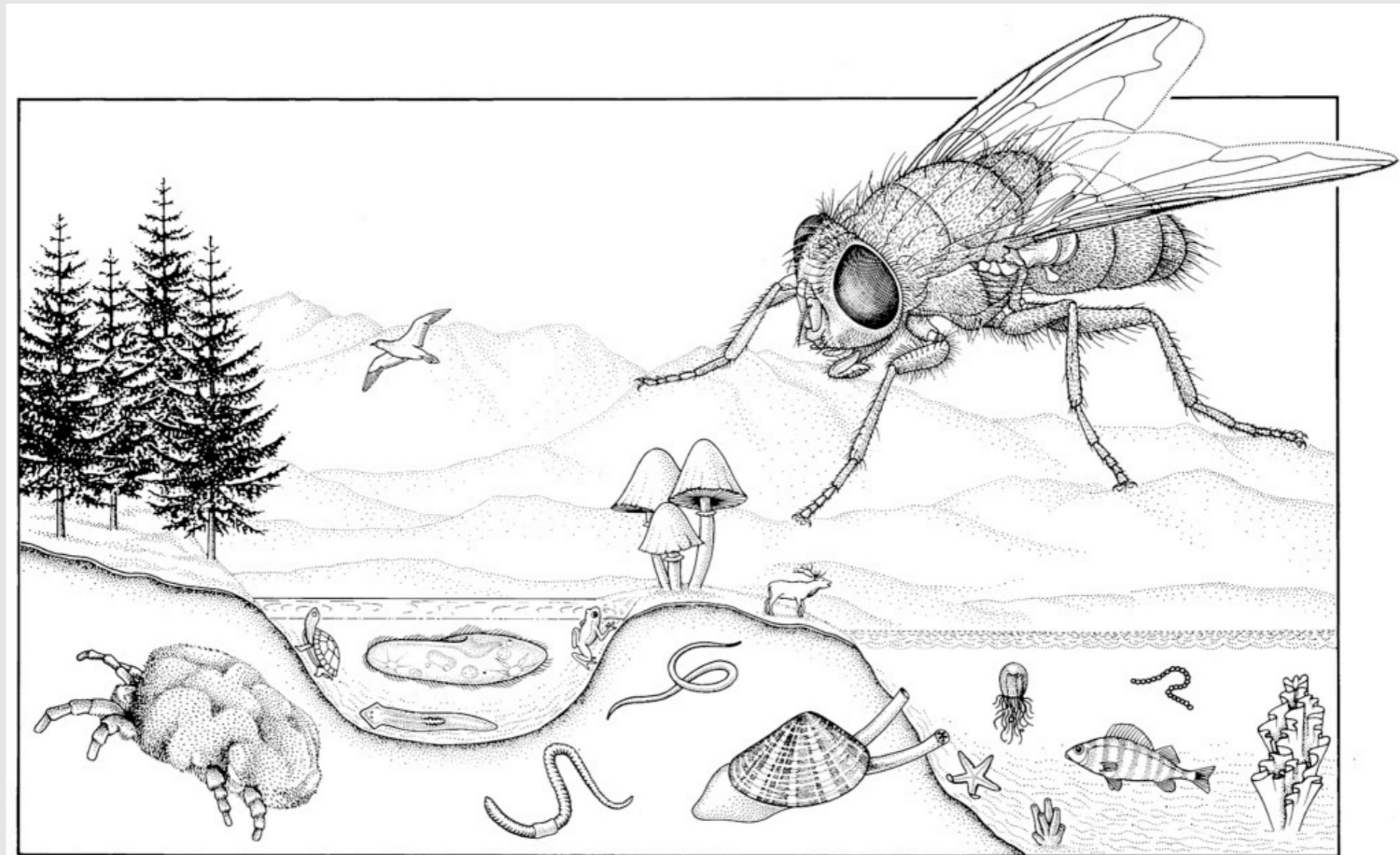


# Insects



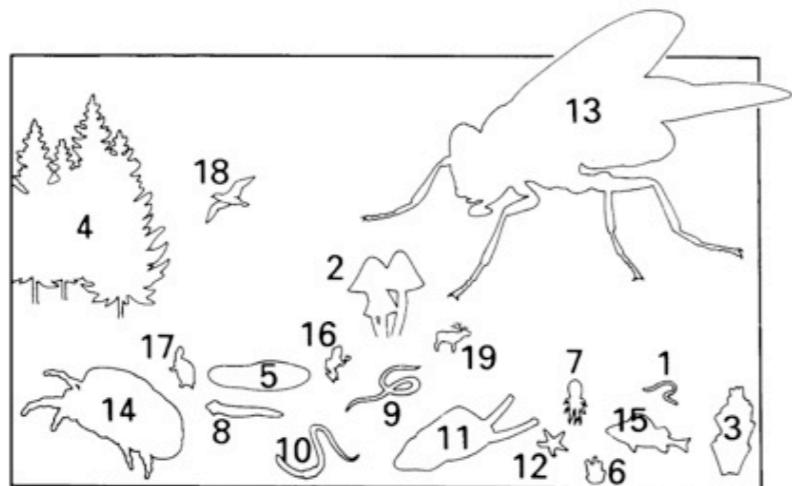
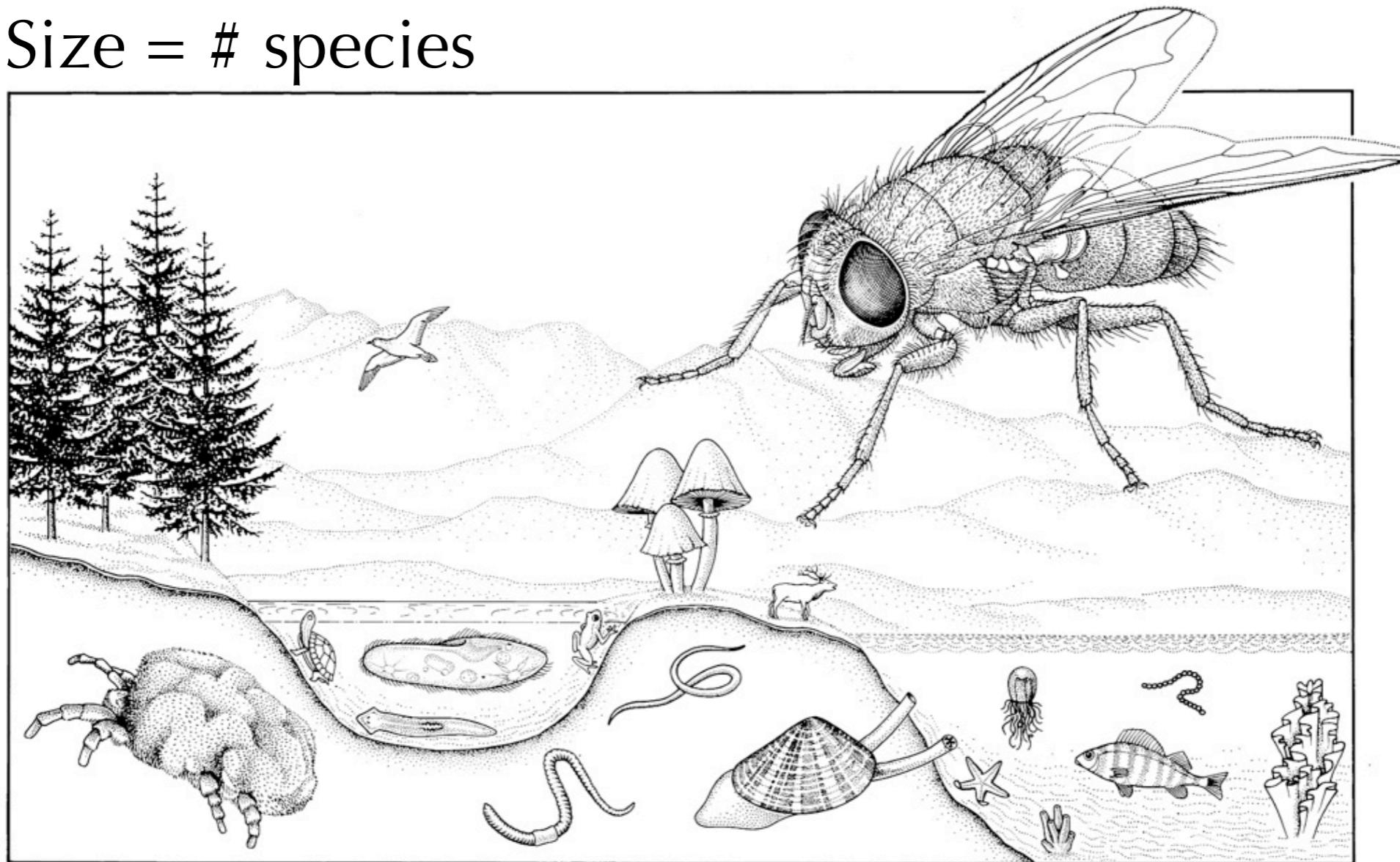
Gullan and Cranston The Insects

