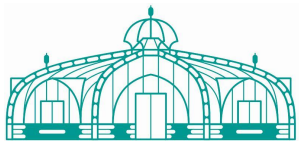
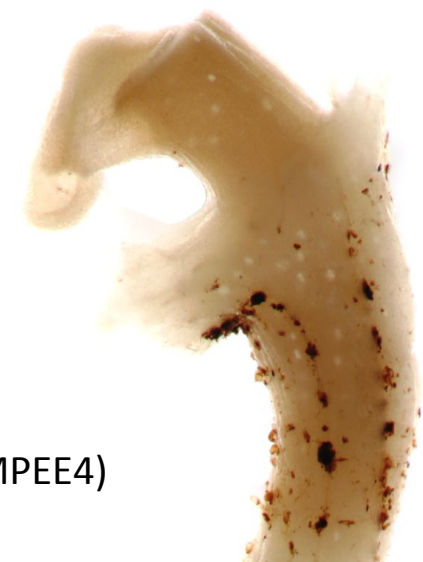


# Towards a pollination syndrome classification of angraecoid orchids focusing on the rostellum: the case of *Rhipidoglossum*

João N. M. FARMINHÃO, Pierre MEERTS, Tariq STÉVART

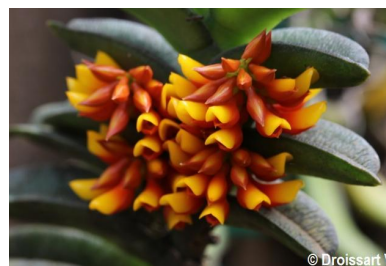
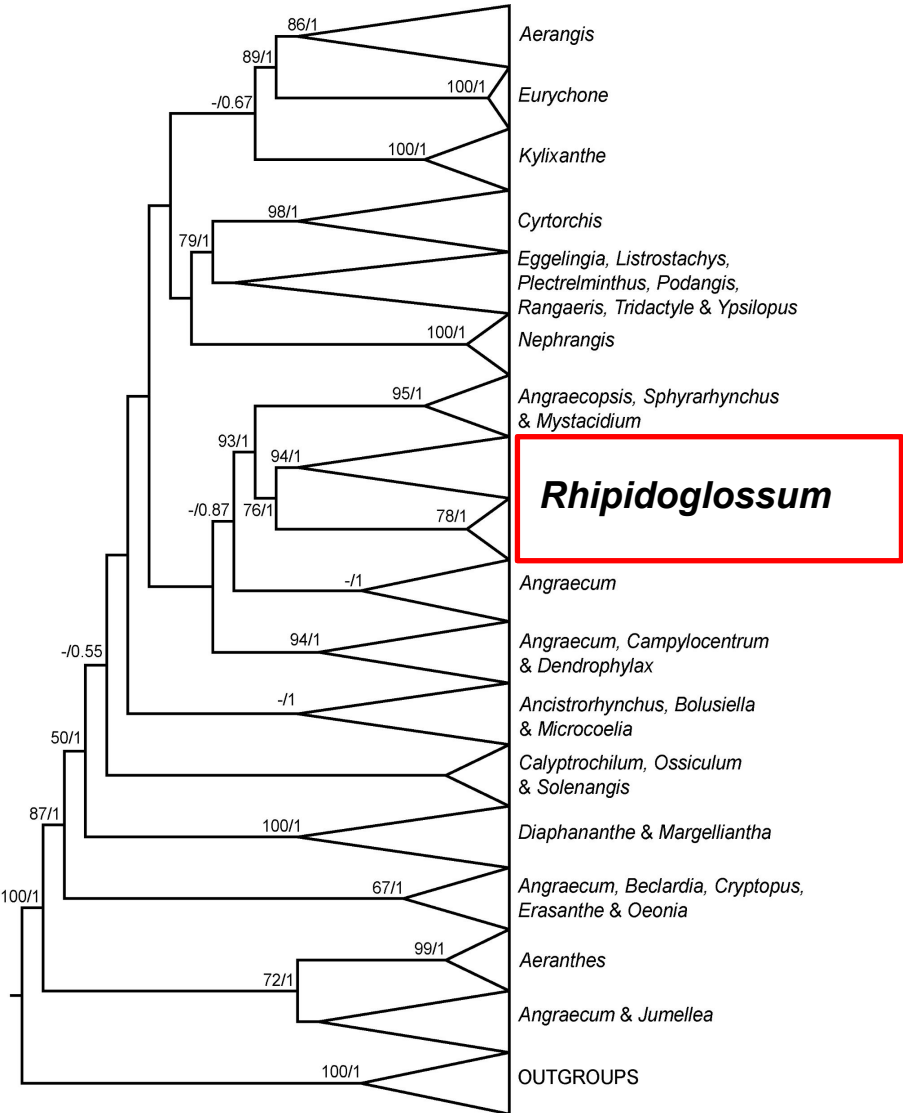


