

What types of networks in ecology?

Part II: Elisa Thébault



CESAB
CENTRE FOR THE SYNTHESIS AND ANALYSIS
OF BIODIVERSITY

Part II

**How is data collected?
What type of data is there?**

Data collection: a time-consuming work and different methods

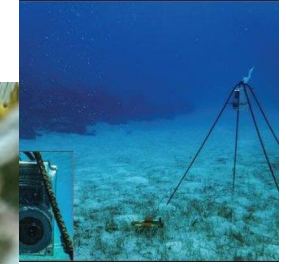
Species sampling



Taxonomic determination



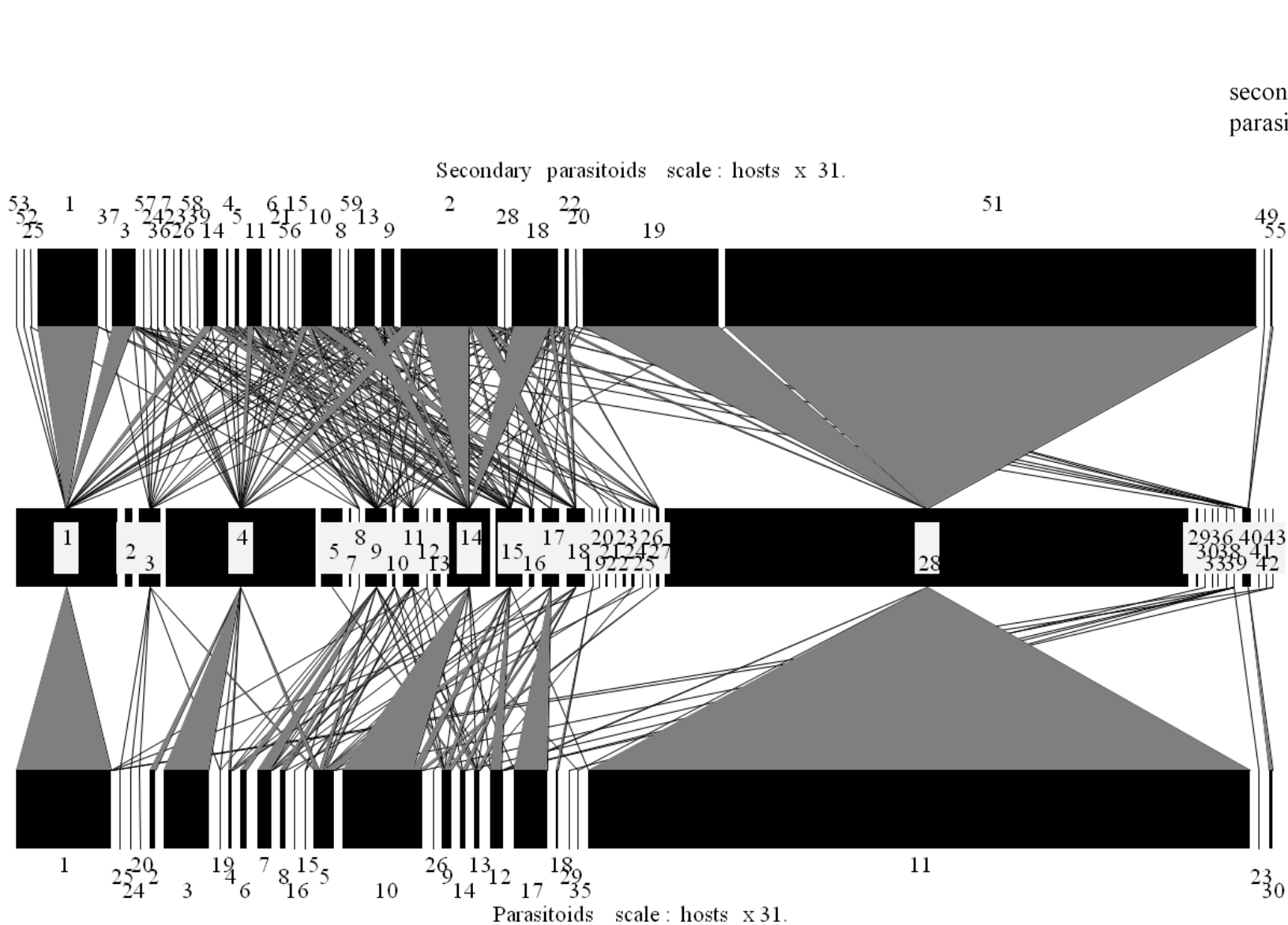
Direct observation



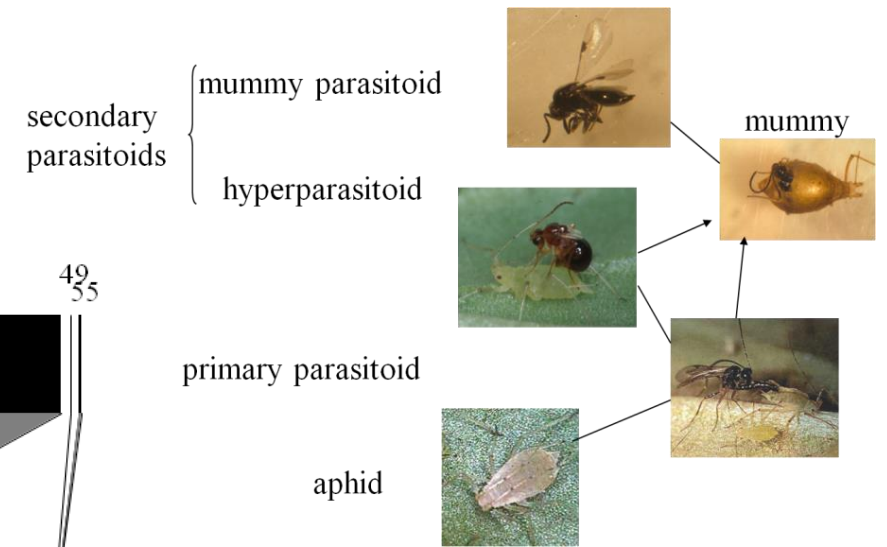
*Determining
interactions
between species*



Direct observation of interactions: an example



Total aphid density in 1994, 1995, 1996, 1997, 1998, 1999, 2000 : 6376. per square metre