Brian O'Meara  
EEB464 Fall 2019

# Learning objectives

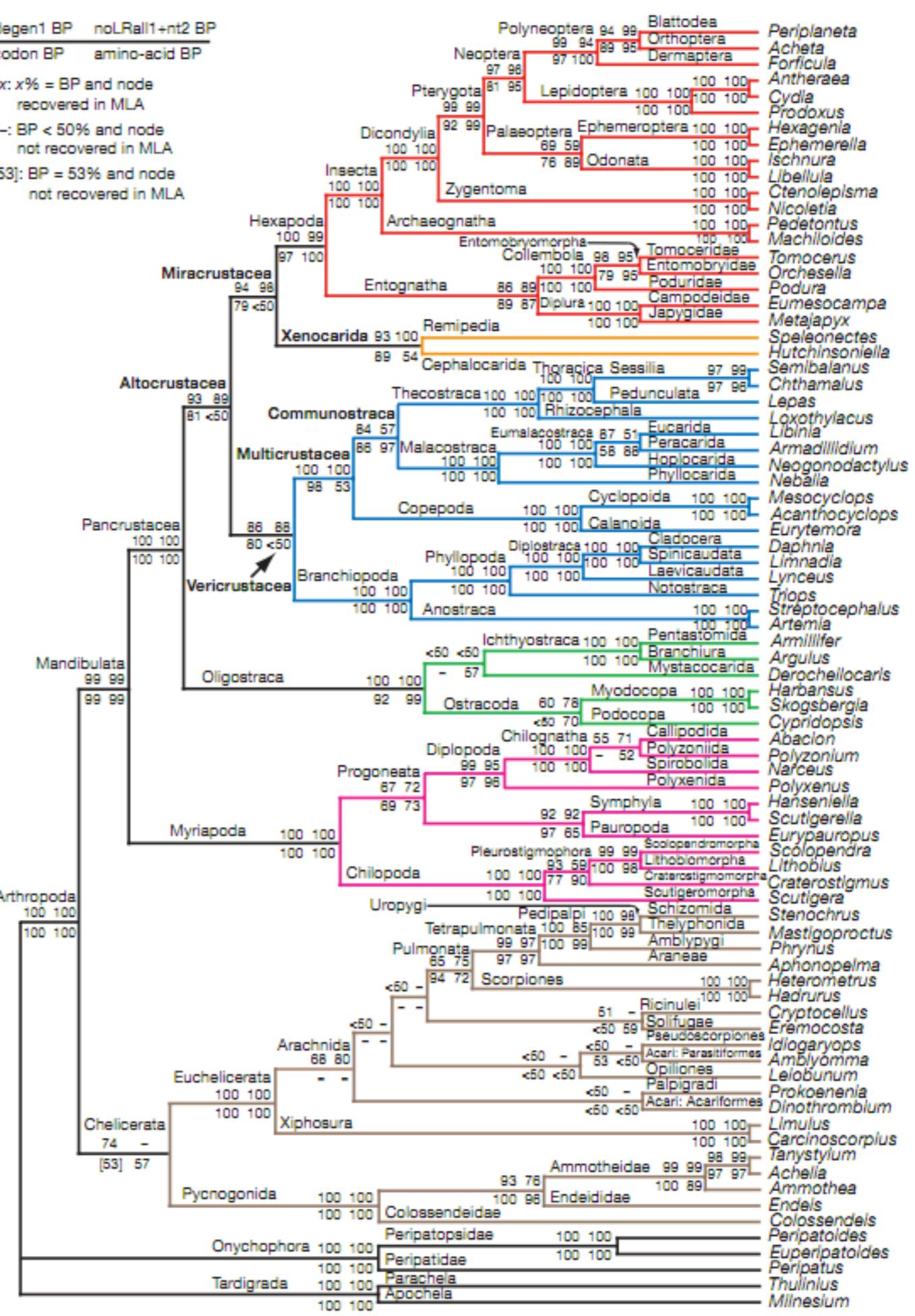
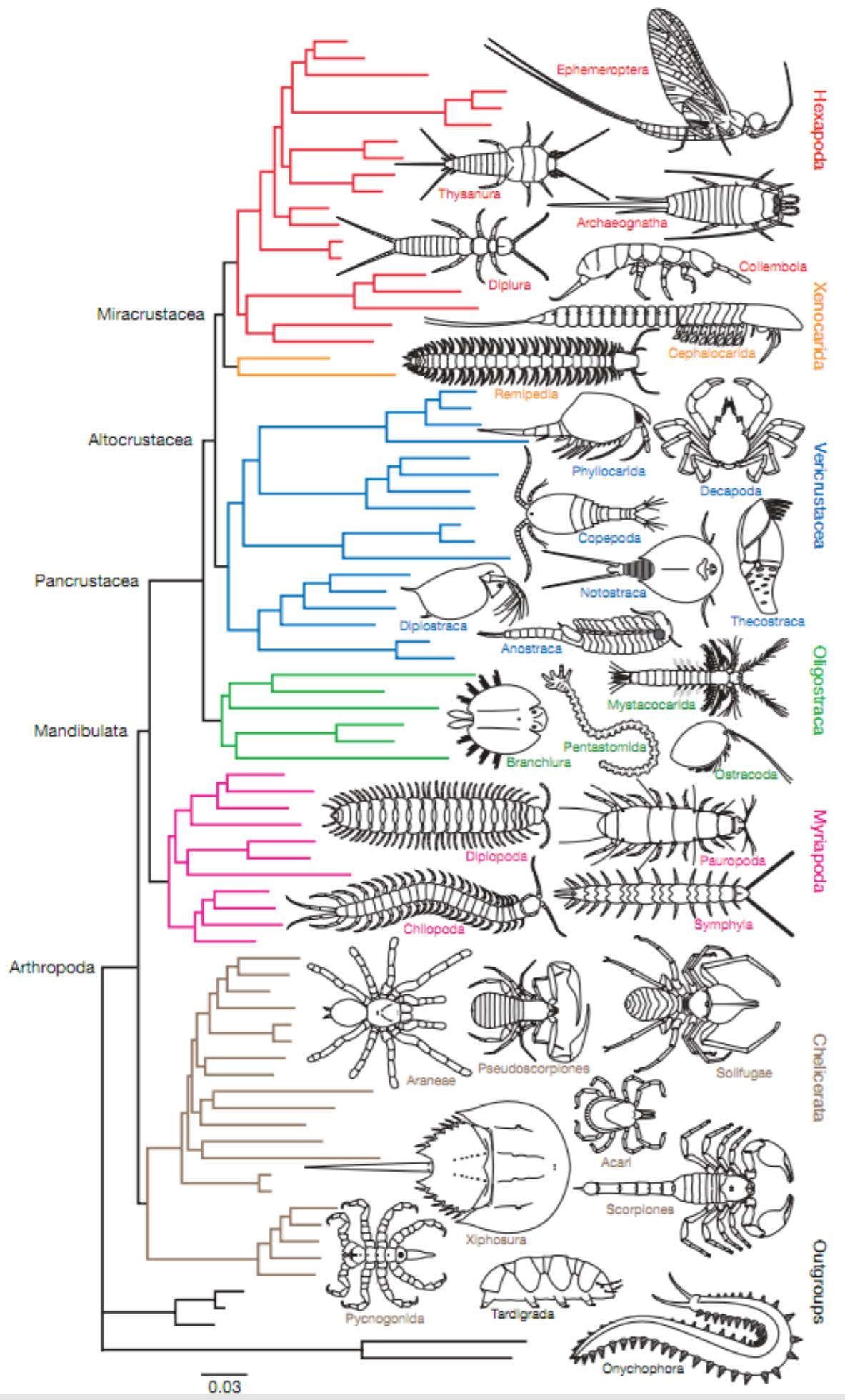
- Understand key natural history of a major group
- Apply concepts from the class to natural history

