

# LECANOPTERIS

Ant Ferns

A wonder of mutualism

San Francisco Fern Society

September 19, 2015

Lyn Gomes



A close-up photograph of a fern frond, showing the intricate, lobed structure of the leaves. The frond is a vibrant green color, but it is heavily affected by a rust disease, which is visible as numerous small, bright orange-brown spots scattered across the leaf surface. The background is a soft, out-of-focus white, suggesting a bright, possibly overcast day.

## ACKNOWLEDGEMENTS

- Dan Yansura
- Basil Madieros
- SF Fern Society Members
- Frank Omilian
- Charles Alford
- Andreas Wistuba
- UC Berkeley Botanic Garden

WHAT ARE THEY?  
WHAT MAKES  
THEM SPECIAL?

- 13 species
- Indonesia to Thailand
- Sea level to montane
- Mutalistic with ants!



# RHIZOMORPHIC MORPHOLOGY



# WHERE DO THEY COME FROM?



# THREATS TO SURVIVAL

- Climate change
- Deforestation
  - Lumber
  - Palm oil

## Rate of deforestation in Indonesia overtakes Brazil, says study

By John Vidal, [www.theguardian.com](http://www.theguardian.com)

June 29th, 2014

[View Original](#)



[ Union of  
Concerned Scientists

FACT SHEET

## Palm Oil and Global Warm

### FORESTS AND PEATLANDS AT RISK

*Current methods of palm oil production*

Palm oil is ubiquitous in the global marketplace. It is a part of many of everyday products, from baked goods to shampoo. It is used in food and to fuel cars and trucks in many places around the world.

Current palm oil production methods often clear large areas of land. To reach tropical forests and peatlands, it is a major driver of deforestation. In order to conserve our natural resources, and to reduce the risk of climate change, we must transform the way we produce palm oil.

## Science News

### High-altitude climate change to kill cloud forest plants

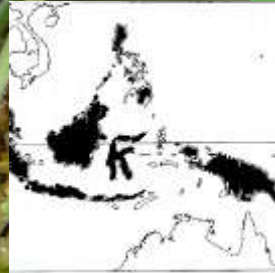
Date: August 7, 2015

Source: James Cook University



# L. DEPARIOIDES (FORMERLY CURTISII)

- Waxy coating gives it a bluish cast
- Fronds 16-36" long
- Widespread but rare
- 300' to 4000'
- Easiest to grow
- Most available
- Spores as "eyelashes" on leaf margins





# L. MIRABILIS

- The only one with no internal chambers
- Rounded peltate scales
- 16-42" high
- Rhizomes can reach 8" wide!
- Likes it warm
- Literature says to grow it cool



# L. CELEBICA

- Flattened rhizome
- Green-apple melted wax
- Some spines
- Very limited range
- Mountains of Sulawesi
- Tolerates temps on the cooler side



# L. LUZONENSIS

- Smallest of genus
- 6-10" tall
- Only from Philippines
- Closed mid-montane forests
- Populations can be distinct



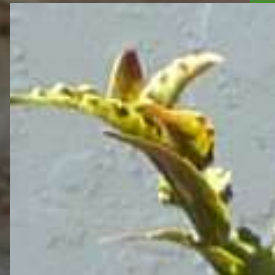
# L. SARCOPUS / LOMARIOIDES

- Dimorphic rhizome
- Completely covered with scales
- Ants live in phyllopodia as well as the space between rhizomes
- Leaves can be over 4' long
- Wet lowland to mid-montane to roadside trees



# L. 'ALFORD'

- The only known hybrid?
- *L. curtisii* x *mirabilis*
- Named after Charles Alford
- Flattened rhizomes with scales
- Not hollow!!
- Sterile
- Sori location intermediate between *mirabilis* and *curtisii*!