Plantentuin  
Meise

23.III.2018

The 4th Annual Meeting on Plant Ecology and Evolution (AMPEE4)

# Angraecoids: 760 spp



**“Good Heavens what insect can suck it”**  
Darwin 1862



V. Droissart



U. Knecht



*Dendrophylax funalis*  
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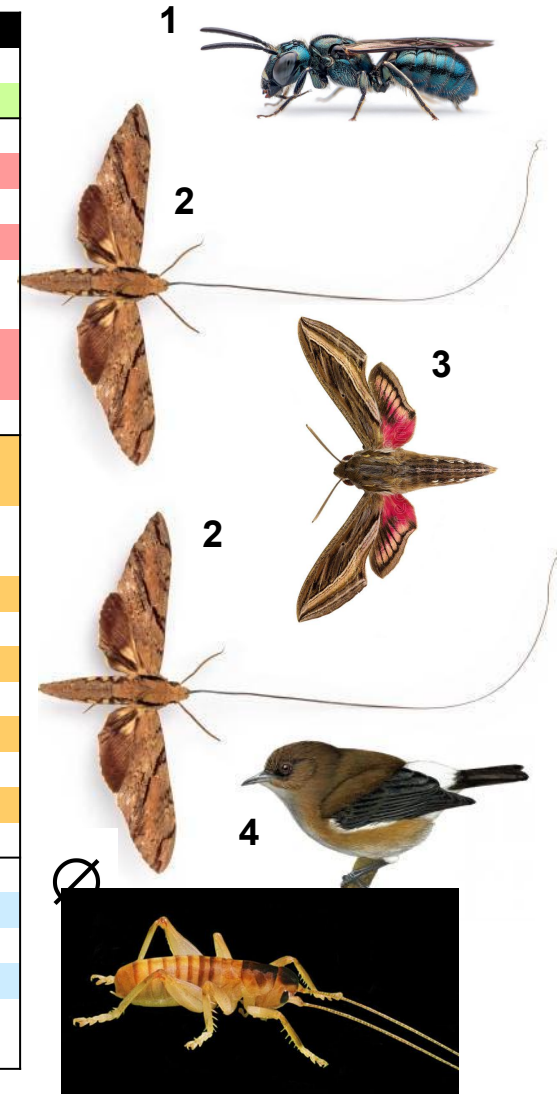


# Pollination syndromes in angraecoids

(a first overview)