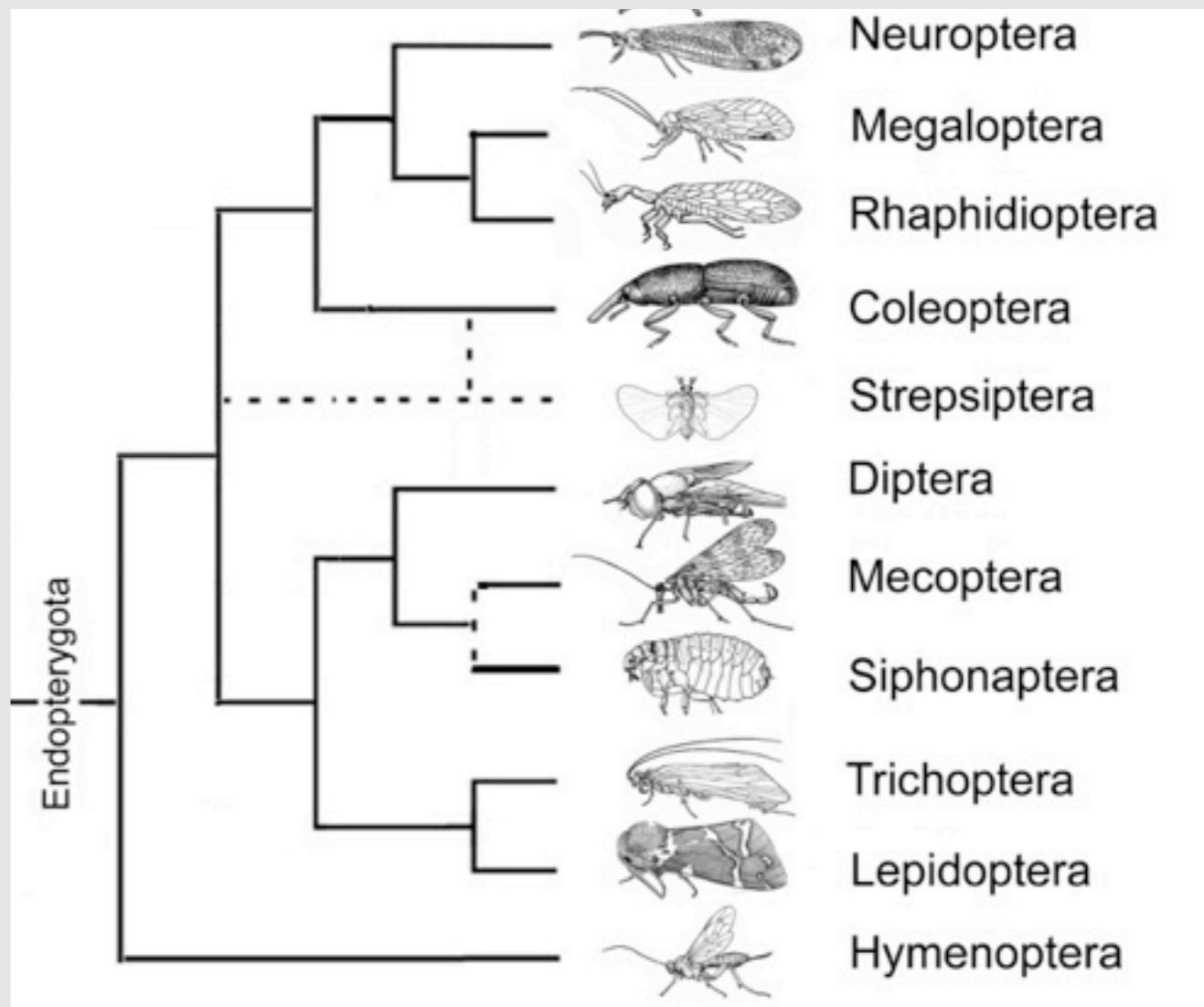
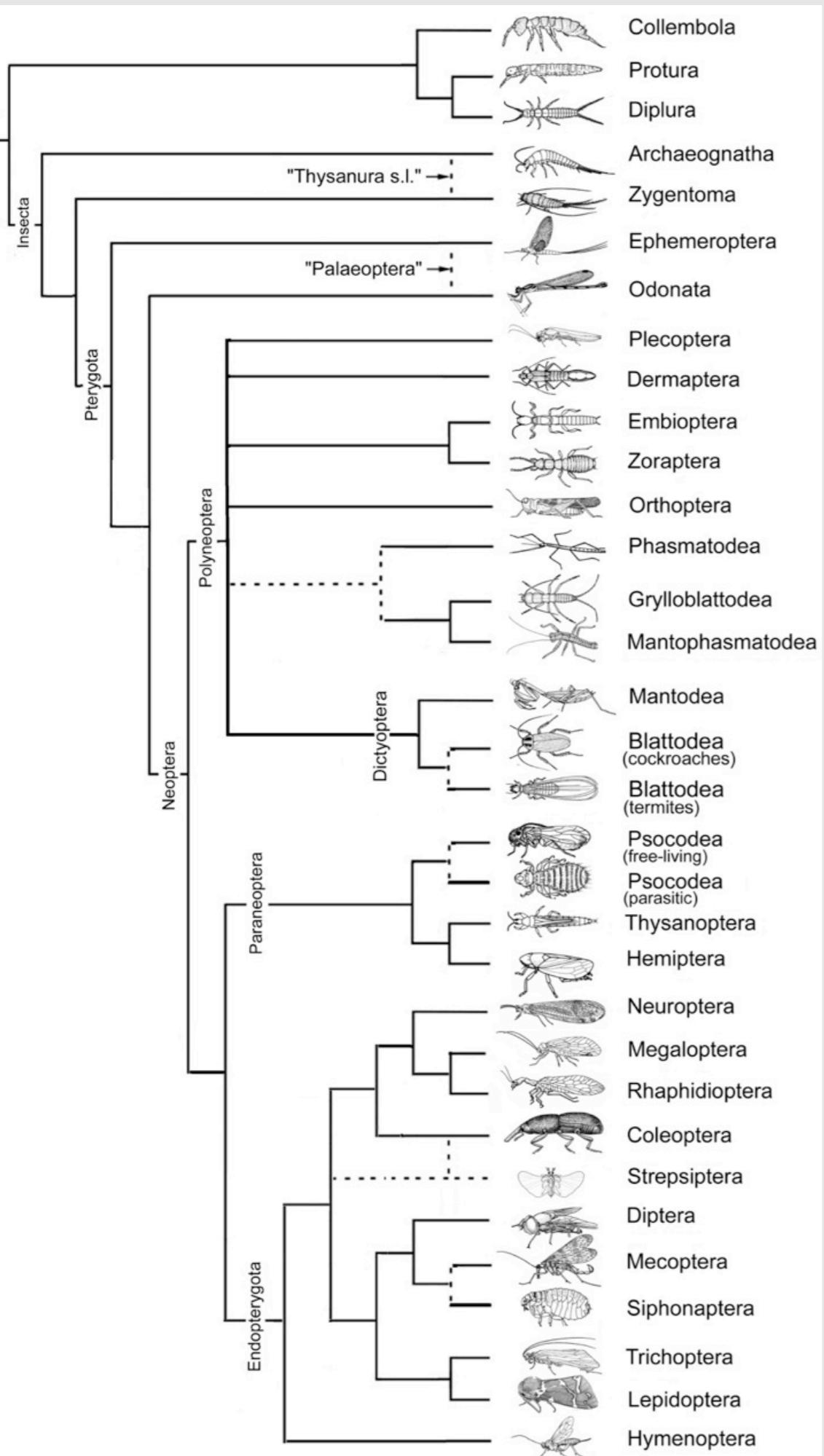
# Size = # species