# OTHER SPECIES



Crustacea

C. Alford



Holtumii



Spinosa

© Andreas Wistuba





Sinuosa



Pumila



Balgooyi

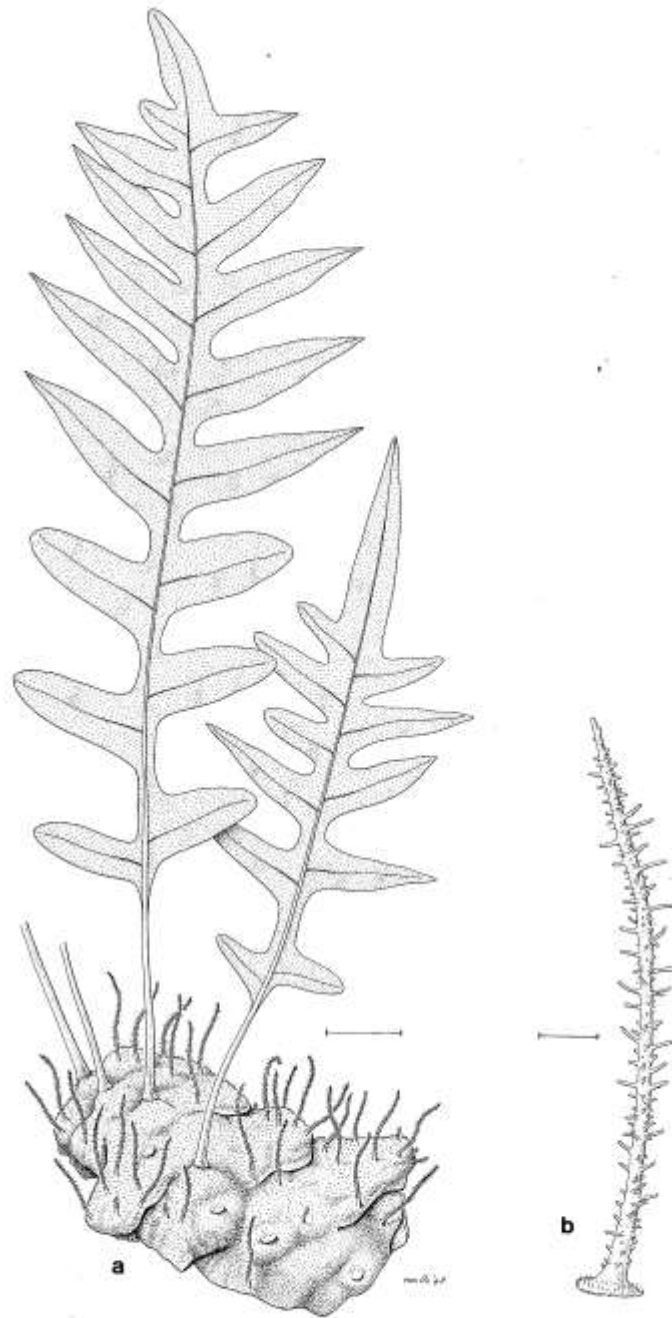


Fig. 11. *Lecanopteris carnosa* (Reinw.) Blume. a. Habit; b. rhizome outgrowth. (De Vogel & Vermeulen 7141). Scale bars: a = 2 cm, b = 2 mm. Drawings by J.H. van Os.