# 5 pollination syndromes in Angraecoids identified

Angraecoid species	Pollinator	Location	Reference
<i>Campylocentrum aromaticum</i>	halictid bees	Brazil	Singer & Cocucci 1999
<i>Campylocentrum micranthum</i>	apid bees	Brazil	Cabral & Pansarin 2016
<i>Rangaeris amaniensis</i>	long-tongued sphinx moth	Kenya	Martins & Johnson 2007
<i>Aerangis brachycarpa</i>	long-tongued sphinx moth	Kenya	Martins & Johnson 2007
<i>Aerangis kotschyana</i>	long-tongued sphinx moth	Kenya	Martins & Johnson 2007
<i>Aerangis thomsonii</i>	long-tongued sphinx moth	Kenya	Martins & Johnson 2007
<i>Aerangis confusa</i>	short-tongued sphinx moth	Kenya	Martins & Johnson 2007
<i>Mystacidium venosum</i>	short-tongued sphinx moth	South Africa	Luyt & Johnson 2001
<i>Mystacidium pusillum</i>	settling moth	South Africa	Peter & Venter 2016
<i>Angraecum arachnites</i>	long-tongued sphinx moth	Madagascar	Nilsson et al. 1985, Nilsson & Jonsson 1987, Wasserthal 2015
<i>Angraecum compactum</i>	long-tongued sphinx moth	Madagascar	Nilsson & Jonsson 1987, Wasserthal 1997
<i>Aerangis fuscata</i>	long-tongued sphinx moth	Madagascar	Nilsson & Jonsson 1987
<i>Aerangis articulata</i>	long-tongued sphinx moth	Madagascar	Nilsson & Jonsson 1987
<i>Neobathiea grandidierana</i>	long-tongued sphinx moth	Madagascar	Nilsson & Jonsson 1987
<i>Jumellea teretifolia</i>	long-tongued sphinx moth	Madagascar	Nilsson & Jonsson 1987
<i>Angraecum sesquipedale</i>	long-tongued sphinx moth	Madagascar	Wasserthal 1997, 2015
<i>Angraecum sororium</i>	long-tongued sphinx moth	Madagascar	Wasserthal 1997
<i>Angraecum longicalcar</i>	long-tongued sphinx moth	Madagascar	Wasserthal 2015
<i>Aerangis ellisii</i>	long-tongued sphinx moth	Madagascar	Nilsson & Rabakonandrianina 1988
<i>Jumellea stenophylla</i>	autogamous	Reunion Is.	Micheneau et al. 2008a
<i>Angraecum striatum</i>	white-eye (bird)	Reunion Is.	Micheneau et al. 2006
<i>Angraecum bracteosum</i>	white-eye (bird)	Reunion Is.	Micheneau et al. 2008b
<i>Angraecum jeanineanum</i>	white-eye (bird)?	Mauritius Is.	Fournel et al. 2015
<i>Angraecum cadetii</i>	cricket	Reunion & Mauritius Is.	Micheneau et al. 2010, Fournel et al. 2015





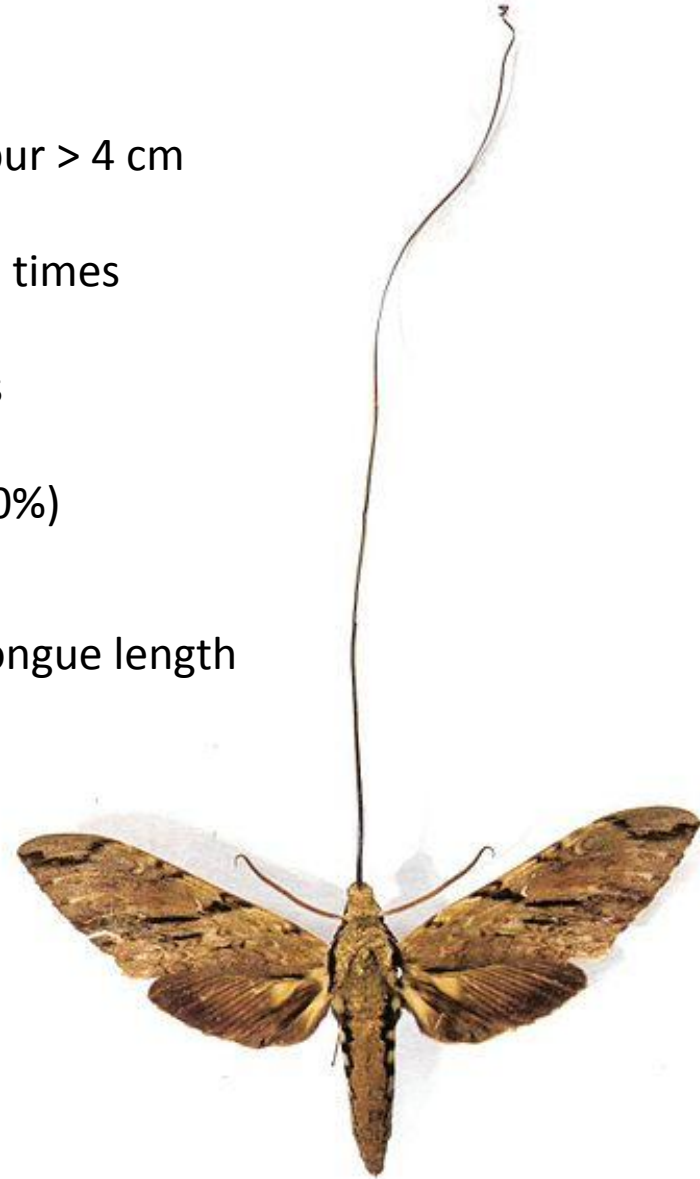
# Example 1: the well-known Sphingophily (sphinx moth pollination)



