

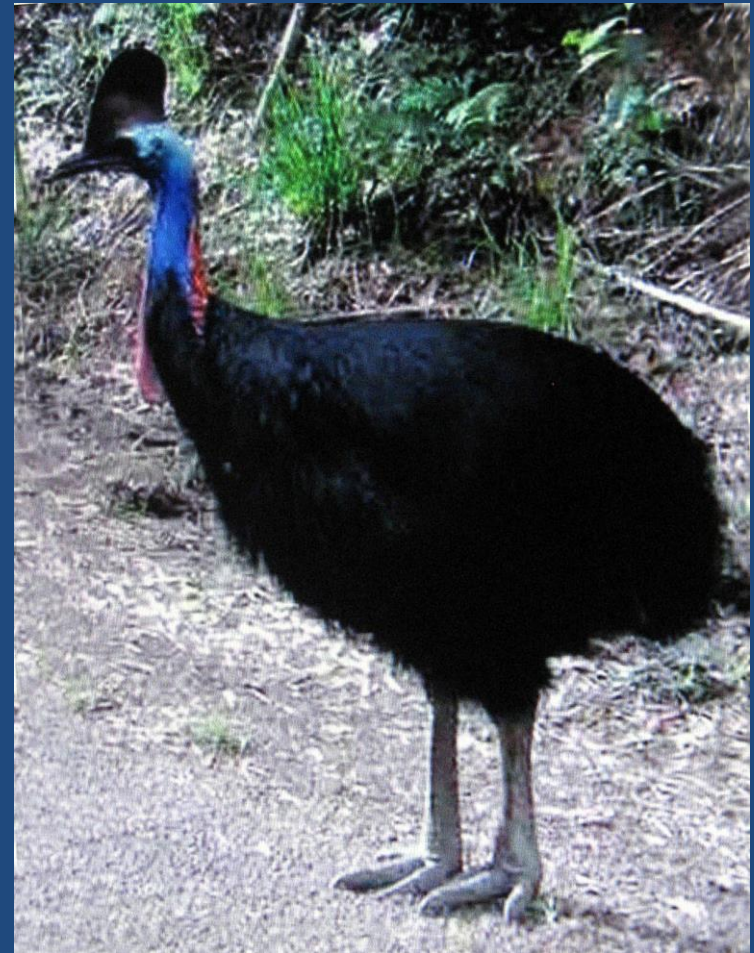
CASUARINACEAE

Casuarinas: Taxonomy, Biology and Uses



Name derivation

- “Casuarina” given by Rumphius in 1650s
- Alludes to hanging branchlets resembling plumage of a cassowary (*Casuarius* spp.)
- “sheoaks” in Australia, “agoho” in Philippines
- “Australian pine” in USA and Caribbean



Casuarinas in ANBG

Allocasuarina

- 29 species. Best representation in Section 40 above Eucalypt Lawn. Good examples around Visitors Centre

Casuarina

- 5 species. Many examples of *Casuarina cunninghamiana*

Gymnostoma

- 1 species (*G. australianum*) in Rain Forest Gully



Allocasuarina inophloia



*Casuarina
cunninghamiana*



*Gymnostoma
australicum*

Casuarinaceae genera

Casuarina (17 spp.)

Allocasuarina (59)

Gymnostoma (18)

Ceuthostoma (2)

96 species S.E. Asia & Pacific

Casuarinas in Australia

Gymnostoma

- 1 species in northeast Queensland

Allocasuarina

- 59 species, all in Australia
- Shrubs or small trees
- Low nutrient status soils

Casuarina

- 6 species in Australia
- Mainly fast-growing tall trees
- Moderate nutrient status soils

