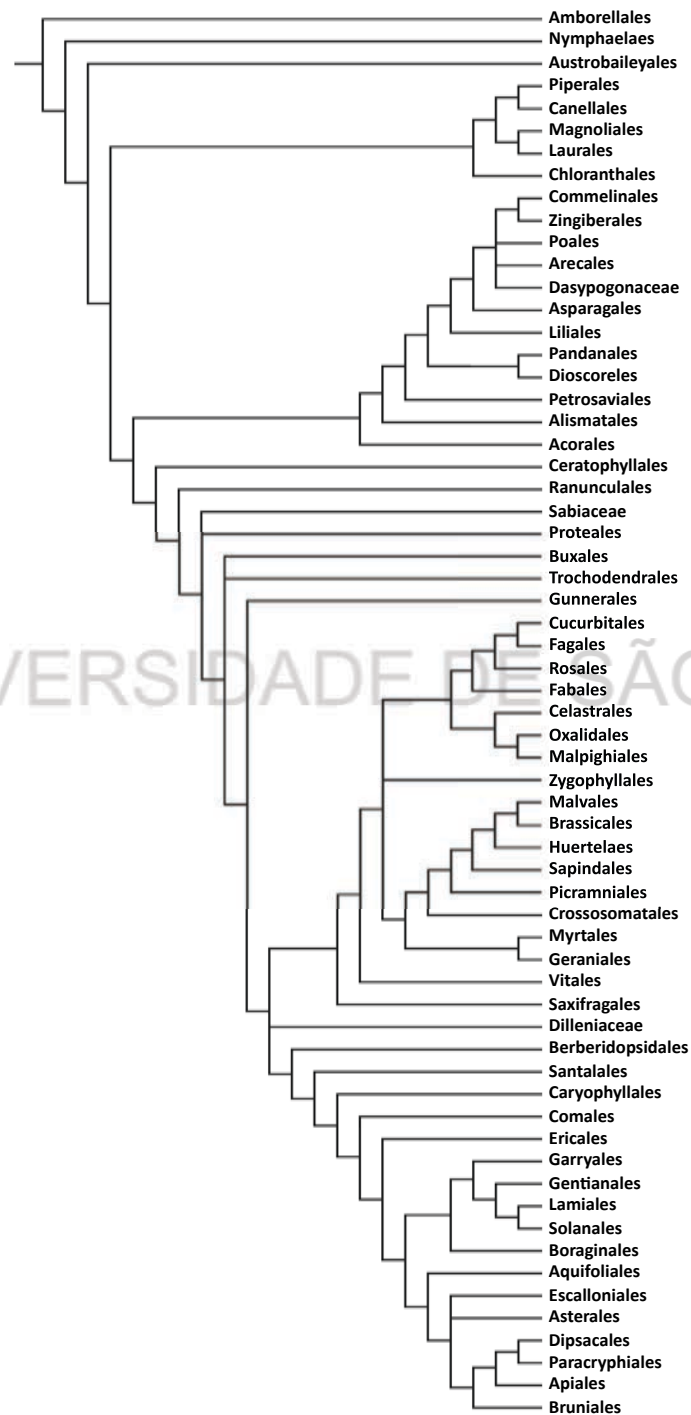


**Monocotiledôneas
ordens
mais
importantes**

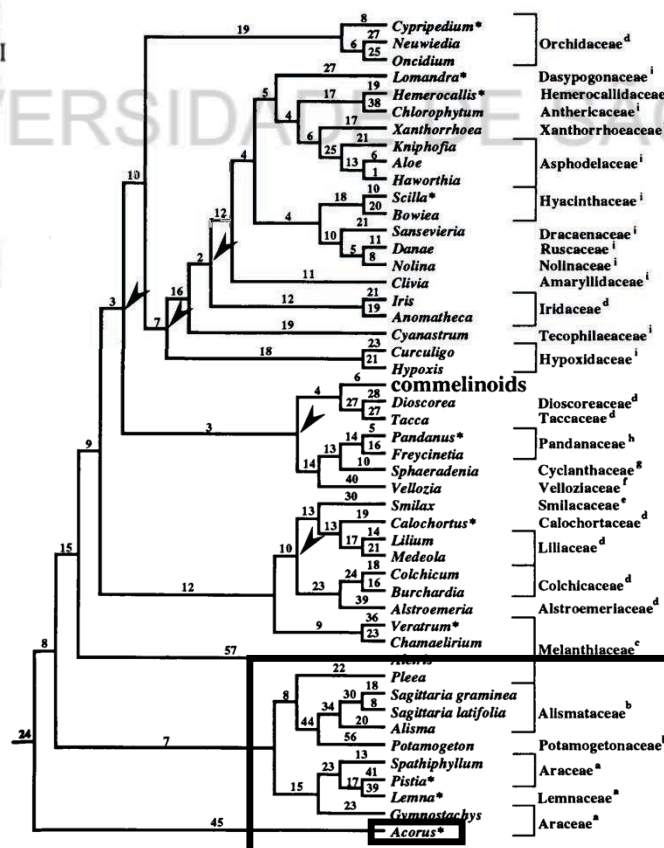
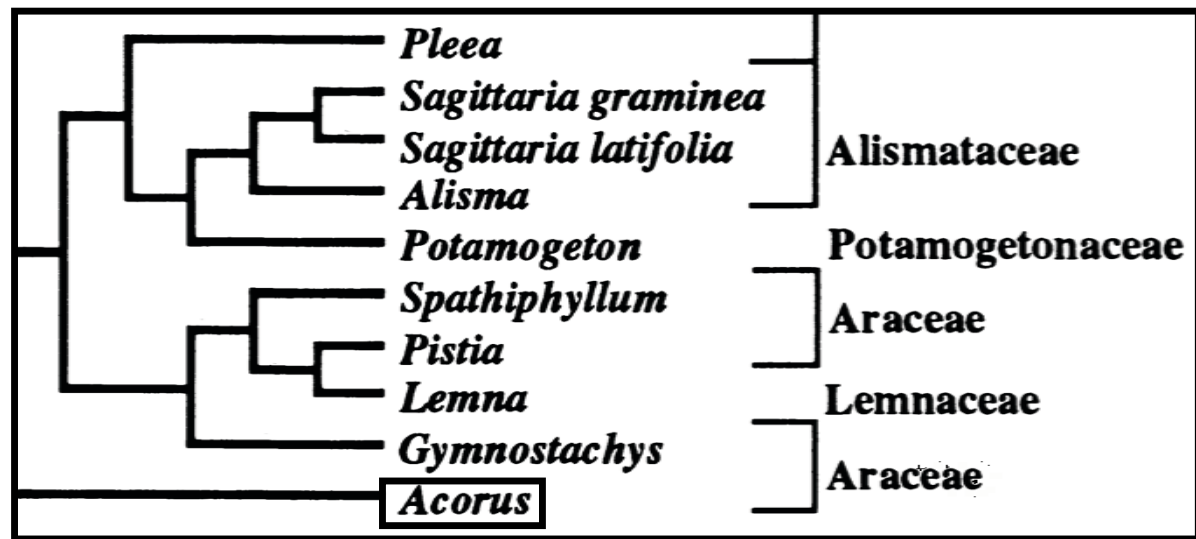
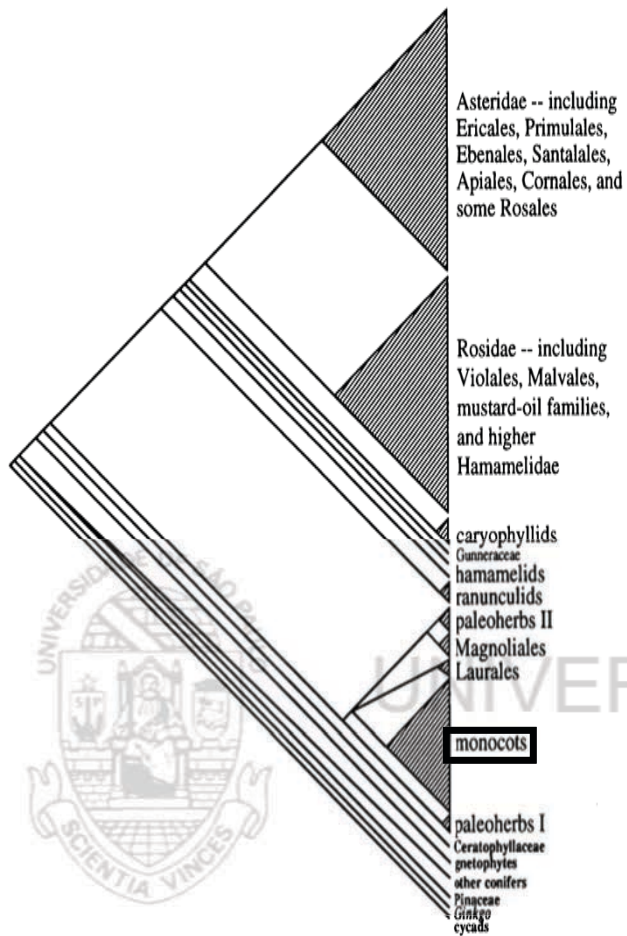




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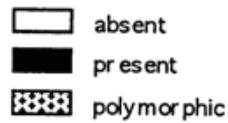
APG III (2009)



Chase et al. (1993)
rbcL



reticulate venation



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Chase et al. (1995)

494 caracteres *rbcl*

96 táxons

5 728 árvores

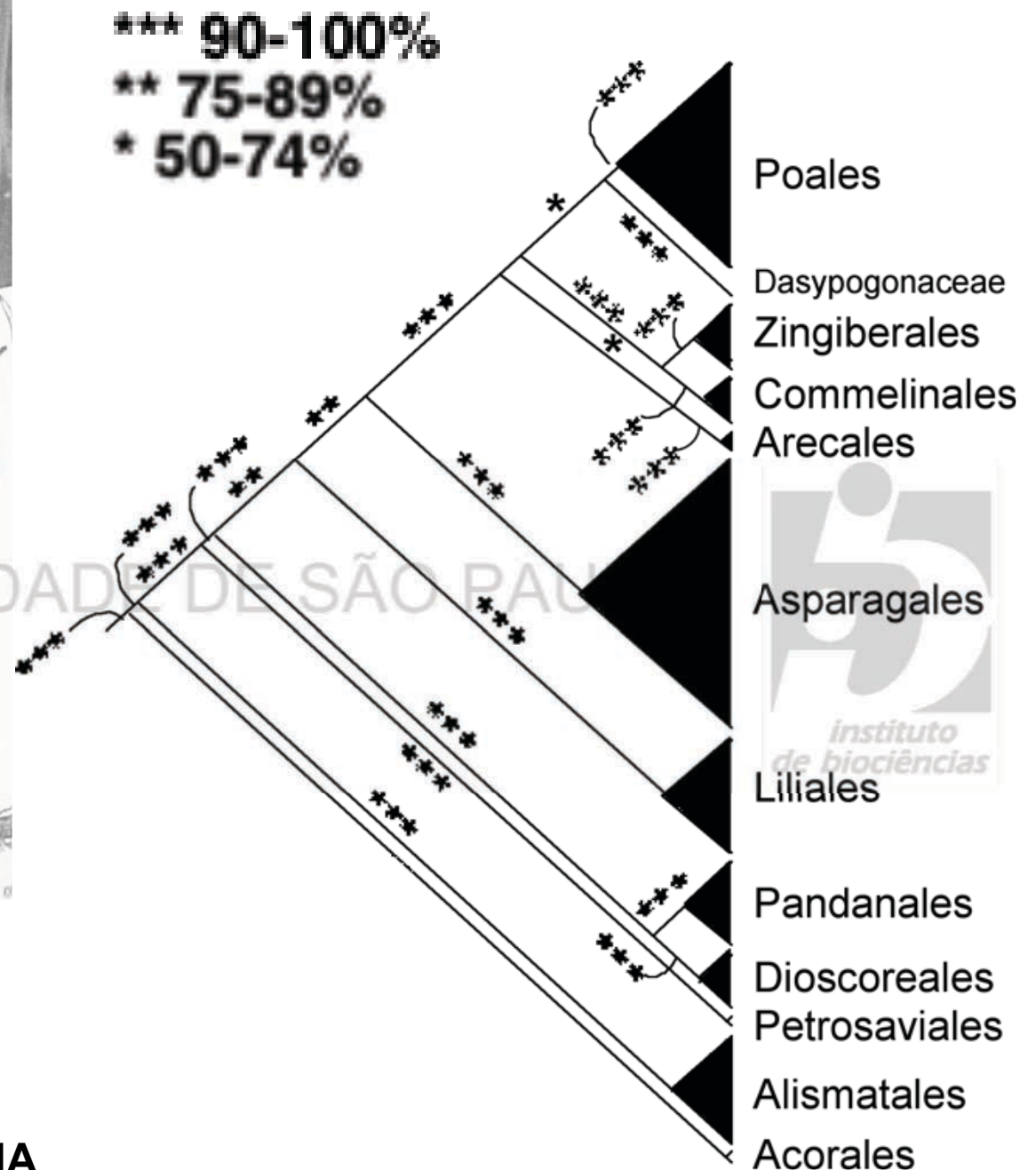
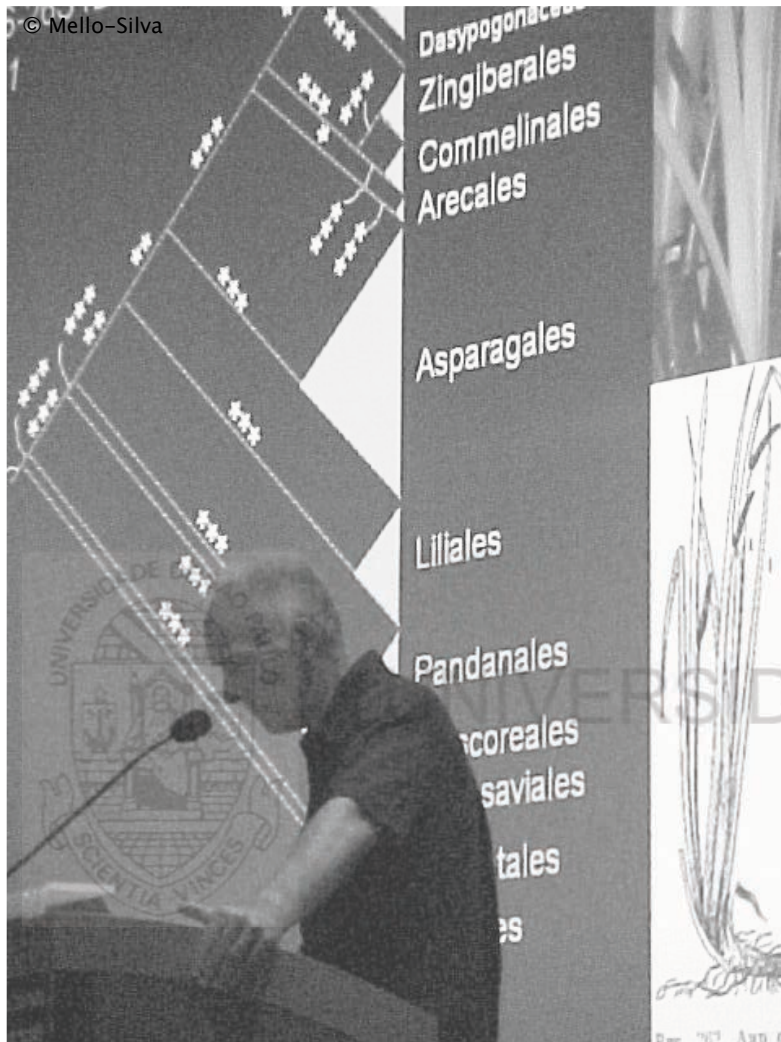
Chase et al. (1995)

análise combinada 597 caracteres

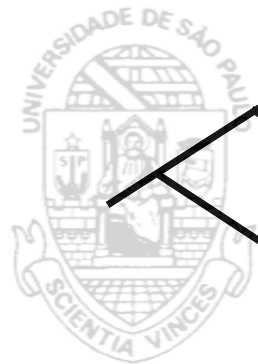
95 táxons

50 árvores





Chase et al. (2006)
atpB, *matK*, *ndhF*, *rbcL*,
 18S rDNA, 26S rDNA, *atp1* DNA



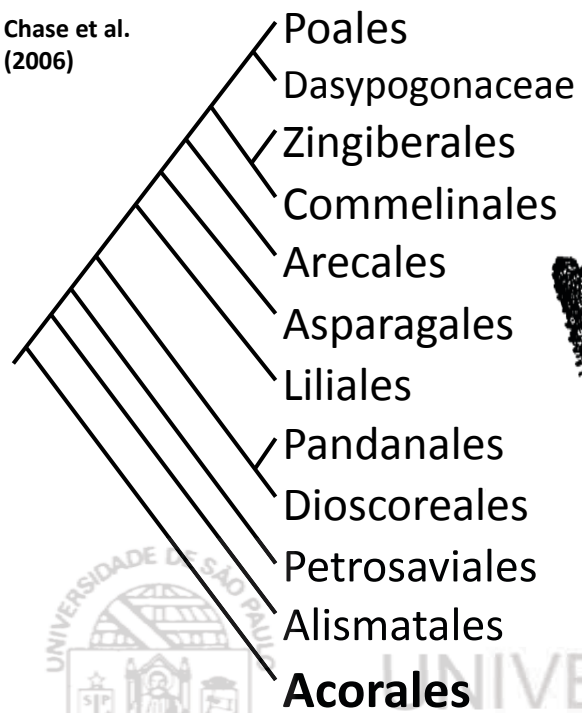
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Chase et al. (2006)
atpB, matK, ndhF, rbcL,
18S rDNA, 26S rDNA, *atp1* DNA

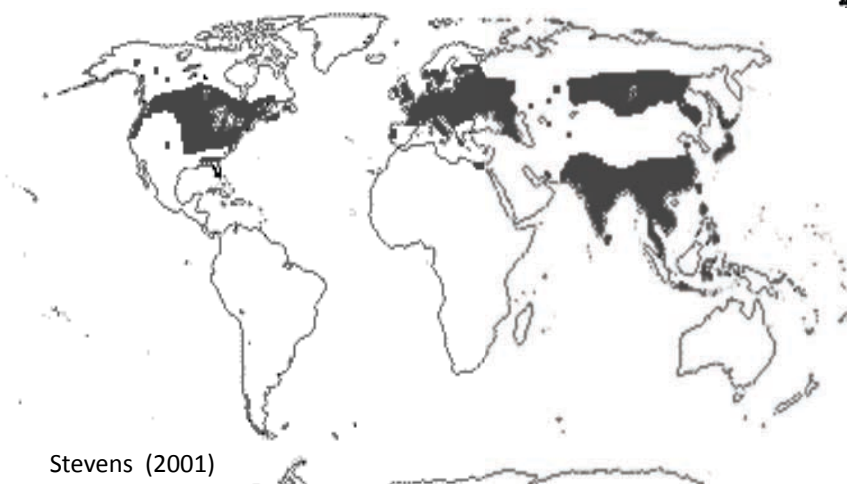
Poales
Dasypogonaceae
Zingiberales
Commelinales
Arecales
Asparagales
Liliales
Pandanales
Dioscoreales
Petrosaviales
Alismatales
Acorales

Chase et al.
(2006)

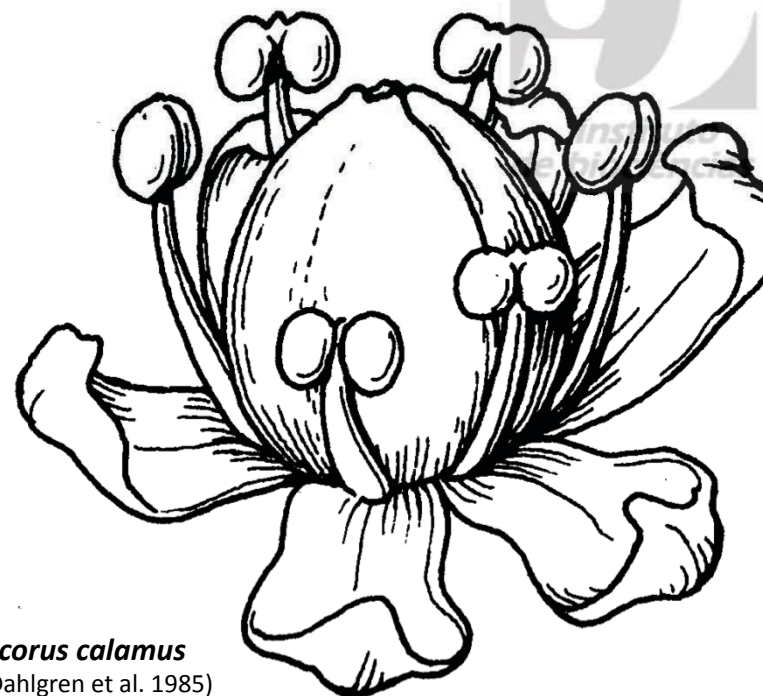


Acorus calamus L.
©Thomas Schöpke

Acoraceae 1/2-4

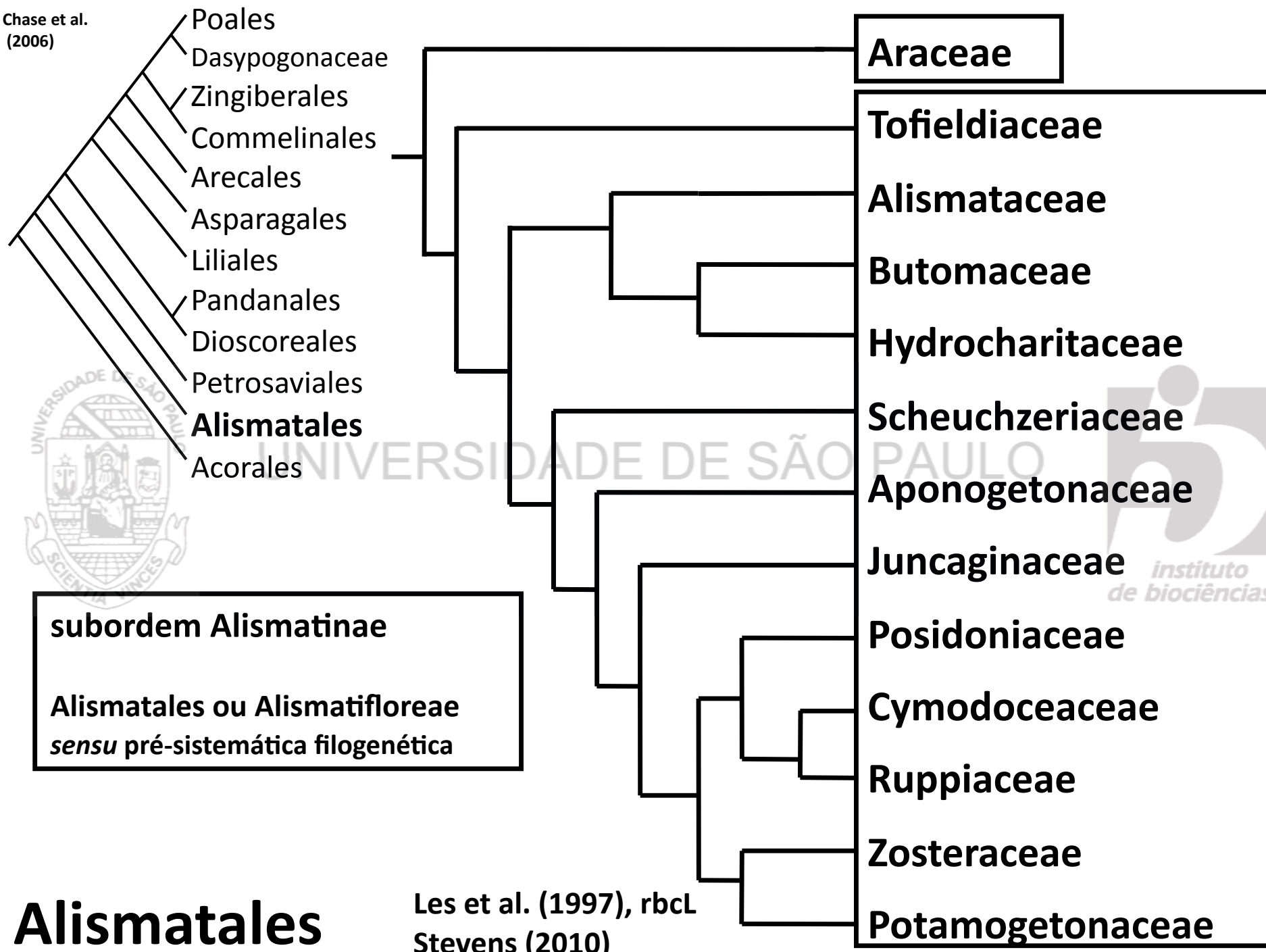


Stevens (2001)

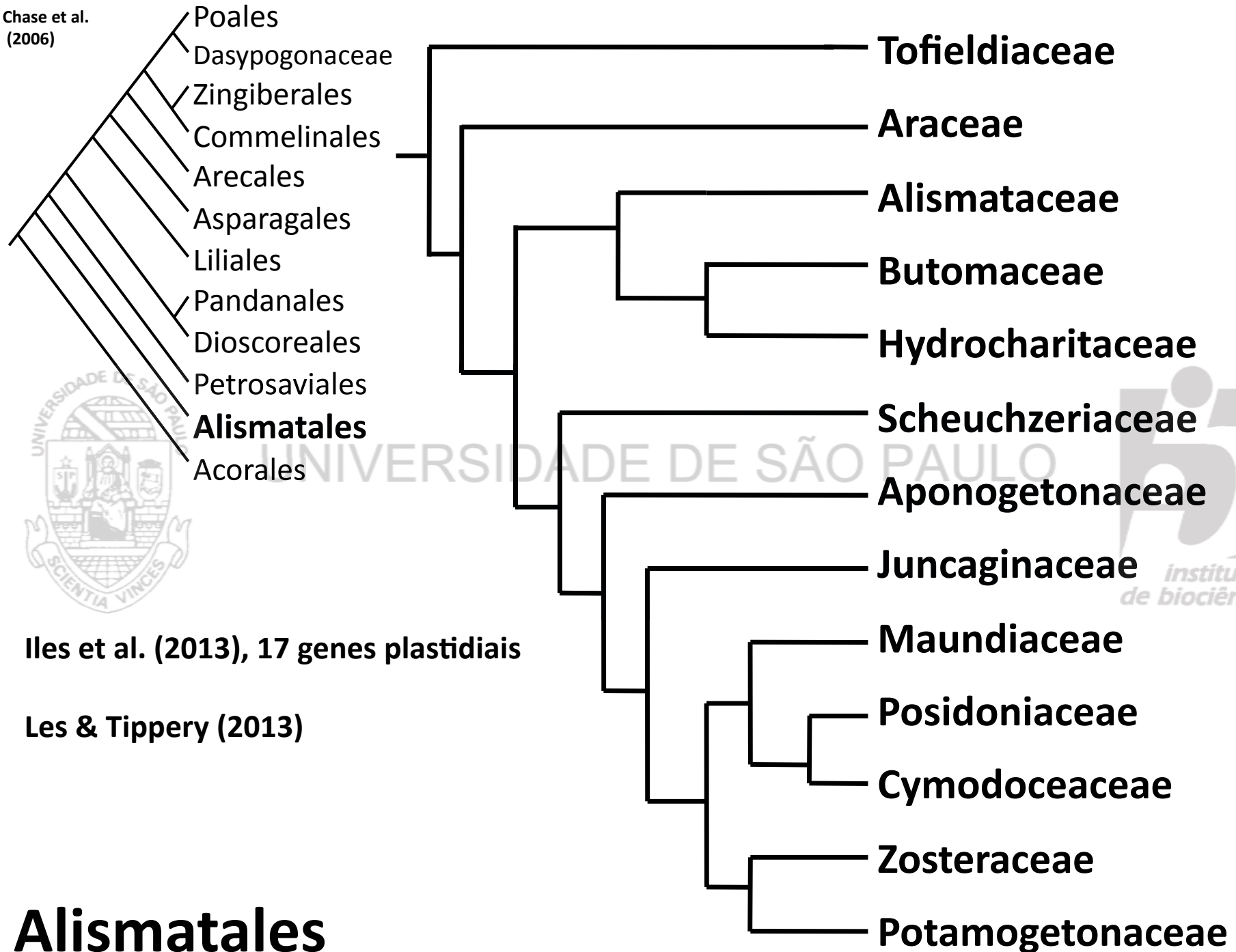


Acorus calamus
(Dahlgren et al. 1985)

Chase et al.
(2006)



Chase et al.
(2006)



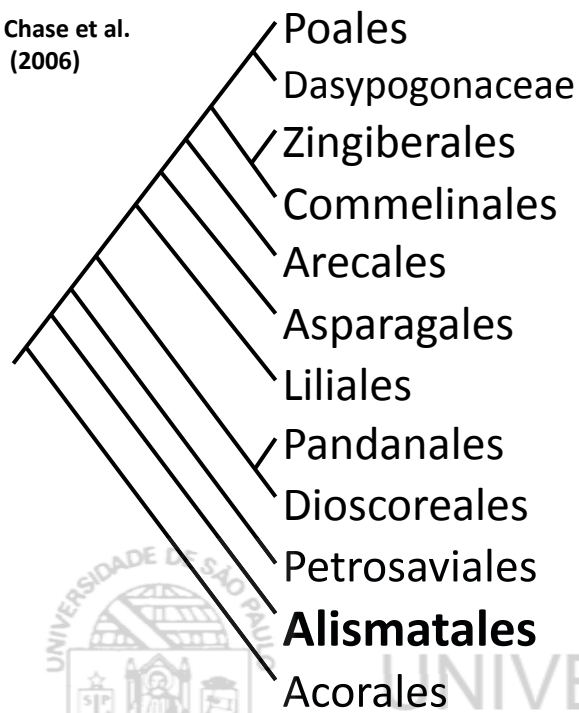
Iles et al. (2013), 17 genes plastidiais

Les & Tippery (2013)

Alismatales



Chase et al.
(2006)



Sinapomorfia:
embriões grandes, clorofilados (?)

Características:
aquáticas ou semi, lugares úmidos
endosperma helobial
flores reduzidas, frequentemente nuas

Alismatales

Tofieldiaceae 3 gên./31 spp

Araceae 117/4095

Alismataceae 15/88

Butomaceae 1/1

Hydrocharitaceae 18/116

Scheuchzeriaceae 1/1

Aponogetonaceae 1/43

Juncaginaceae 3/15

Maundiaceae 1/1

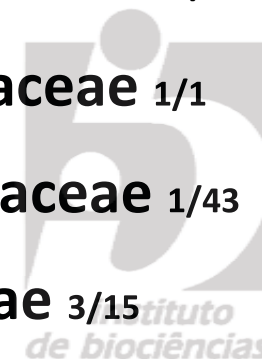
Posidoniaceae 1/9

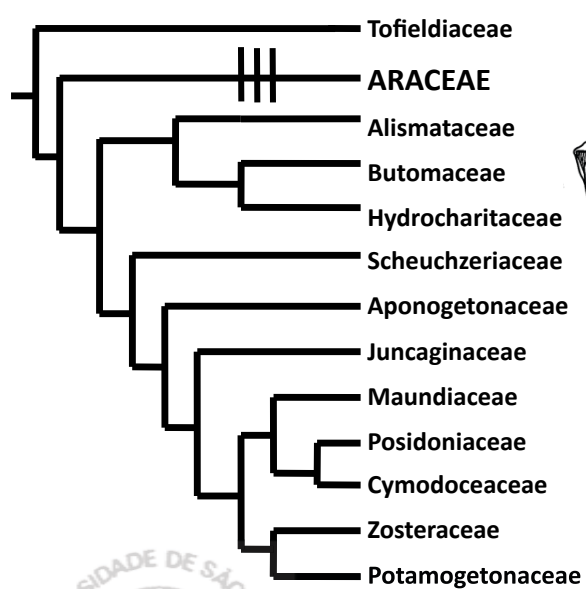
Cymodoceaceae 6/17

Zosteraceae 2/14

Potamogetonaceae 6/102

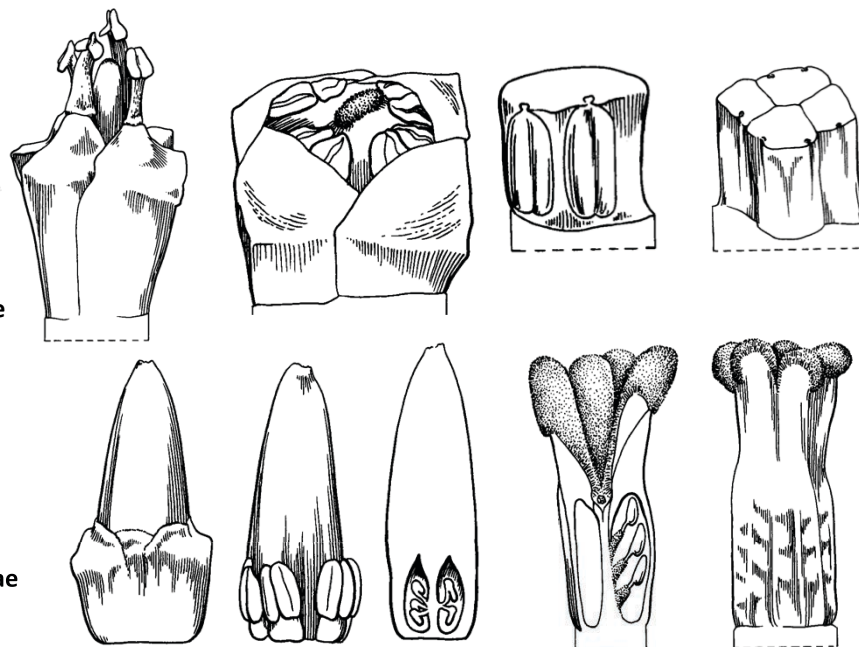
Iles et al. (2013)
Les & Tippery (2013)





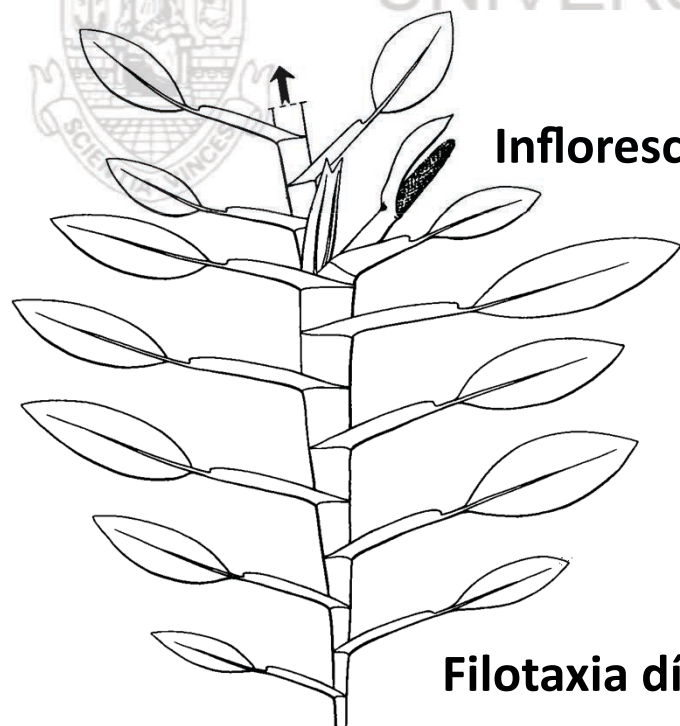
ARACEAE
117 gên., 4000 spp.