L. Grobler

*Summerhayesia zambesiaca*

- flowers mostly whitish, lip spur > 4 cm
- arised independently several times
- 16/49 genera, c. 30% species
- *Jumellea* (98%), *Aerangis* (80%)
- pollination guilds linked to tongue length



# Example 1: the well-known Sphingophily



© Droissart V.

*Aerangis bouarensis*



Ecuagenera via WOI

*Jumellea comorensis*



©2017 fotosynthesys@gmail.com

*Aeranthus schlechteri*

What about the rostellum?





# Study case: *Rhipidoglossum*

- c. 60 species





# Sphingophily in *Rhipidoglossum*?

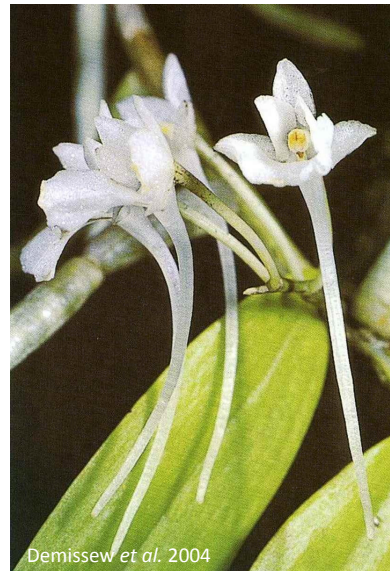


*R. polydacylum*



FIG. 8. *Rhipidoglossum candidum*. A habit  $\times 1$ ; B flower  $\times 3$ ; C flower with petal turned back  $\times 3$ ; D dorsal sepal  $\times 6$ ; E lateral sepal  $\times 6$ ; F petal  $\times 6$ ; G lip  $\times 6$ ; H column, side view  $\times 14$ ; J column, base view  $\times 14$ ; K anther cap  $\times 14$ ; L viscidia and stipes  $\times 14$ . All drawn from Gilbert & Thulin 002 by Mrs M. S. Chase.

*R. candidum*



*R. tenuicalcar*



*R. arbonnieri*

- Four species potentially sphingophilous

# Other syndromes?



Small fly/bee pollinated?