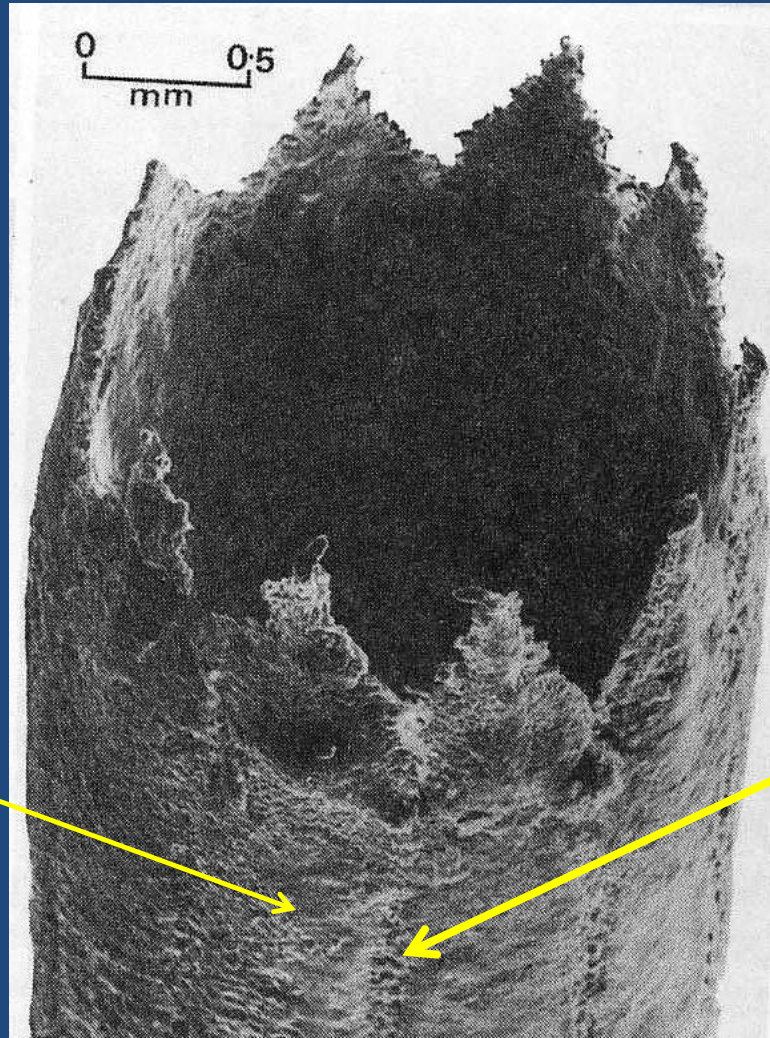
Casuarinaceae

- Flowering plants (not conifers)

Foliage is long, needle-like branchlets (cladodes)

Branchlets have regularly spaced nodes at which is a ring of reduced leaves (teeth)

Internodes (articles) have ridges (phyllichnia) with stomates in grooves between them