Mayo et al. (1997)

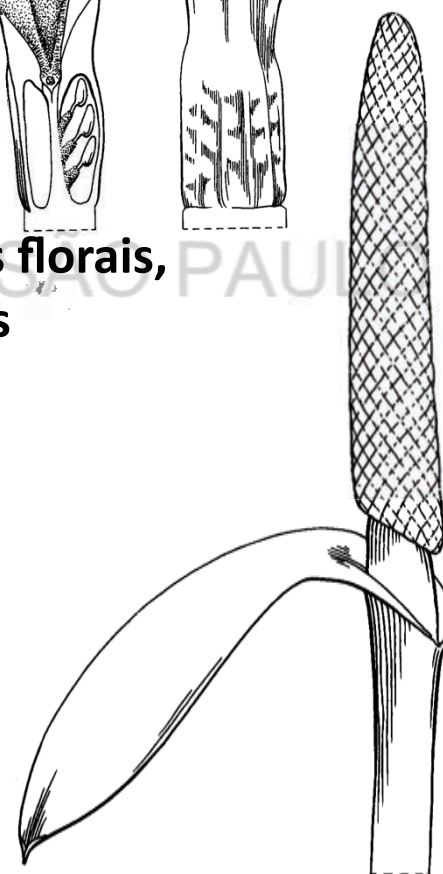


**Flores sem brácteas florais,
protogínicas**

Inflorescências terminais



Filotaxia dística

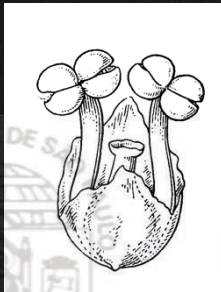
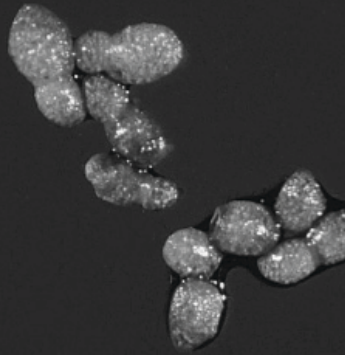


**Inflorescências com espata e
espádice**

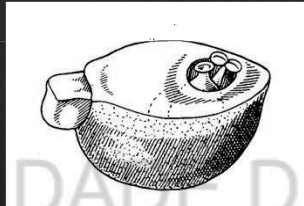


Judd et al. 1999

Wolffia columbiana



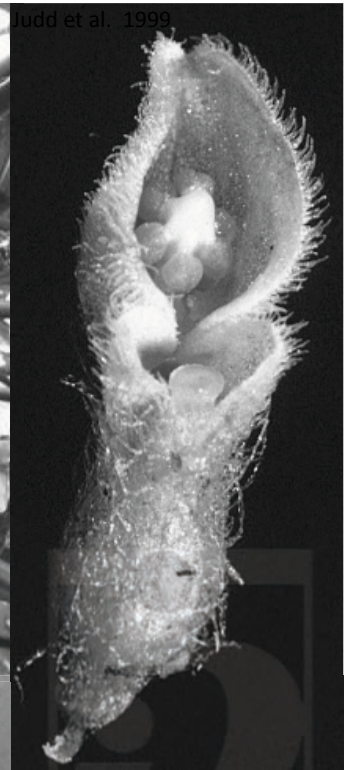
Lemna minor



© Thomas Heller, RBG, Kew

Anthurium cordatum





Judd et al. 1999

Philodendron bipinnatifidum

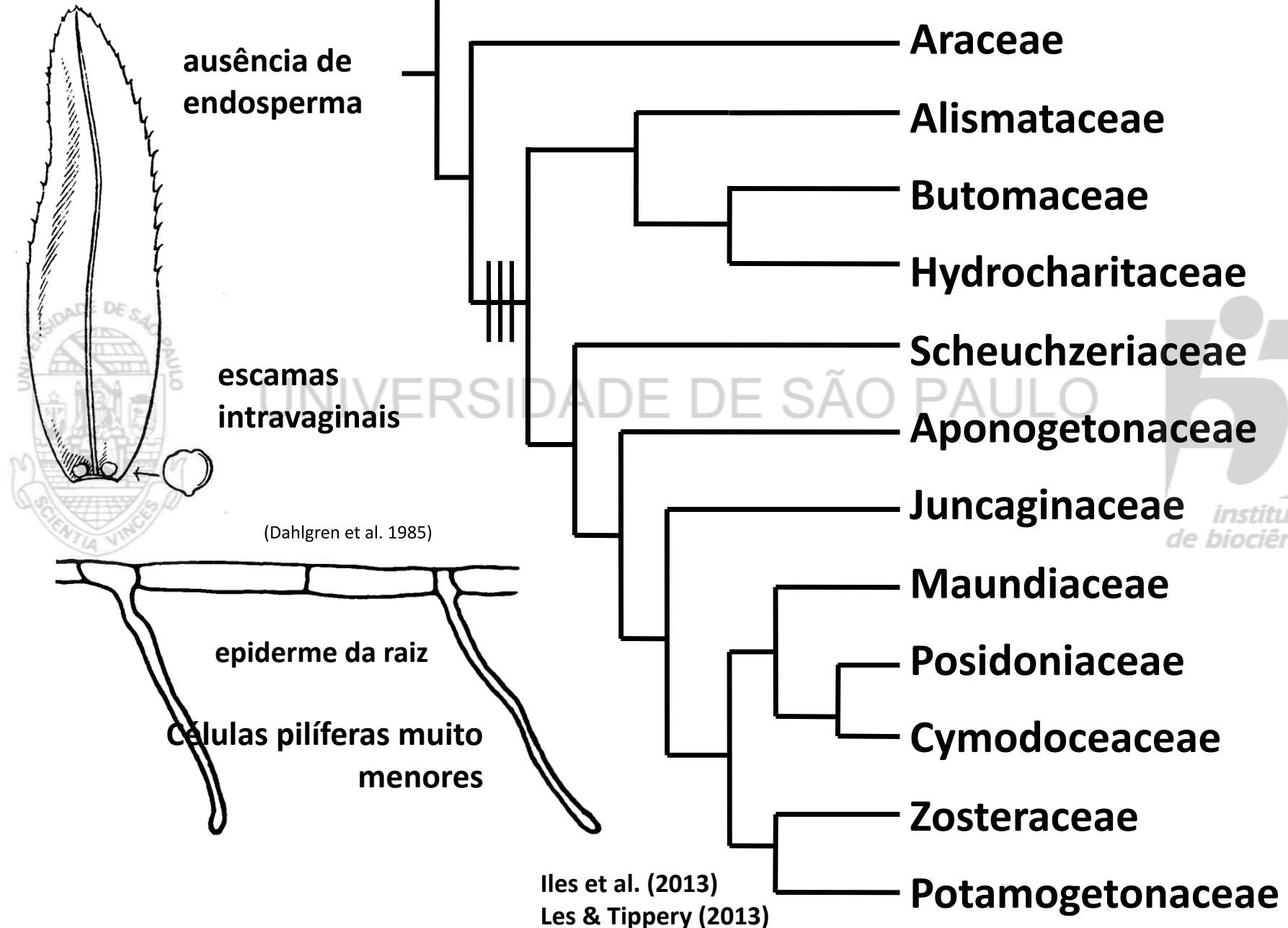
Pistia stratiotes

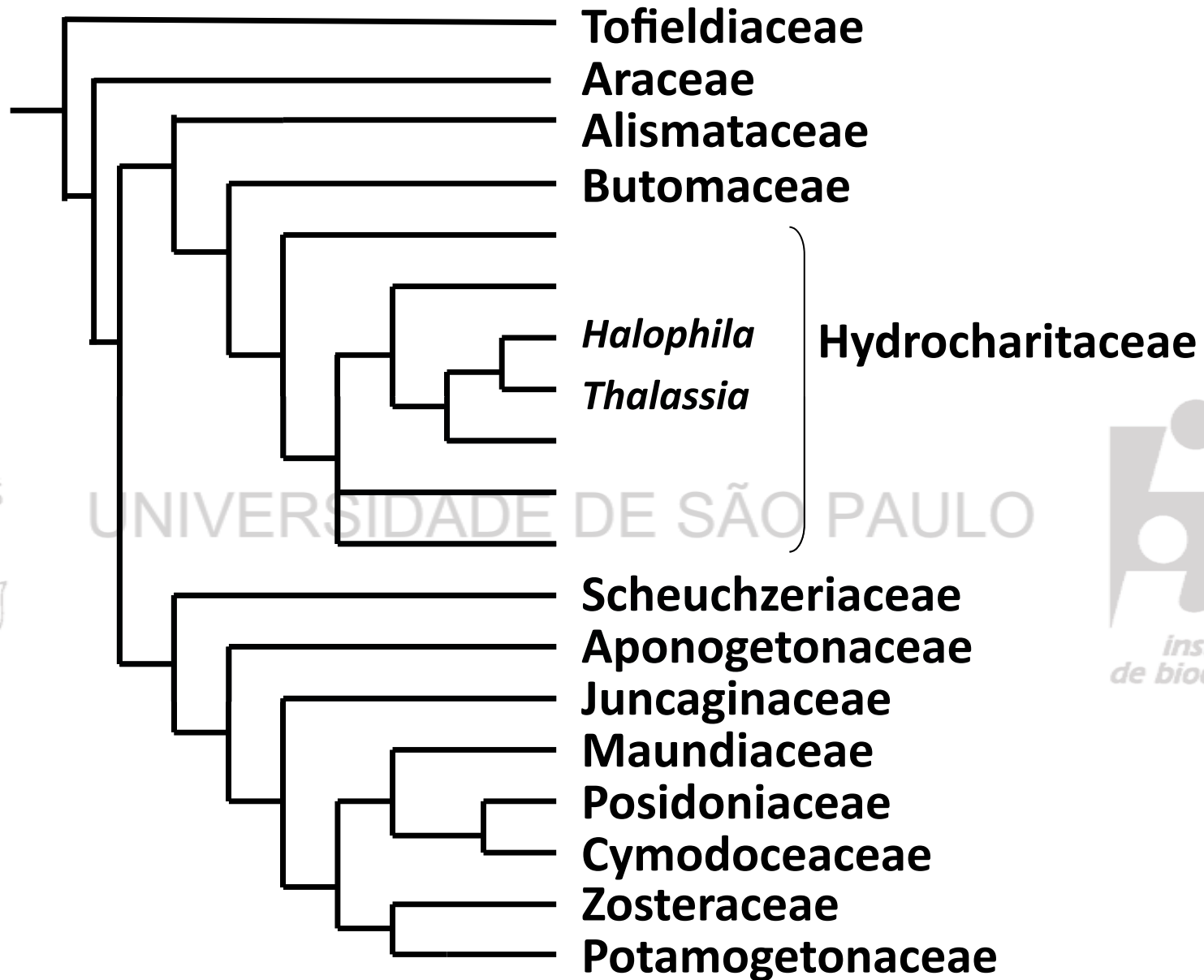


Cradidium hortulanum

Jennings 2001

Subordem Alismatinae
12 famílias, 500 spp.





Perianto desenvolvido

Iles et al. (2013)
Les & Tippery (2013)

Judd et al. 1999



Sagittaria lancifolia

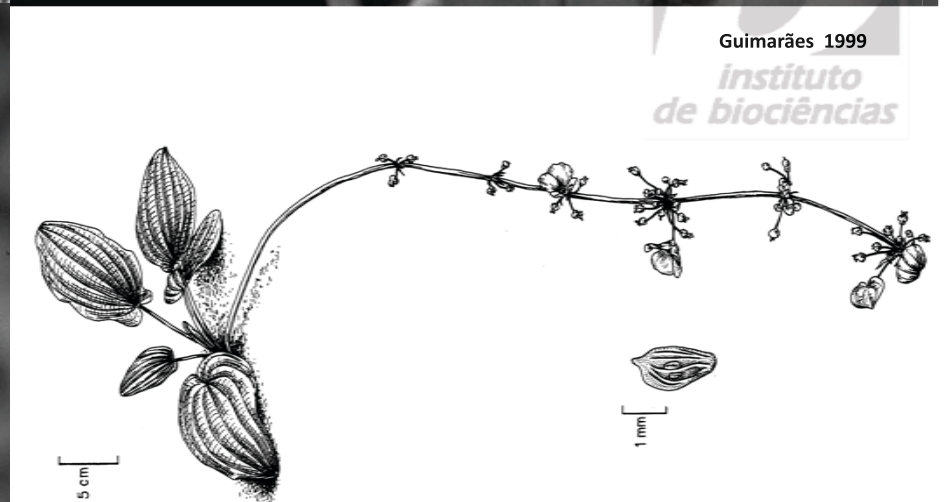


Guimarães 1999

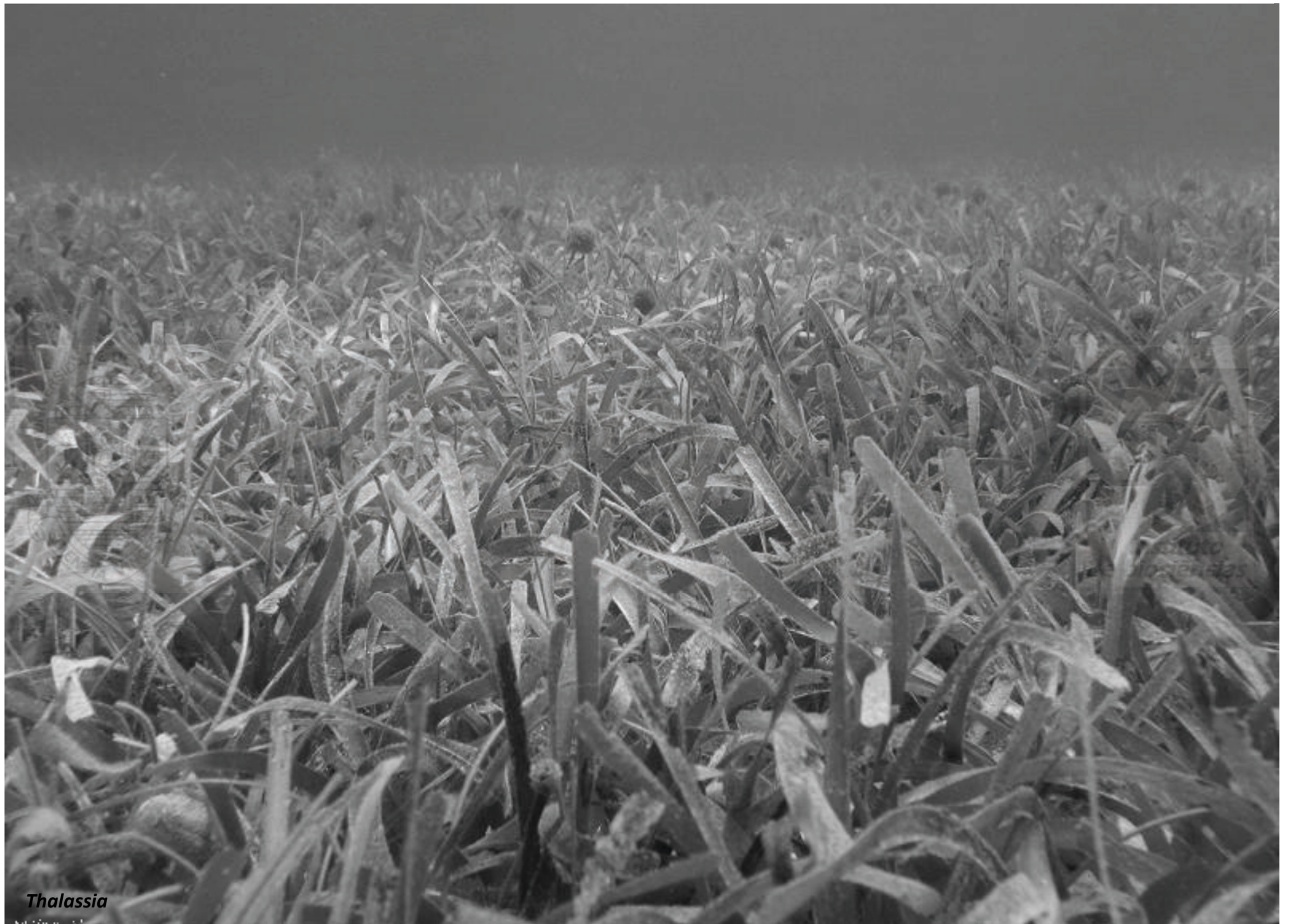
*instituto
de biociências*



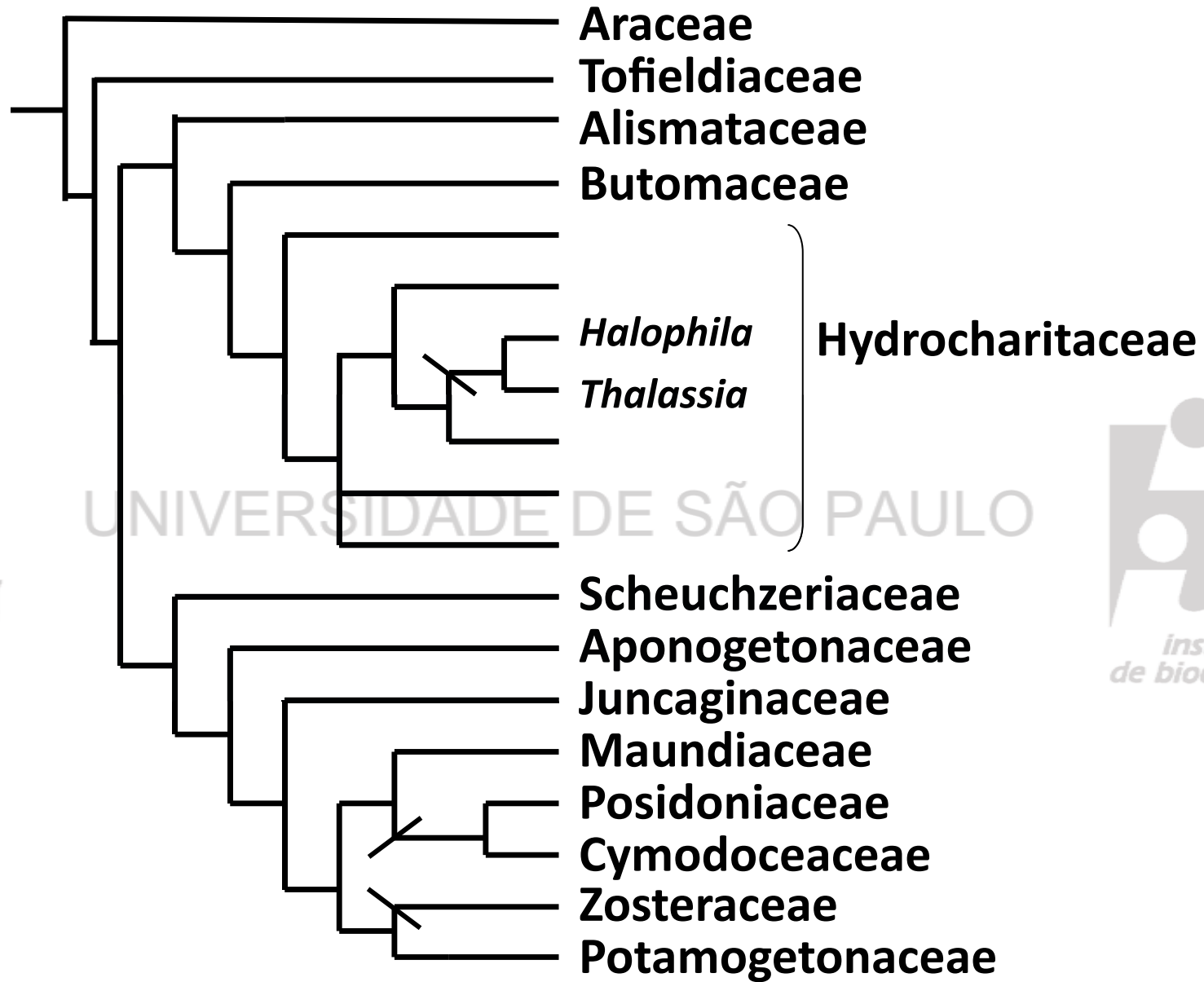
Echinodorus berteroi



Echinodorus grandiflorus



Thalassia



Colonização do mar

Iles et al. (2013)
Les & Tippery (2013)

Liliales

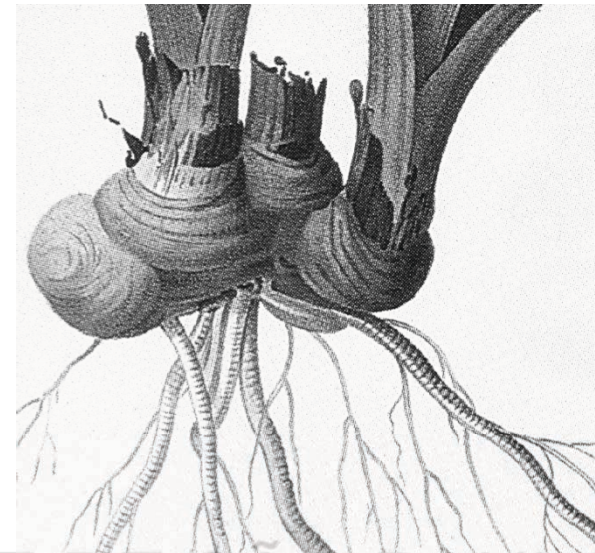
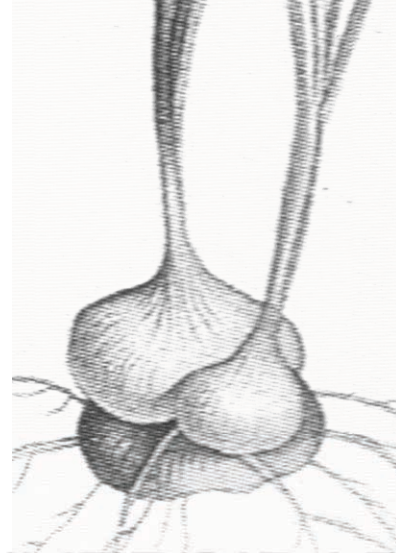
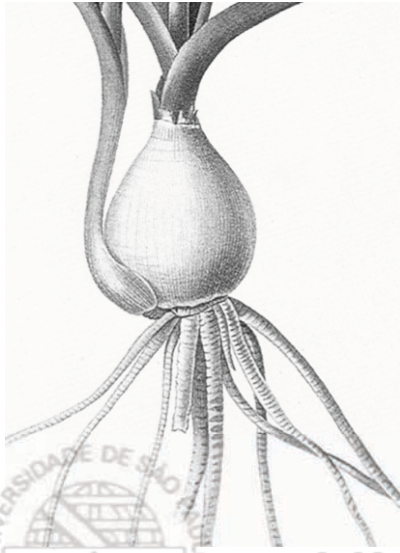
Asparagales



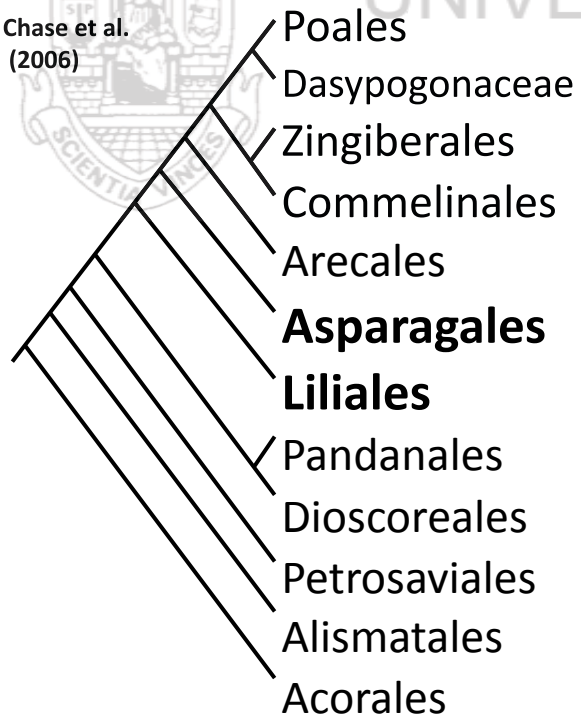
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grado das Liliales e Asparagales



Chase et al.
(2006)

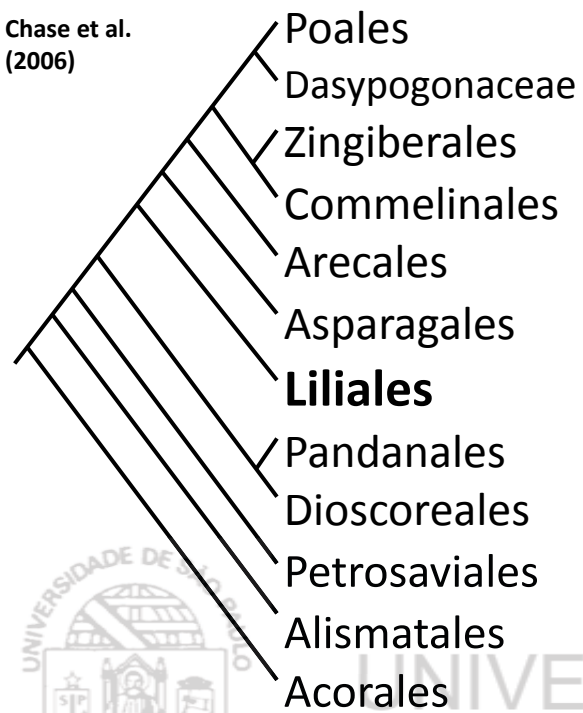


Bulbos, cormos, rizomas.

**Perianto diclamídeo,
homoclamídeo,
petalóide (perigônio,
tépalas),
frequentemente com
desenhos.**



Chase et al.
(2006)



**Tépalas com
nectários na base,
muitas com
estampagem variada**

Anteras extrorsas



Liliales



Lilium superbum

P.-J. Redouté

O problema “LILIACEAE” sensu Cronquist (1988)

ou

O problema

“LILIACEAE” e “AMARYLLIDACEAE” sensu

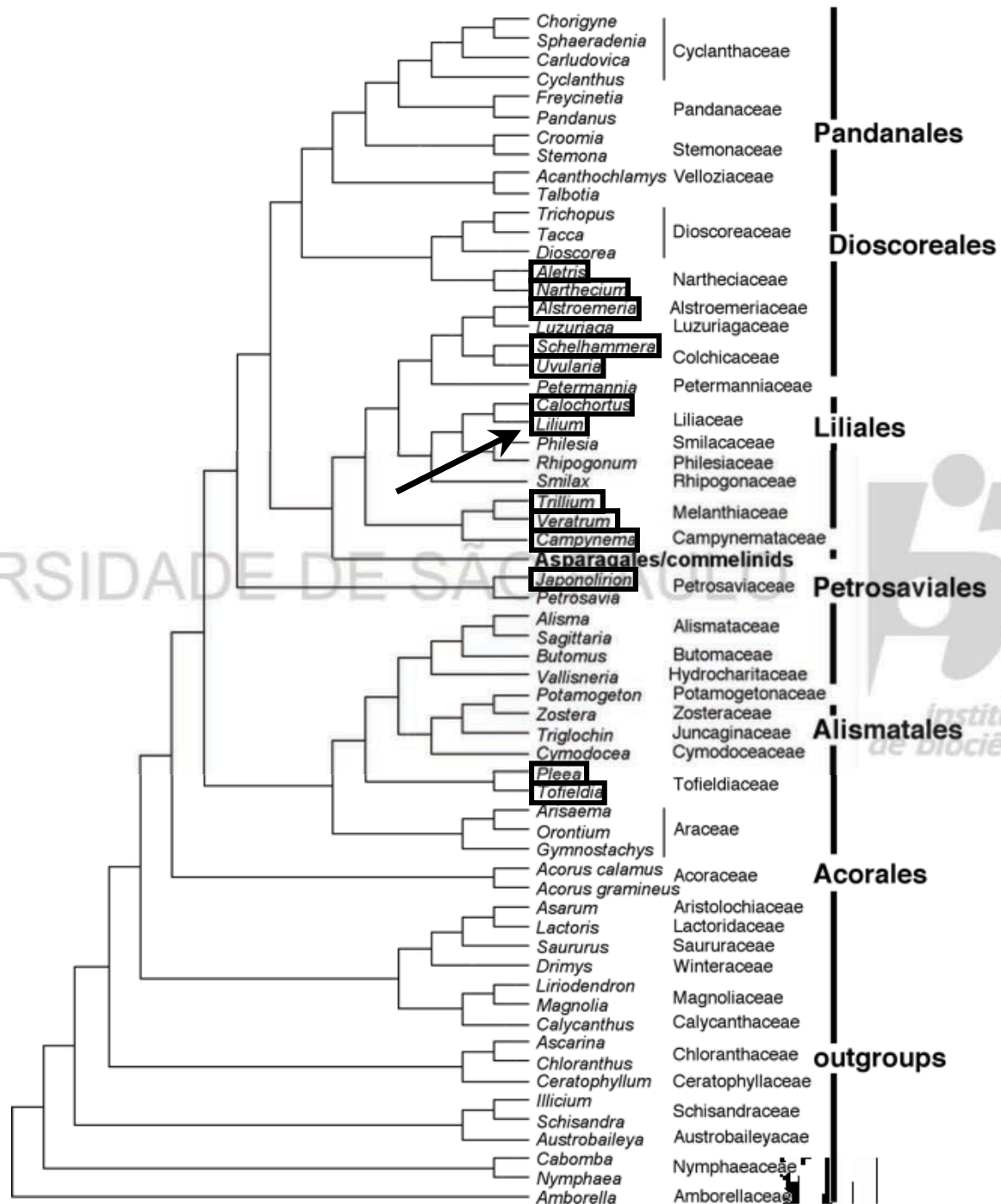
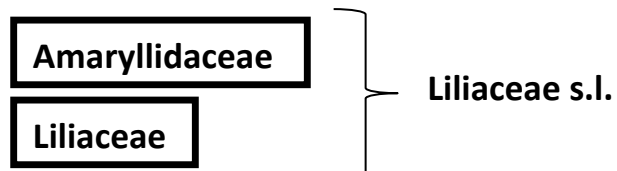
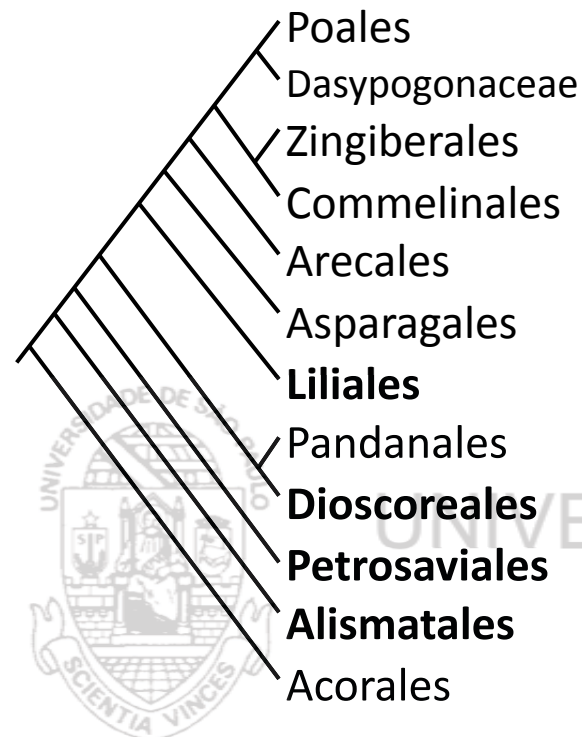
autores anteriores