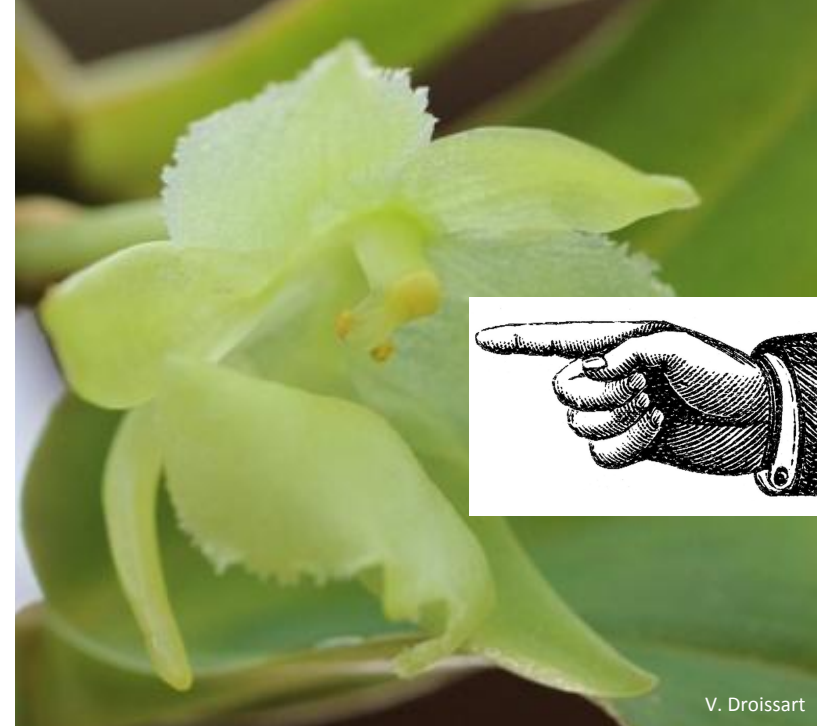
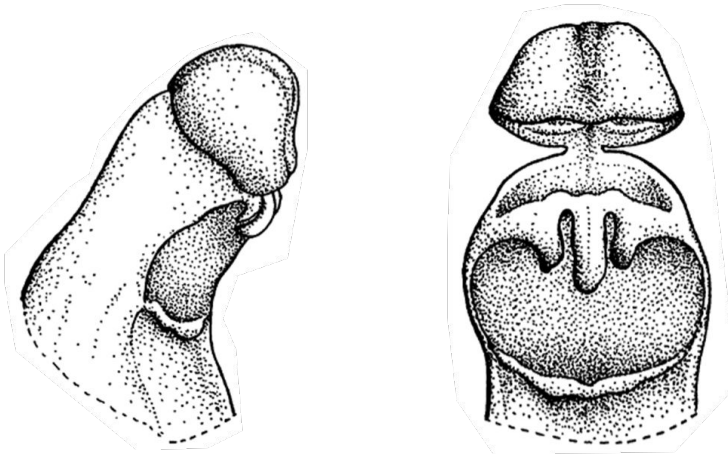
Moth pollinated?

wing scales!





# Rostellum: structure & diversity



- modified stigma lobe

- part of the column or gynostemium

# Under pressure: rostellum and sphingophily

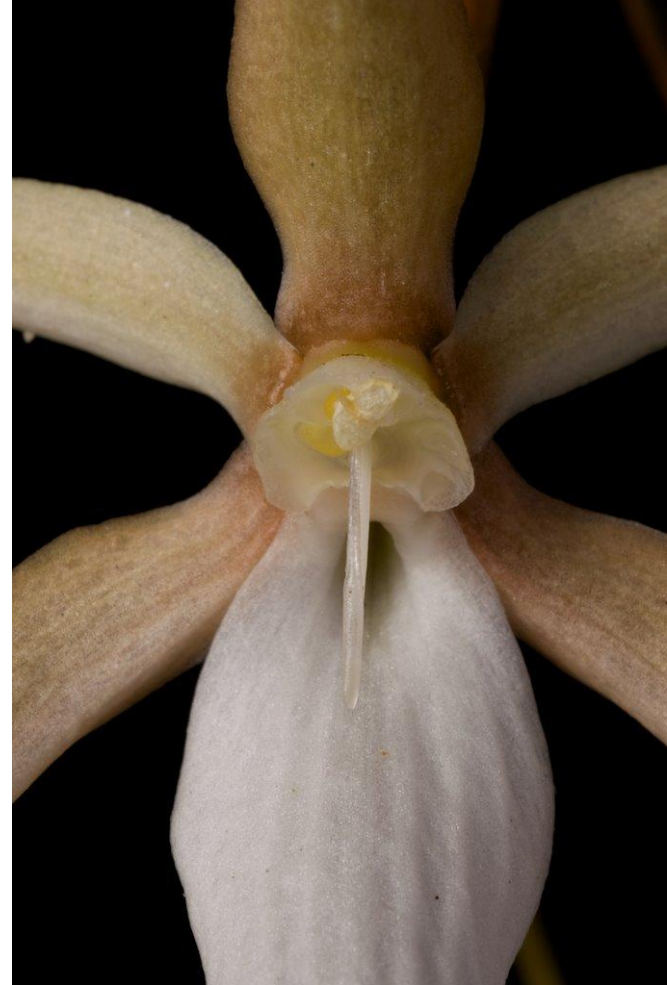
- 'Barombia-type' of column arised independently in *Rangaeris schliebenii* and *Aerangis gracilima*