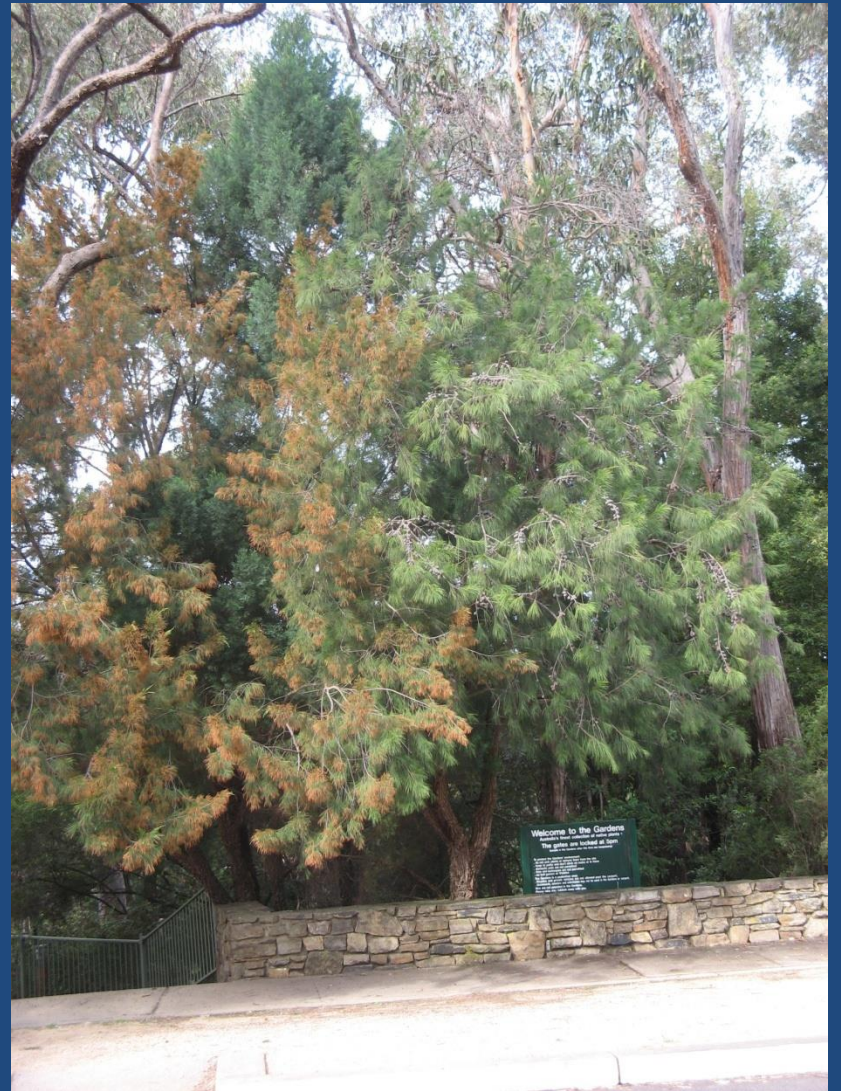
Phyllichnium

Stomates

Leaf 'teeth' of *Casuarina cristata*

Casuarinaceae

- Flowers are unisexual and greatly reduced
- Most species have male and females on separate plants (dioecious)
- Male flowers are in catkins
- Females flowers have no perianth and are produced in small cones
- Cones (infructescences) enlarge, become woody and enclose a small winged seed.