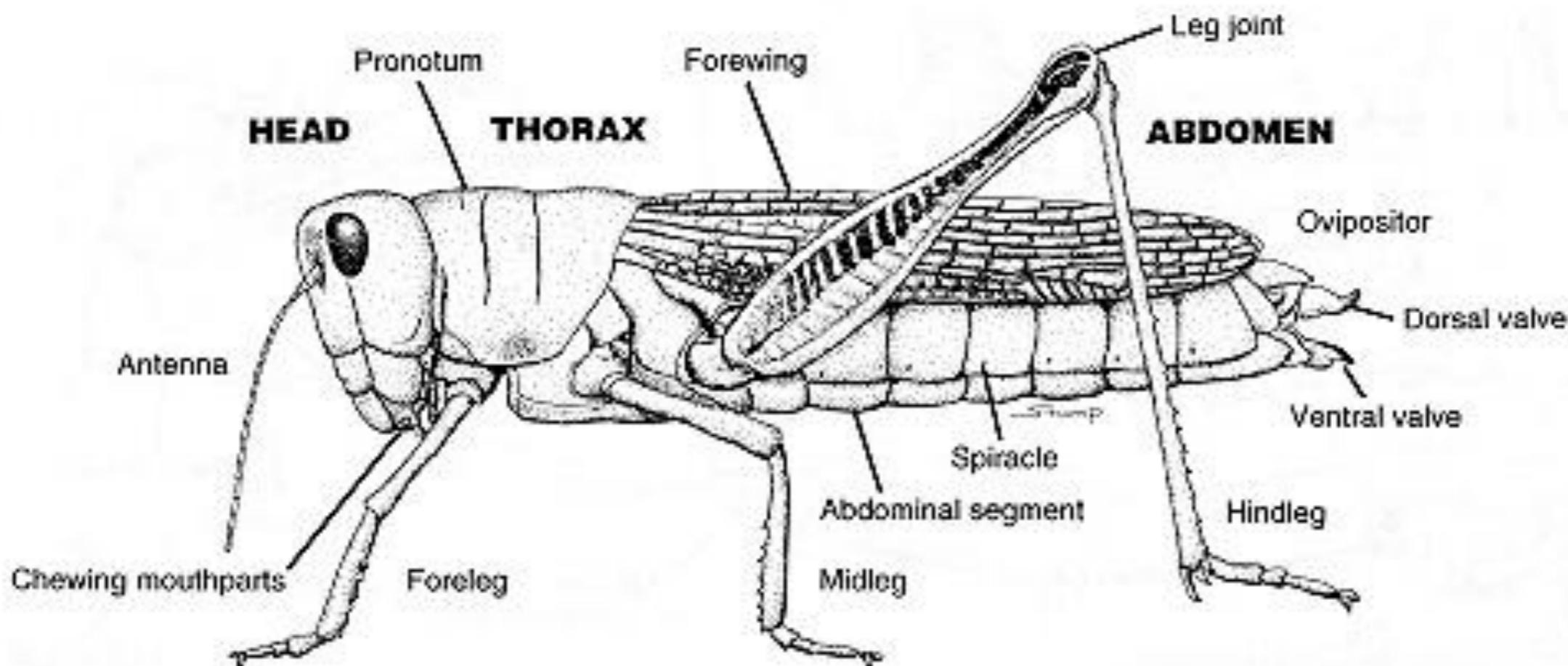


- 1 Prokaryotes
- 2 Fungi
- 3 Algae
- 4 Plantae (multicellular plants)