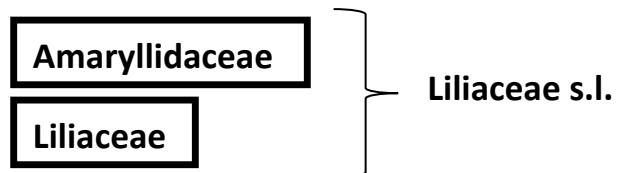
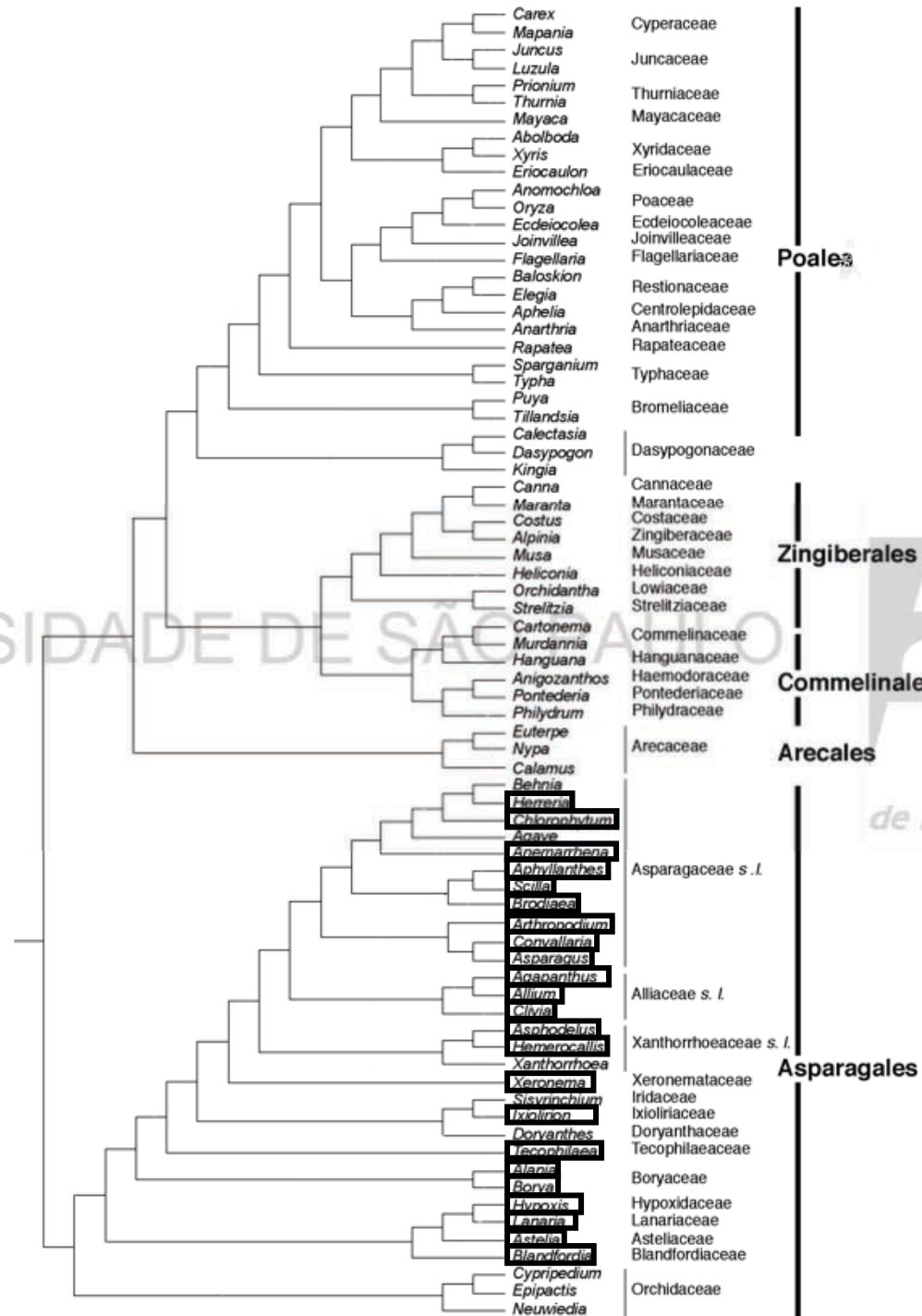
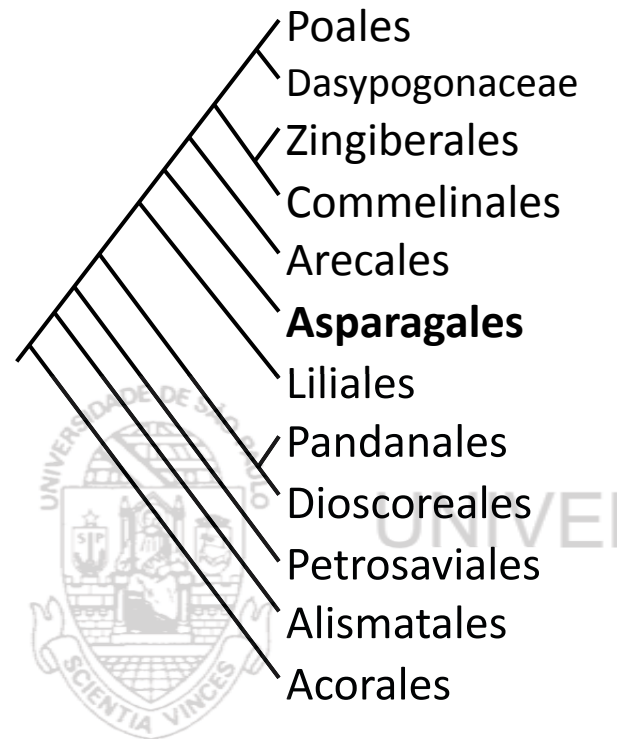
UNIVERSIDADE DE SÃO PAULO

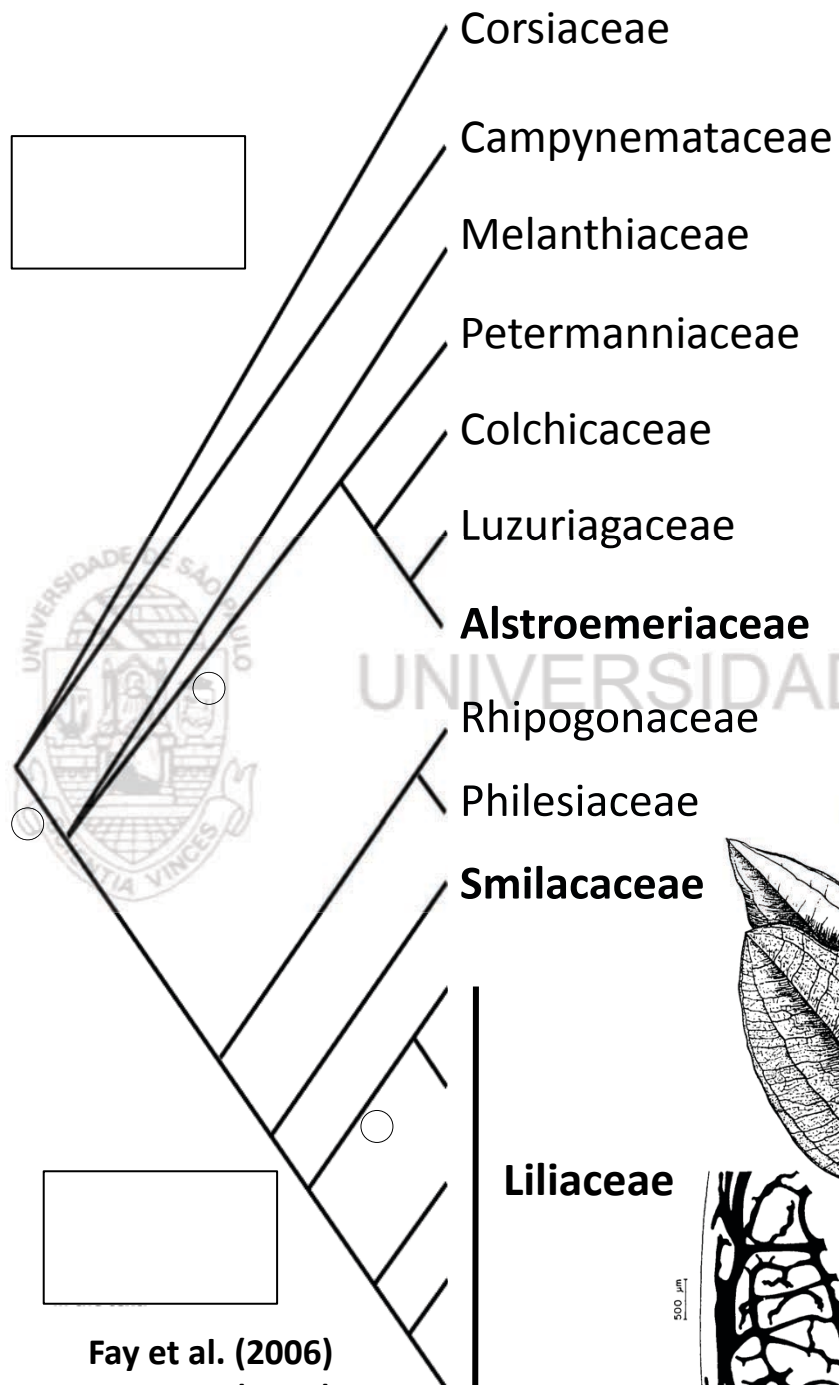


Chase et al. (2006)



Chase et al. (2006)



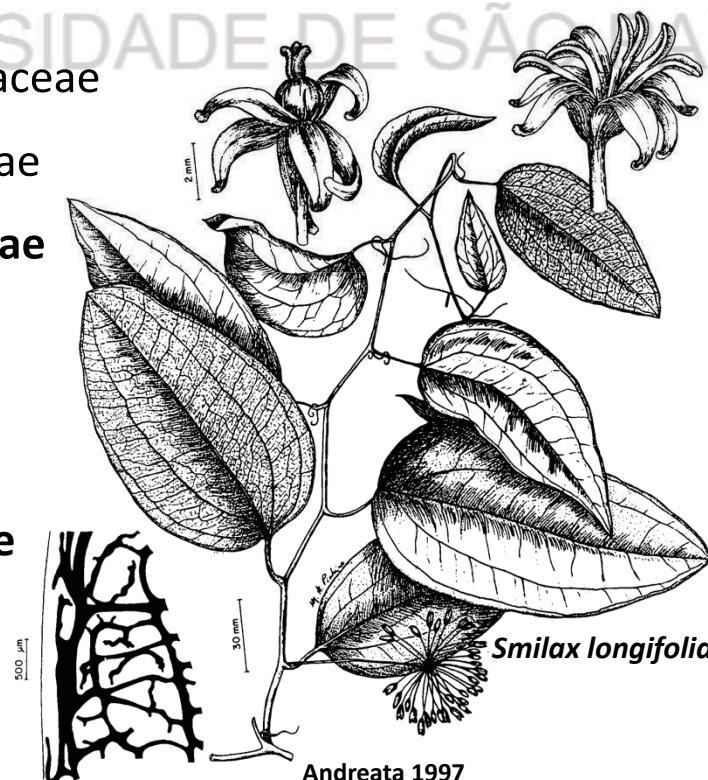


Fay et al. (2006)
Stevens (2011)



P.-J. Redouté

Alstroemeria pelegrina

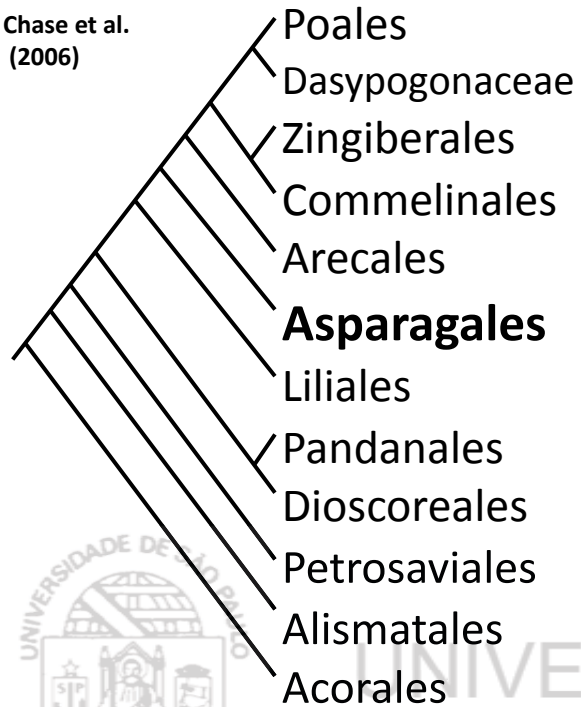


Andreata 1997

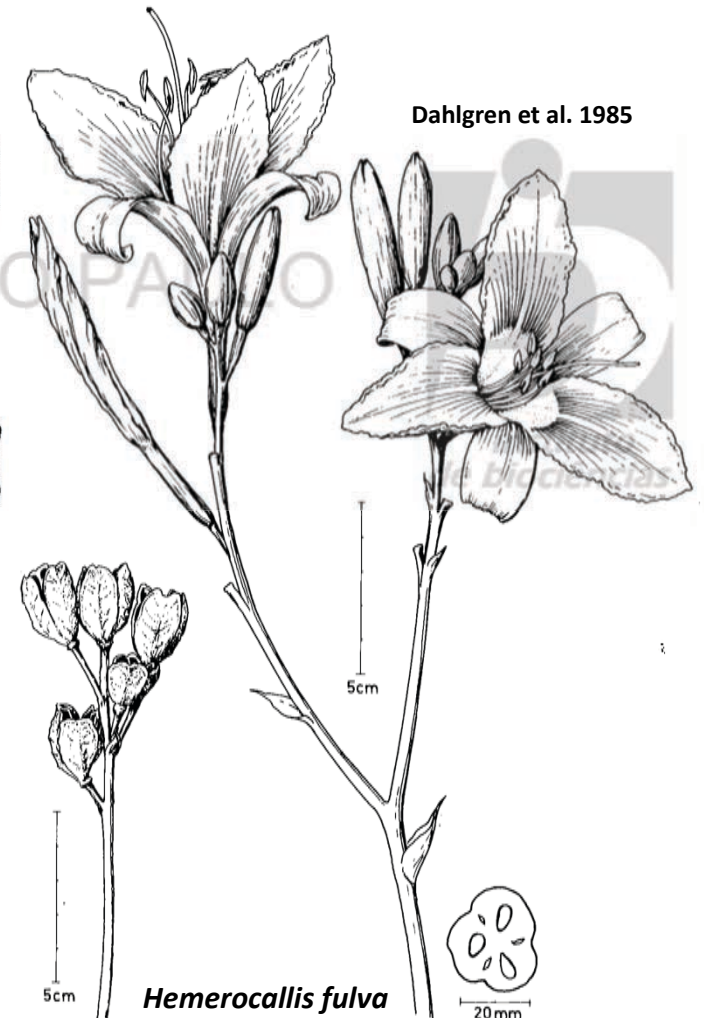
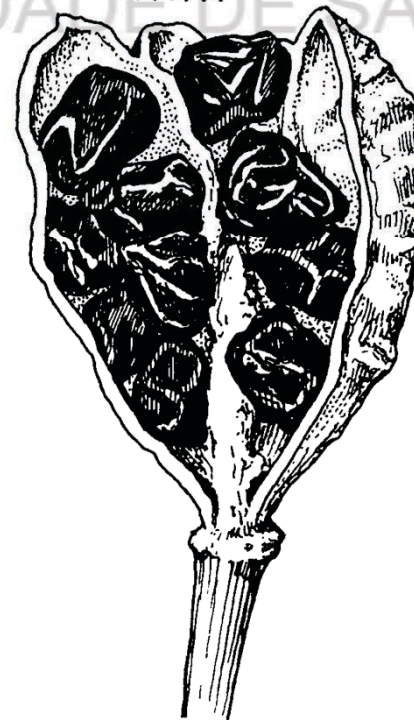
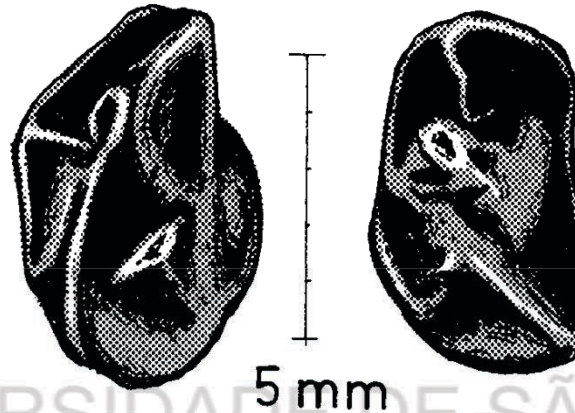


foto Gentry

Chase et al.
(2006)



Asparagales

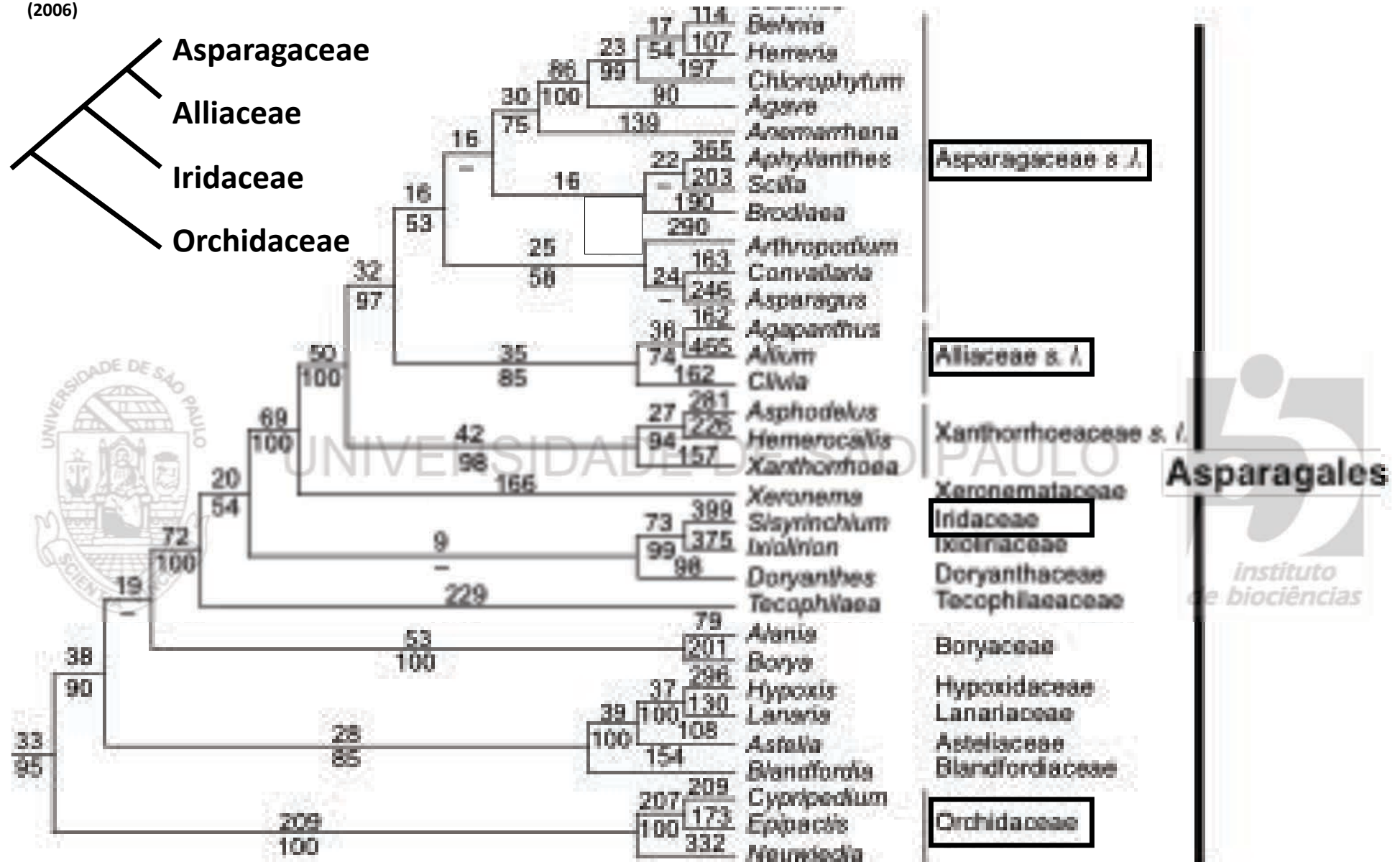


Dahlgren et al. 1985

**Testa da semente
frequentemente com
fitomelanina**

**(ausente em Orchidaceae e
táxons com bagas)**

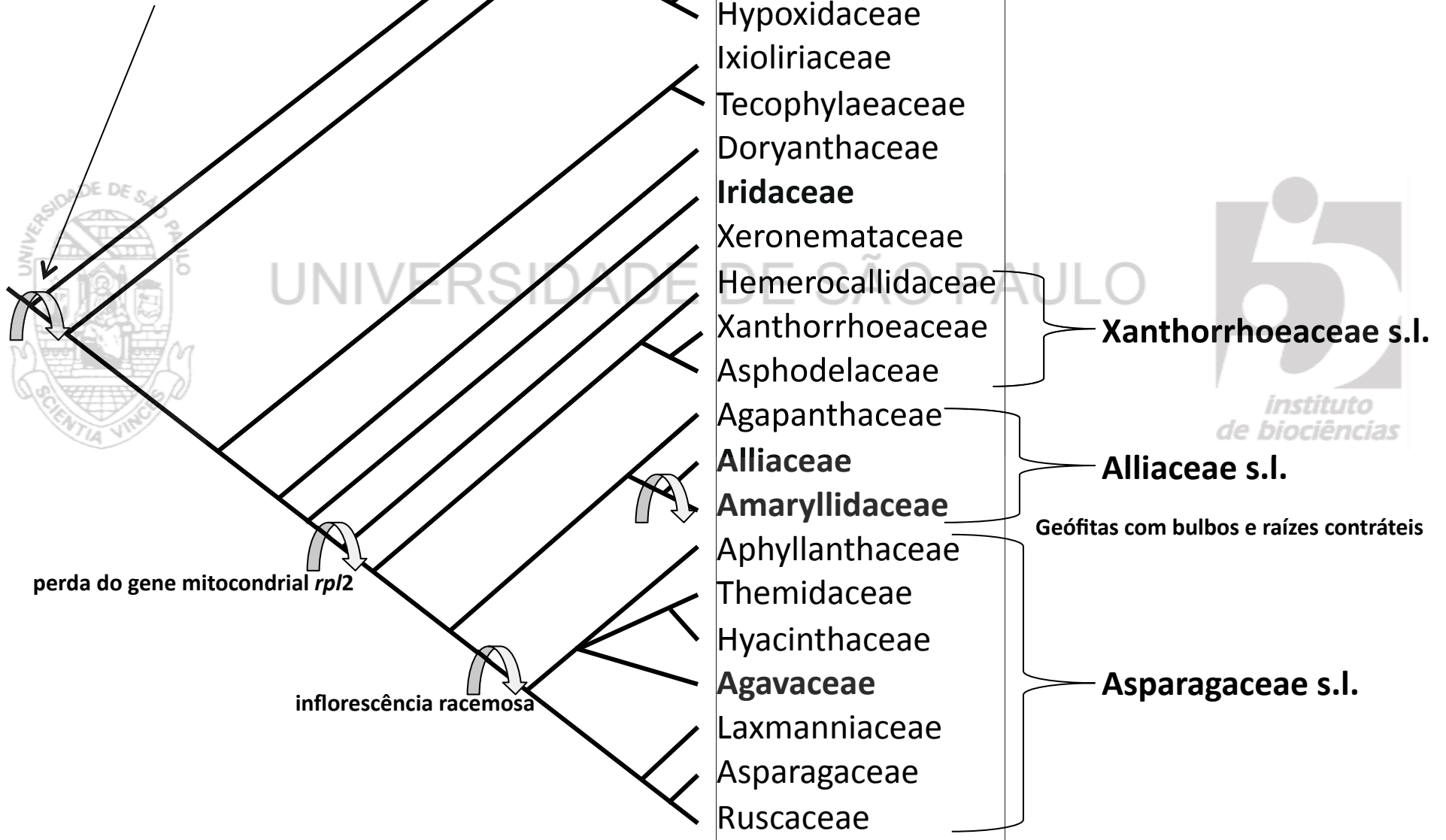
Chase et al.
(2006)

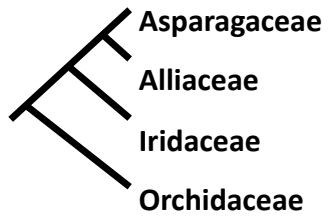


Chase et al. (2006)

Chase et al. (2006)
Stevens (2011)
Soltis et al. (2007)

perda do gene mitocondrial *sdh3*



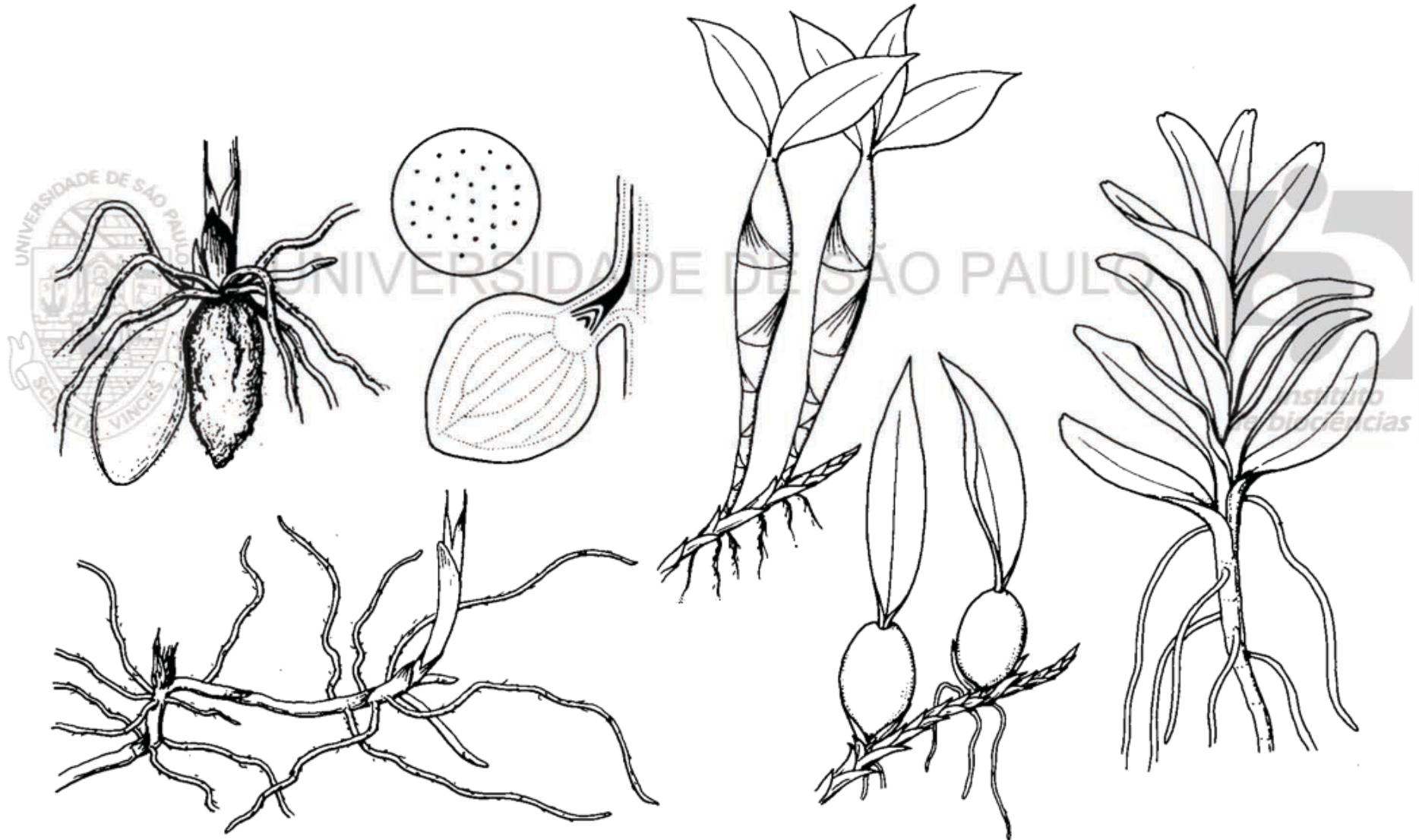


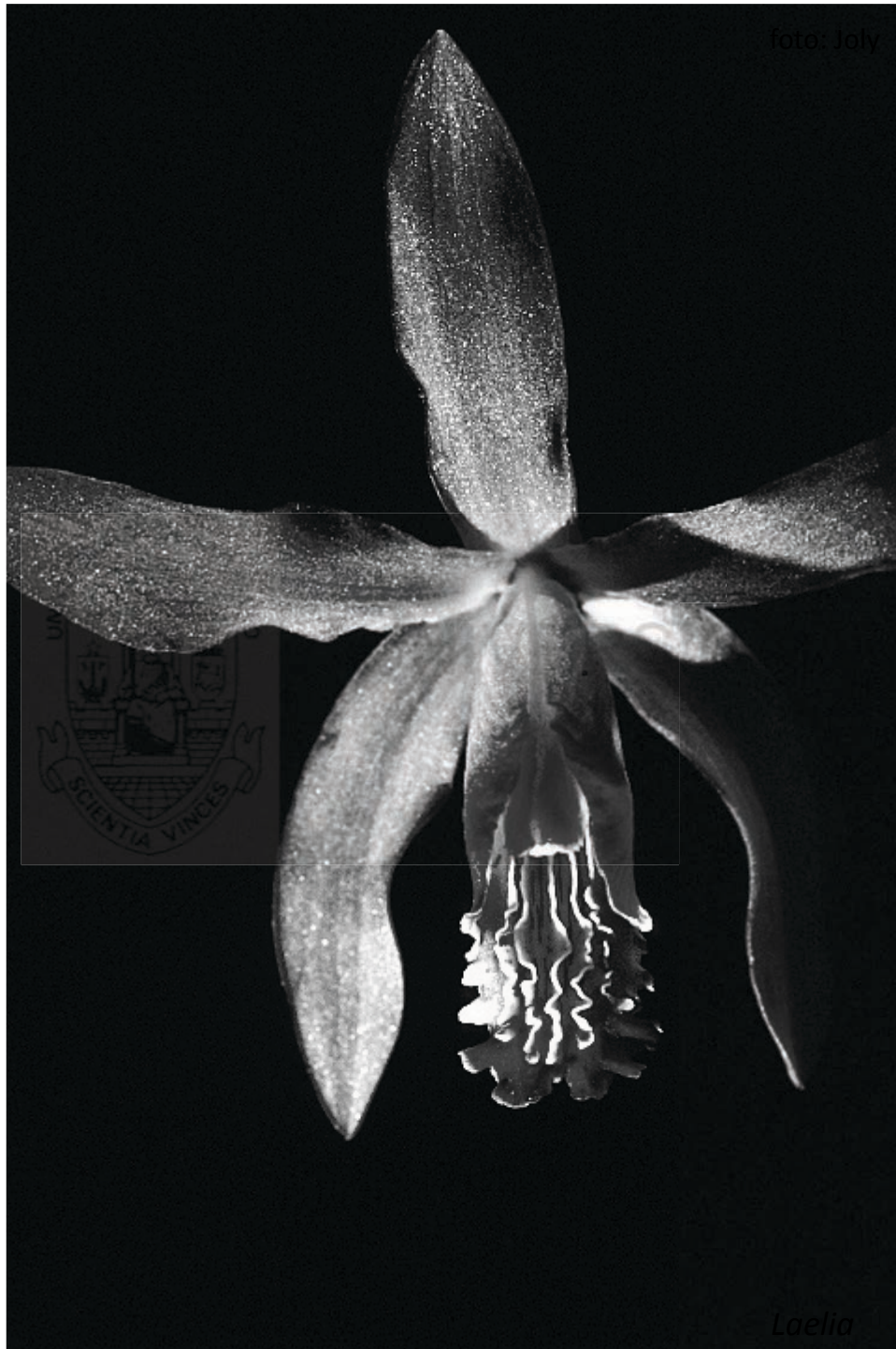
18 000 spp.

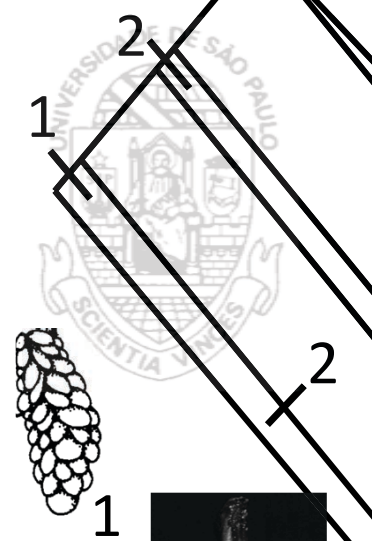
850 gên.

Orchidaceae

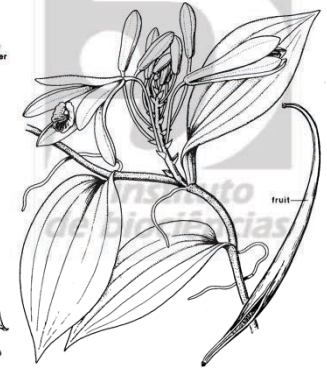
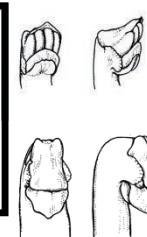
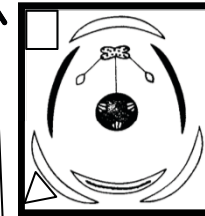
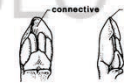
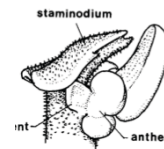
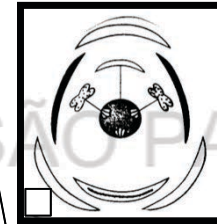
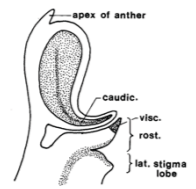
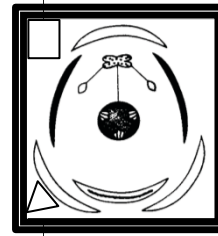
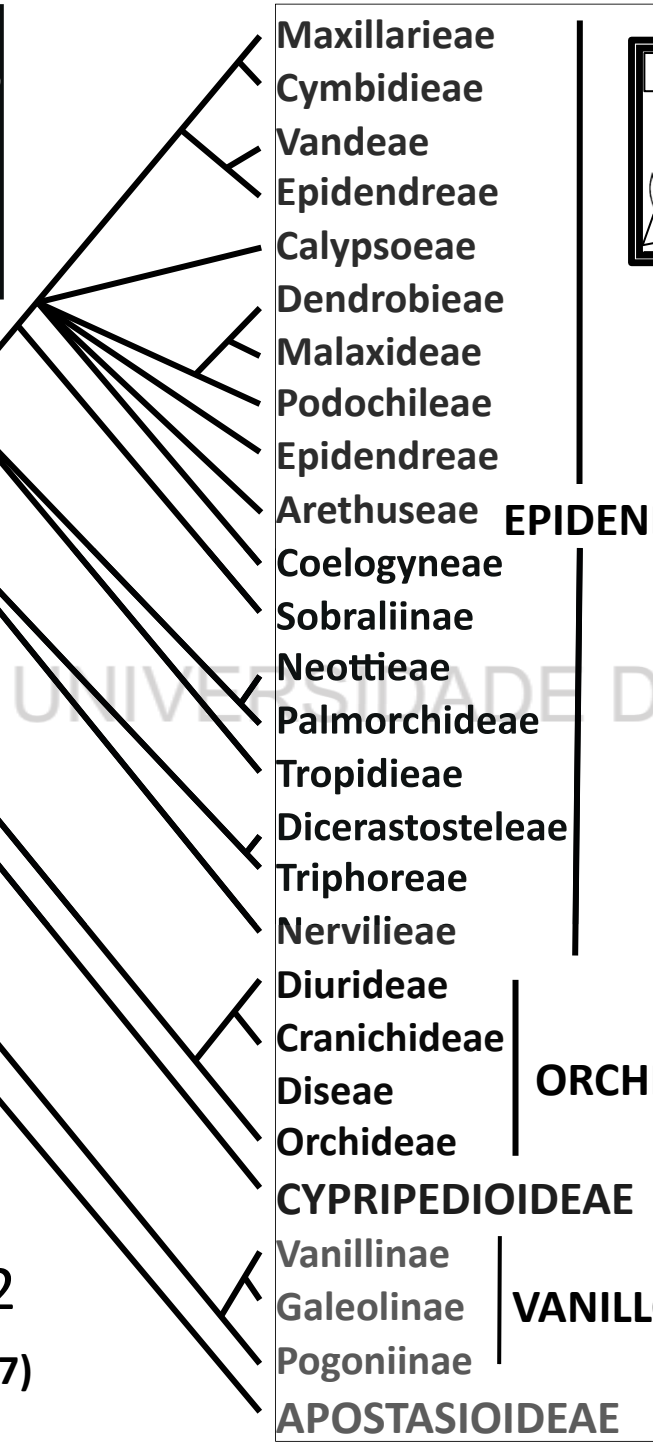
Chase et al.
(2006)







Cameron et al. (2007)
Stevens (2011)



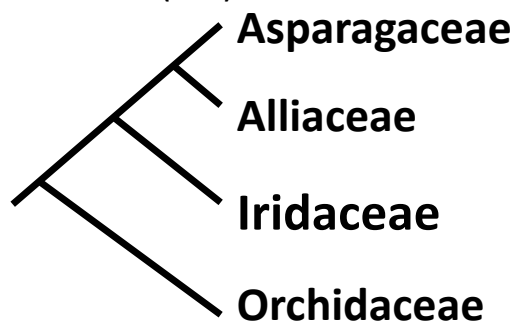
EPIDENDROIDEAE

ORCHIDOIDEAE

VANILLOIDEAE



Chase et al. (2005)



2000 spp.