C. Grey-Wilson via WO1



M. Simo-Droissart



*Aerangis monantha*

- very long rostellum in *Aerangis monantha*

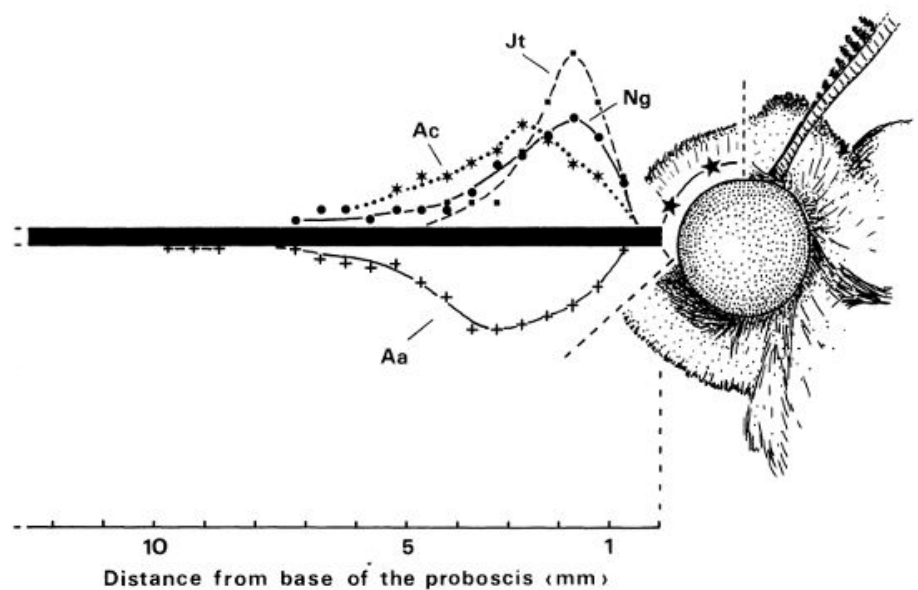


# Rostellum: 2 hypotheses for adaptation in *Rhipidoglossum*

- selective mechanical barrier controlling  
access to the nectar spur



- sorting of pollinia on pollinator's body



Adapted from Nilsson *et al.* 1987

# Rostellum phylogenetically informative or homoplasious?



*R. obanense*



*R. globulosocalcaratum*



*R. ochyrae*

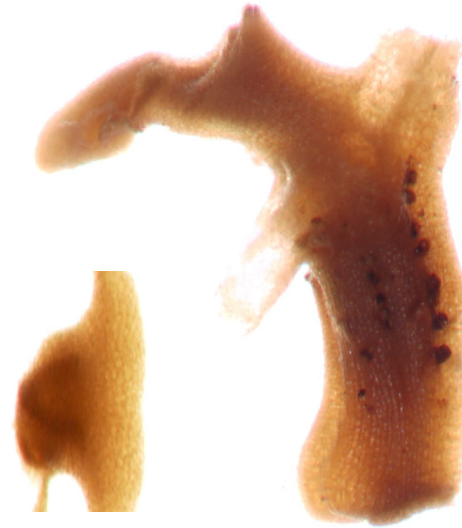


# Rostellum phylogenetically informative or homoplastic?

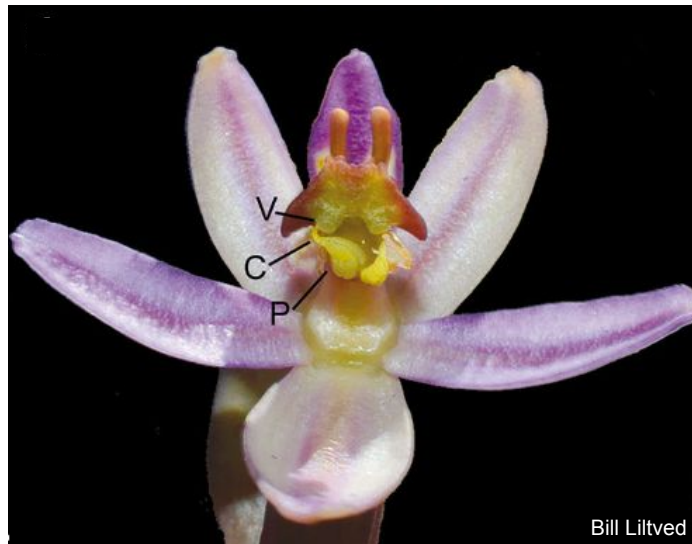
*R. stellatum*



*R. eggelingii*



Identical hammer-shaped rostellum in *Pachites appressus* (Orchidoideae)