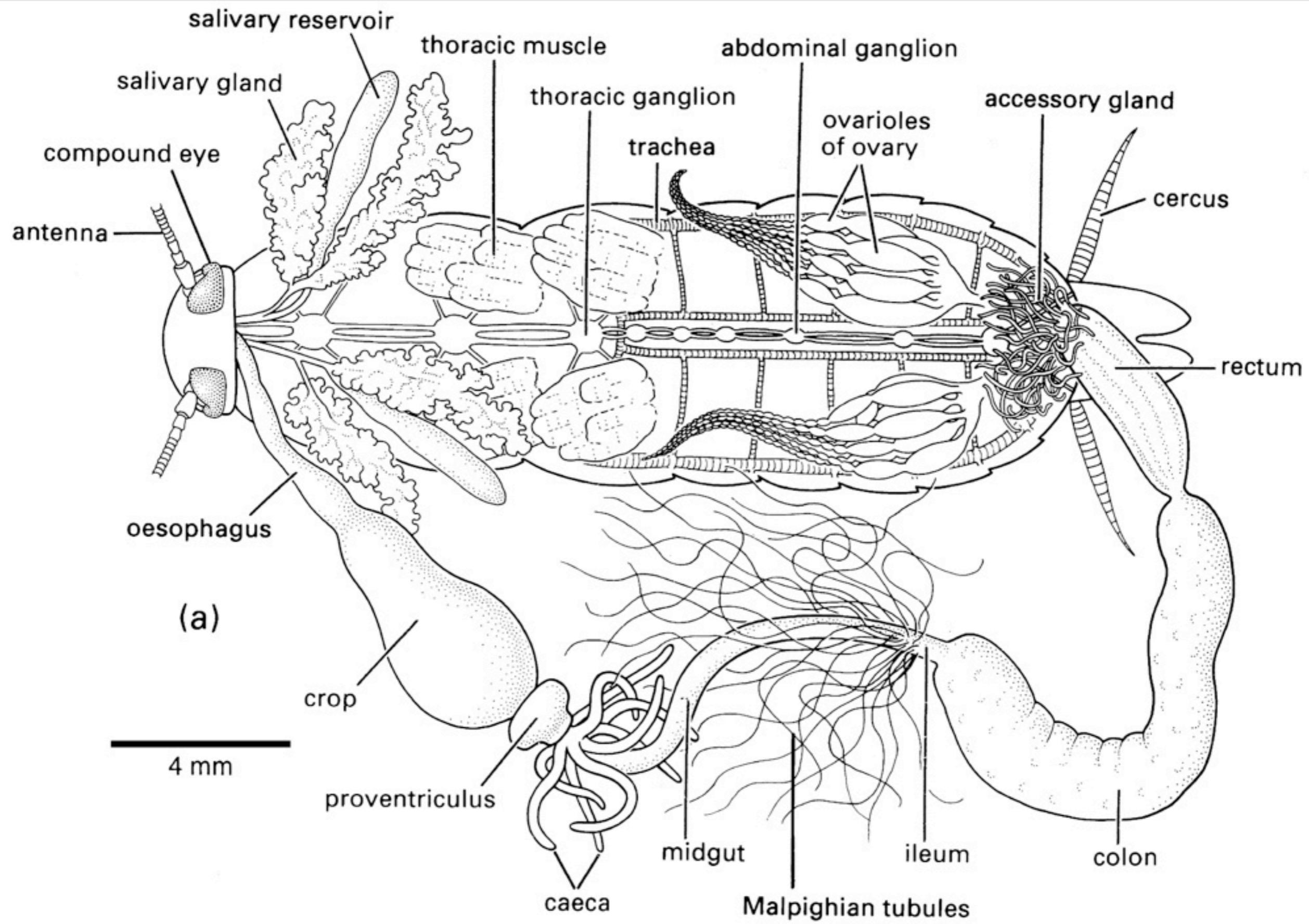
- 5 Protozoa
- 6 Porifera (sponges)
- 7 Cnidaria (jellyfish, corals, etc.)
- 8 Platyhelminthes (flatworms)
- 9 Nematoda (roundworms)
- 10 Annelida (earthworms, leeches, etc.)
- 11 Mollusca (snails, bivalves, octopus, etc.)
- 12 Echinodermata (starfish, sea urchins, etc.)
- 13 Insecta
- 14 Non-insect Arthropoda
- 15 Pisces (fish)
- 16 Amphibia (frogs, salamanders, etc.)
- 17 Reptilia (snakes, lizards, turtles)
- 18 Aves (birds)
- 19 Mammalia (mammals)