66 gên.

Iridaceae

Folhas equitantes, isobifaciais

Anteras extrorsas

**Estigmas na margens de estiletes
expandidos e complexos**

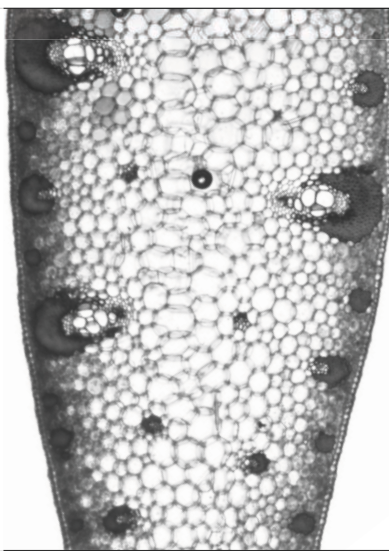
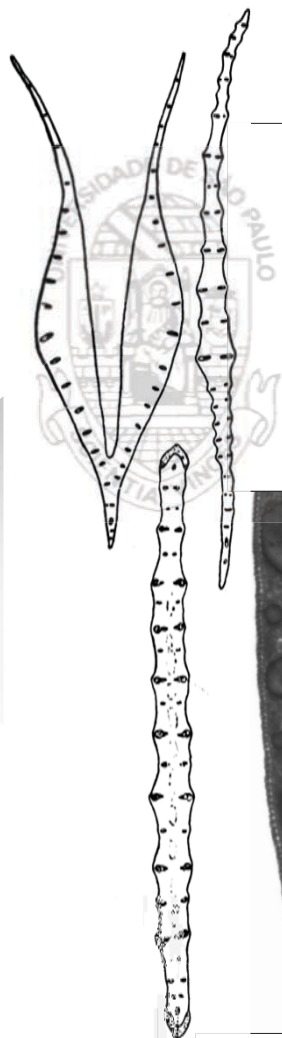
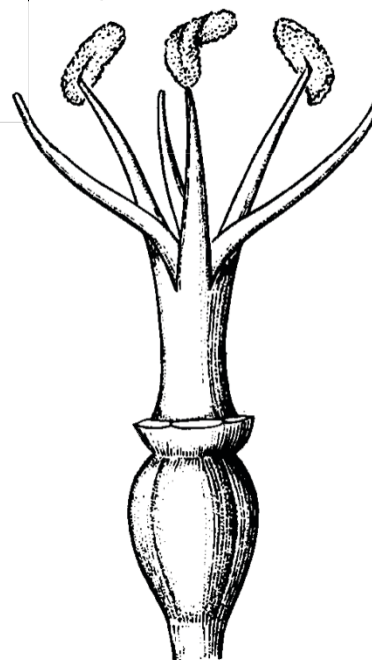


foto: A. Nogueira



Pseudiris speciosa

foto: J. Lovo



Cipura palustris

foto: Lovo



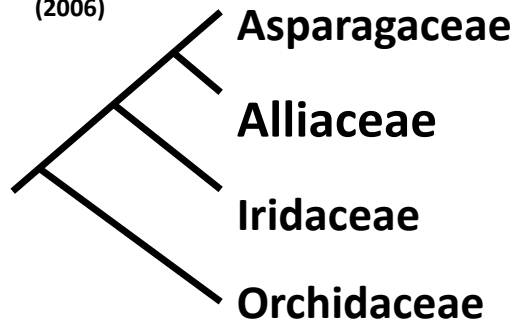
Neomarica coerulea

foto: J. Lovo



Neomarica candida

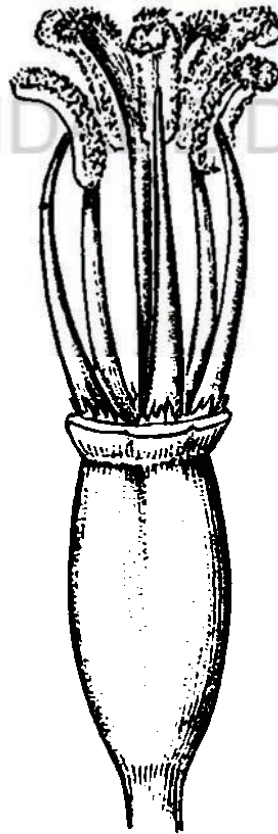
Chase et al.
(2006)



**Geófitas com
bulbos e raízes
contráteis**



Alliaceae
1 600 spp. Alliaceae + Amaryllidaceae
73 gên.





Eucharis



Wikipedia

Narcissus



Wikipedia



Crinum

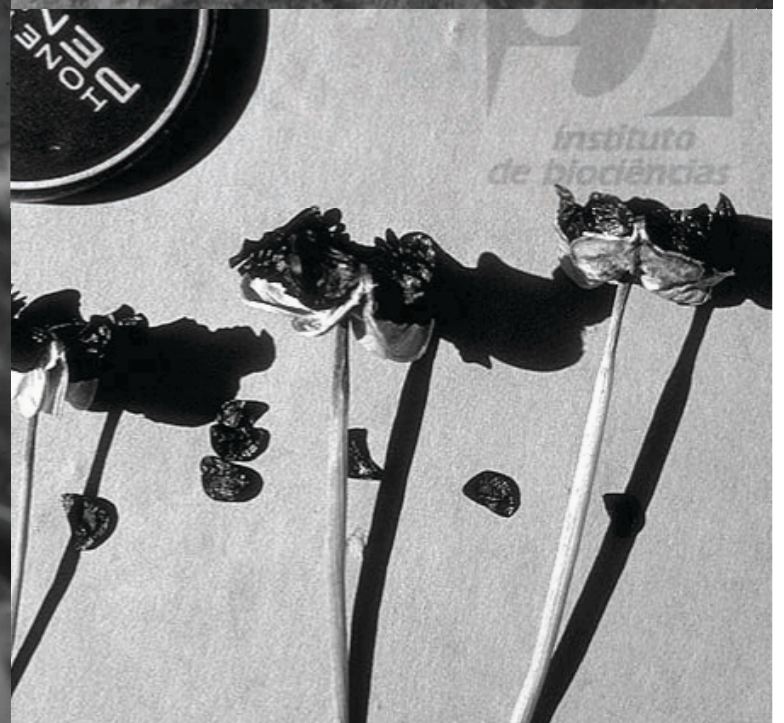


Habranthus

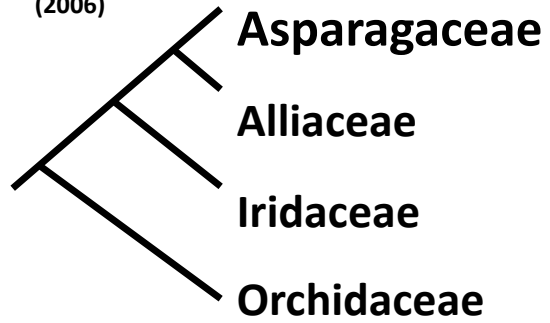


Hippeastrum

foto: Mendes



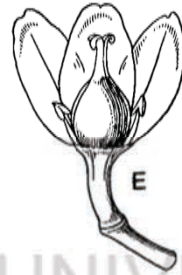
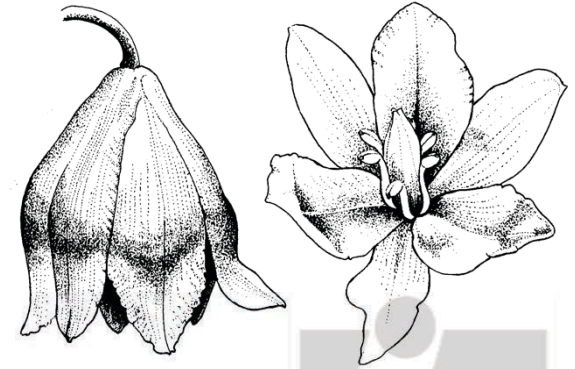
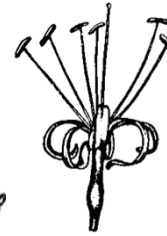
Chase et al.
(2006)



1 500 spp.

66 gên.

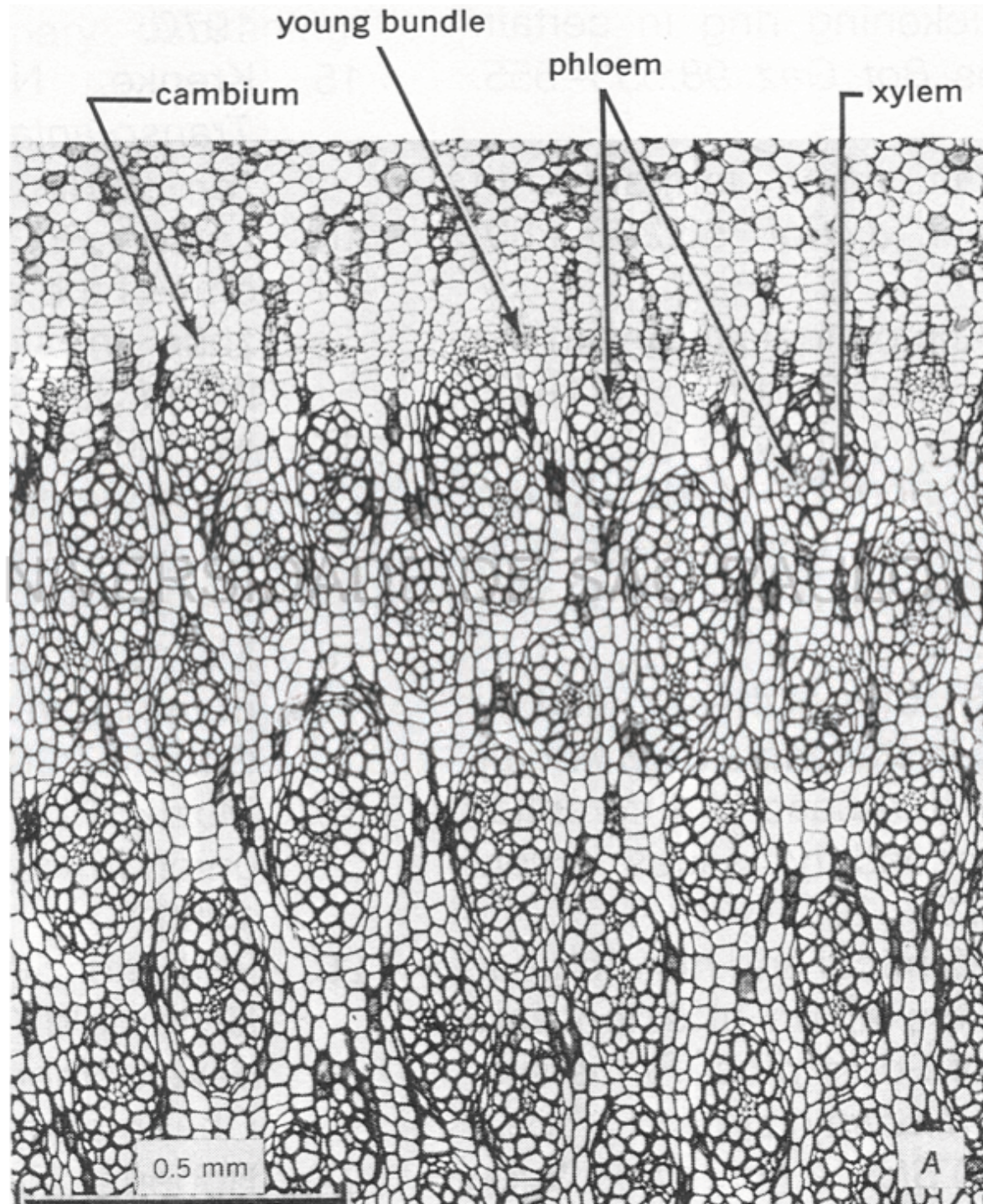
Asparagaceae



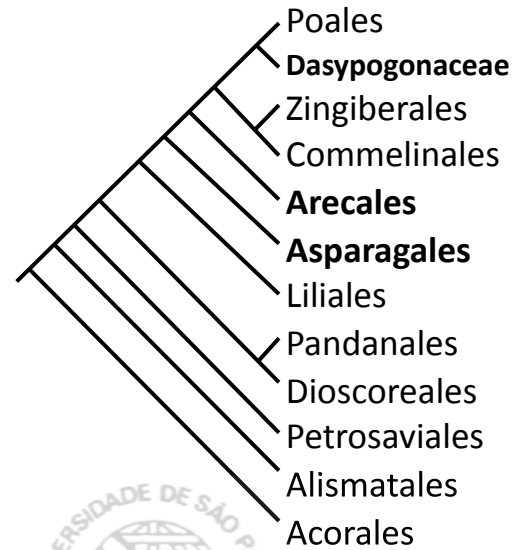
Crescimento secundário



Cheadle 1937



Chase et al. (2006)



ALOEACEAE

Aloe

ASPARAGACEAE s.l.

Agavaceae

Agave

Cordyline

Furcraea

Yucca

Dracaenaceae

Beaucarnea

Dasyllirion

Dracaena

Nolina

Sansevieria

ASPHODELACEAE

Kniphofia

DASYPOGONACEAE

Kingia

IRIDACEAE

Aristea

Klattia

Nivenia

Patersonia

Witsenia

LOMANDRACEAE

Lomandra

PALMAE (Angialossy et al. 2008)

Attalea

Butia

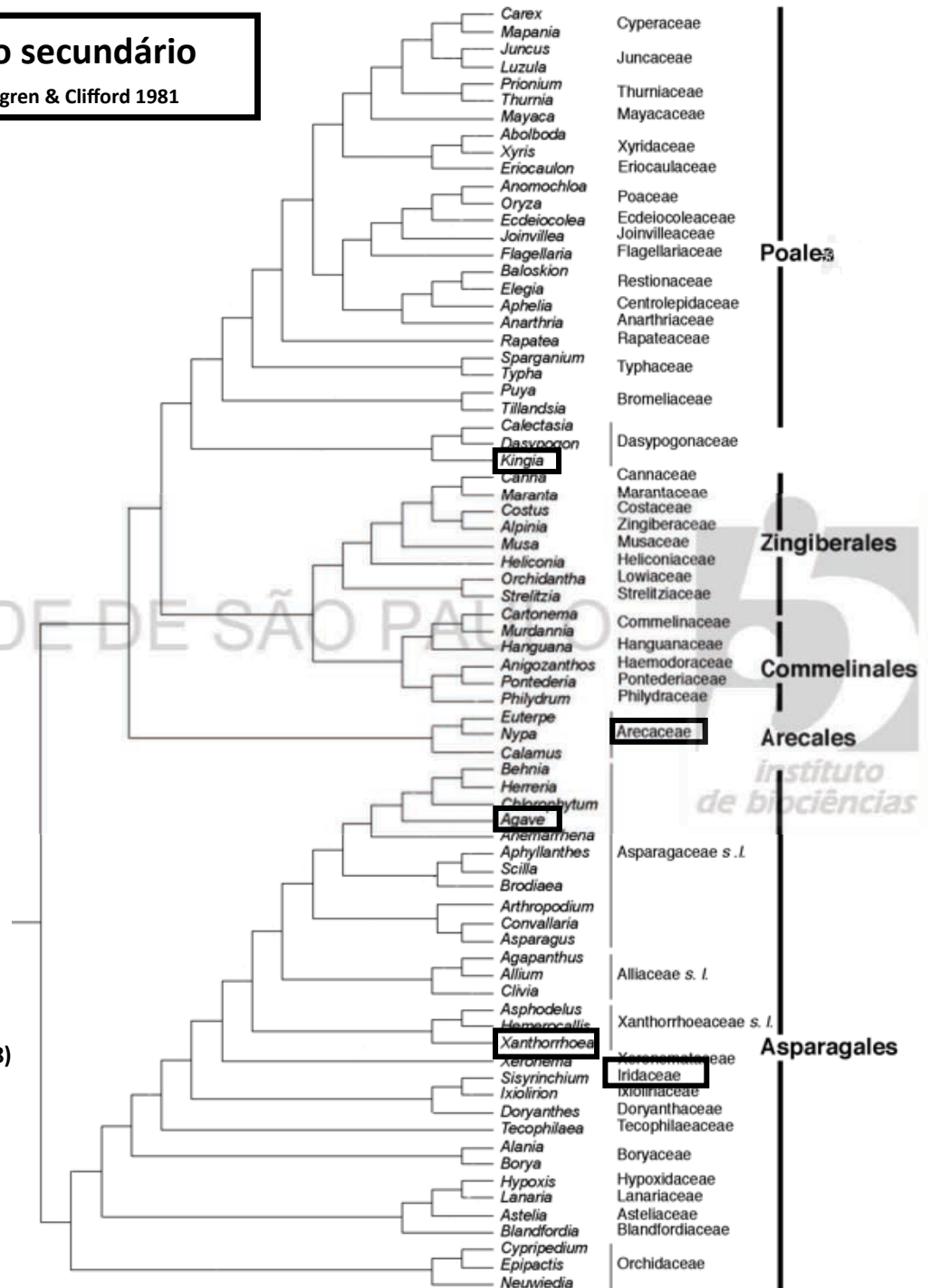
Syagrus

XANTHORRHOEACEAE

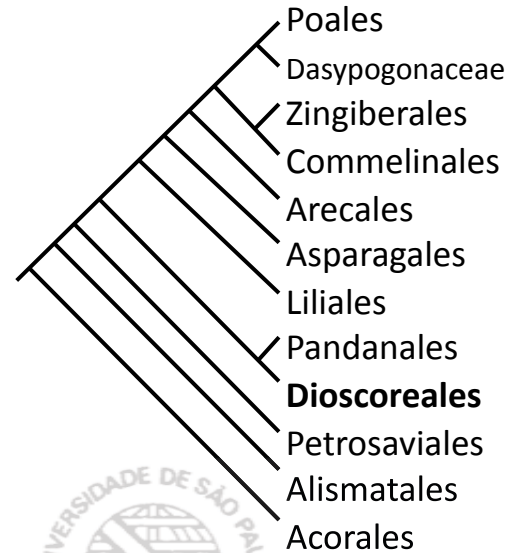
Xanthorrhoea

Crescimento secundário

Atualizado de Dahlgren & Clifford 1981



Chase et al. (2006)



DIOSCOREACEAE

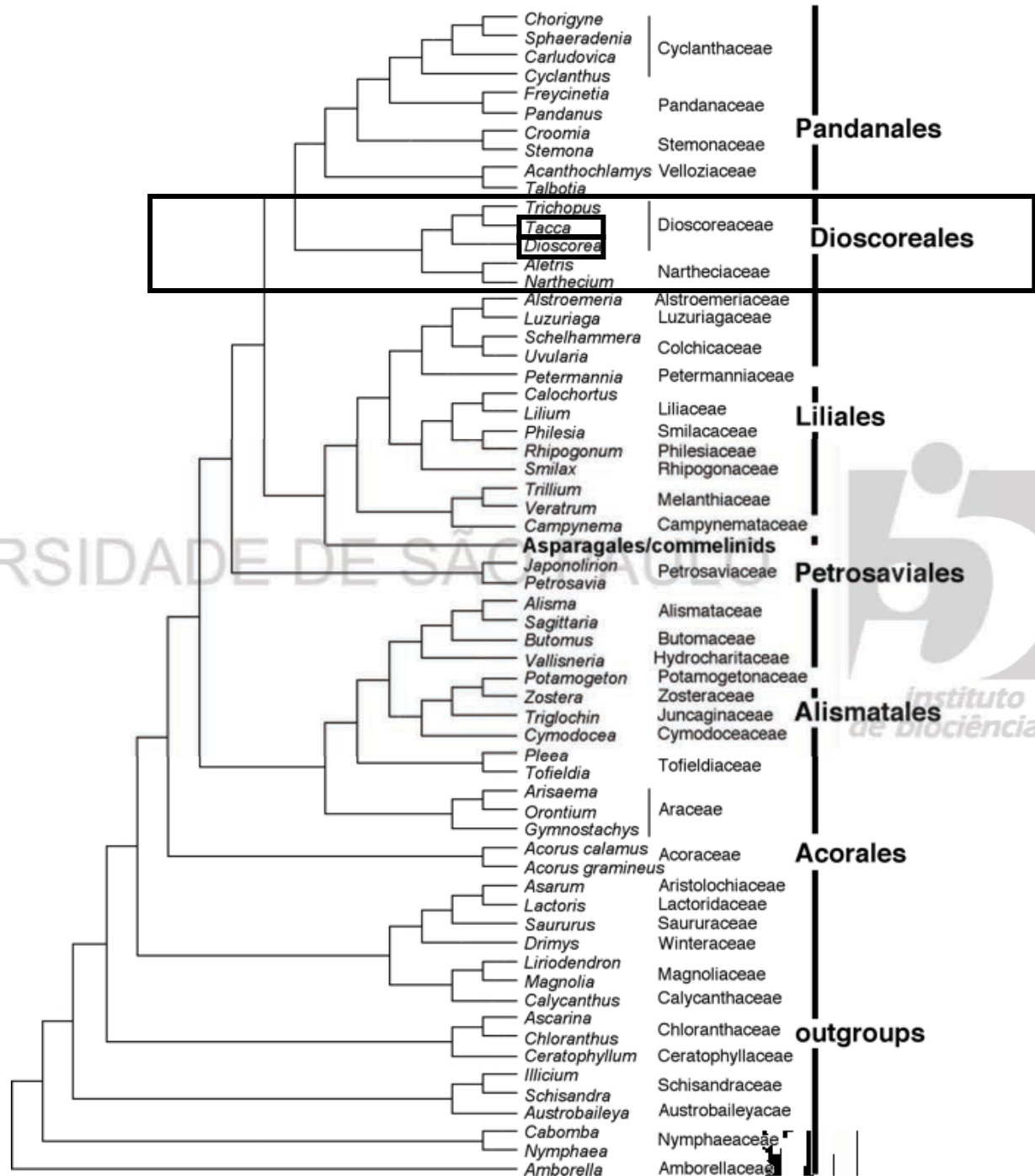
Dioscorea

Tacca ?

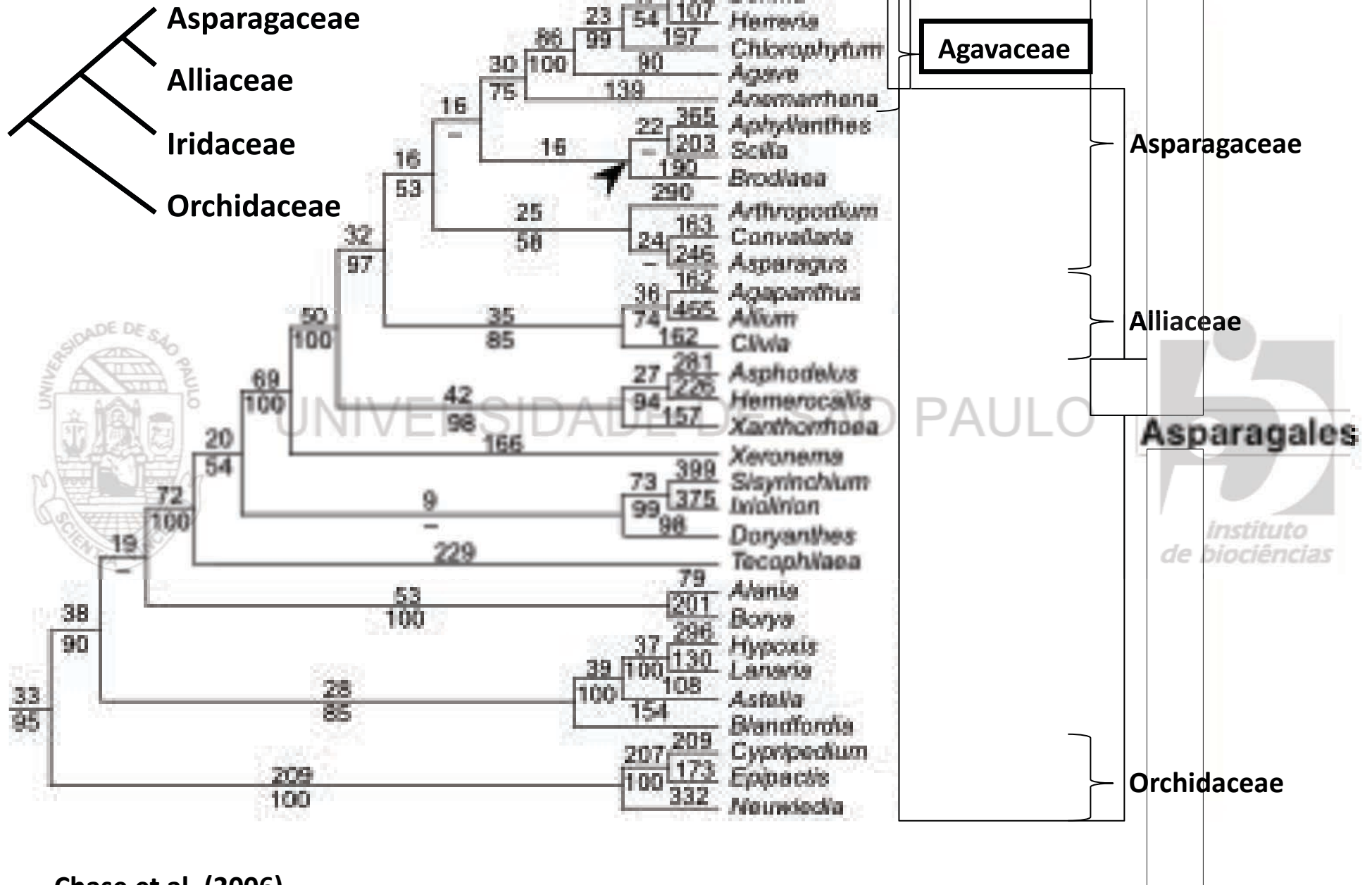
Tamus

Crescimento secundário

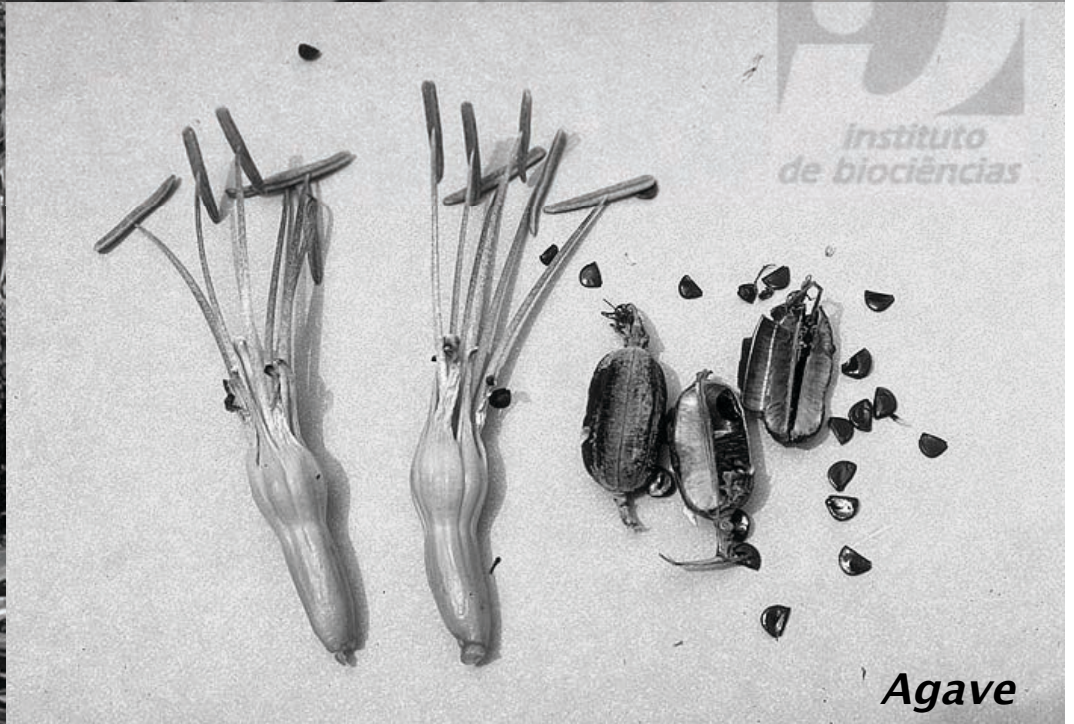
Atualizado de Dahlgren & Clifford 1981



Chase et al.
(2006)



Chase et al. (2006)



Agave

Agave sisalana



Agave tequilana



Foto: Rancho Tequila



Instituto
de Biociências

Cordyline spectabilis

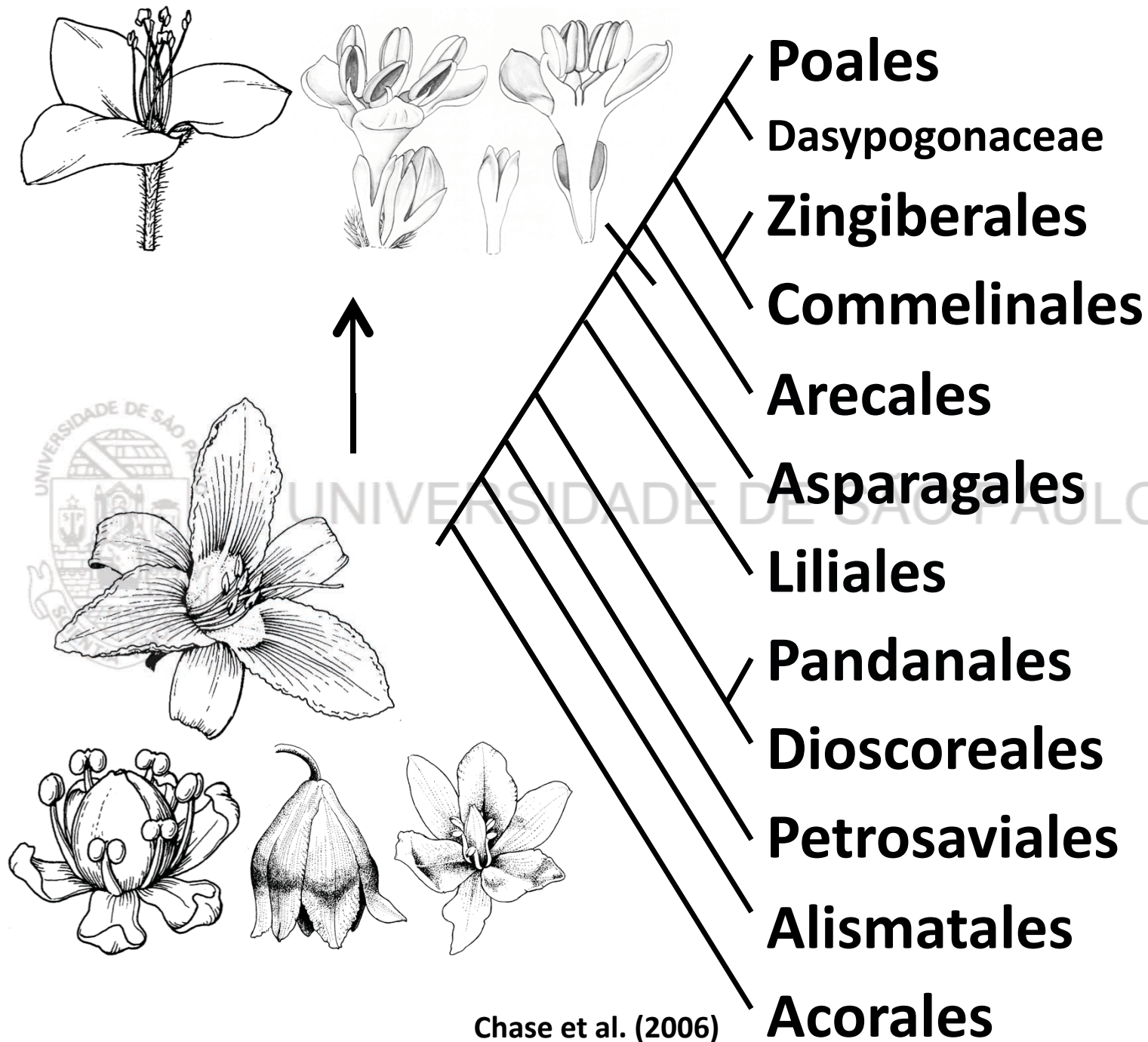


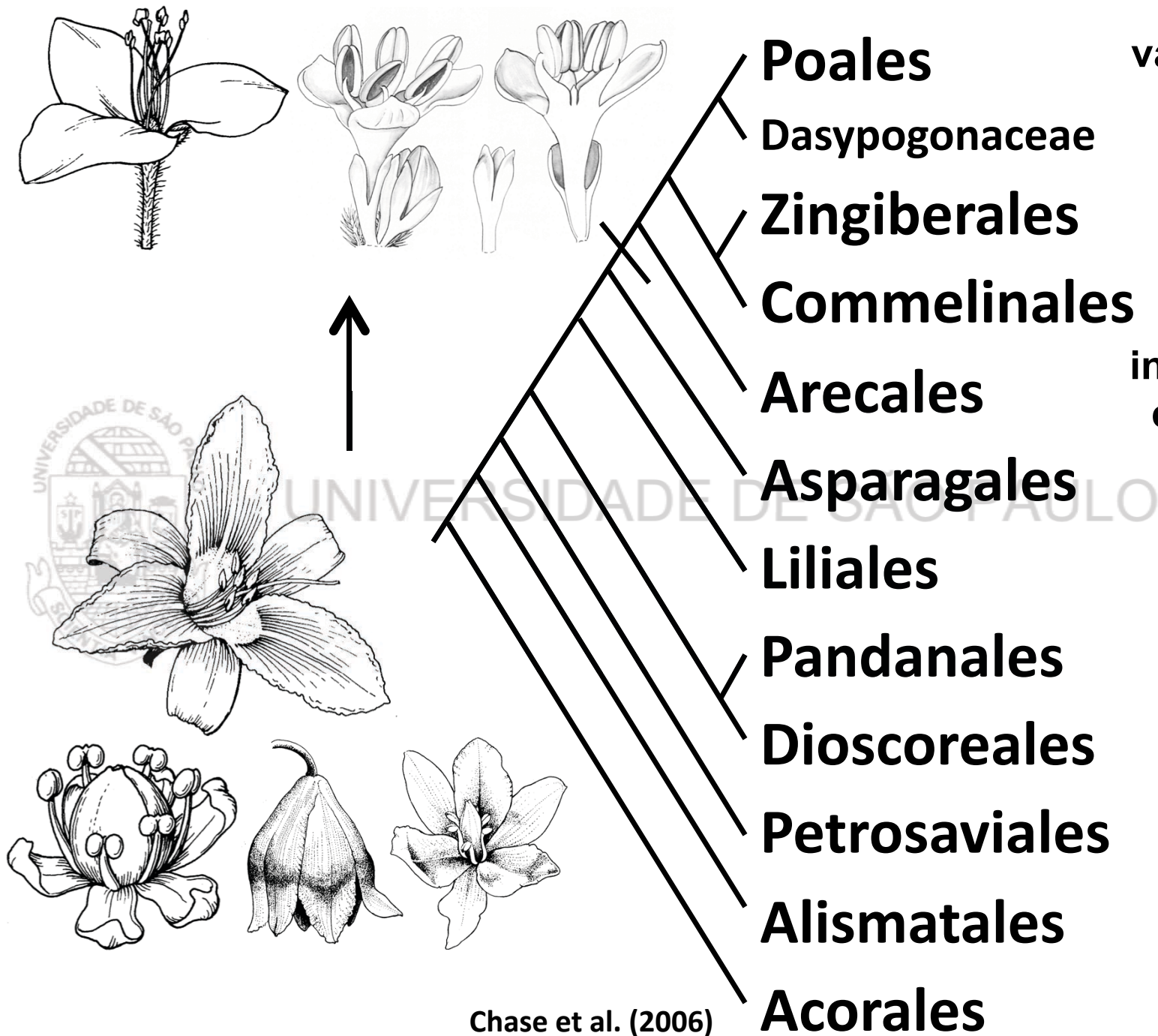
Foto: Projeto Flora do Rio Grande do Sul