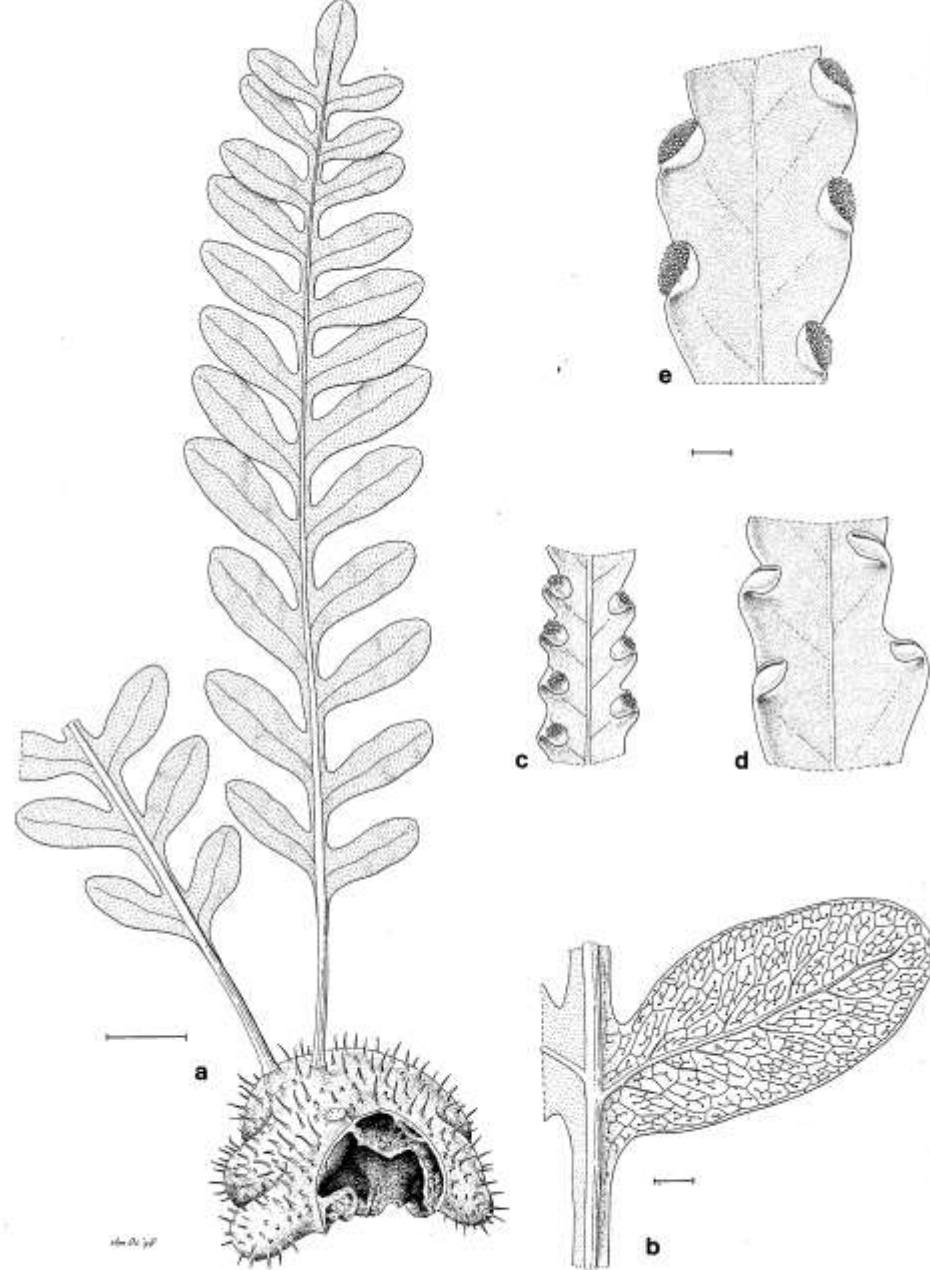


Fig. 12. *Lecanopteris darnaedii* Hennipman. a. Habit; b. venation. — *L. pumila* Blume. c. Sori. — *L. luzonensis* Hennipman. d. Sori. — *L. celebica* Hennipman. e. Sori (a, b: *Darnaedi* 1564; c–e: cultivated specimens in Leiden Botanical Garden). — Scale bars: a = 2 cm, b = 7 mm, c = 6 mm, d, e = 15 mm. Drawings by J.H. van Os.

# CULTURE

- >60 deg F
- Happiest 70-90 deg F
- >40% humidity
- Very bright light!



# MEDIA



- Epiphyte mix
- Long fiber New Zealand sphagnum
- Tree fern
- Mounted
- Mix: equal parts
  - Perlite
  - Coir
  - Short fiber NZ sphagnum

# LIGHT

- Epiphytes
  - Tree crowns
  - Ridgelines
  - Roadcuts
- Very bright light
  - But not direct
- South facing with white sheer curtain
- 800 to 1200 Foot Candles



# TEMPERATURE

- Equatorial tropics
- Mostly montane
- 70-90 deg F with little seasonal change
- <60 deg F night time temps courts disaster
- <50 night time and wet – fungal infection certain



# FERTILIZER

- “Weakly Weekly”
- Maxsea
  - Doesn’t kill living sphagnum
- Epiphytes Delight
- African violet food ok
- Osmocote – not so good





# WATER

- Water when top of media dry to the touch
- Reduce in winter
- Not succulents!
  - Can't tolerate periods of drought
  - Roots die
- Hetch Hetchy water is excellent
  - very pure, low minerals/TDS