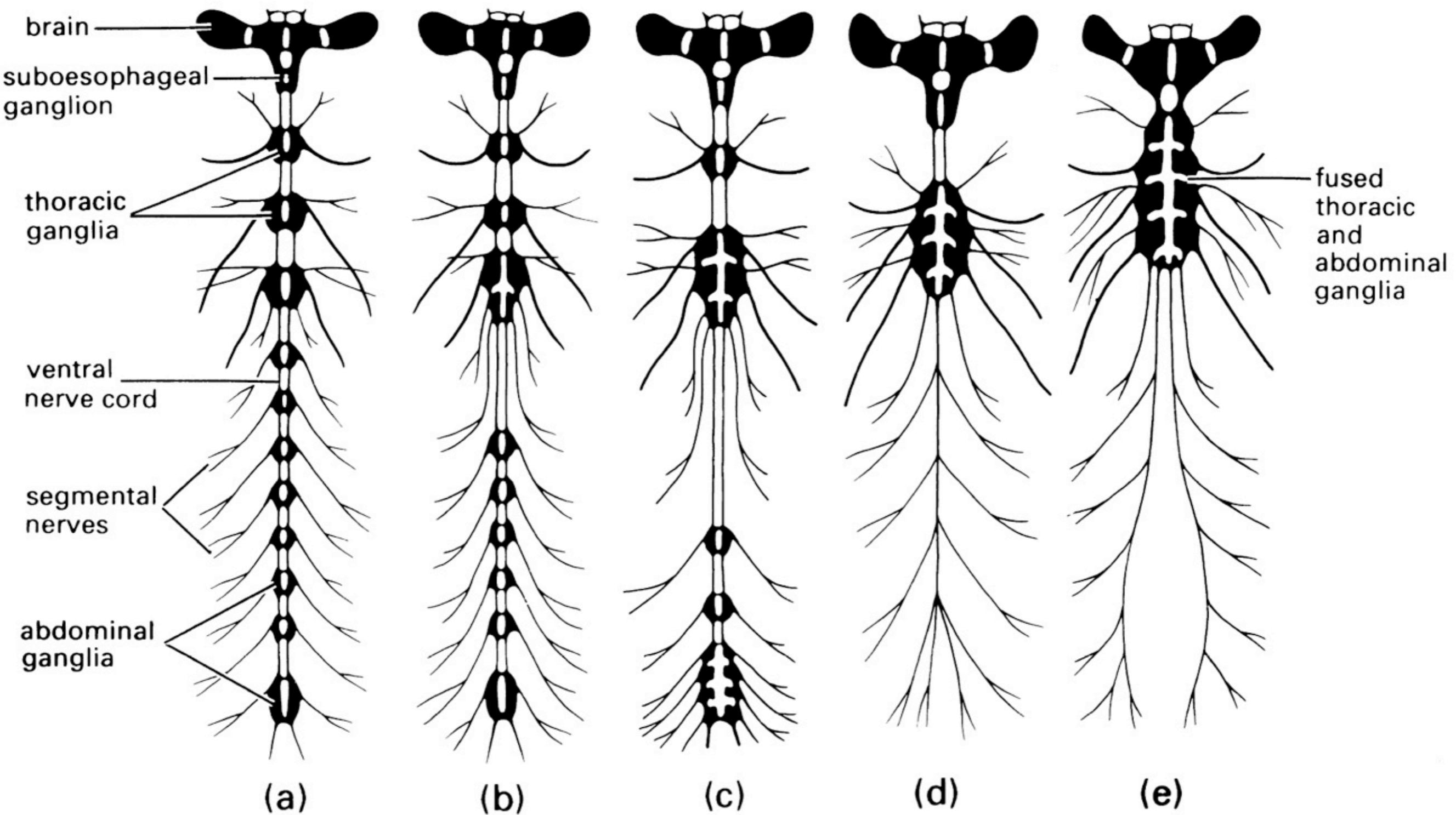


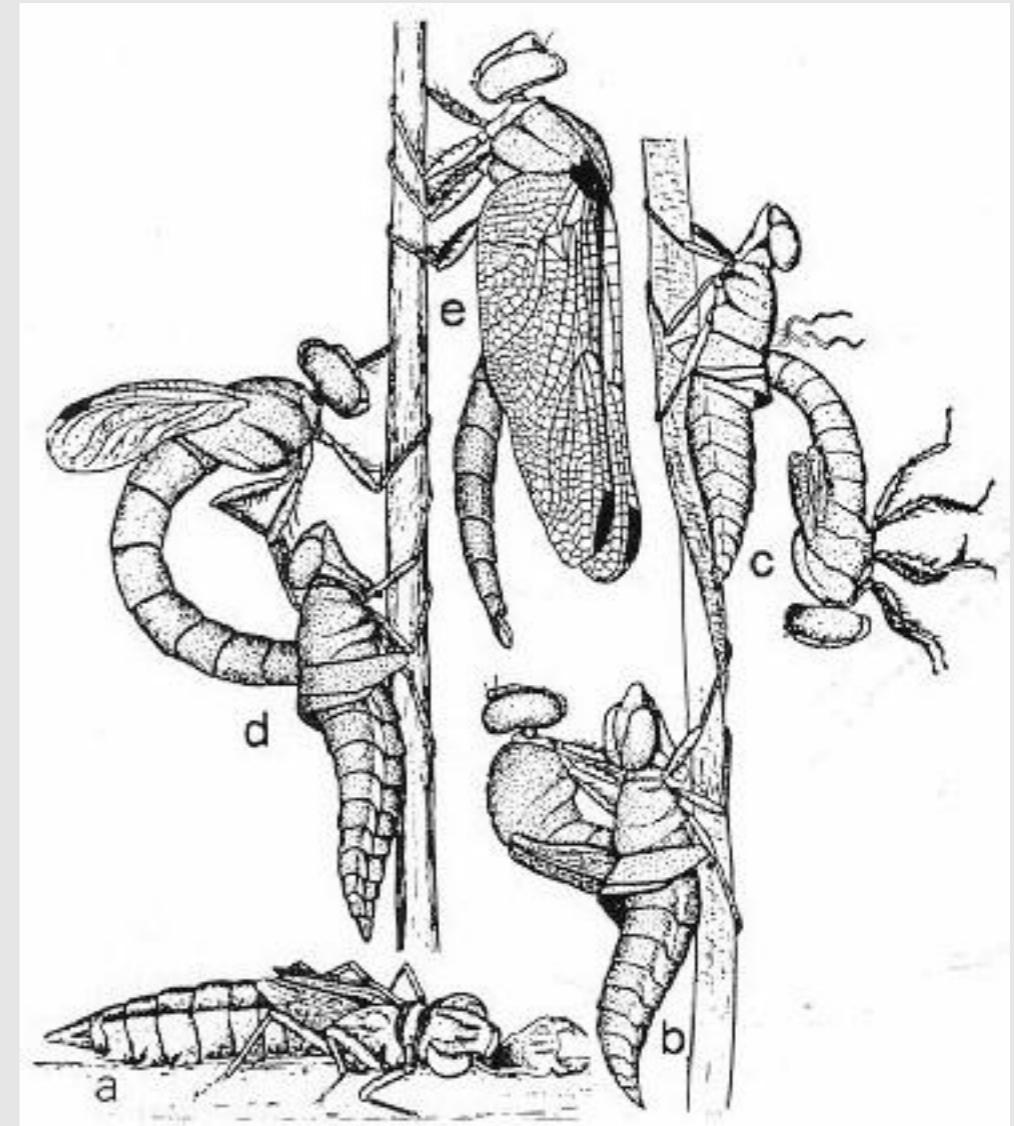
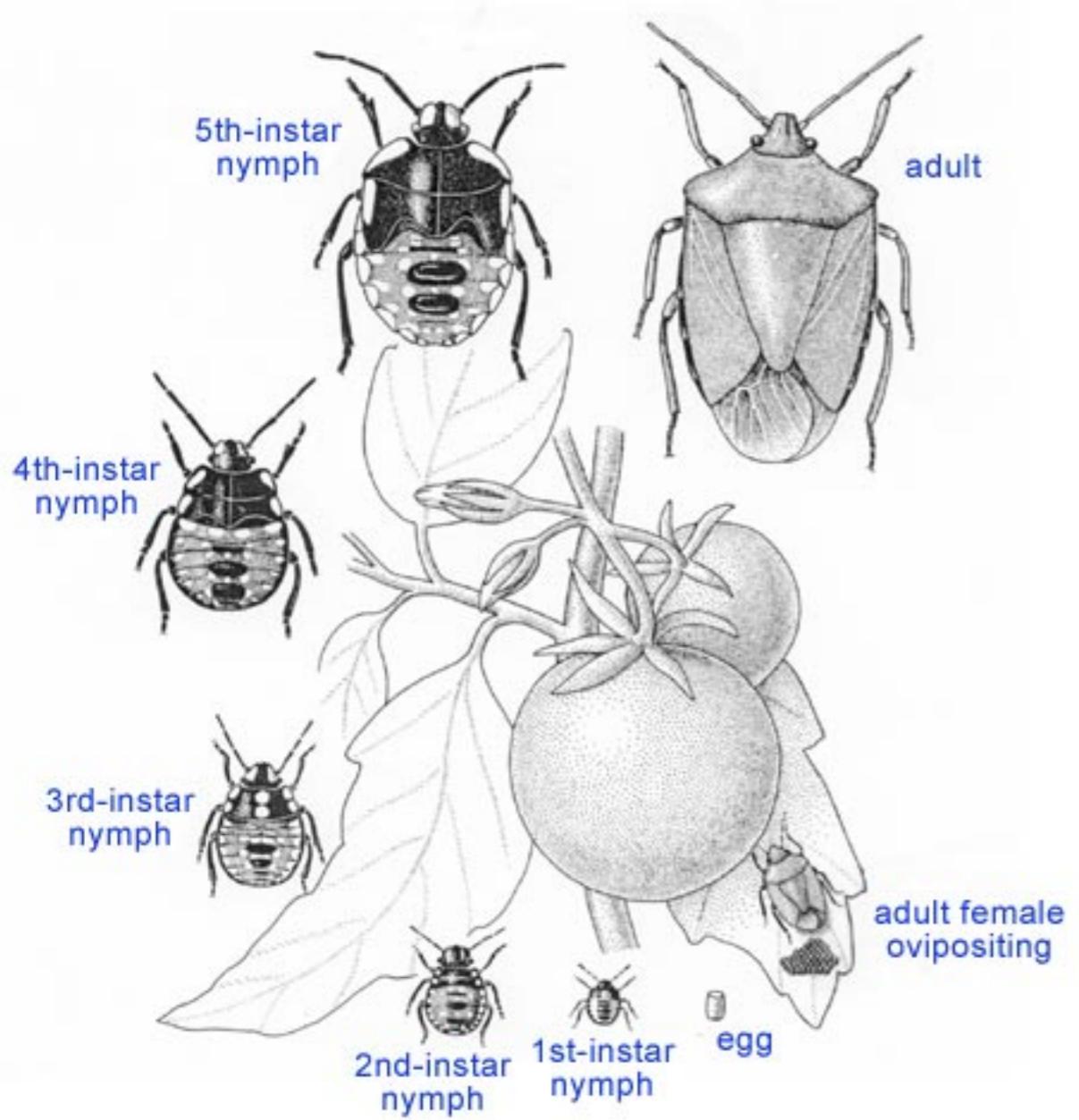




