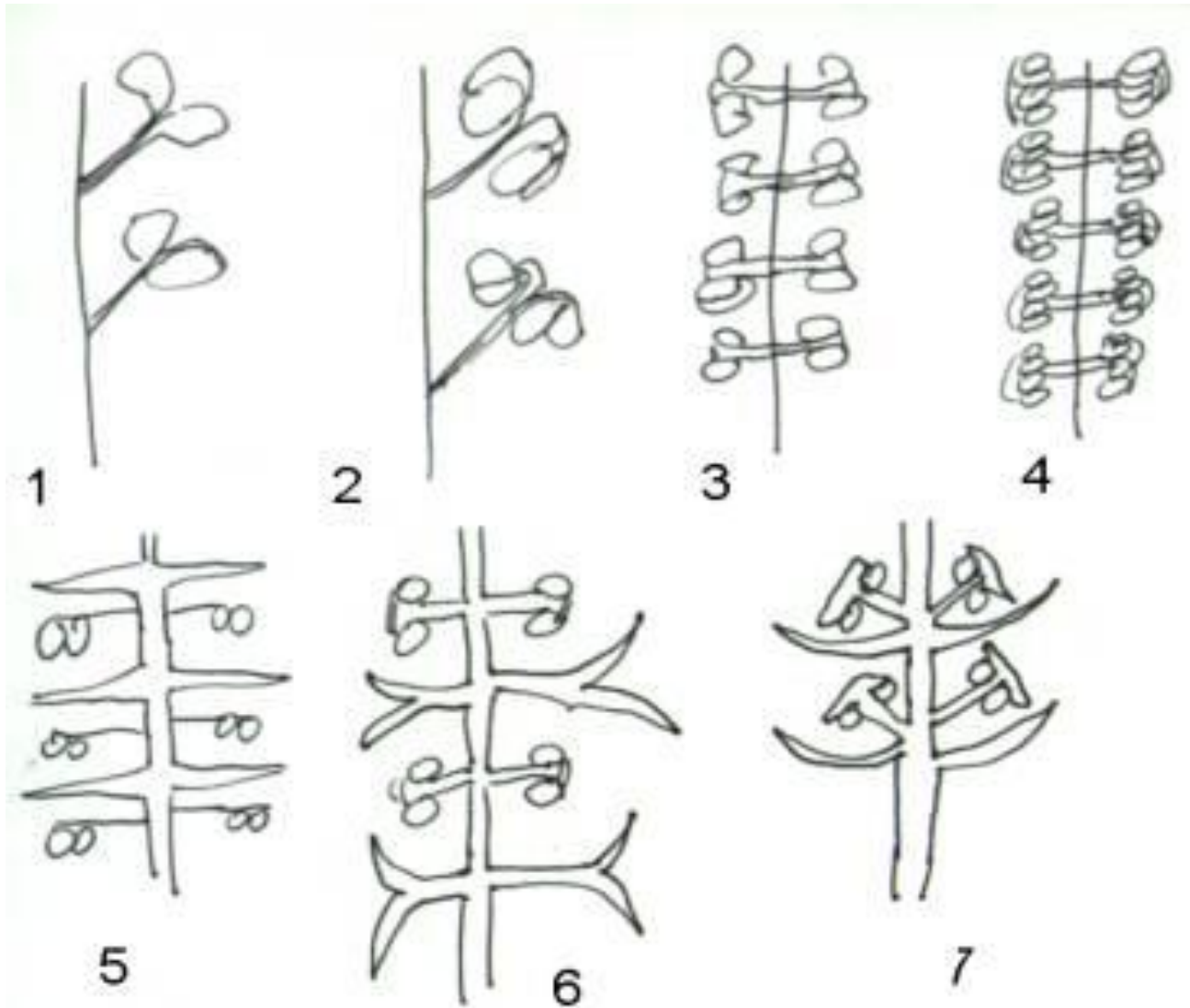


Calamophyton spp.