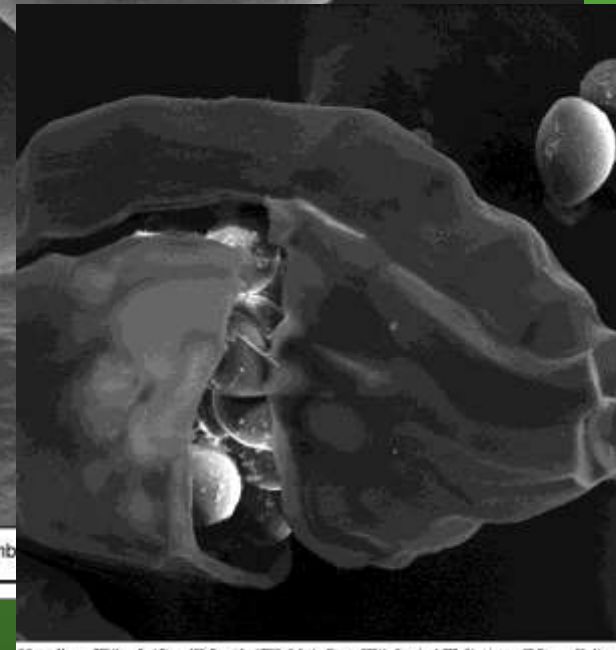
# PESTS AND DISEASES

- Fungal rot
- Thrips
- Snails
- Fungus gnats
- Springtails – not a pest, but annoying
- Do not tolerate insecticides well
  - Safer soap, but apply only when cool
- Prevention is best
  - Night time temps >60 deg F
  - Heat mat
  - Humidity tray
  - Constant vigilance!



# GROWING FROM SPORES

- NO tolerance for chlorine
- Media:
  - 50/50 mix short fiber sphagnum and rinsed sand
  - Sterilize media with distilled water and microwave
- Sporophytes emerge after ~6 weeks
  - Look like Christmas trees!
- Fertilizer a must
- Hybrids are possible
  - Lec. 'Alford'  
= Lec. deparioides + mirabilis



100  $\mu$ m EHT = 20.00 kV WD = 9.5 mm Mag = 2.63 K X Spot Size = 429 Signal A = VPSE Collector Bias = 380 V Signal = 1.000 Chamb

3.0 mm Mag = 893 X Spot Size = 429 Signal A = VPSE Collector Bias = 380 V Signal = 1.000 Chamber = 30 Pa File M



## PROPAGATION BY DIVISION

- Surgery!
- **Divide before gets to edge of pot**
- **Exacto knife**
- Anti-fungal on cut surfaces
- If it has roots:
  - Cut roots through media
  - Use as anchor

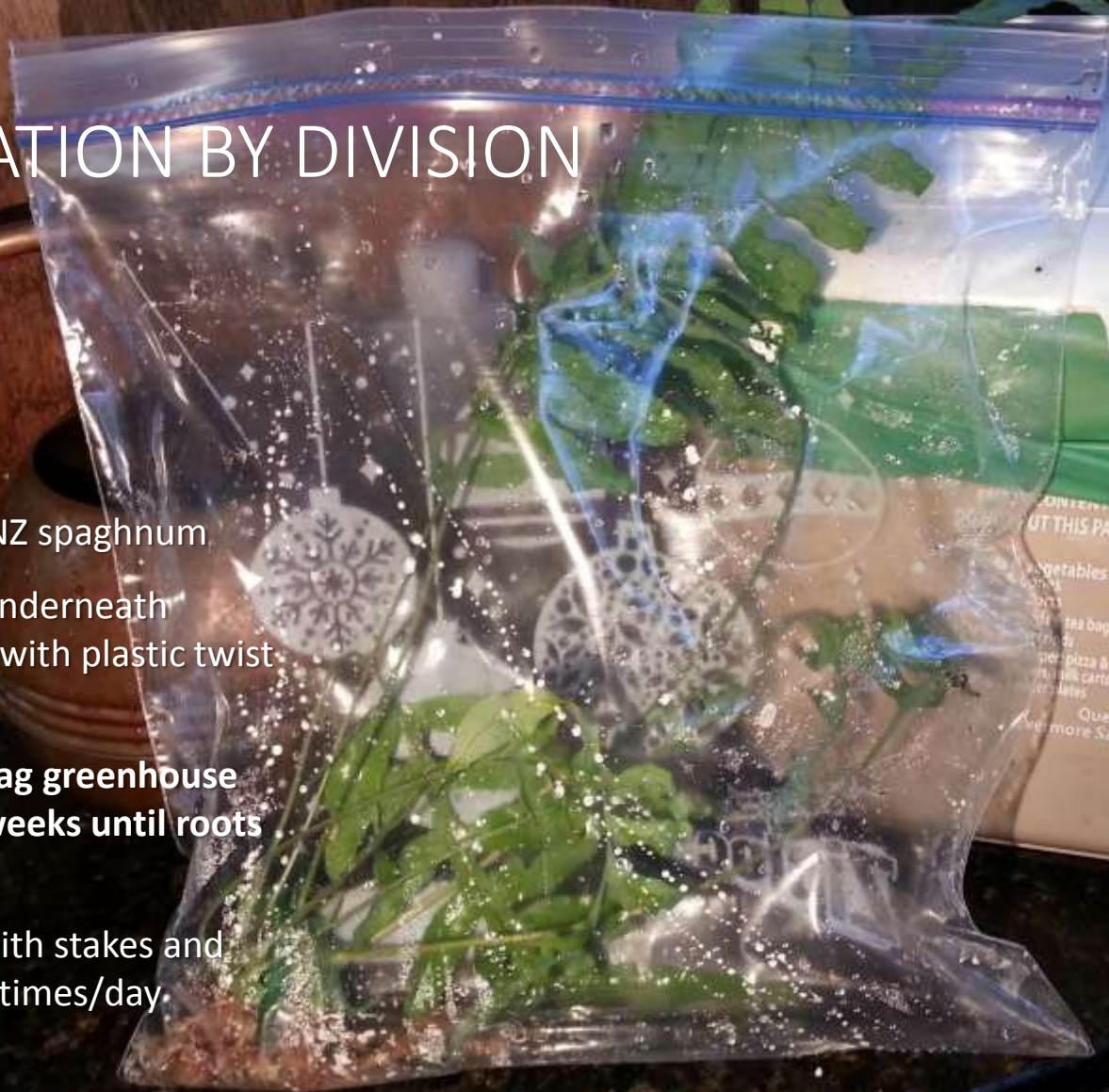
# PROPAGATION BY DIVISION, CONT.