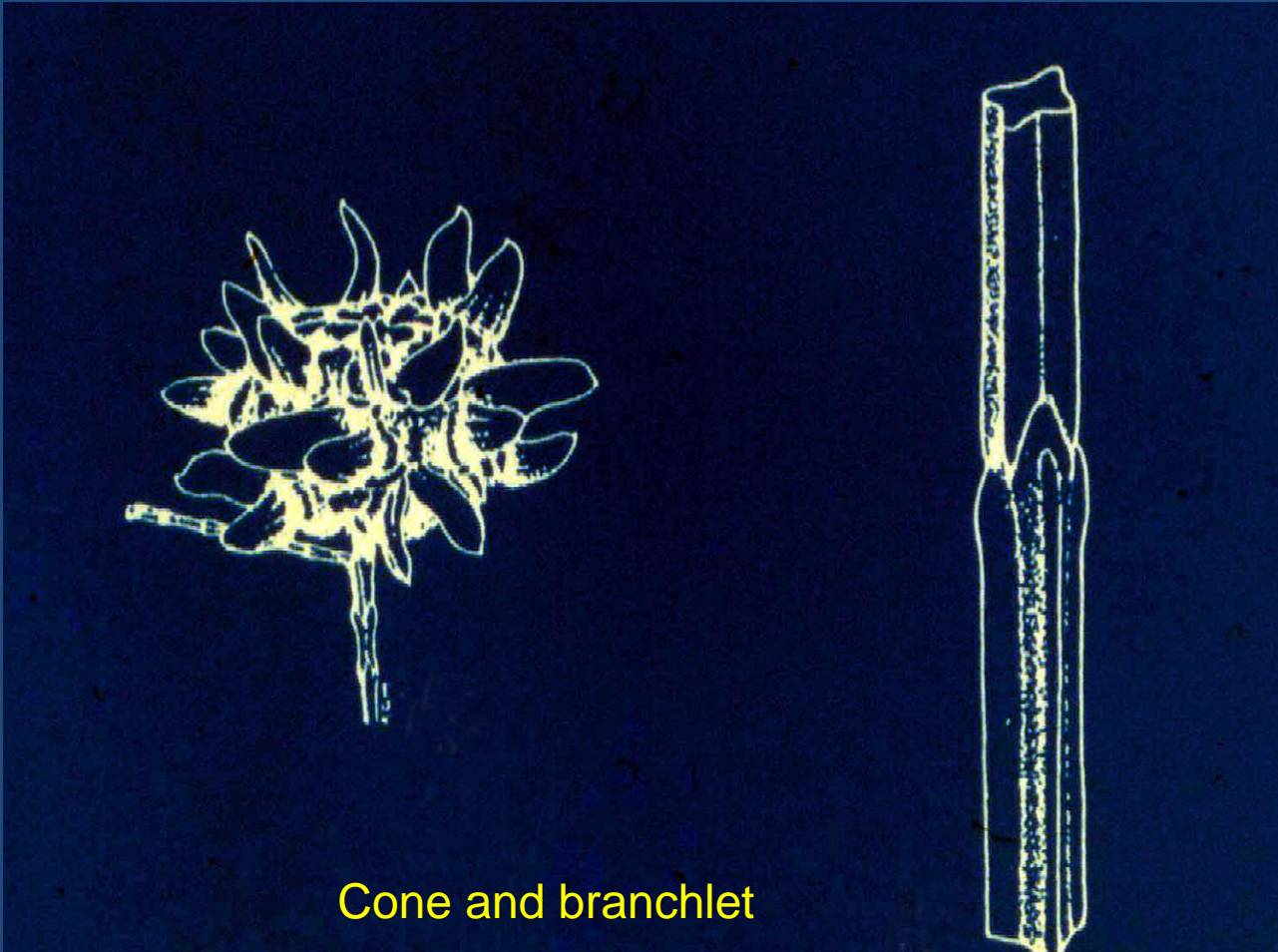


Male and female flowers

Gymnostoma

- Least specialized genus with Gondwanaland history. Fossils in S. America and N. Zealand
- Trees or tall shrubs in moist tropical forests
- Small chromosomes $n = 8$
- Branchlets always 4-sided with stomates on faces
- “Cones” have simple beak-like valves