Sporangije
pojedinačne



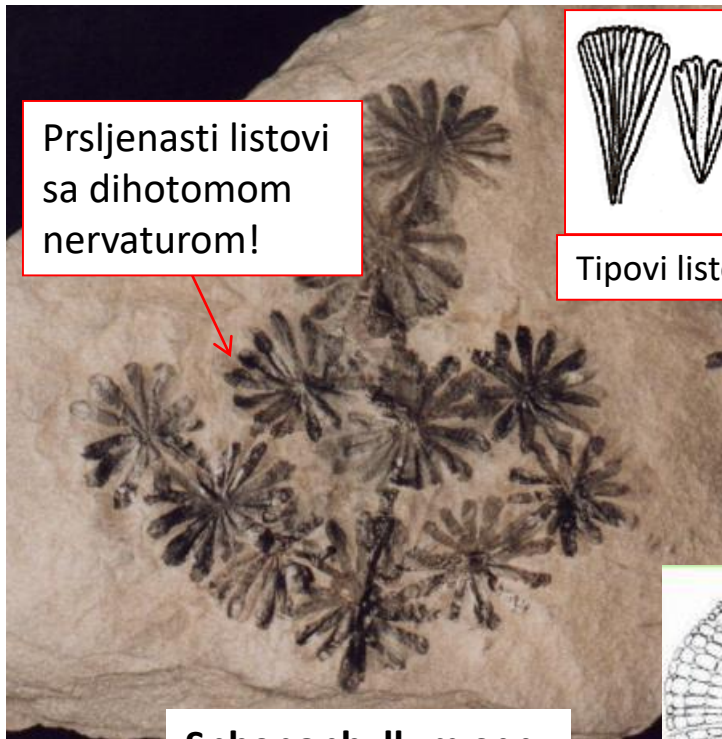
**Calamophyton spp.
fosilni nalaz**



1 – Calamophyton 2 – Hyenia 3- Archaeocalamites 4- Equisetum
5 – Lingularia 6 – Calamostachys 7 – Paleostachys

o. Sphenophyllales

fam. Sphenophyllaceae



Prsljenasti listovi
sa dihotomom
nervaturom!

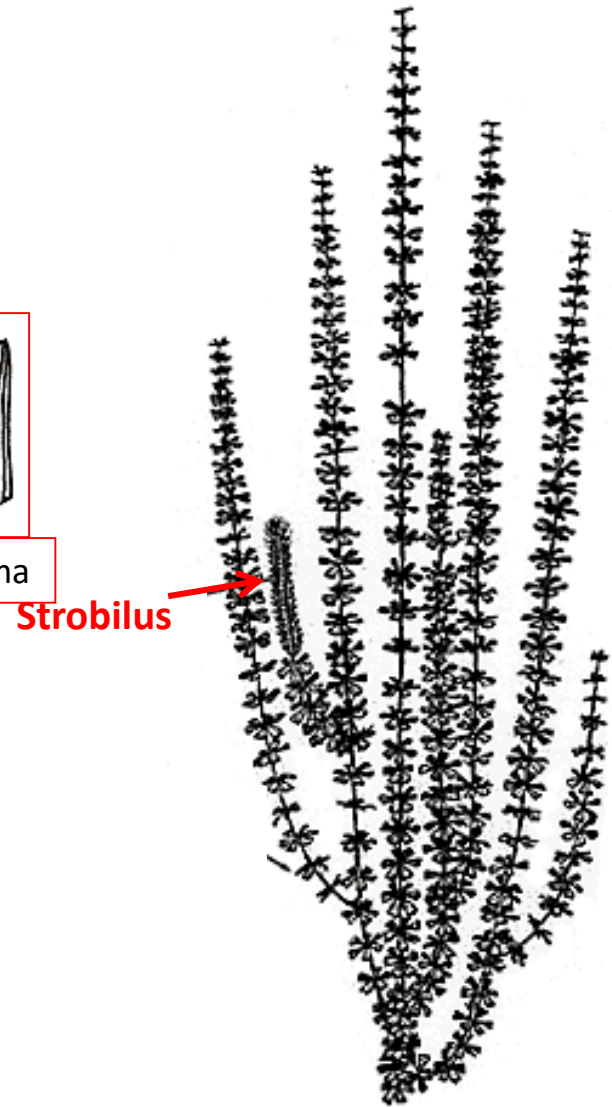
Sphenophyllum spp.
fossilni ostaci



Tipovi listova kod Sphenophylluma



Aktinostela
(triarhna)



Sphenophyllum spp.
rekonstrukcija

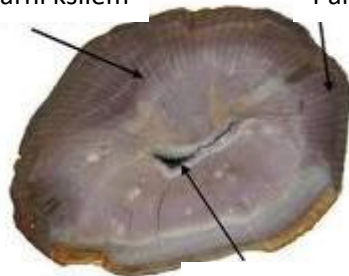
o. Calamitales fam. Calamitaceae



Prsljenovi sa
sporonosnim i
vegetativnim listovima
su se naizmjenicno
smjenjivali.