Furcraea foetida



Foto: Forest Starr





**vasos no caule
e nas folhas**

**corpos de
sílica (SiO_2)
nas folhas**

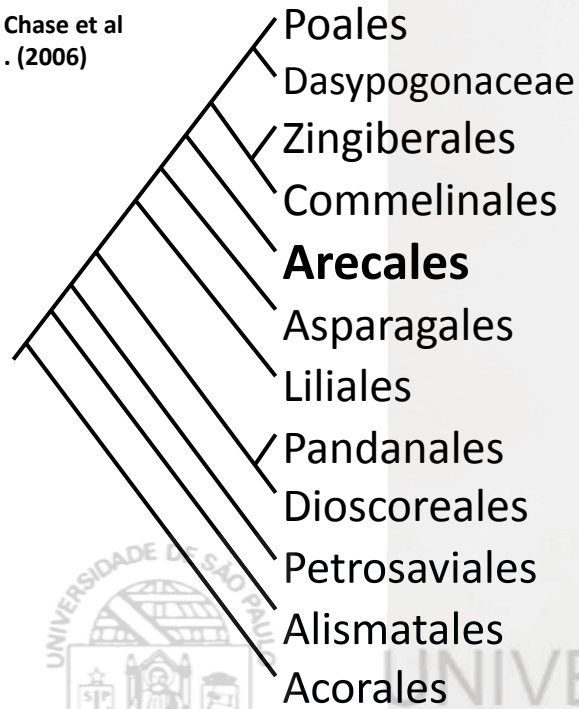
**inflorescências
com brácteas**



Arecales



Chase et al
(2006)



Arecales

1 família: Arecaceae (ou Palmae)

190 gêneros

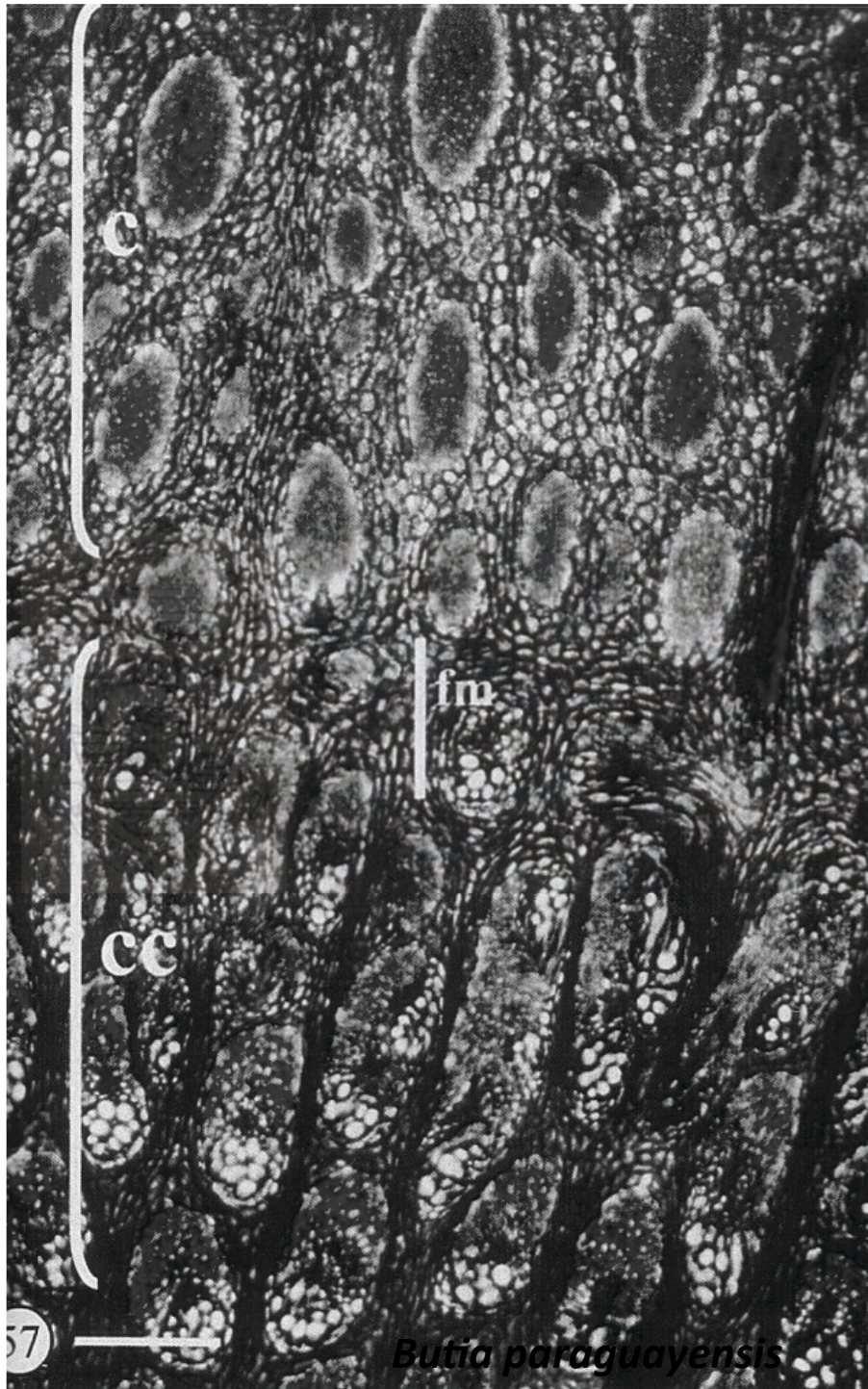
2 300 espécies

Lenhosas, monopodiais

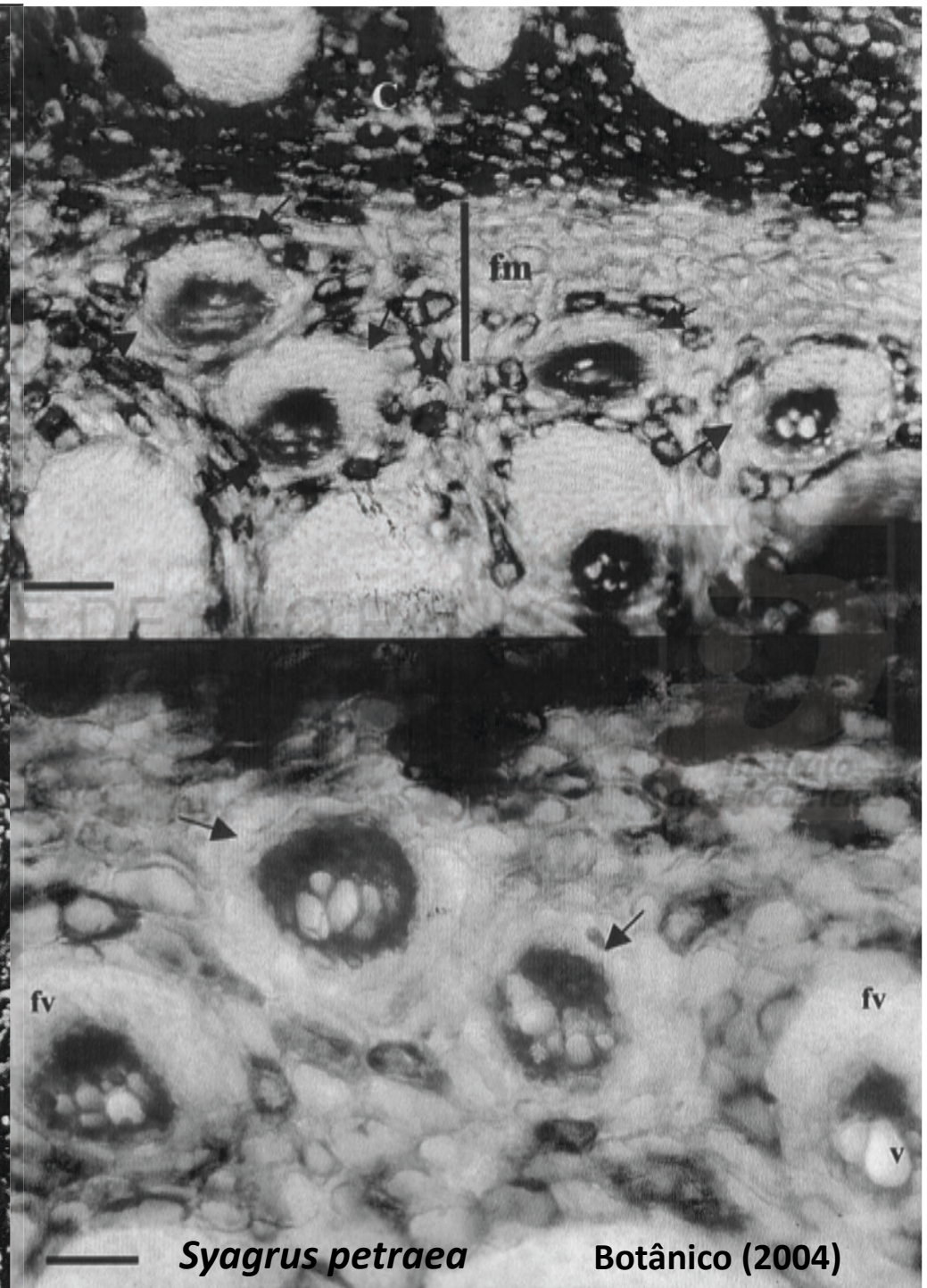
Folhas pecioladas, bainhas fechadas

Inflorescências com bráctea conspícua

Ceroxylon quindiuense



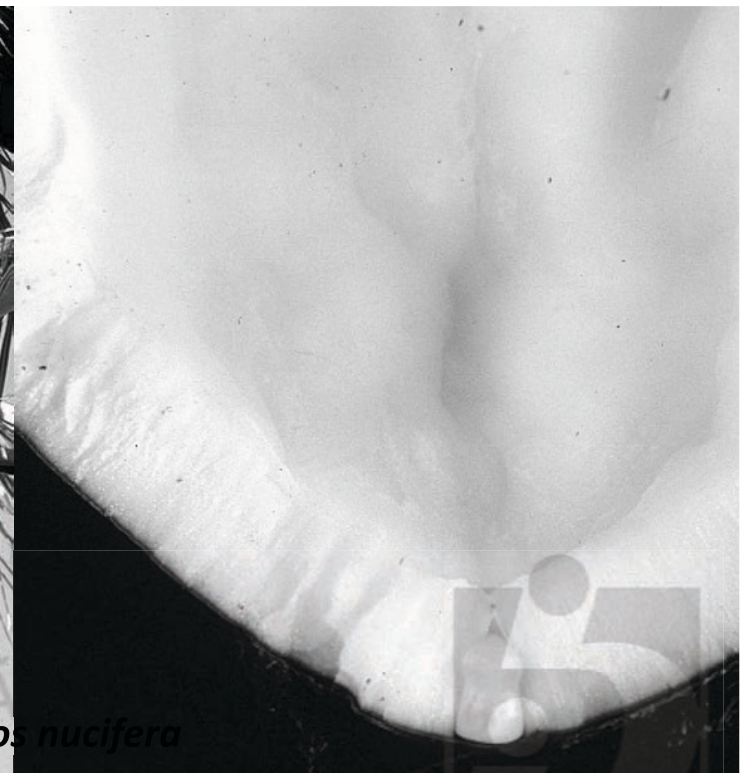
Butia paraguayensis



Syagrus petraea

Botânico (2004)







Lodoicea maldivica





Palmito (*Euterpe edulis*)



Açaí (*Euterpe oleracea*)



piçava (*Attalea funifera*)



babaçu (*Orbignya phalerata*)



carnaúba (*Copernicia prunifera*)



tamareira (*Phoenix dactylifera*)



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Zingiberales

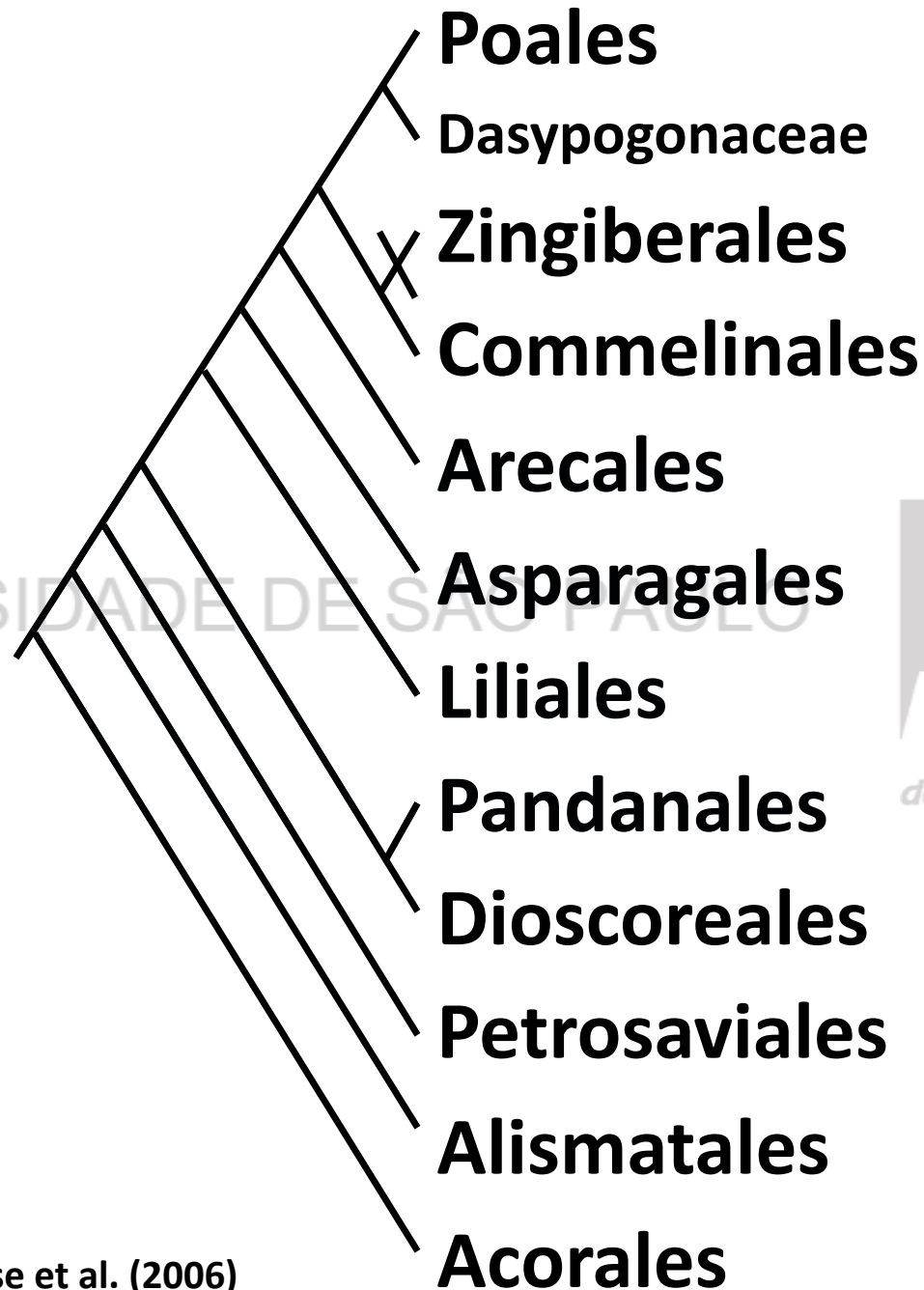


Alpinia calcarata

P.-J. Redouté

**Folhas com pecíolo
e limbo distintos e
nervação pinado-
paralelinérvea**

Ovário ínfero



Chase et al. (2006)



Rizoma

Folhas com pecíolo e limbo

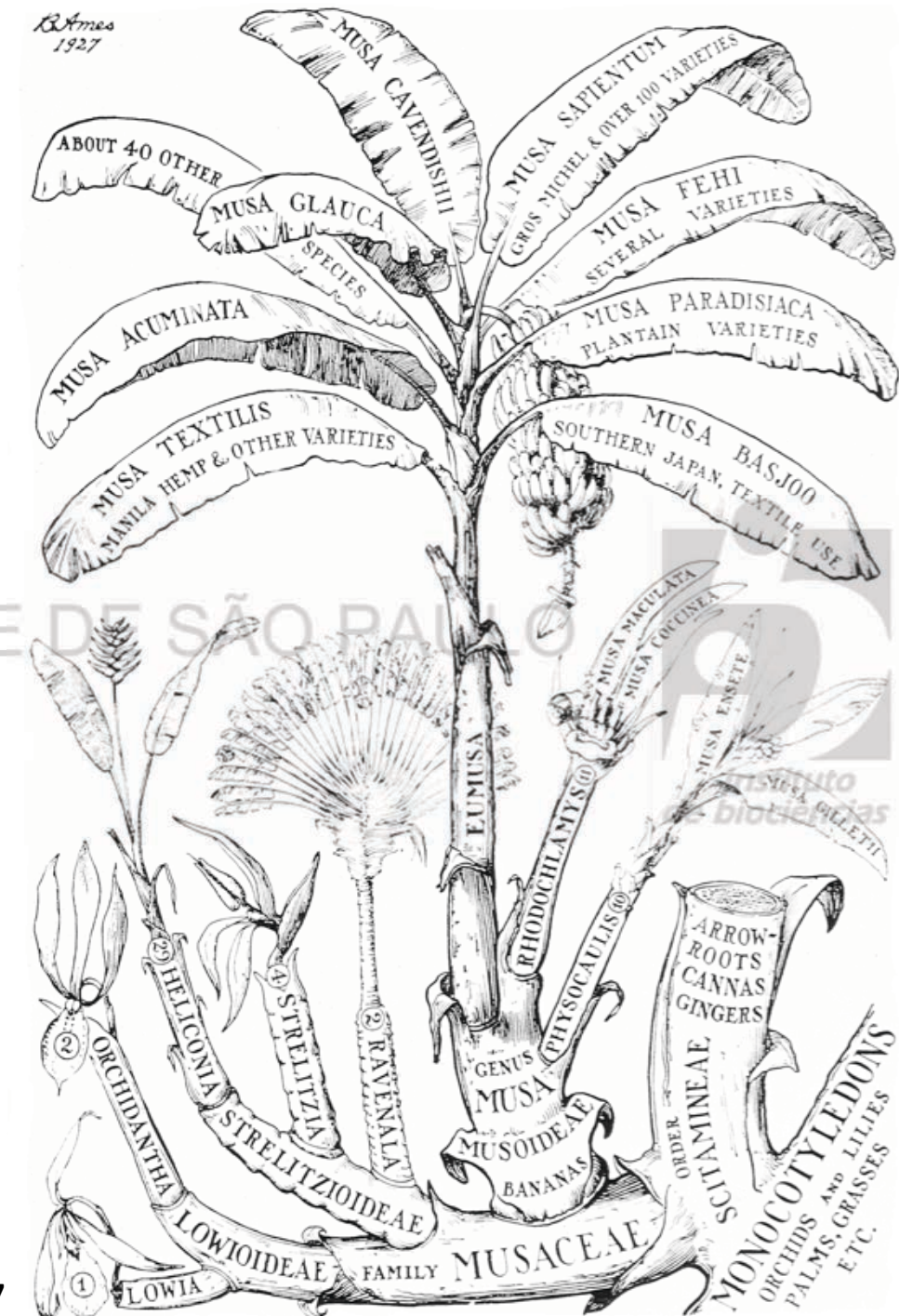
bem diferenciados

Nervação pinado-paralelinérvea

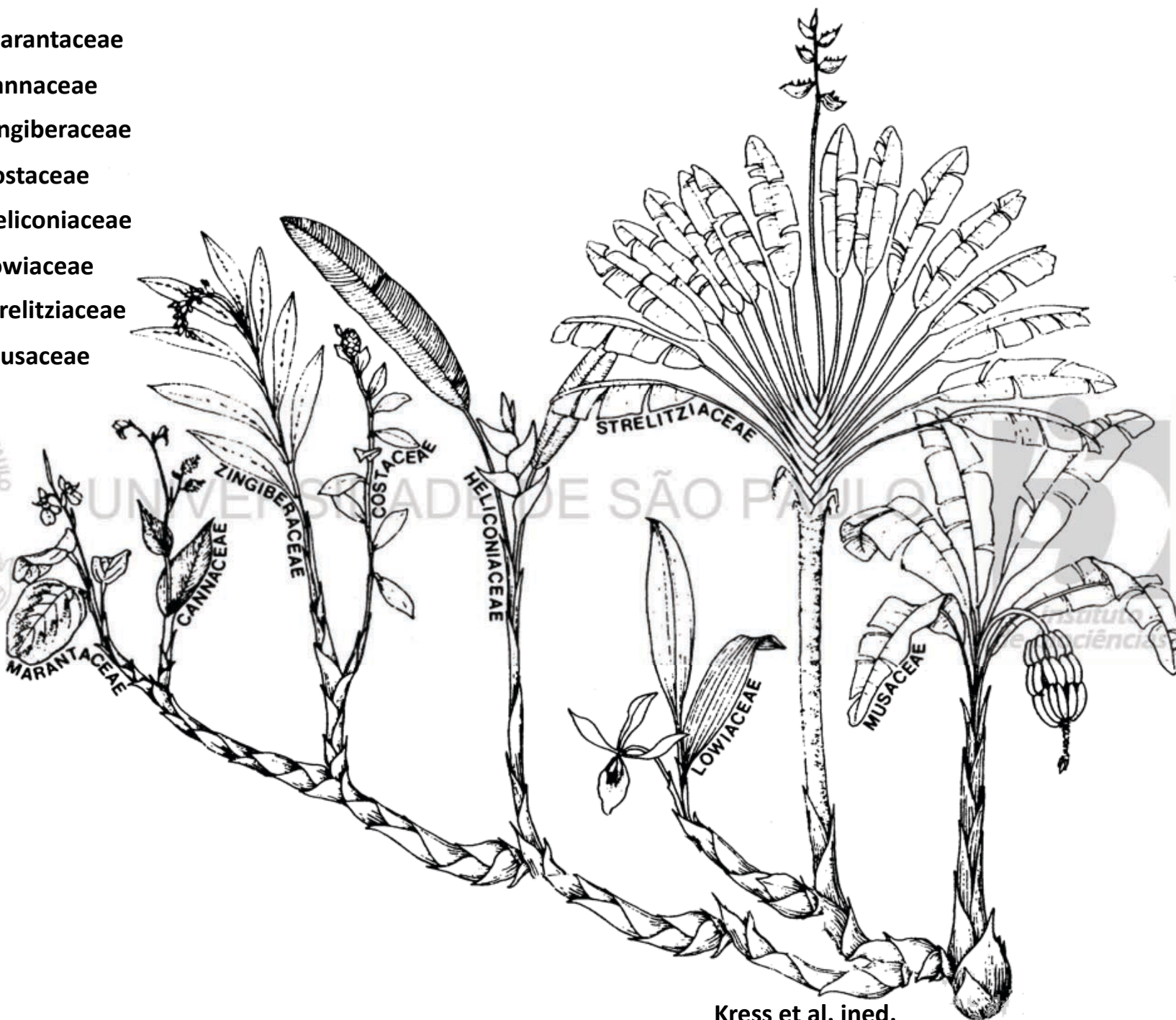
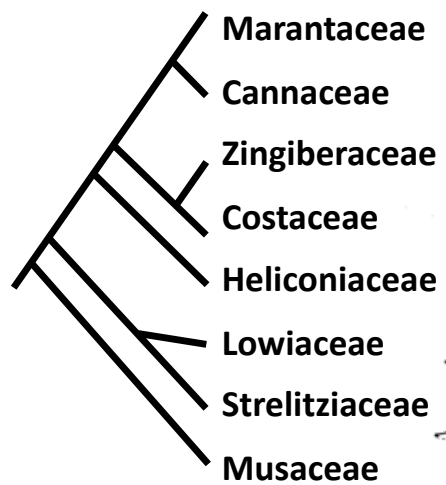
Filotaxia dística

Ovário ínfero

Maioria com arilo nas sementes

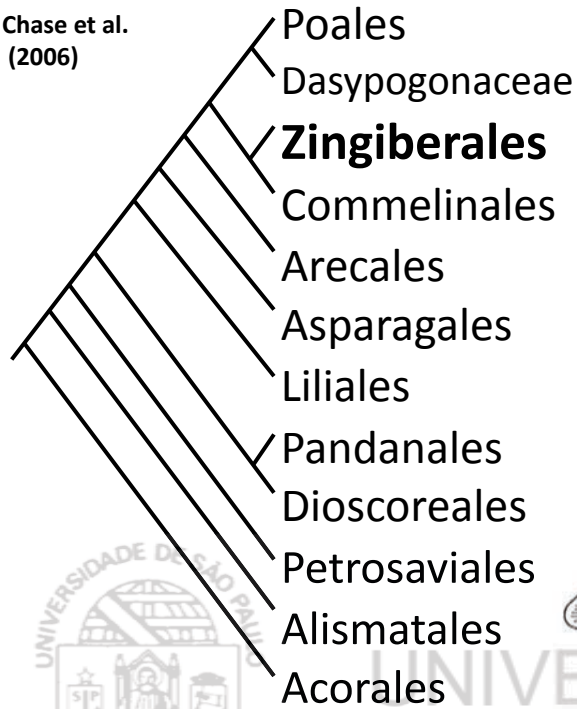


Reynolds 1927



Kress et al. ined.

Chase et al.
(2006)



Rizoma

Folhas com pecíolo e limbo

bem diferenciados

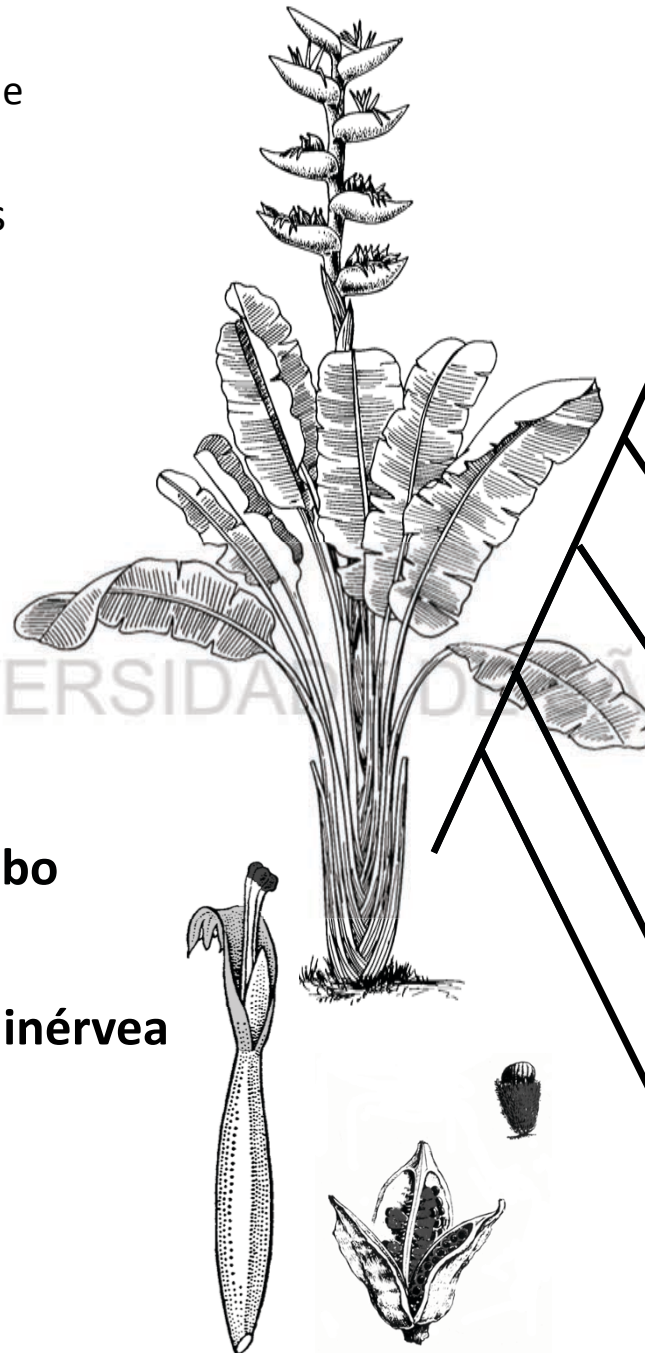
Nervação pinado-paralelinérvea

Filotaxia dística

Ovário ínfero

Maioria com arilo

Zingiberales



(Kress et al. ined.)

Marantaceae

Cannaceae

Zingiberaceae

Costaceae

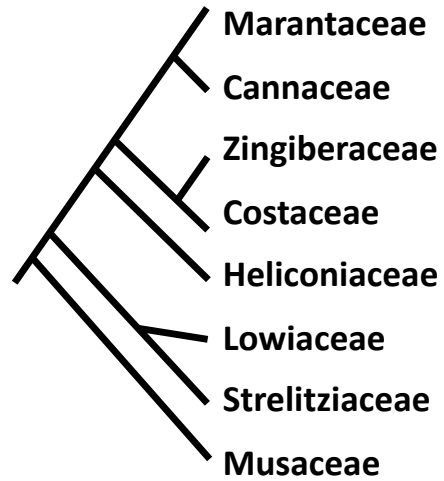
Heliconiaceae

Strelitziaceae

Lowiaceae

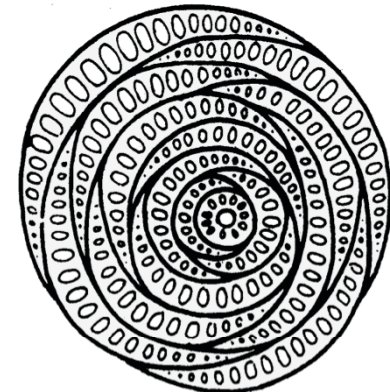
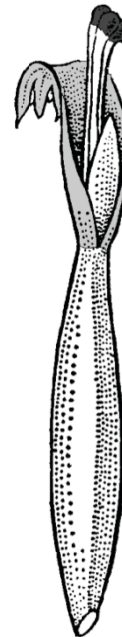
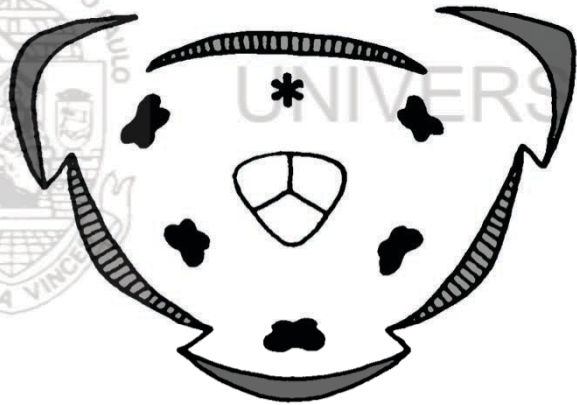
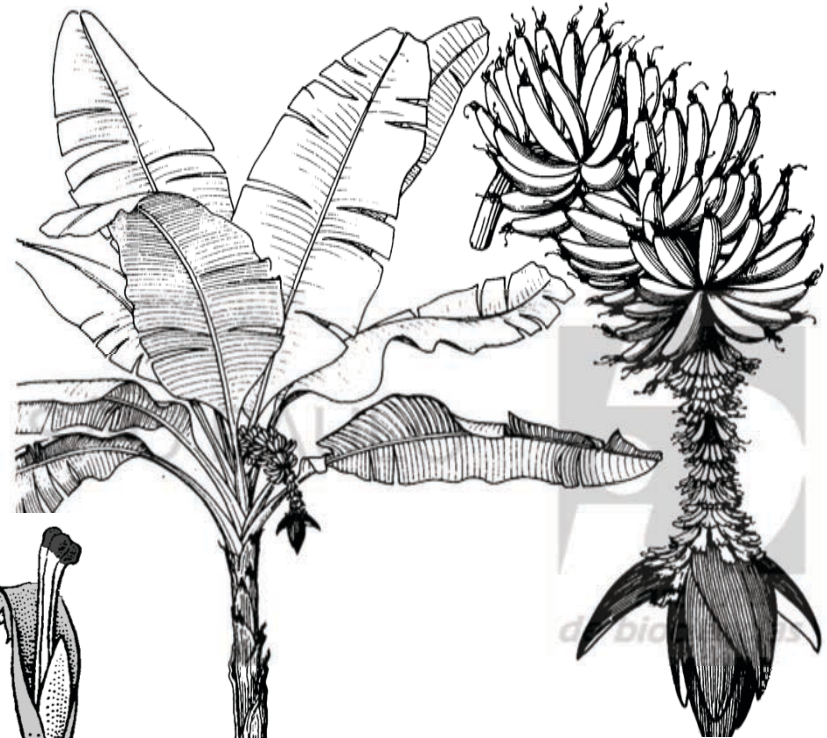
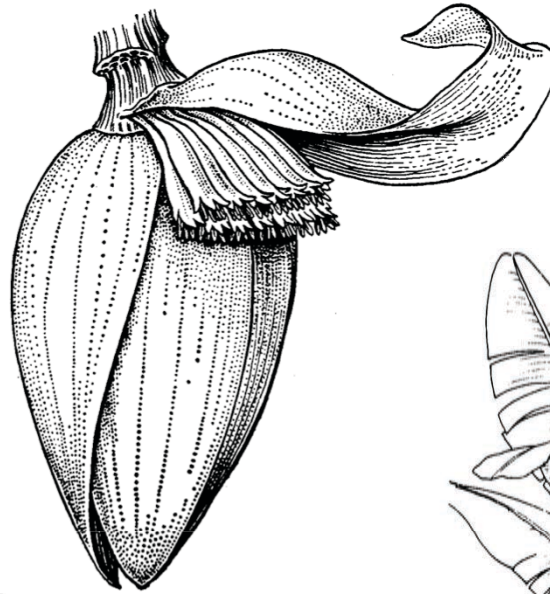
Musaceae

(kress et al. ined.)