[http://www.uwyo.edu/grasshoppersupport/html\\_pages/fieldgde.htm](http://www.uwyo.edu/grasshoppersupport/html_pages/fieldgde.htm)







<http://entomology.ucr.edu/ebeling/figures/fig056.jpg>

<http://bugs.bio.usyd.edu.au/learning/resources/Entomology/lifeCycles/imagePages/greenBugLifecycle.html>



BBC Earth: [https://www.youtube.com/watch?v=W8vFFM\\_k1FI](https://www.youtube.com/watch?v=W8vFFM_k1FI)

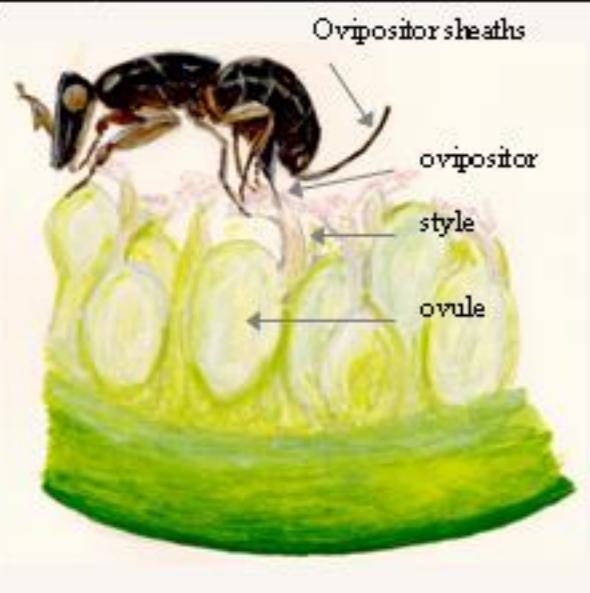
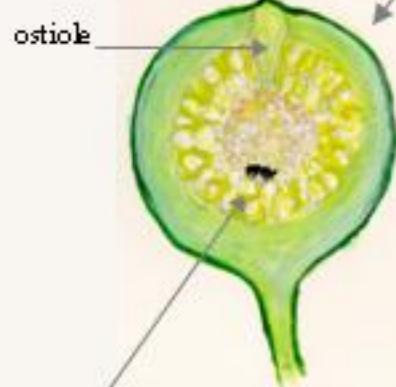


National Geographic <https://www.youtube.com/watch?v=ta2rF6Syi0U>



*Ficus tremula tremula* with female phase figs receptive for pollination and oviposition.

Cross-section through a receptive fig.



Pollinator ovipositing down style of floret inside fig and simultaneously placing pollen on the stigmas with her fore legs. She loses her wings and most of her antennae when negotiating the ostiole.



*Philocreas clairae* – a galling non-pollinating fig wasp that enters the fig for oviposition at the same time as the pollinator.

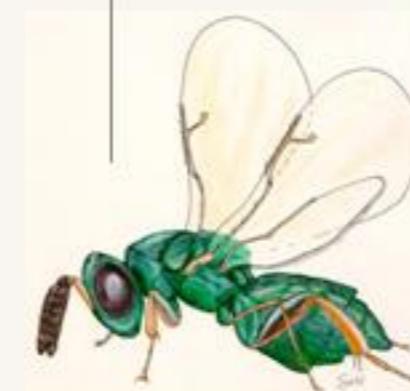


## Cycle of the fig – fig wasp mutualism

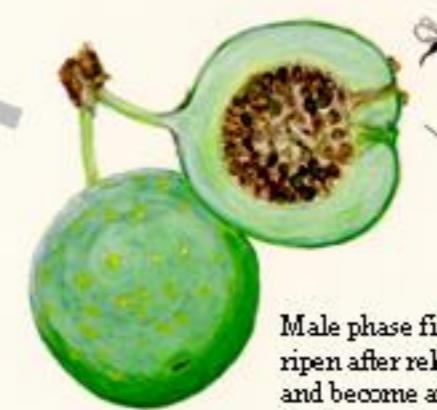
### Monoecious species



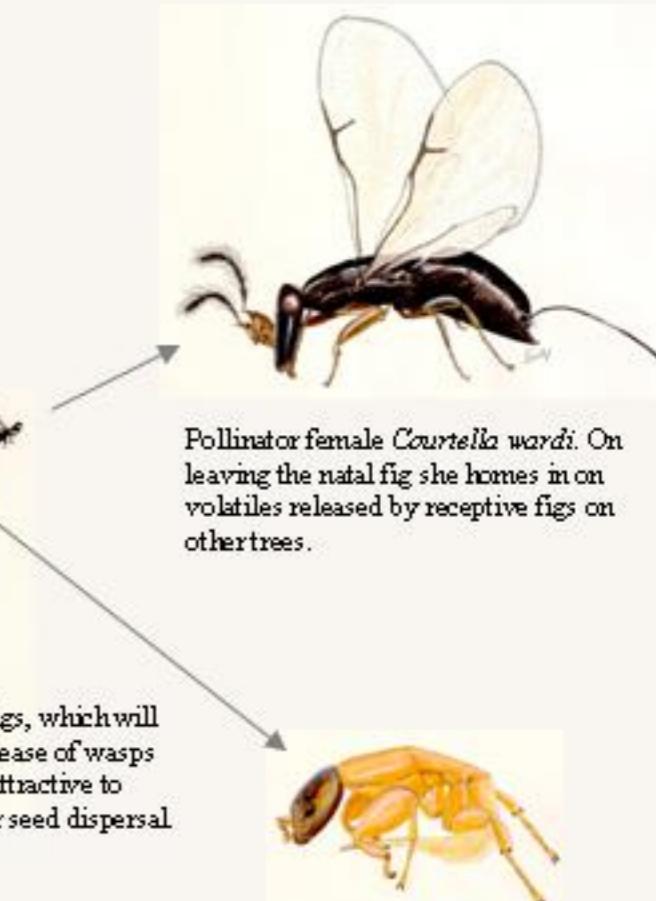
Interfloral phase – fig and wasp larval development taking 3 – 20 weeks.



*Oritesella* (right) and *Sycohytes* (above) – two non-pollinating fig wasps that oviposit through the fig wall during the interfloral phase. *Oritesella* species are gall formers and *Sycohytes* species are parasitoids of galling fig wasps.