Sekundarni ksilem

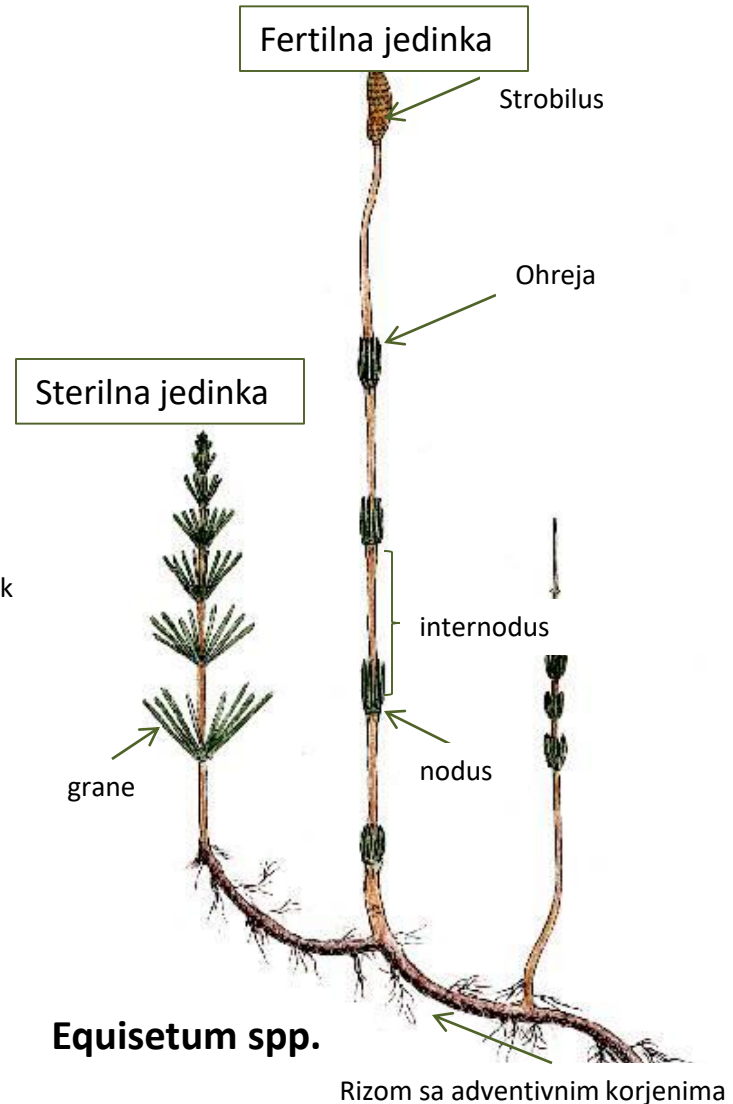
Parenhimski zrak



Centralna supljina

Calamites spp.