# News from the field

## Study case 1 : *Rhaesteria eggelingii*

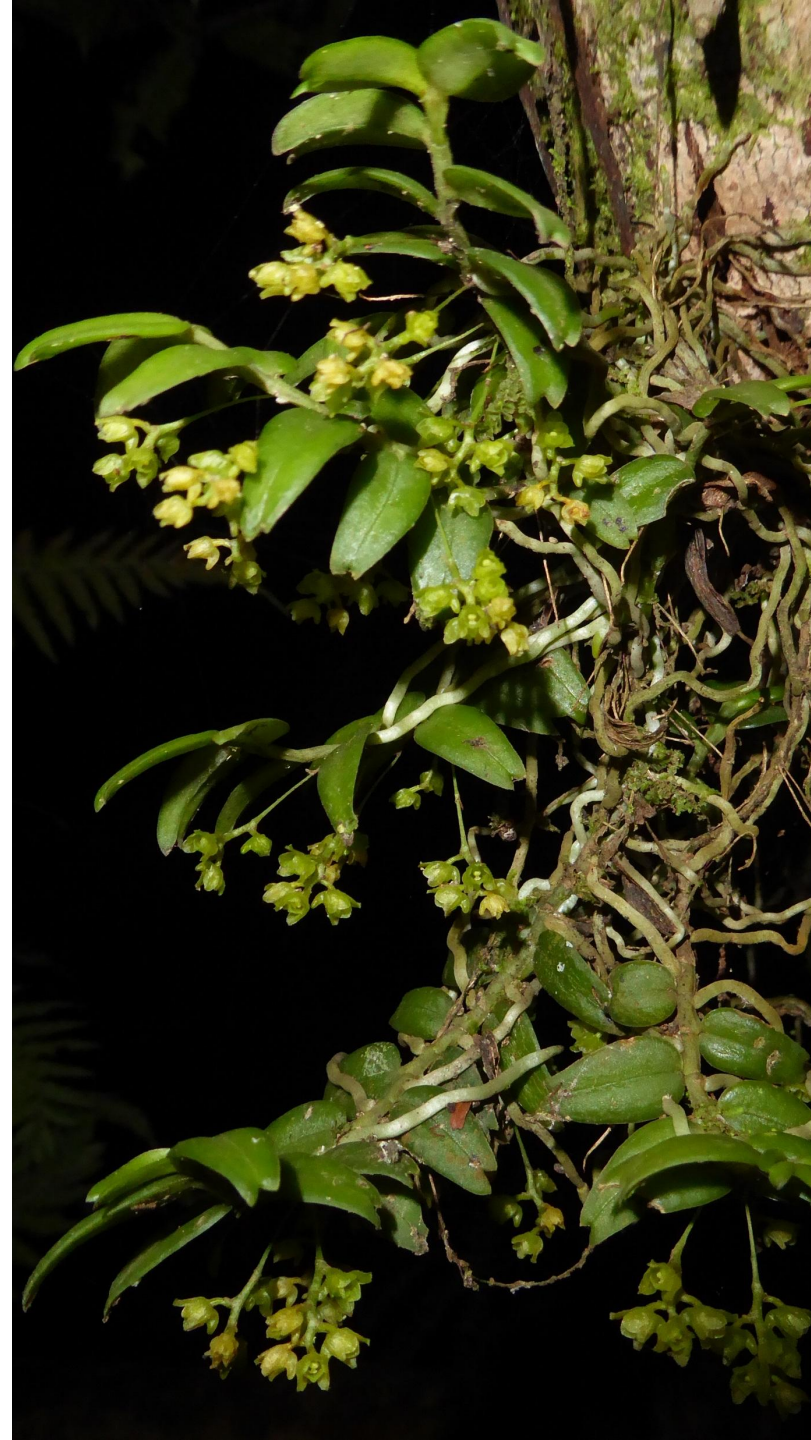




# News from the field

## Study case 1: *Rhaesteria eggelingii*

- nocturnally-scented
- butter-like smell
- Cyamudongo Forest: new locality
- no flower visitors observed...





# News from the field

## Study case 2: *Rhipidoglossum brevifolium*



*R. brevifolium*  