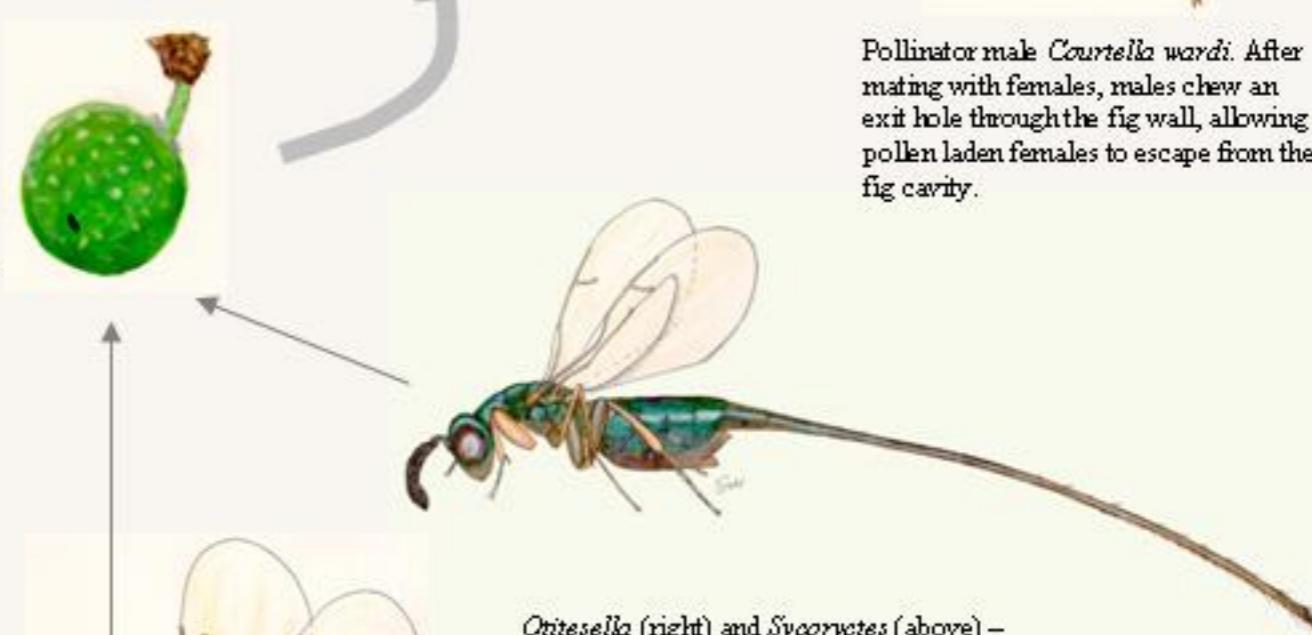
Male phase figs, which will ripen after release of wasps and become attractive to frugivores for seed dispersal.



Pollinator female *Courtella wardi*. On leaving the natal fig she homes in on volatiles released by receptive figs on other trees.



Pollinator male *Courtella wardi*. After mating with females, males chew an exit hole through the fig wall, allowing pollen laden females to escape from the fig cavity.



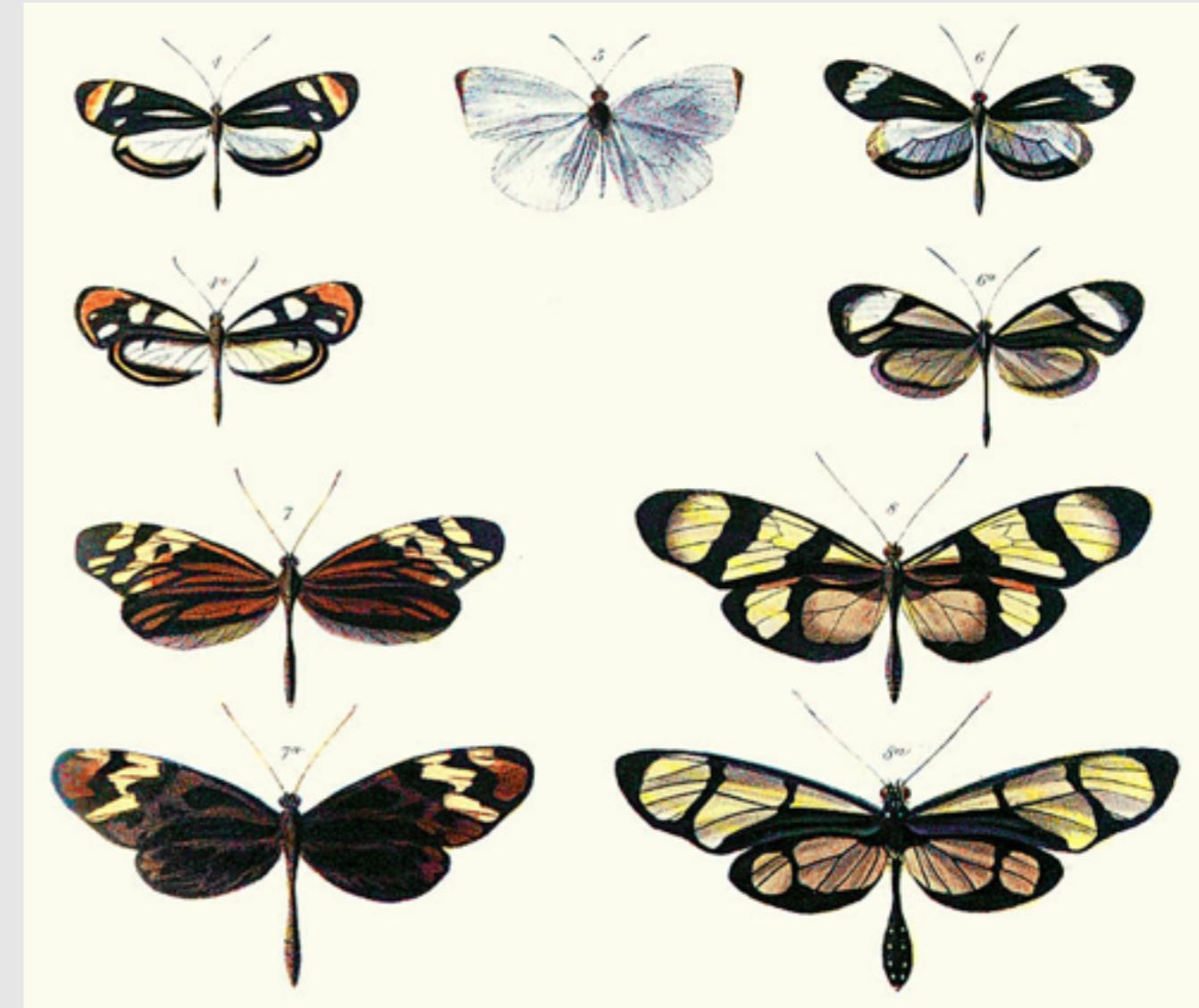
# Müllerian mimicry

All nasty



# Batesian mimicry

Tasty ones look like nasty ones



Repeating Patterns of Mimicry. Meyer A, PLoS Biology, Vol. 4/10/2006,  
e341 <http://dx.doi.org/10.1371/journal.pbio.0040341>



BBC: Life [https://www.youtube.com/watch?v=\\_MT9RoTbFoY](https://www.youtube.com/watch?v=_MT9RoTbFoY)



Toby Barton



Brian V. [poster on Canon forums]



[http://www.youtube.com/watch?v=KYp\\_Xi4AtAQ](http://www.youtube.com/watch?v=KYp_Xi4AtAQ)



Deep Look:  
[https://www.youtube.com/watch?v=EHo\\_9wnnUTE](https://www.youtube.com/watch?v=EHo_9wnnUTE)



Eric Warrant & National Geographic



Mark Hiner <https://www.youtube.com/watch?v=W2uX0HaDm2Q>



Team Candiru: <https://www.youtube.com/watch?v=-ySwuQhruBo>