o. Equisetales fam. Equisetaceae

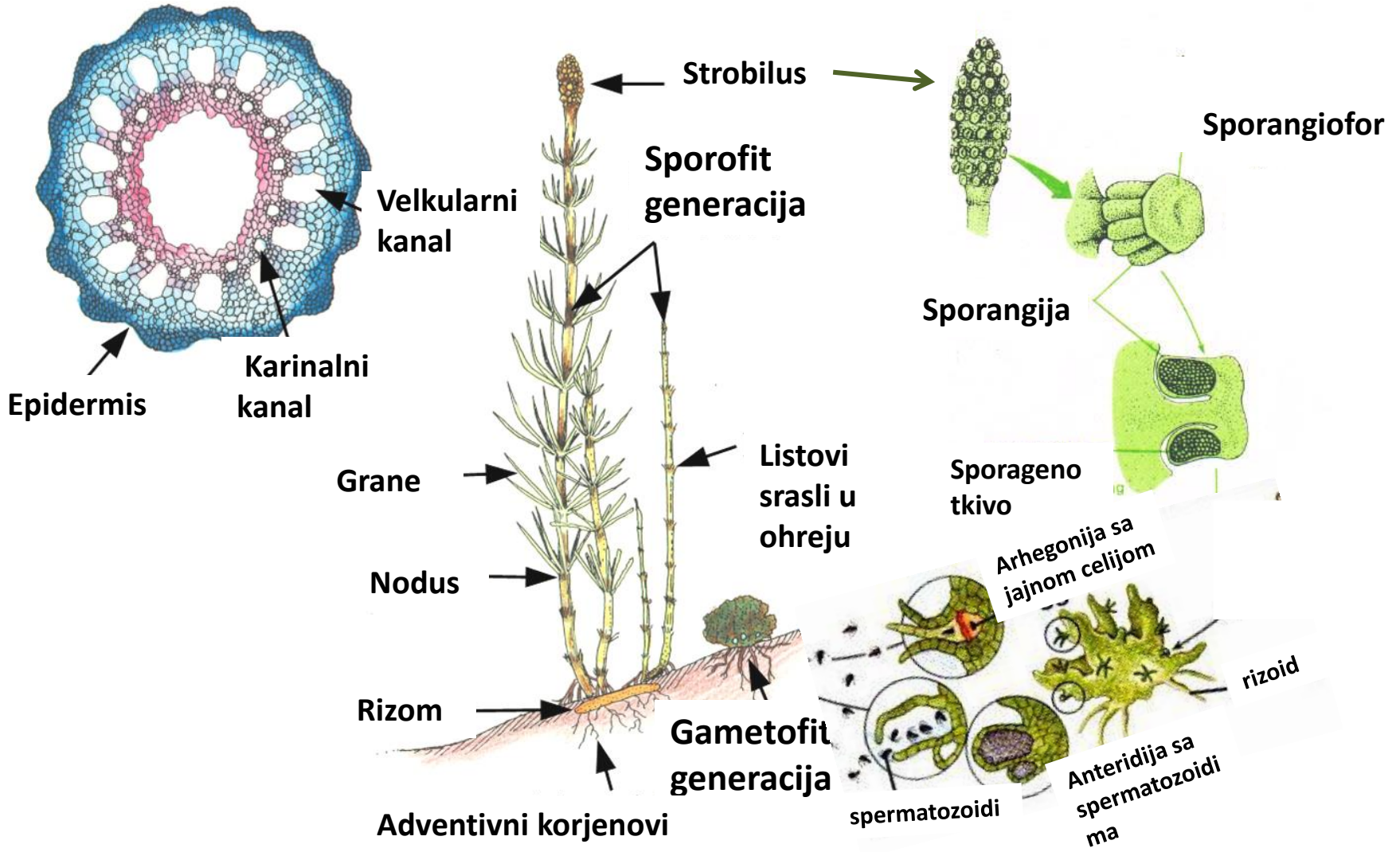


Equisetum spp.