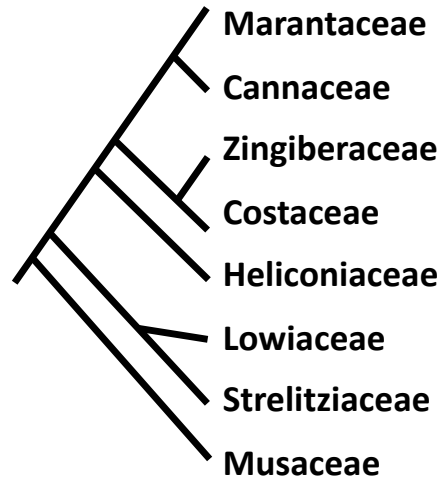


Musaceae

2 gên., 41 spp.

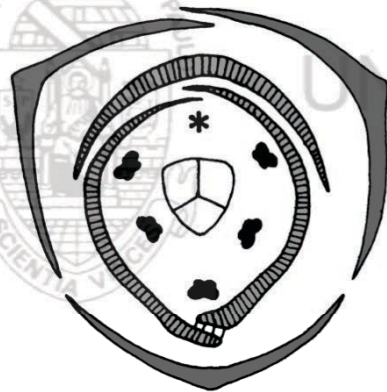


(kress et al. ined.)

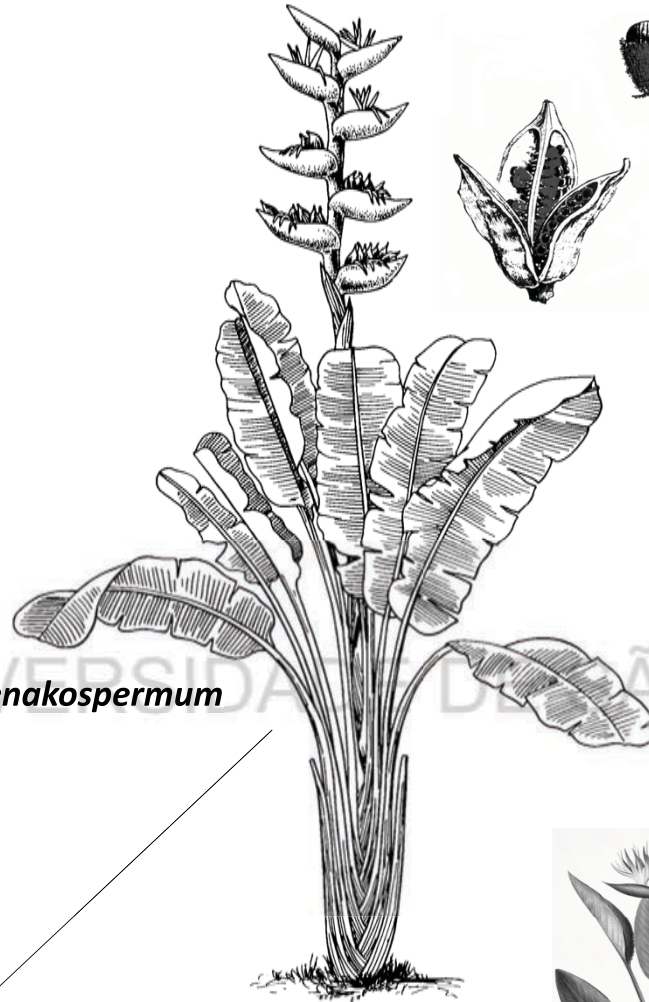


Strelitziaceae

3 gên., 7 spp.



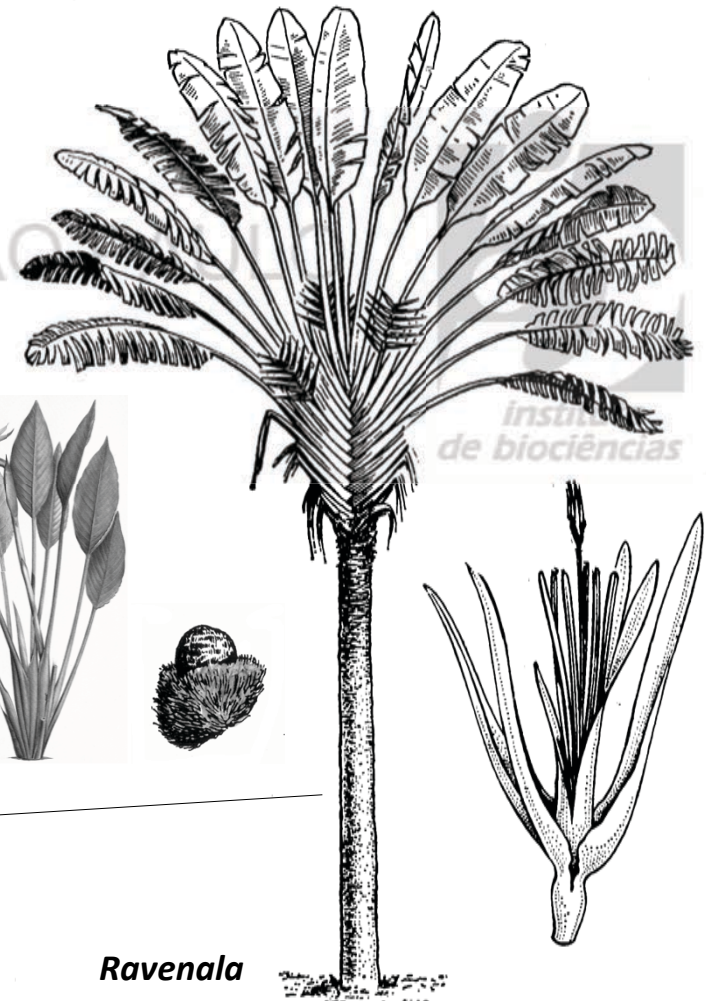
Phenakospermum



Strelitzia



Ravenala



instituto
de biociências

R. Mello-Silva



Ravenala madagascariensis



A. Gentry

Strelitzia gigantea



Strelitzia reginae



A. Gentry

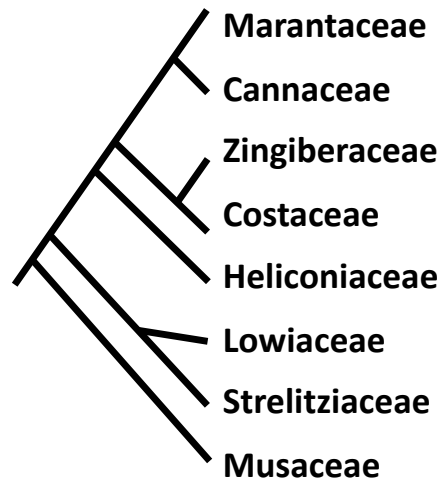


T.B. CROAT © 1982



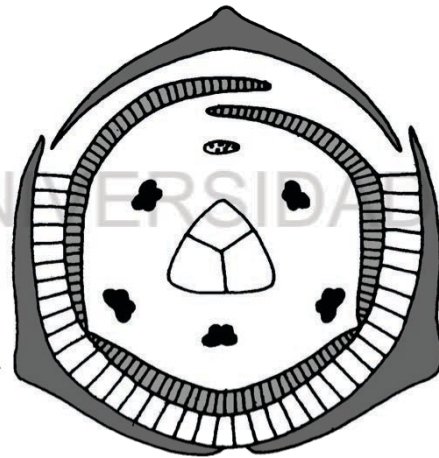
Phenakospermum guyannense

(kress et al. ined.)



1 gên., 100-200 spp.

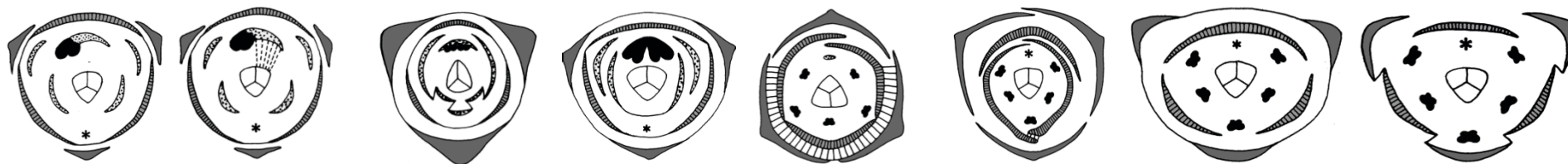
Heliconiaceae



Heliconia humilis



Hedychium coronarium



Marantaceae

Cannaceae

Costaceae

Zingiberaceae

Heliconiaceae

Strelitziaceae

Lowiaceae

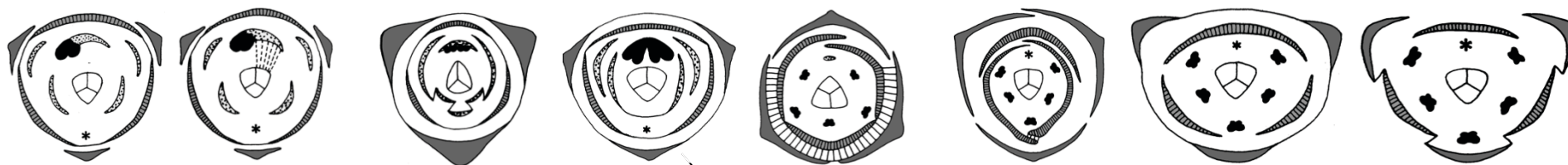
Musaceae

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1 estame

Kress et al. (ined.)



Marantaceae

Cannaceae

Costaceae

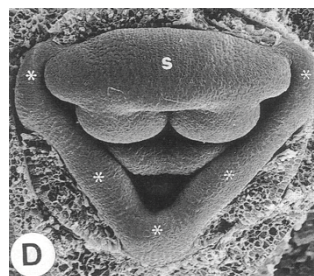
Zingiberaceae

Heliconiaceae

Strelitziaceae

Lowiaceae

Musaceae

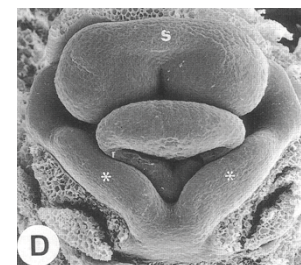


Labelo = 5 estaminódios
(Endress 1995)

Kress et al. (ined.)

**estaminódios
conatos**

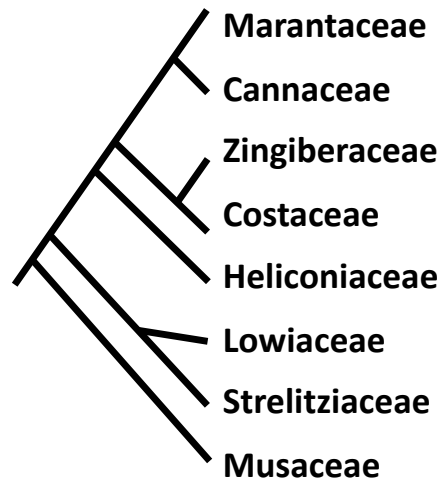
1 estame



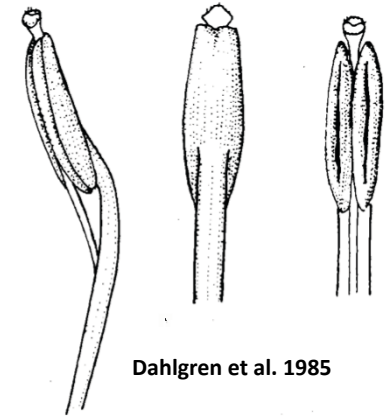
Labelo = 2 estaminódios
(Endress 1995)



(kress et al. ined.)



46-52 gên., 1000-1300 spp. Zingiberaceae



Dahlgren et al. 1985

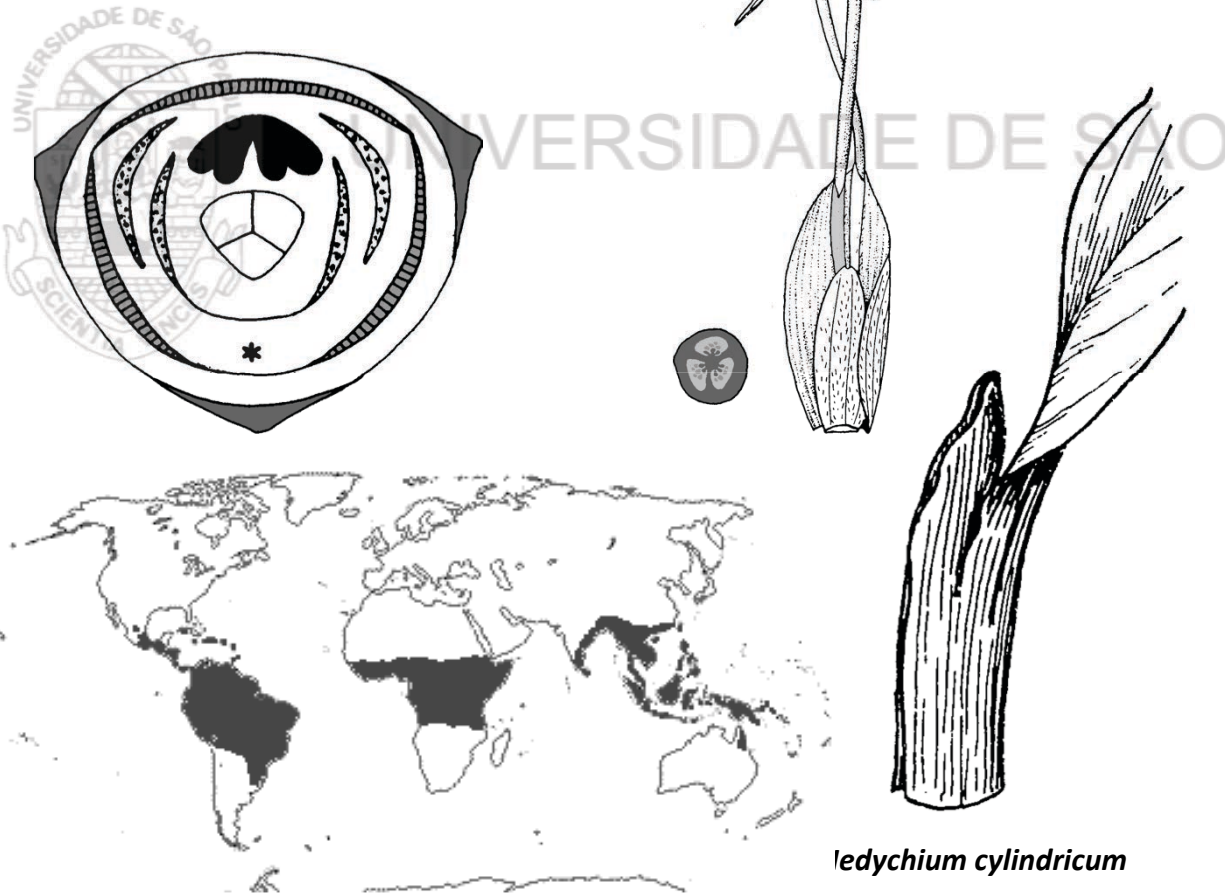


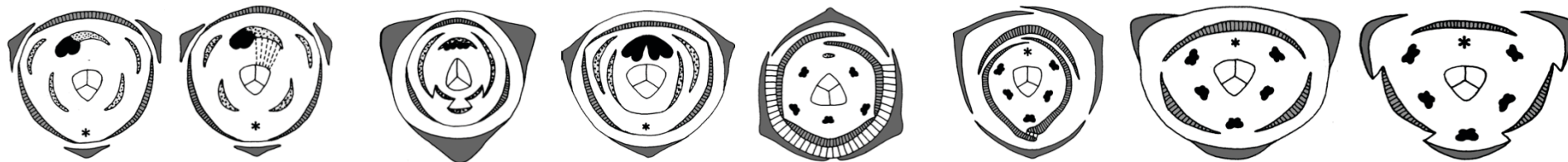
ledychium cylindricum



P.-J. Redouté

Alpinia zerumbet





Marantaceae

Cannaceae

Costaceae

Zingiberaceae

Heliconiaceae

Strelitziaceae

Lowiaceae

Musaceae

1 teca fértil



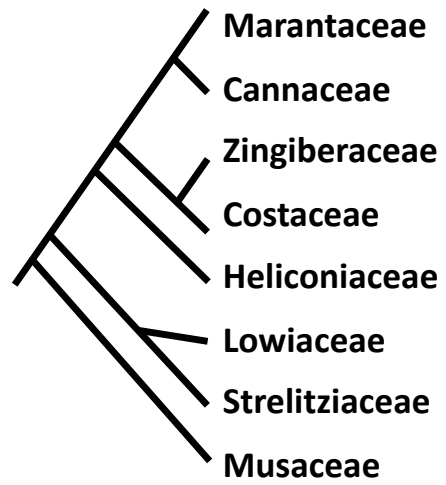
**estaminódios
conatos**

1 estame

Kress et al. (ined.)



(kress et al. ined.)



1 gên., 10 spp.

Cannaceae

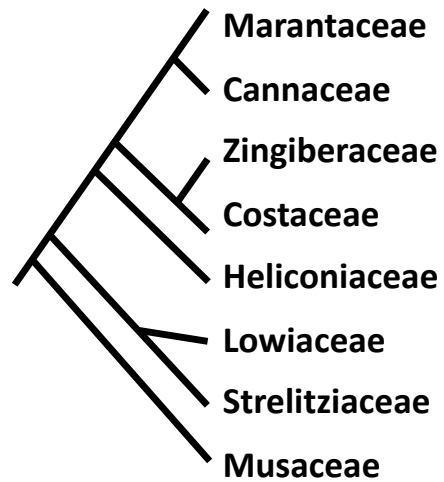


Canna lutea

P.-J. Redouté

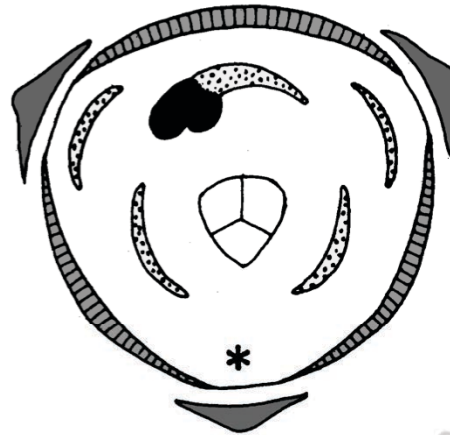


(kress et al. ined.)

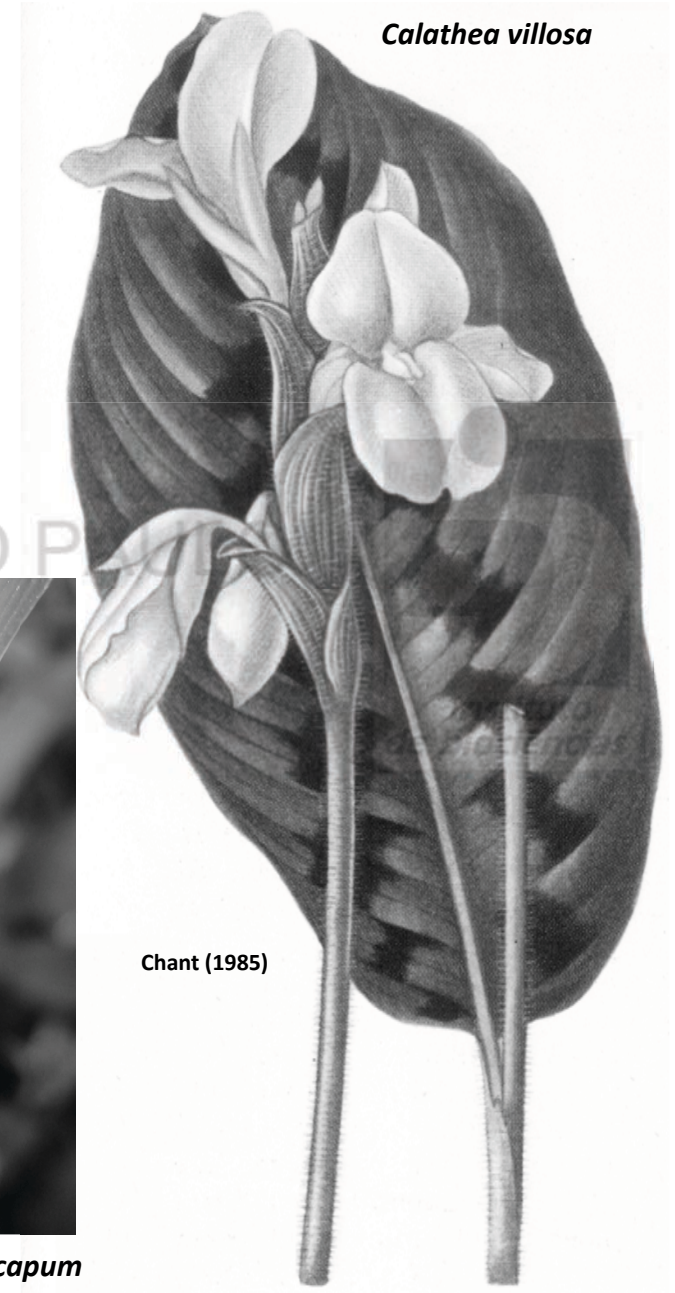


31 gên., 550 spp.

Marantaceae



Calathea villosa



Chant (1985)

Folhas com pulvino no
ápice do pecíolo

Costa et al. (2008)



Monotagma breviscapum

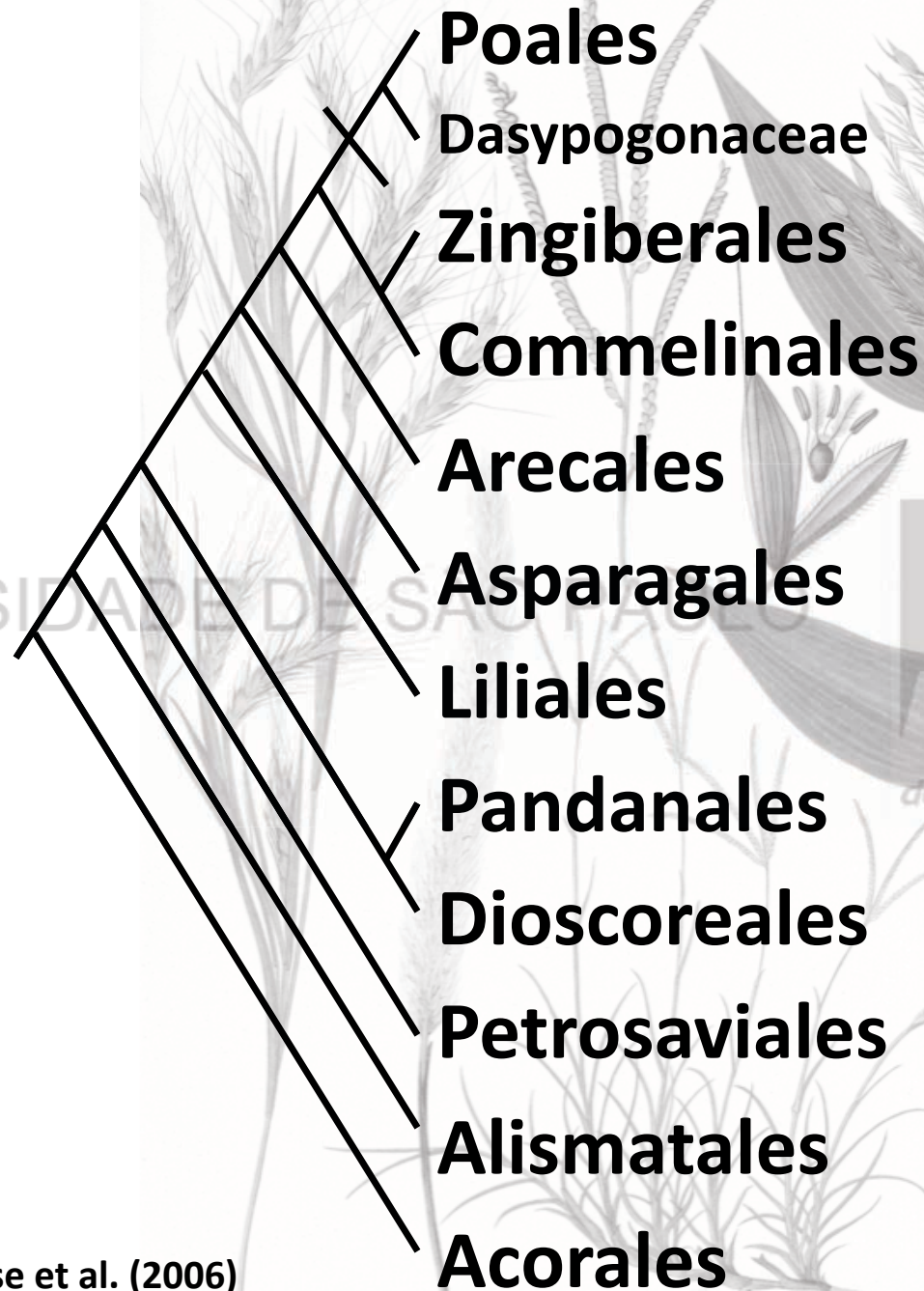


Perda das ráfides

**Sílica nas células
epidérmicas**

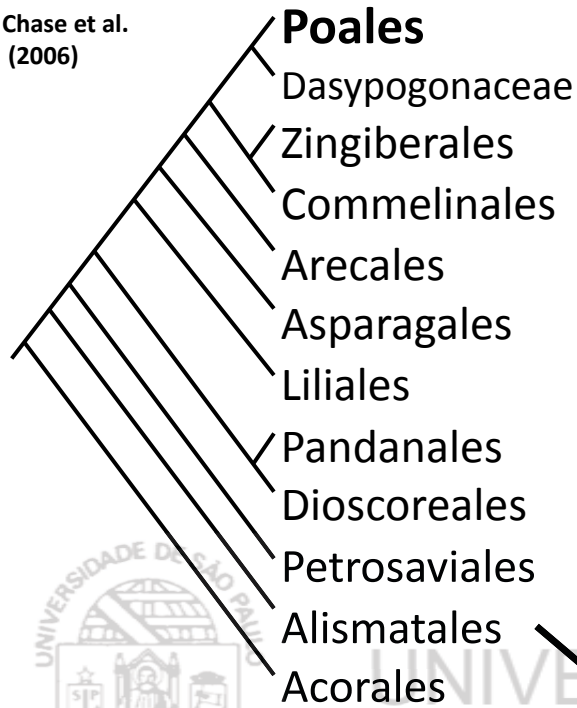
**Endosperma
nuclear**

**Perda do gene
mitocondrial *sdh3***



Chase et al. (2006)

Chase et al.
(2006)



Tiphaceae

Bromeliaceae

Rapataeaceae

Juncaceae

Cyperaceae

Thurniaceae

Mayacaceae

Eriocaulaceae

Xyridaceae

Anarthriaceae

Centrolepidaceae

Restionaceae

Flagellariaceae

Joinvilleaceae

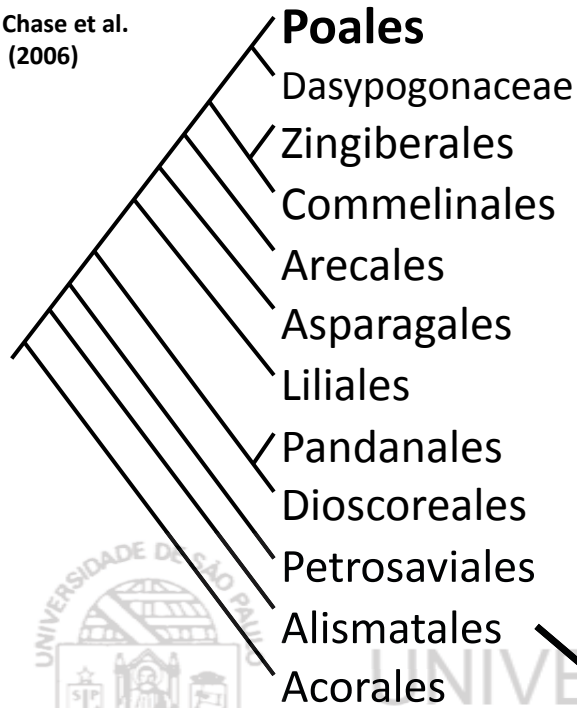
Ecdeiocoleaceae

Poaceae

Stevens (2008)

Poales

Chase et al.
(2006)

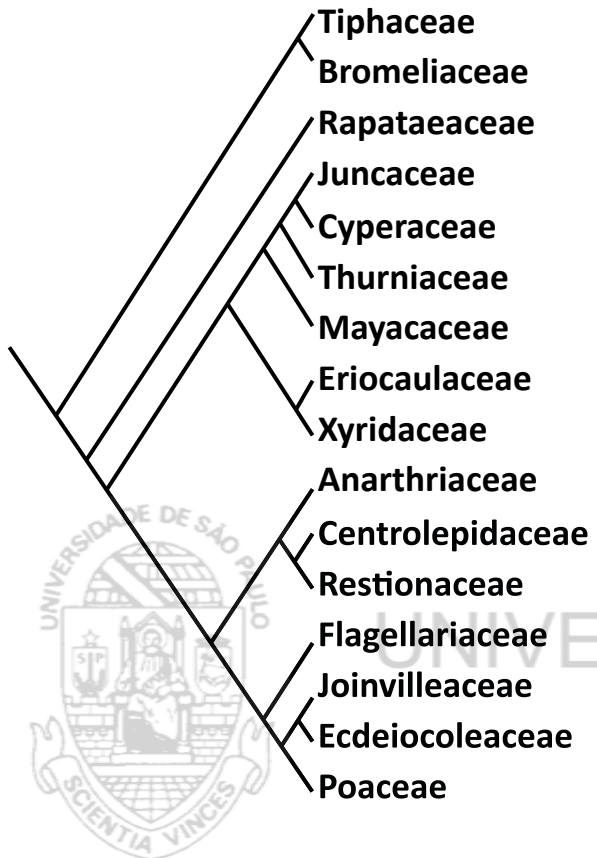


Poales

Stevens (2013)



Stevens (2011)



57 gên., 1800 spp.