Gymnostoma



Cone and branchlet

Allocasuarina

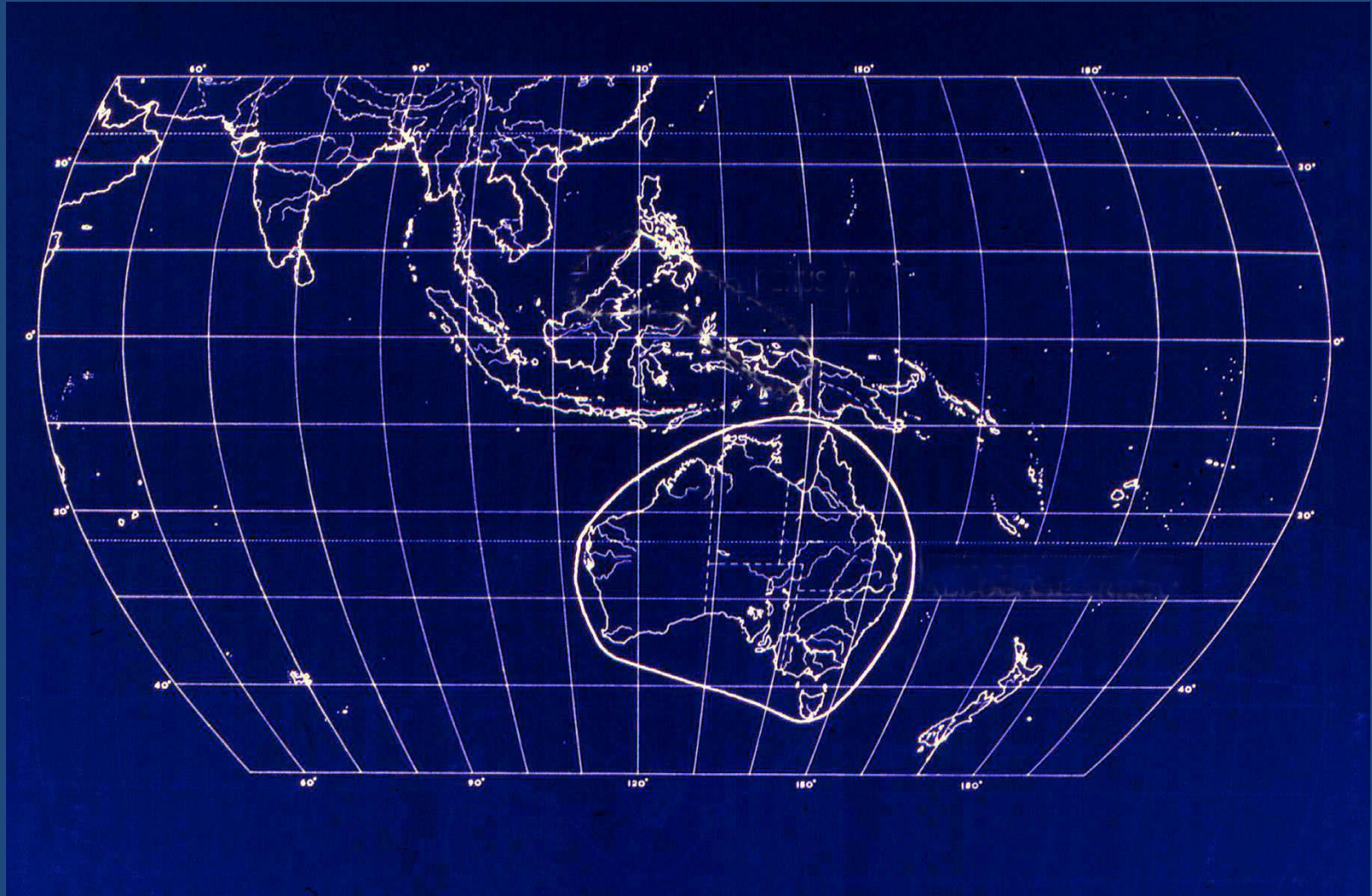
- Most specialization from ancestral stock

Mainly small trees or shrubs. All occur in Australia, often in semi-arid areas and usually on impoverished soils. Many in Western Australia.

Larger chromosomes $n = 10$ to $n = 14$ and some polyploidy

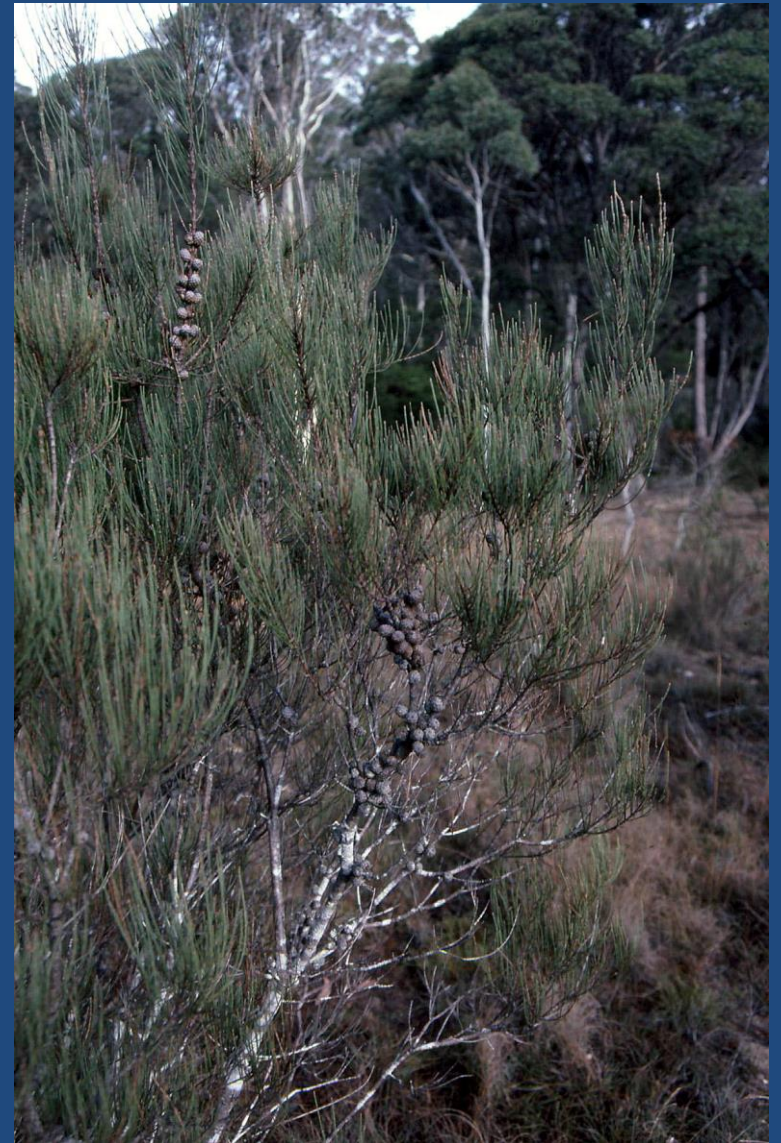
Cones are woody with complex with prominent appendages