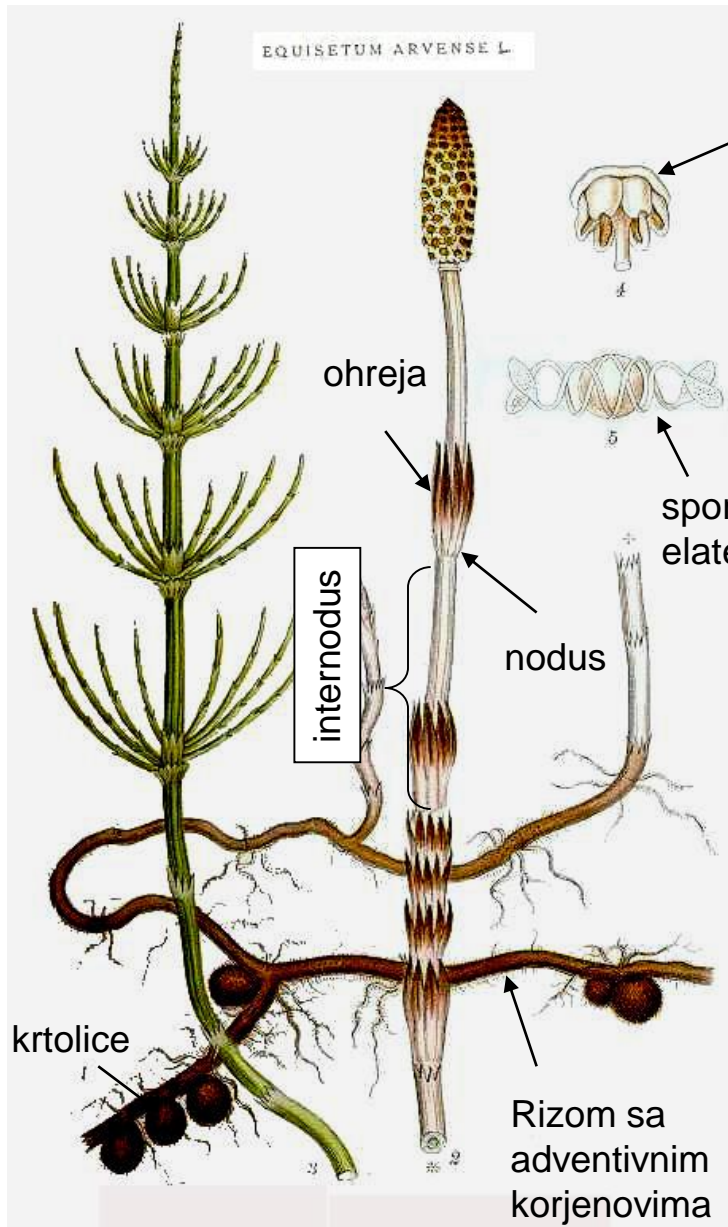
Rizom sa adventivnim korjenima

Presjek kroz stablo

Equisetum - ciklus razvica



Morfološke odlike vrste *Equisetum arvense*



sporangiofor

Člankovitost građe

Odsustvo trajnog primarnog korjena

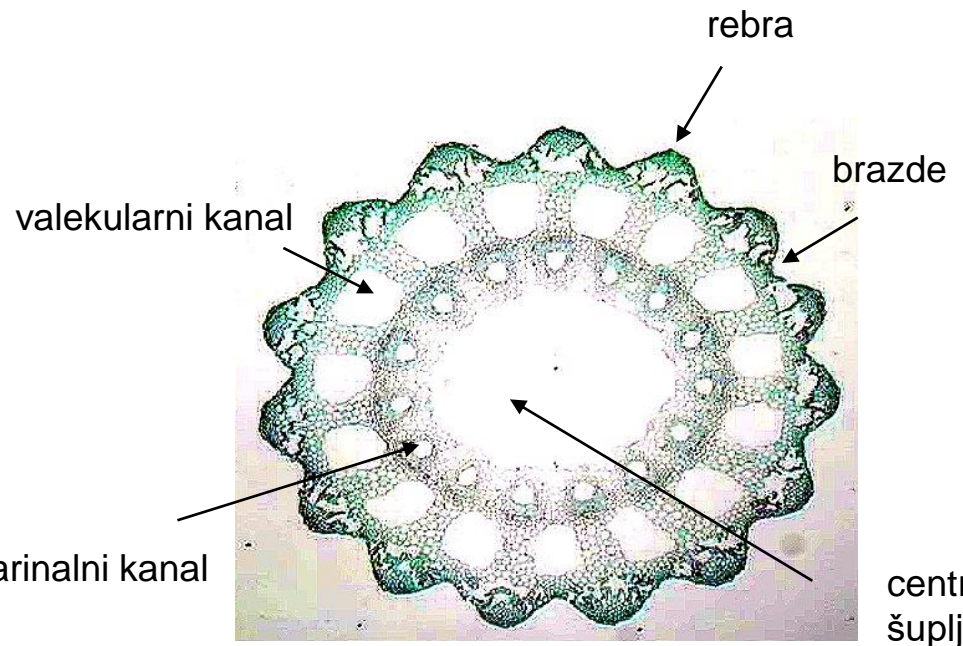
Redukovani listovi

Ohreje

Elatere

Izosporija

spora sa elaterama



Taksonomski markeri

- Dimorfizam fertilne i sterilne jedinke
- Broj zubaca u ohreji
- Broj rebara ili brazda na stablu i vaskularnih šupljina
- Oblik vrha klasića

Izražen dimorfizam fertilne i sterilne jedinke

Equisetum arvense



6-12 zubaca u ohreji



Equisetum telmateia



20-30 zubaca u ohreji

Equisetum sylvaticum



Grane pršljenasto granate

Equisetum pratense



Grane jednostavne



Dimorfizam fertilne i sterilne jedinke nije izražen

STROBILUSI TUPI



Equisetum palustre



Zubići bez brazde i sa širokim obrubom



Equisetum fluviatile

STROBILUSI ŠILJATI



Zubići ,ohreje opadaju

Equisetum hiemale



Zubići ,ohreje trajni

Equisetum variegatum