São Tomé



*R. aff. brevifolium* sp. nov.  
Gabon

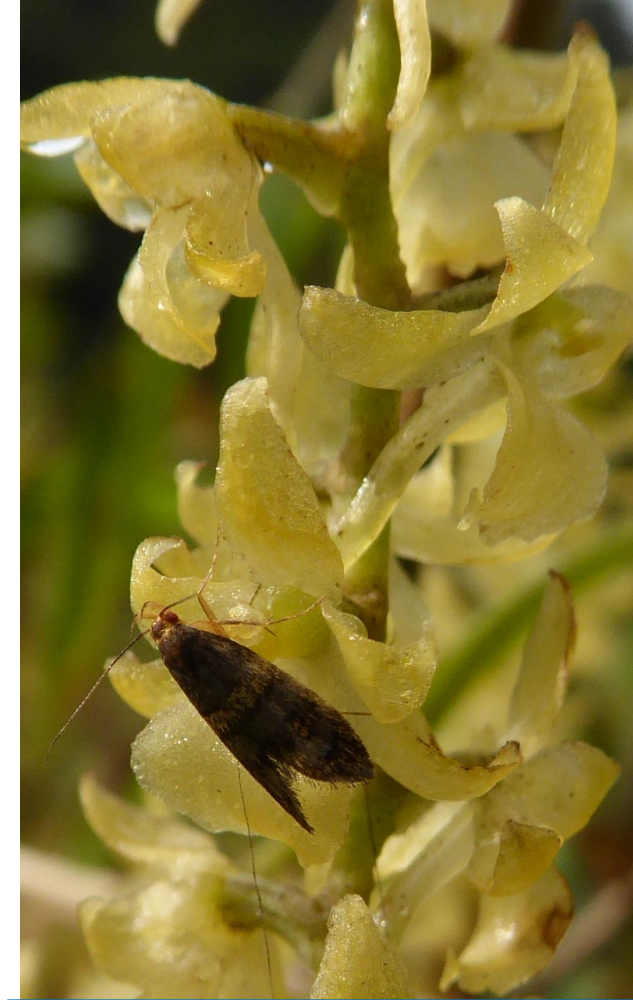




# News from the field

## Study case 2: *Rhipidoglossum brevifolium*

- nocturnally-scented
- no visitors recorded during nighttime
- tipulids and tortricid moths during daytime





Thank you for your attention