- If no roots:
  - Wad of NZ sphagnum
  - **Secure underneath rhizome with plastic twist tie**
  - Plastic bag greenhouse for 4-6 weeks until roots develop
  - Pot up with stakes and mist 2-3 times/day



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# PLANT SALE!

- \$10/plant
- \$40+ Value!
- All proceeds benefit our club
  - You can donate more!



## Lecanopteris curtisii, rare ar

Item condition: --

Ended: Jul 05, 2015, 6:09

Winning bid: **US \$36.00**

[Add to list](#)

Shipping: **\$8.50** Expedited S

Item location: Westlan

Ships to: United States

Delivery: Estimated within 4

Payments: **PayPal** **VISA**

Credit Cards processed

**PayPal CREDIT**

New PayPal Credit cus

[See details](#)

Returns: 14 days money ba

Guarantee: **ebay** MONEY

Get the item you ord

Covers your purchase

## SOURCES

### Ebay:

- Frank Omilian (Michigan)

- Username: frankinmi

### Direct/Online Order:

- Charles Alford (Florida)

- Phone/Fax (772) 770-9119

- chasalford@earthlink.net

- www.rareferns.com

- Andreas Wistuba (Germany)

- <http://www.wistuba.com/dreas@Wistubam>

- Siam Greenculture (Thailand)

- Chonlatit Vuthichai

- www.siamgreenculture.com

- piqzarch14115@gmail.com

- Tropiflora Nursery (Florida)

- www.tropiflora.com

- sales@tropiflora.com

## FURTHER READING

- Epiphytic Myrmecophytes: Bizarre Wonders of Nature. Derrick J. Rowe
  - Electronic only – available on Wistuba.com
- Flora Malesiana, Volume 3, Series II – Ferns and Fern Allies, Foundation Flora Malesiana, 1998
- Ant Plant (Myrmecophytes) forum, <http://myrmecodia.invisionzone.com/>
- The Taxonomy, Distribution, and Ecology of the Epiphytic Malesian Ant-Fern *Lecanopteris*, H. Gay, E. Hennipman, CR Huxley, FJE Parrott, 1993
- Rhizome structure and evolution in the ant-associated epiphytic fern *Lecanopteris* Reinw. (Polypodiaceae), Gay, Honor. Botanical Journal of the Linnean Society, 1993
- Notes on the ant-ferns of *Lecanopteris sensu stricto* in Sulawesi, with the description of two new species, Hennipman, E. Institute for Systemic Botany, 1985

QUESTIONS?



C. Alford