Allocasuarina distribution



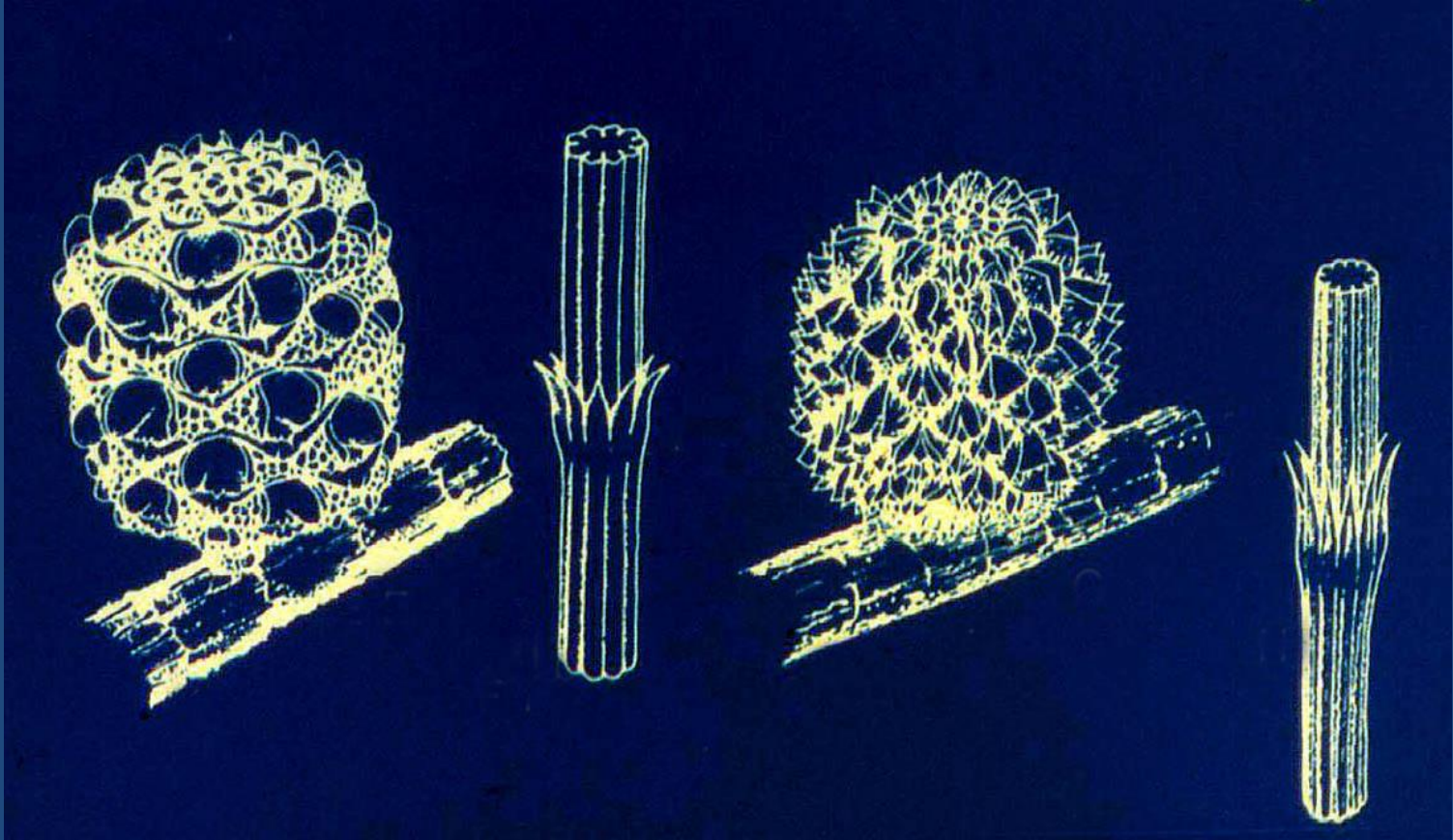


Allocasuarina decaisneana
Desert Oak



Allocasuarina nana
Dwarf Casuarina

Allocasuarina cones and branchlets



Black or dark brown seeds in thickened woody cones

Allocasuarina decaisneana cones



Reproductive biology of *Allocasuarina verticillata* (Red Hill, ACT)