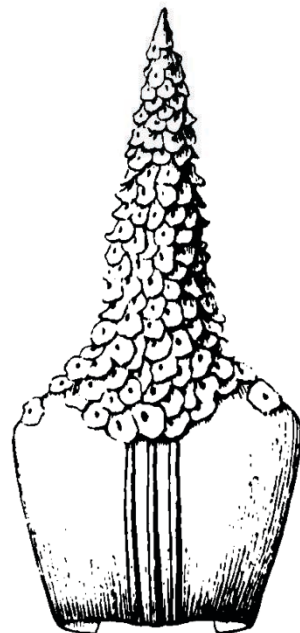
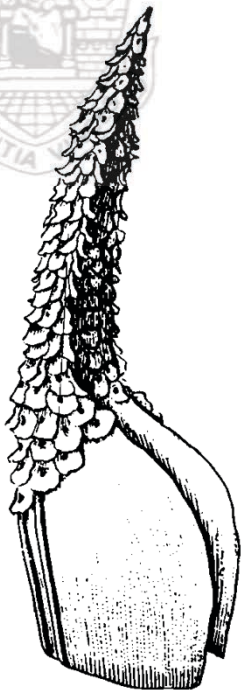
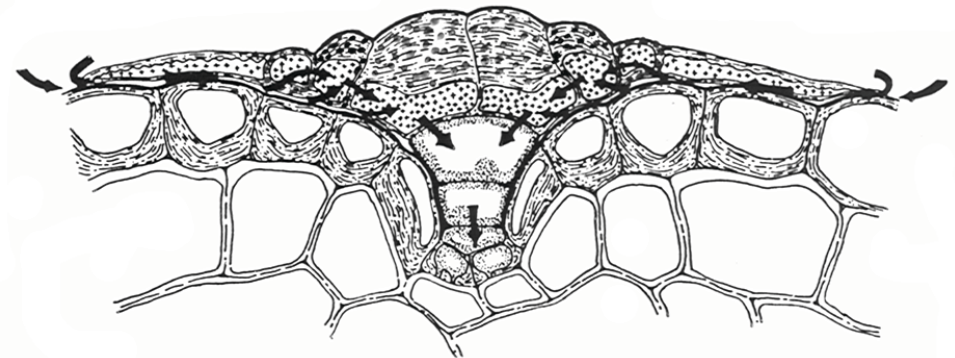
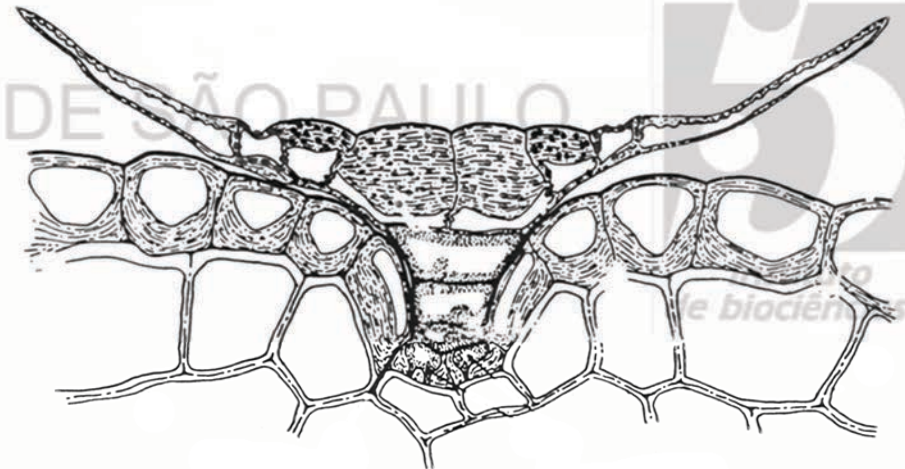
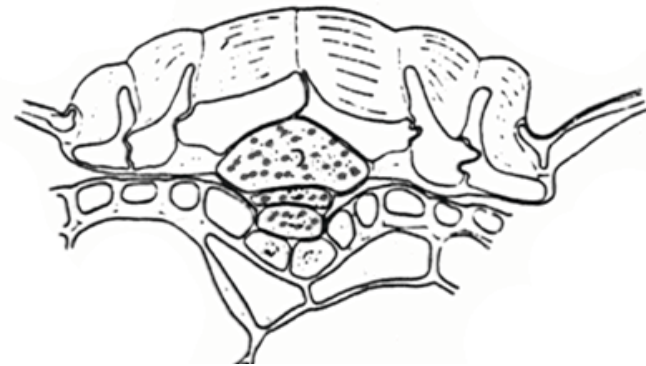
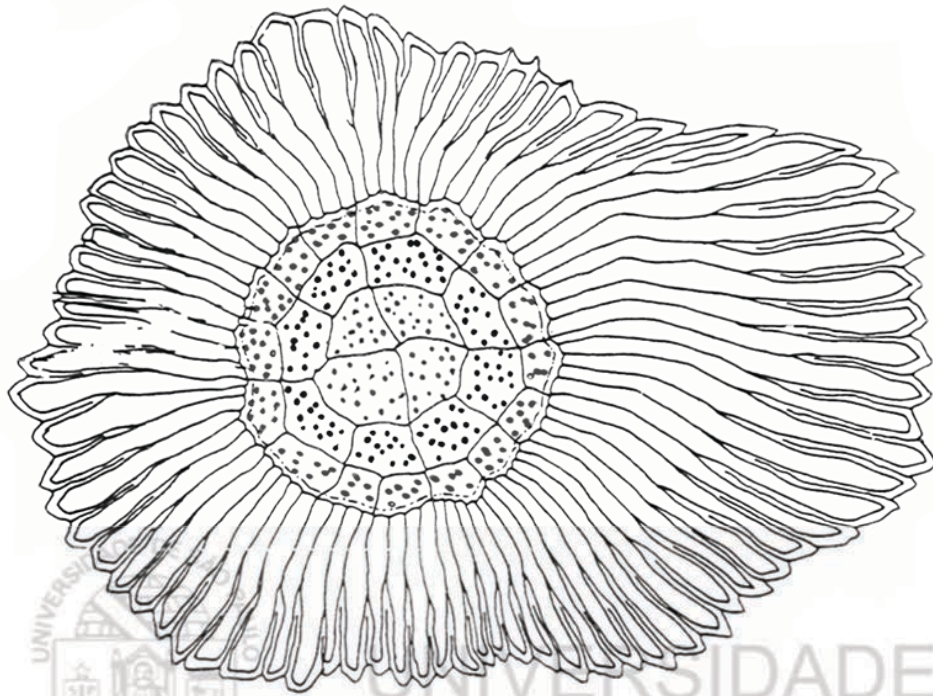


Bromeliaceae

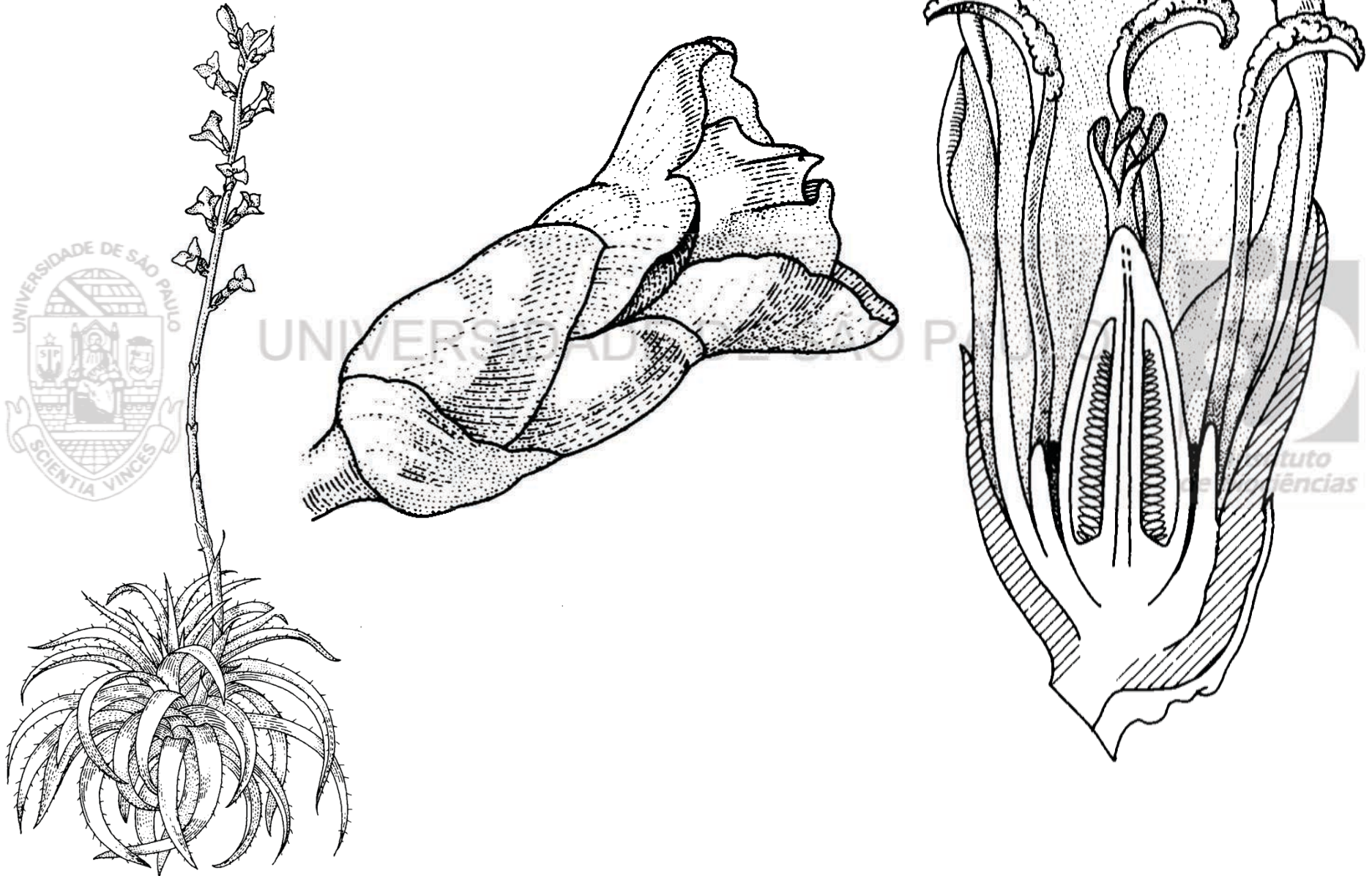


Annanas comosus

P.-J. Redouté



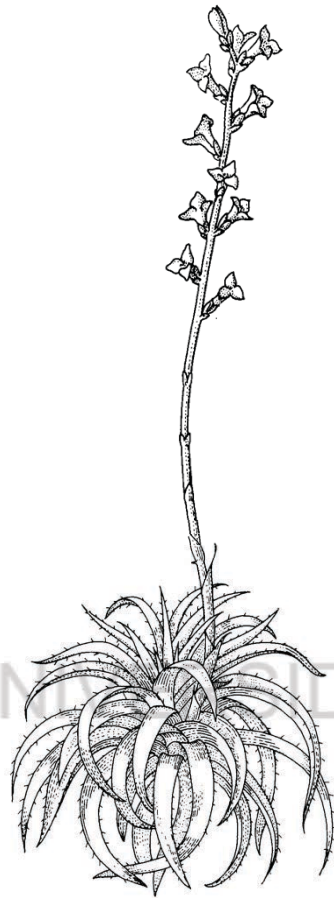
Dahlgren et al. (1985)



Hábitos



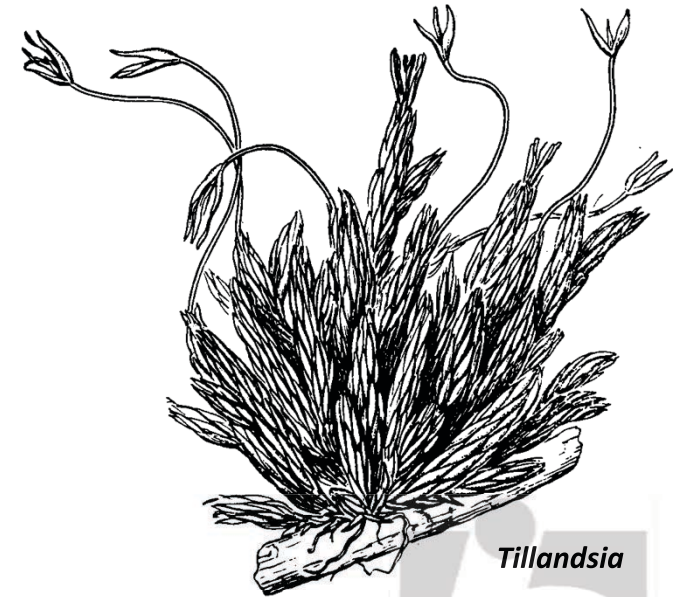
Puya raimondii



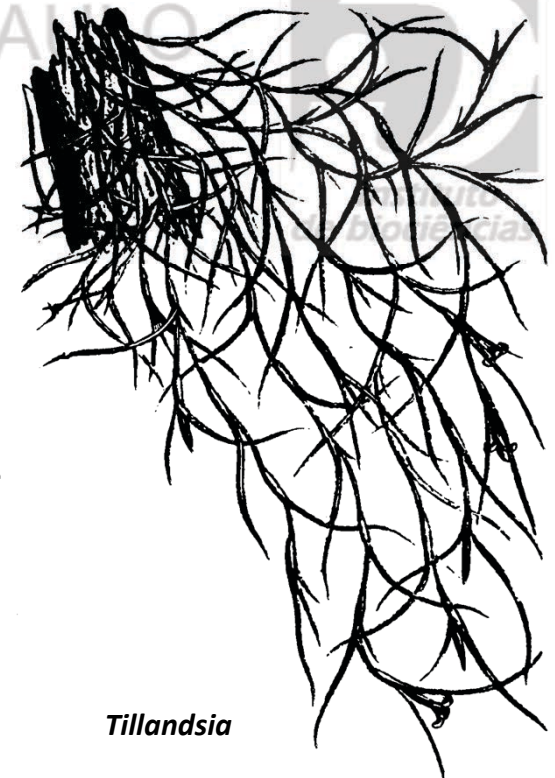
Dyckia



Vriesea

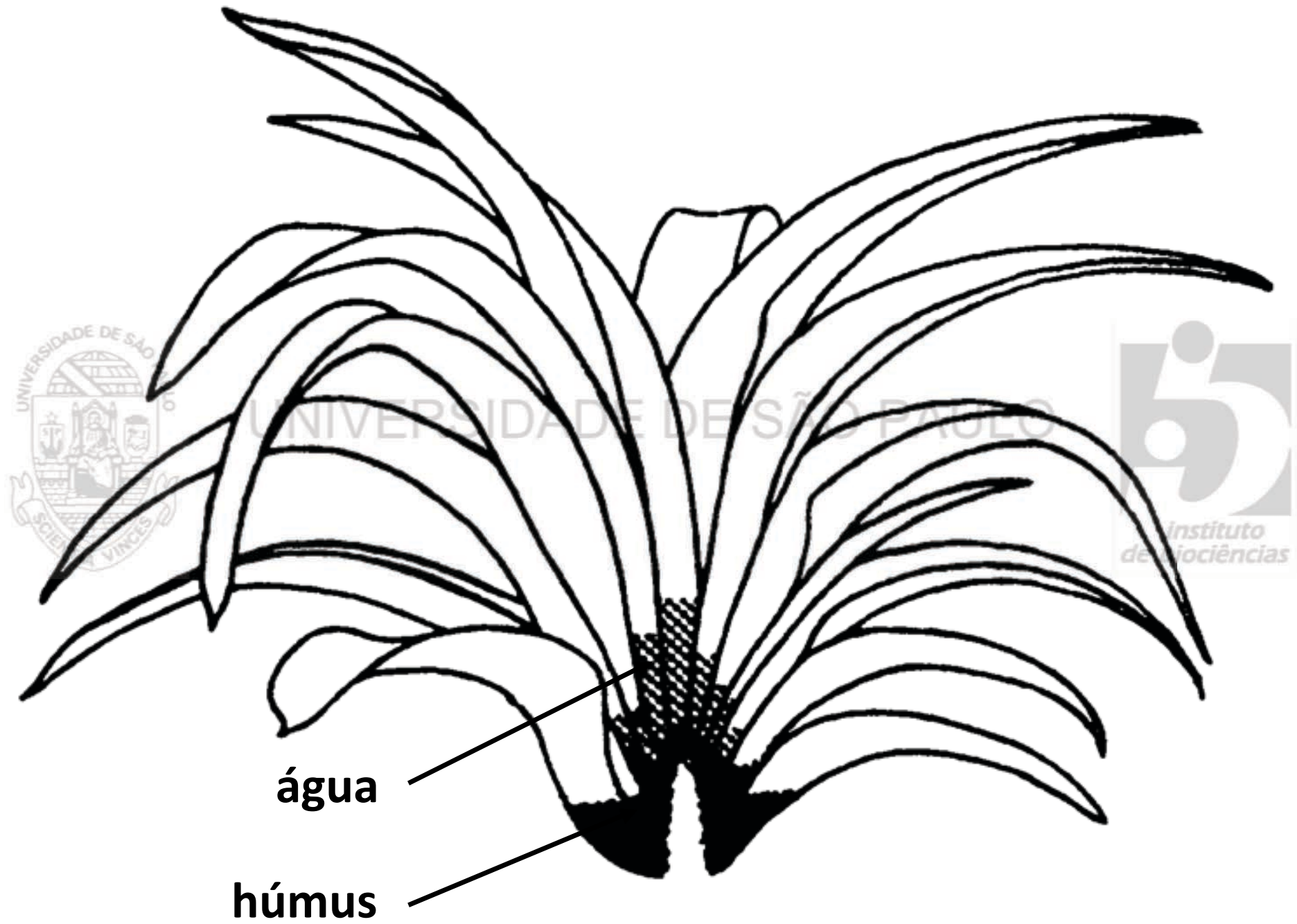


Tillandsia



Tillandsia

Pittenndrigh (1948)

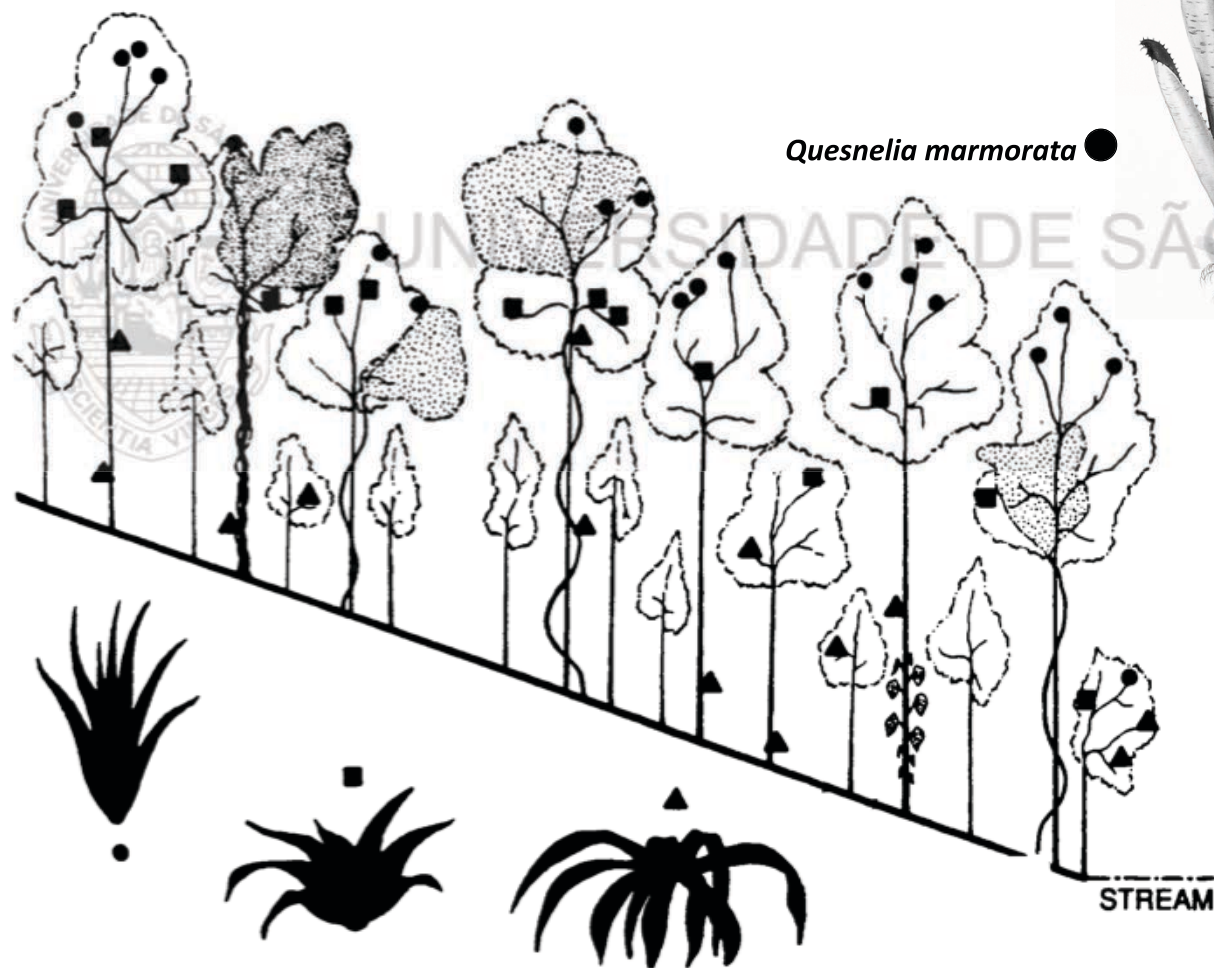


Pittenndrigh (1948)

● tolerantes à exposição

■ ensolaradas

▲ tolerantes à sombra



Quesnelia marmorata ●



Vriesea inflata ■



Canistrum lindenii ▲

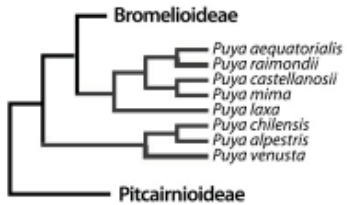


MP cpDNA phylogeny

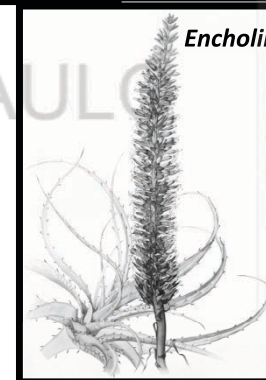
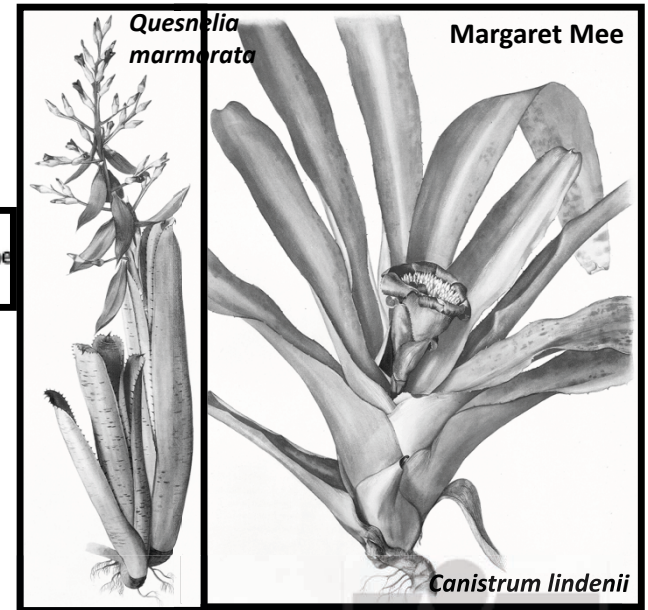
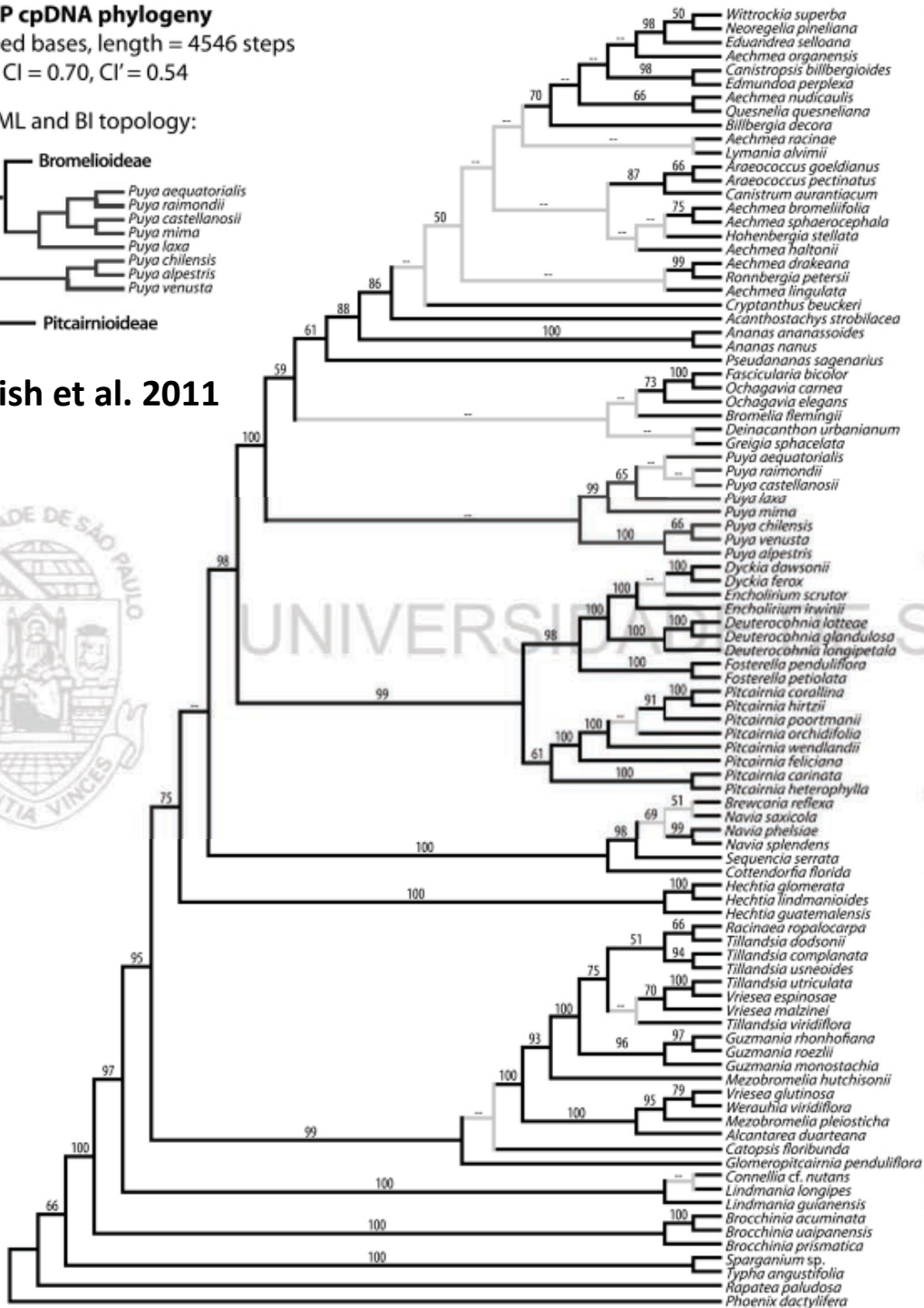
9341 aligned bases, length = 4546 steps

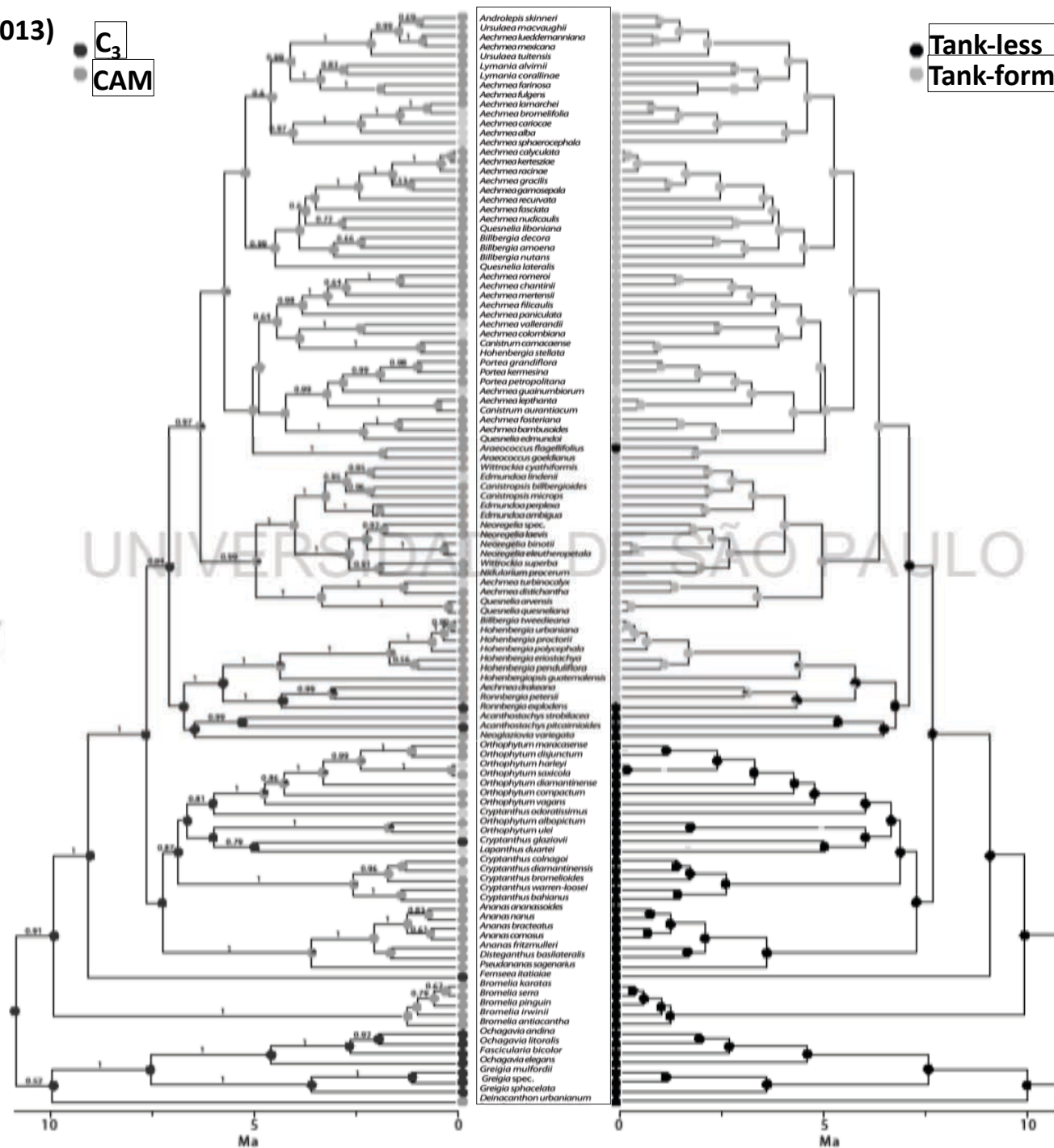
CI = 0.70, CI' = 0.54

ML and BI topology:

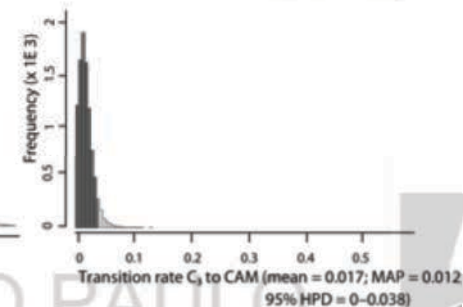
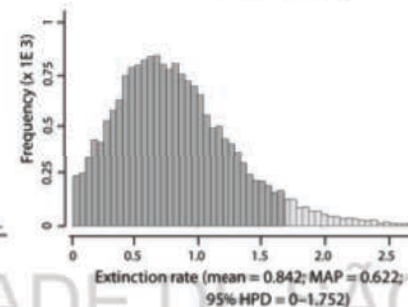
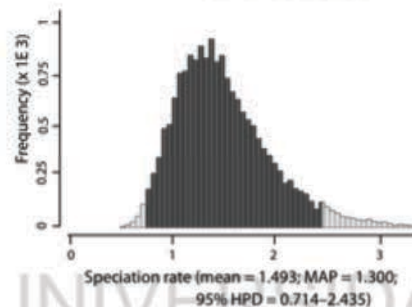
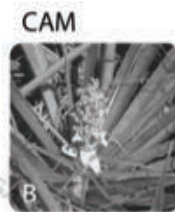
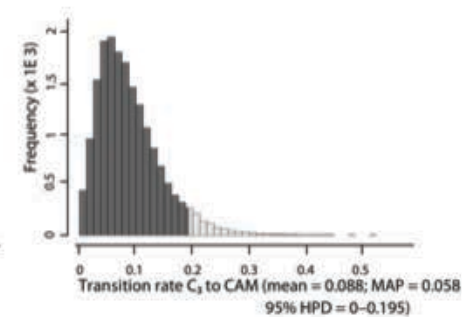
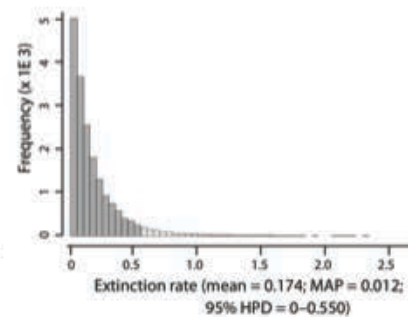
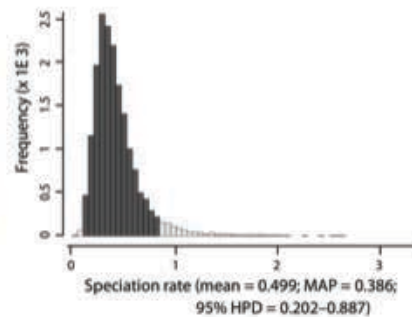


Gvinish et al. 2011

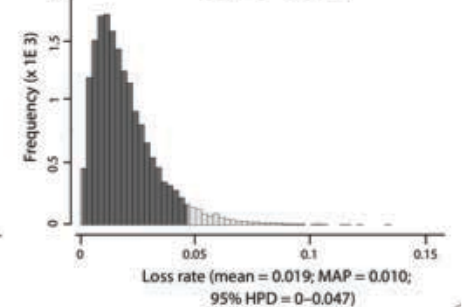
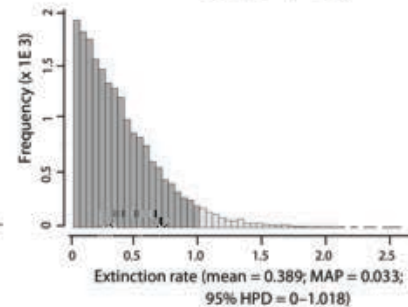
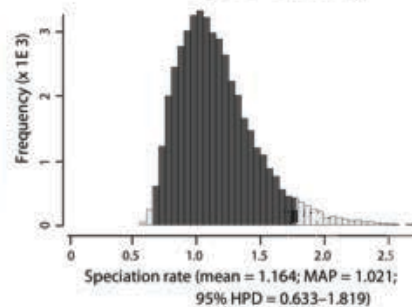
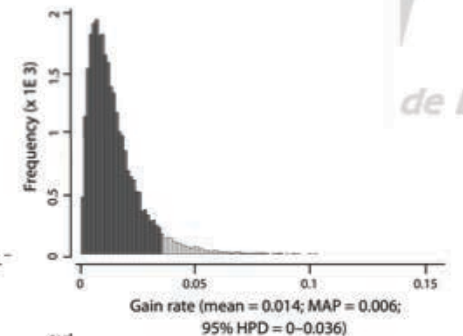
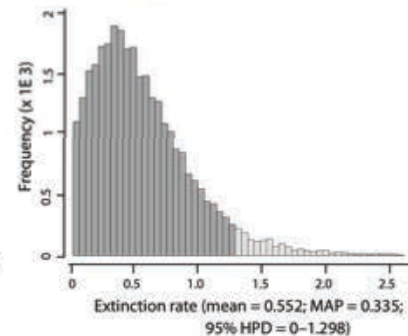
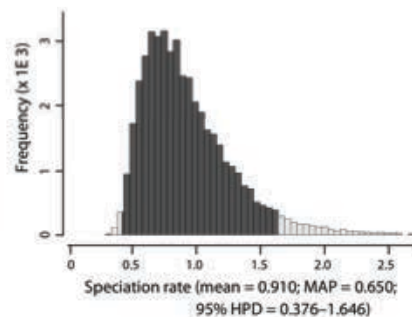




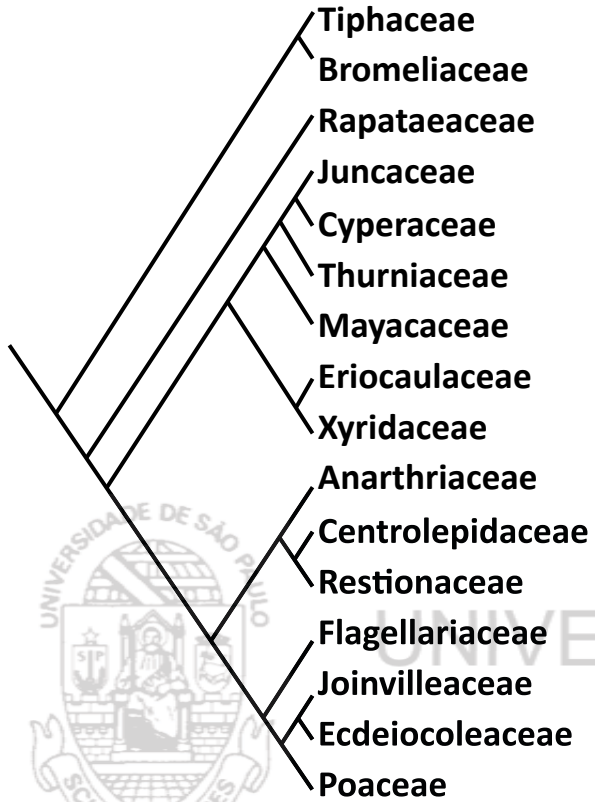
Photosynthetic pathway



Tank habit



Stevens (2008)



Poaceae (Gramineae)

660 gên., 11000 spp.