- Dioecious flowering May-October

Female inflorescence over 100 flowers, receptive up to 12 weeks

Male inflorescence shed pollen 3-9 weeks

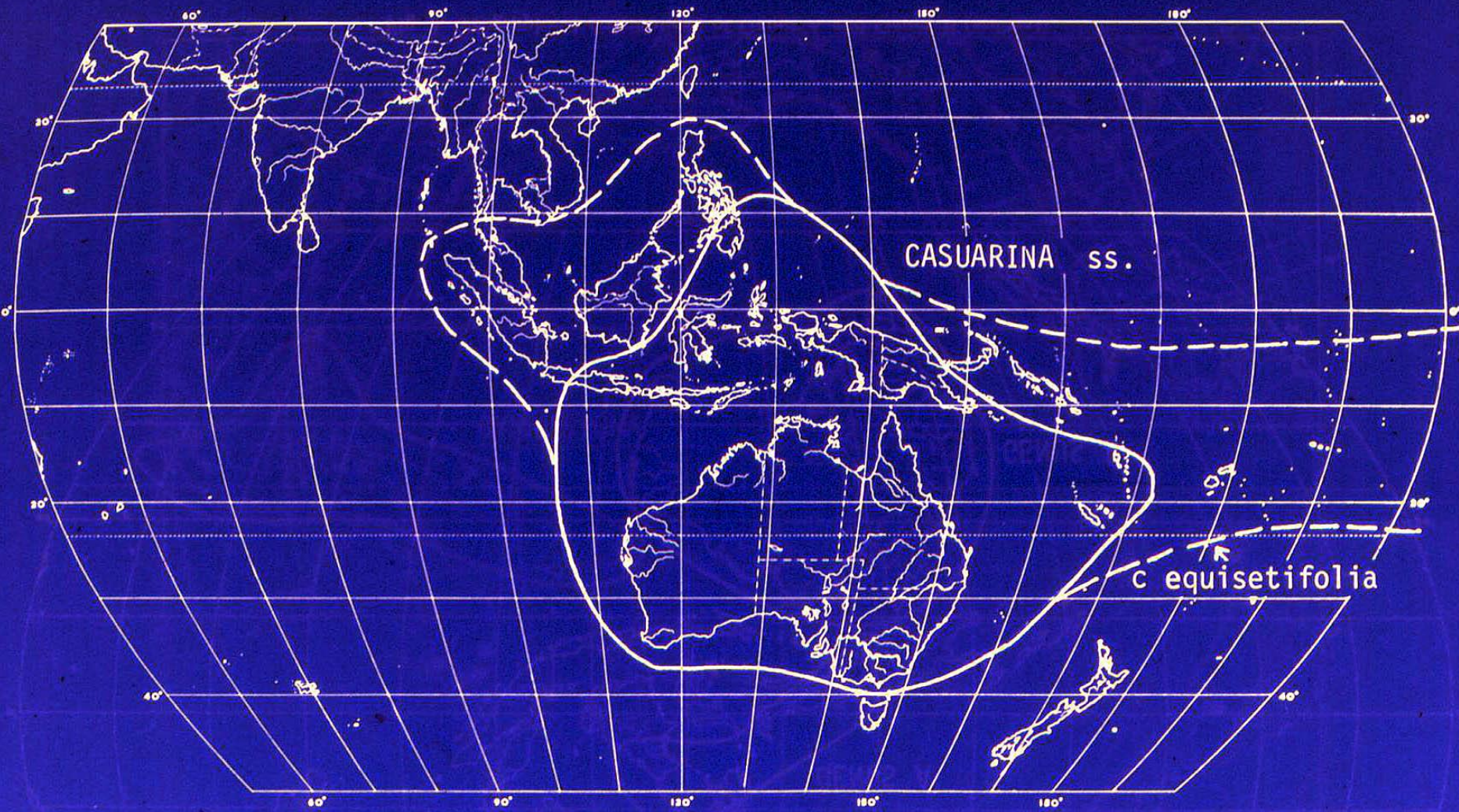
Each male inflorescence 200-240 anthers each with 1000-3000 pollen grains ie. 380,000-650,000 pollen grains per inflorescence

Pollen grains small and smooth, adapted to wind pollination

Moncur and Boland 1996

Casuarina

- Moderate specialization from ancestral stock
- All trees, some quite large, occur in both tropical and temperate climates, usually where there is an adequate supply of water and nutrients.
- Small chromosomes $n = 9$
- Branchlets have 4-16 deep furrows
- Cones are thin, weakly woody, simple valves



CASUARINA SS.

c equisetifolia



Casuarina equisetifolia
Coast She-oak



Casuarina cunninghamiana
River She-oak

Casuarina



Pale grey-brown to yellow-brown seeds in weakly woody cones



Casuarina cunninghamiana cones

Main differences

- *Casuarina*

- Fast growing trees
- More fertile sites
- Small, weakly woody cones shed annually
- Dull, pale grey or brown seed
- Teeth 6-20

- *Allocasuarina*

- Often slow growing small trees or shrubs
- Challenging sites
- Large, woody cones retained for years
- Shiny, black to red-brown seeds
- Teeth 4-14

Adaptation to infertile soils

- Slow growth and low nutrient needs
- Endo- and ecto-mycorrhizas
- Cluster (proteoid) roots
- Nitrogen-fixing actinomycete bacteria (*Frankia* sp.)



Mycorrhizal roots



Nitrogen-fixing root nodules

Utilization of Casuarinas

Casuarina wood is:

- hard and heavy (1 cubic metre=1 tonne)
- difficult to saw
- splits easily
- resists rot in the ground
- burns well

Uses in Australia and New Guinea

- Australian aboriginals: boomerangs, medicines and fishing net preservation
- New Guinea's highlands: for 7000 + years maintained fertility of gardens. *C. oligodon*
- European settlers: bakers' ovens, roofing shingles, fencing posts and rails, and turnery.
- Casuarinas currently used commonly in shelterbelts and garden or street trees.



Shingle cutting near Sydney
1870s

Casuarinas used in other countries

Casuarina equisetifolia - China, India, Vietnam, Senegal, Kenya

C. cunninghamiana – Argentina, Israel, USA

C. glauca - Egypt, Israel, Pakistan

C. junghuhniana – India, Thailand

Allocasuarina species are rarely planted



China















Thailand



Egypt



Egypt



Senegal



Kenya



Red-legged millipede (*Epibolus pulchripes*)

THE
END