Swallenochloa subtessellata

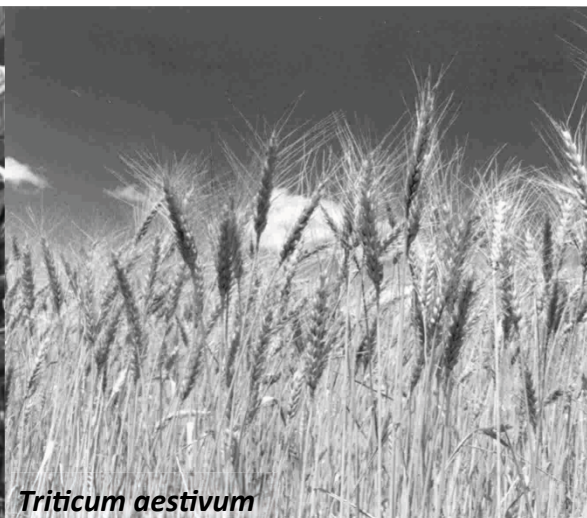


Gramíneas: importância sócio-econômica!





Zea mays



Triticum aestivum



Oryza sativa



Avena sativa



Hordeum vulgare



Secale cereale



Sorghum bicolor



Phalaris canariensis



Pennisetum glaucum



Brachiaria decumbens



Melinis minutiflora



Pennisetum purpureum



Saccharum officinarum

Caule (colmo) circular e geralmente fistuloso (oco)

Folhas dísticas, bainhas abertas, com lígula na junção com a lâmina e corpos de sílica nas células epidérmicas

Meristema intercalar

Inflorescência cuja unidade básica é uma espigueta

Flores pequenas, sem perianto visível, gineceu usualmente com dois estigmas plumosos e 1 óvulo

Pólen uniporado, anemofilia

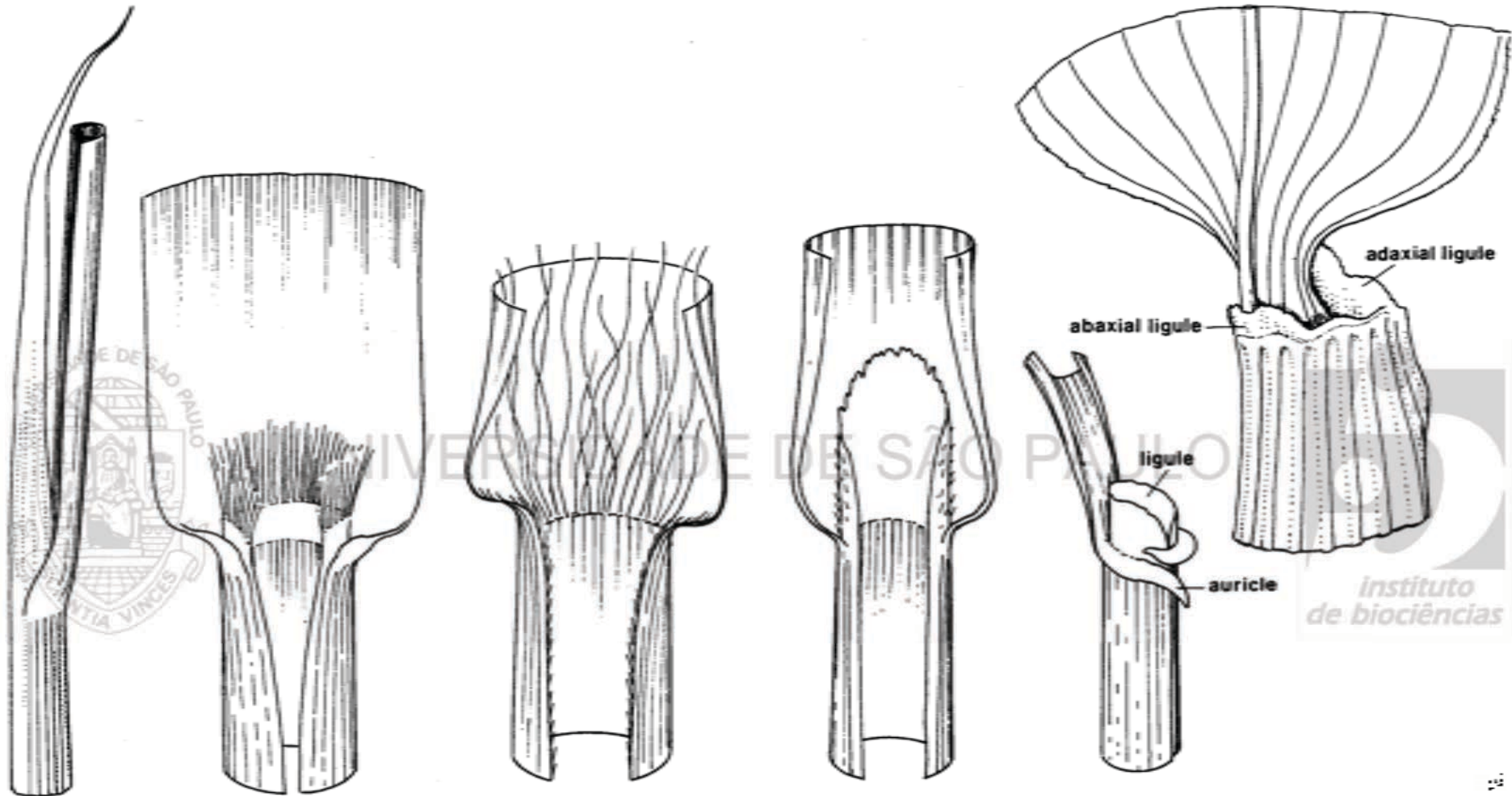
Fruto seco aquenial: cariopse

Embrião grande e lateral, próximo à testa da semente



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Lígula

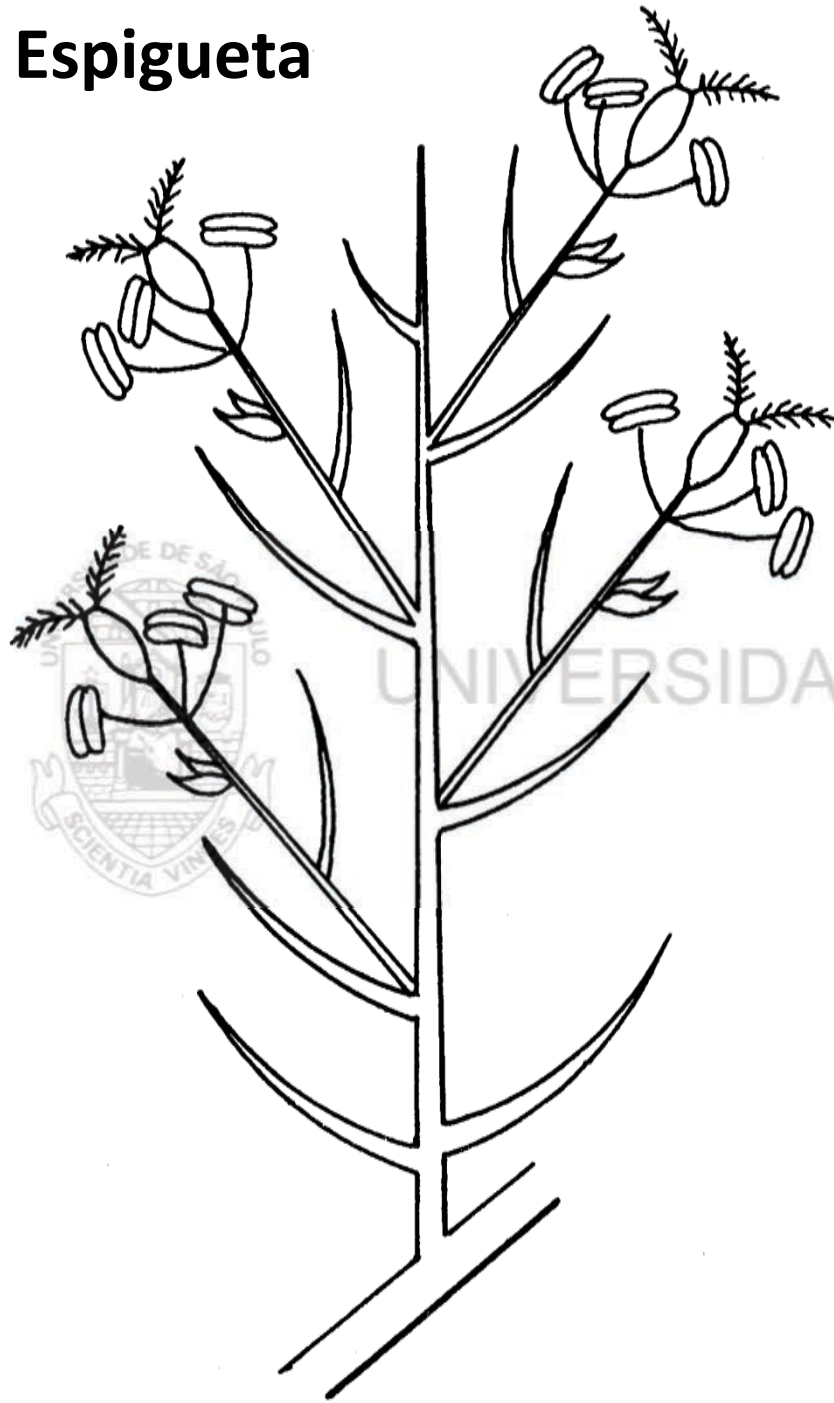
Triticum aestivum



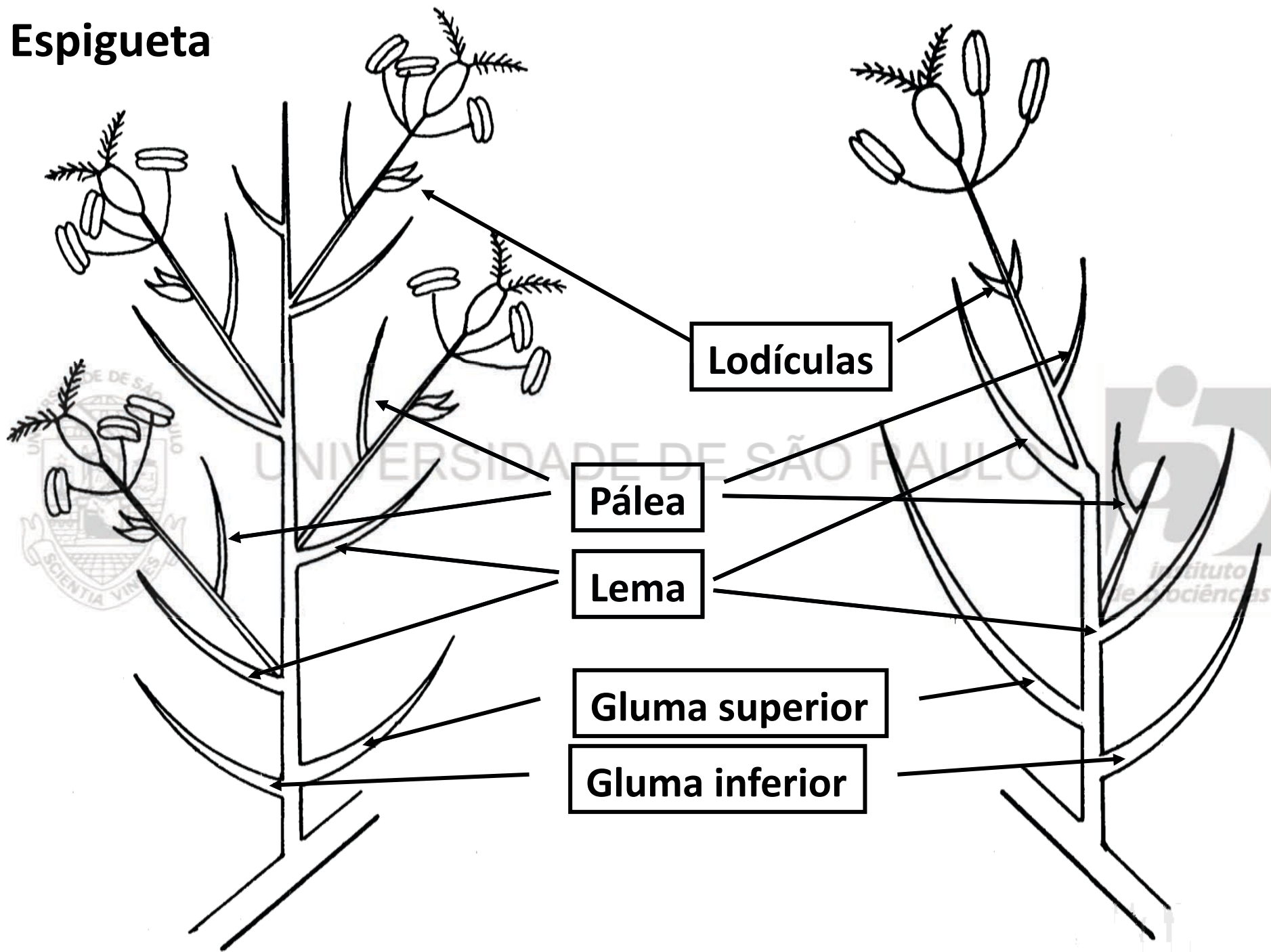
Uniola paniculata



Espigueta



Espigueta

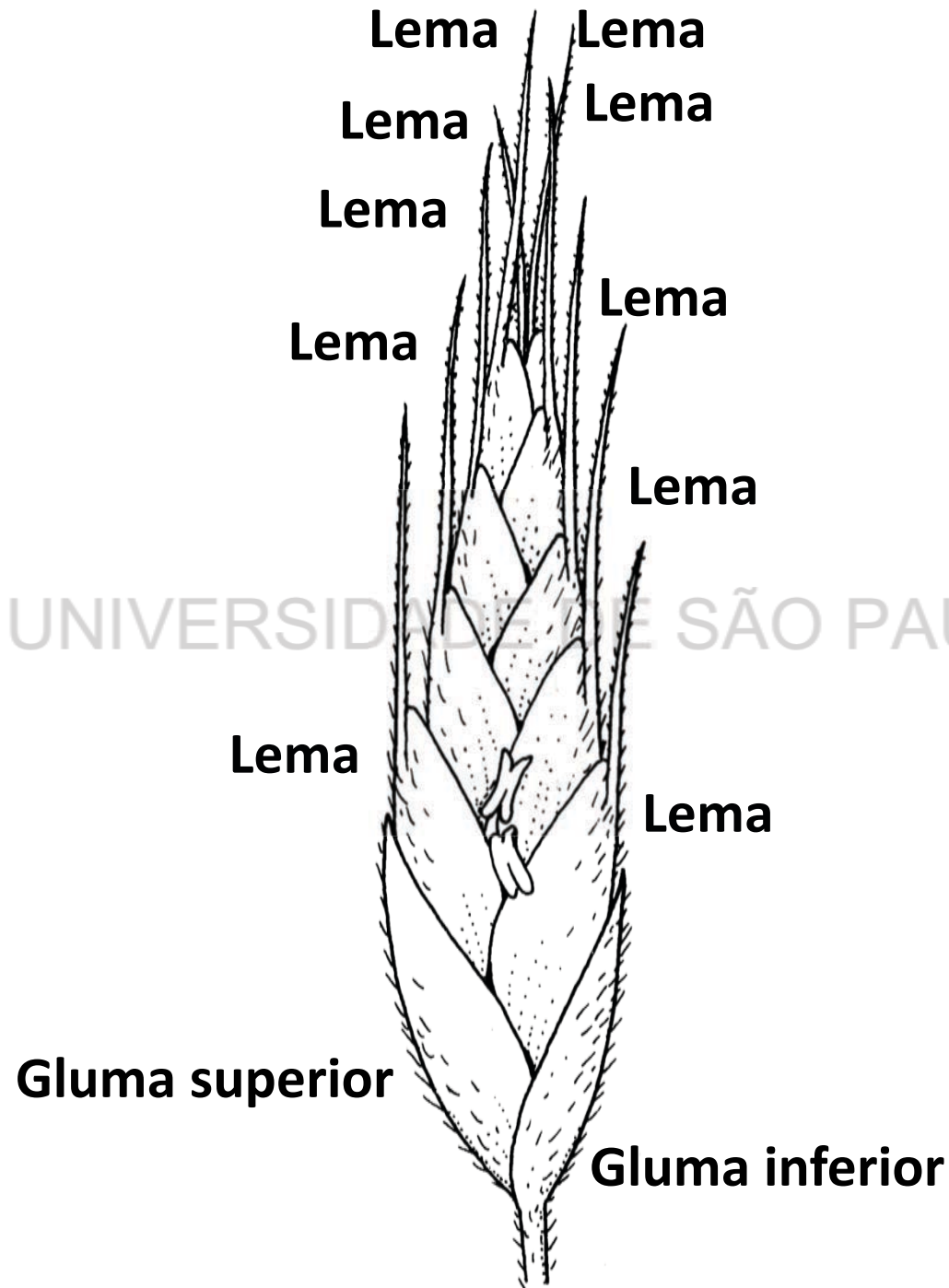


Bromus mollis L.

Espigueta

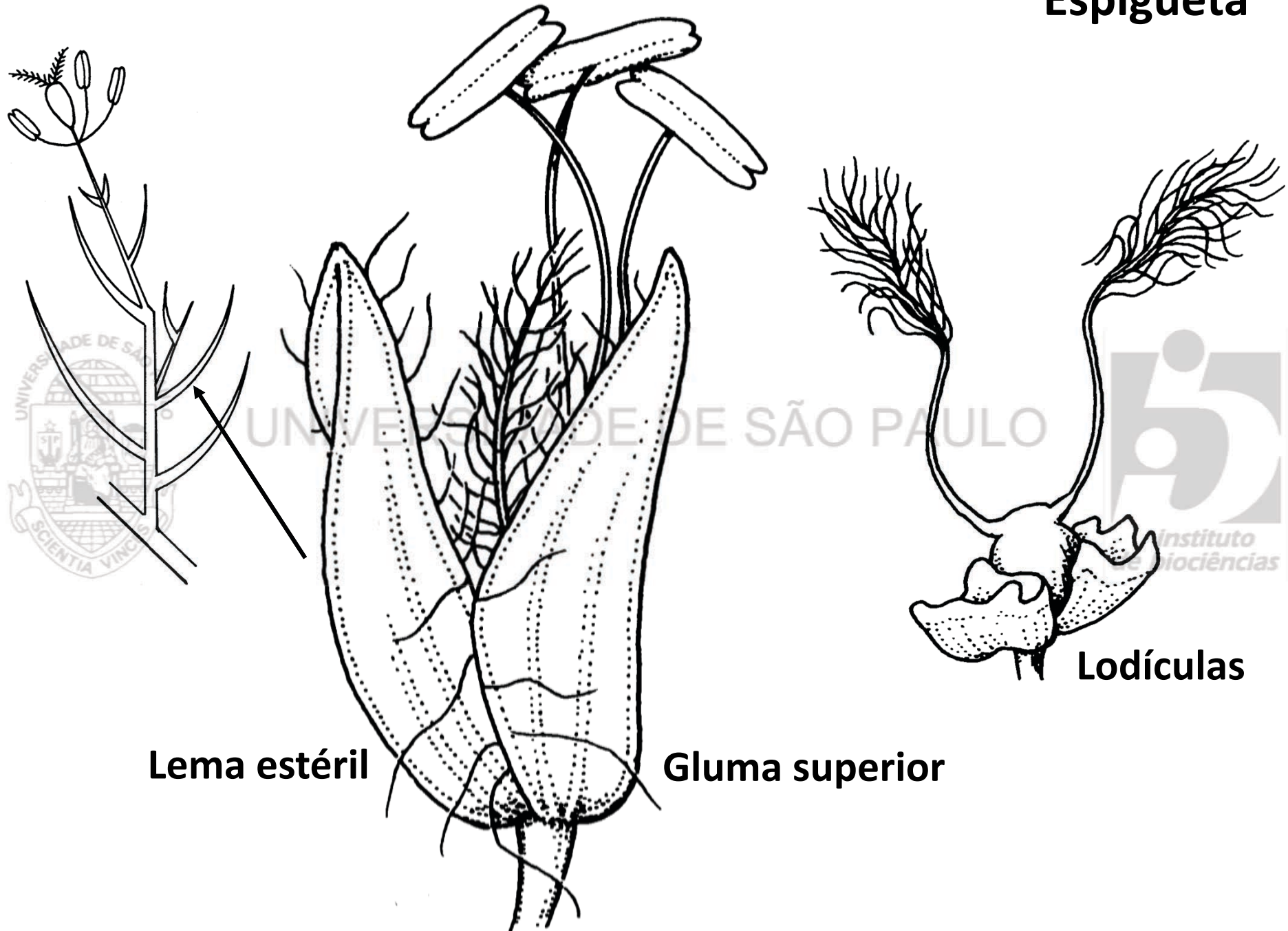


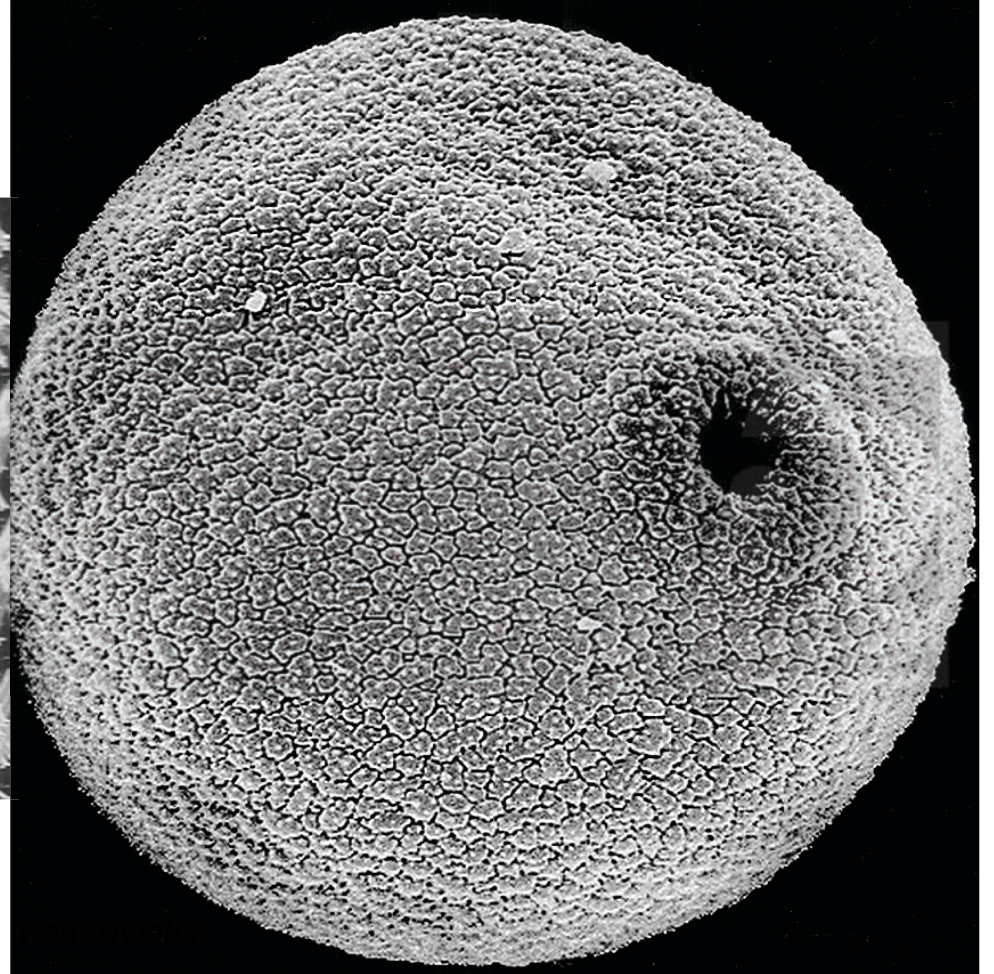
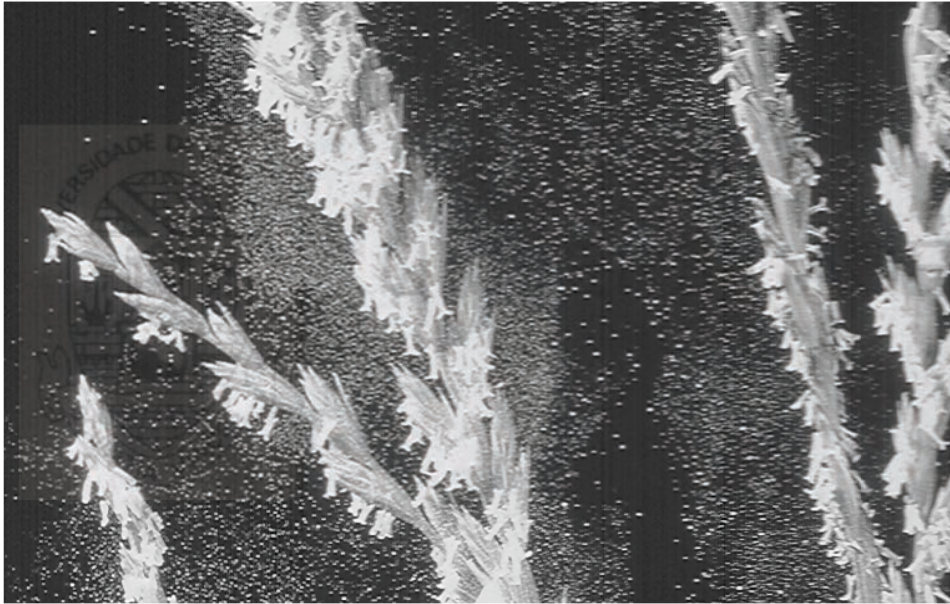
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Paspalum dilatatum Poir.

Espigueta





© Nanuza Menezes



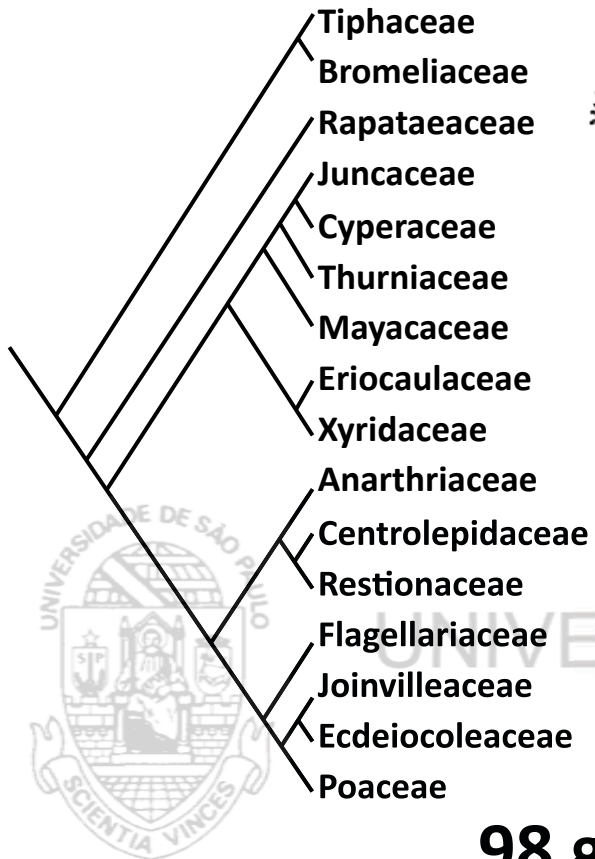
Zea mays



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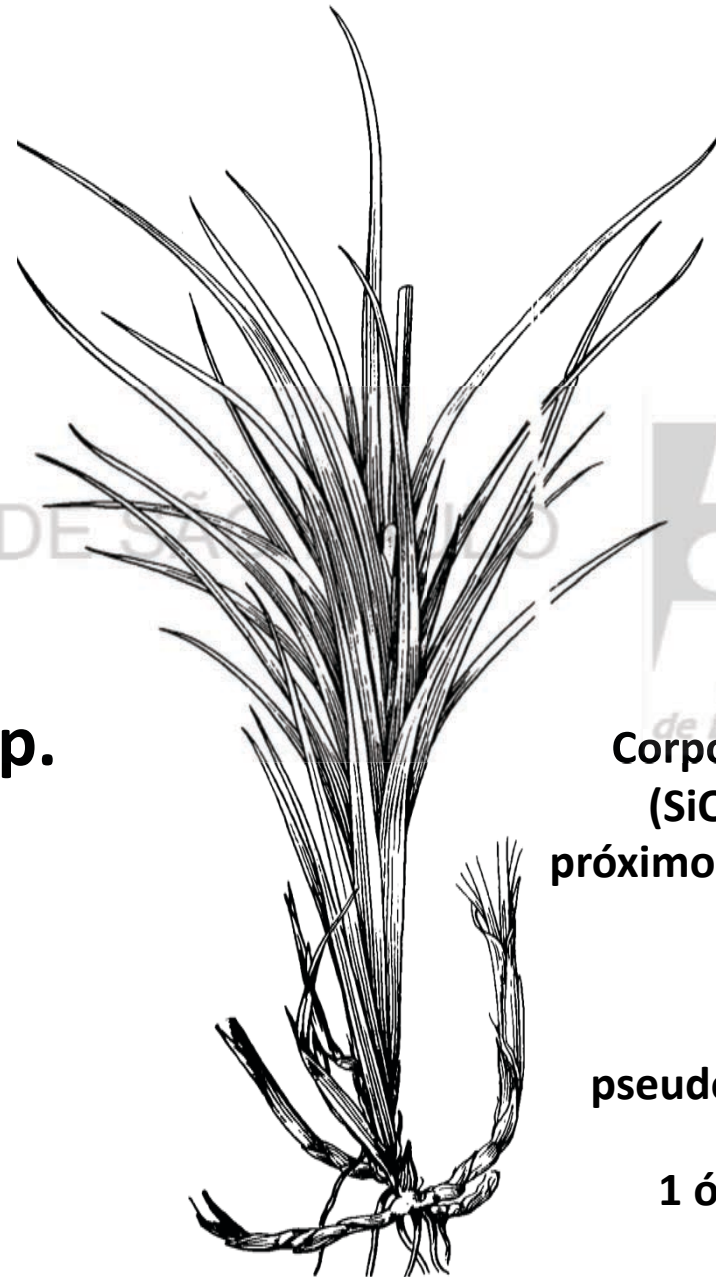
Stevens (2011)



98 gên., 5500 spp.



Cyperaceae

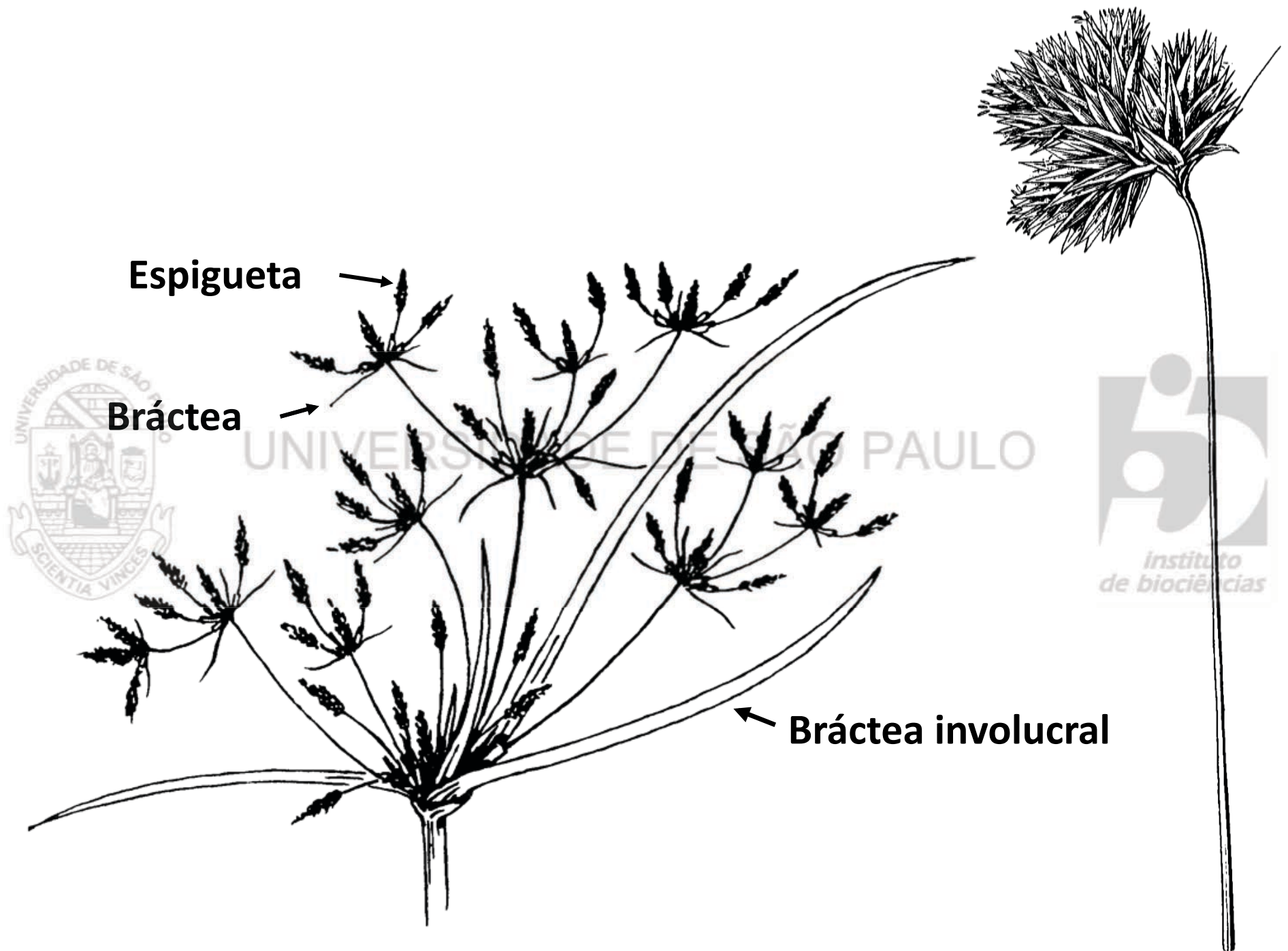


Corpos de sílica
(SiO_2) cônicos
próximos à parede
celular

pólen
pseudomônades

1 óvulo basal

POACEAE (GRAMINEAE)	CYPERACEAE
Caule cilíndrico	Caule triangular
Filotaxia dística	Filotaxia trística
Bainha foliar aberta	Bainha foliar fechada
Lígula presente	Lígula ausente
Flores dispostas disticamente na inflorescência	Flores dispostas espiraladamente na inflorescência
Carpelos 2 (-3)	Carpelos 3 (-2)
Semente soldada ao pericarpo (cariopse)	Semente não soldada ao pericarpo
Embrião periférico ao endosperma	Embrião central



bráctea

espiguetas

Rhynchospora speciosa



Espigueta