Van Veen et al. 2008

Data collection: a time-consuming work and different methods

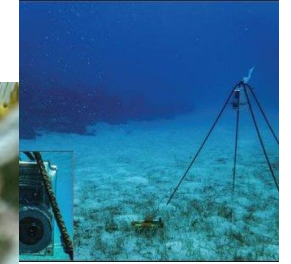
Species sampling



Taxonomic determination



Direct observation



Gut content



*Determining
interactions
between species*

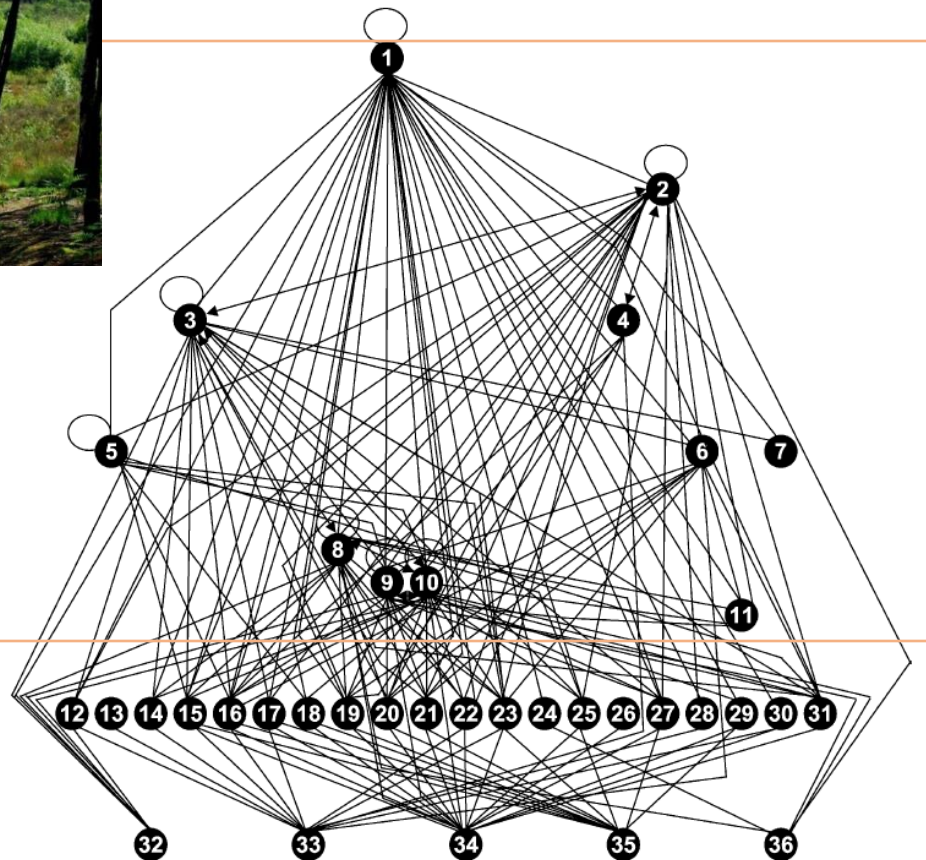


Food webs from gut content: an example

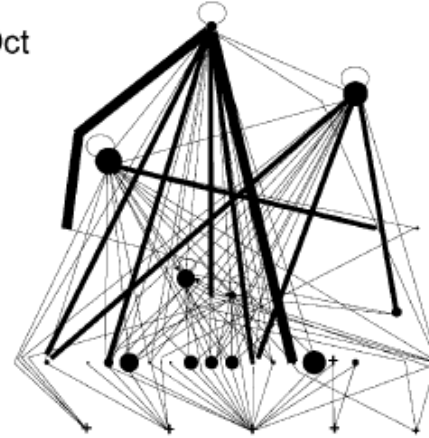
Quantification and Resolution of a Complex, Size-Structured Food Web

GUY WOODWARD, DOUGIE C. SPEIRS, AND
ALAN G. HILDREW

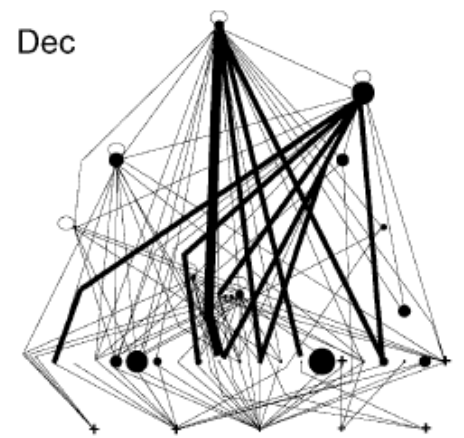
Woodward et al. 2004



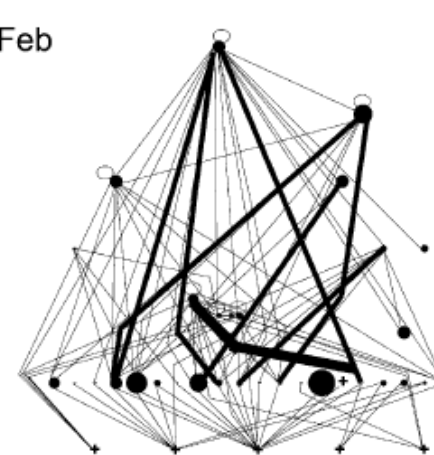
Oct



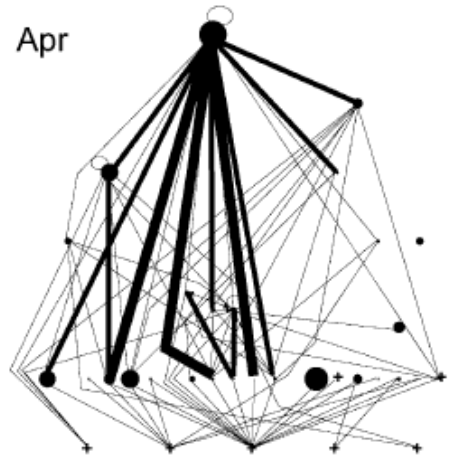
Dec



Feb



Apr



— <0.1%
— 0.1–0.9%
— 1–10%

Data collection: a time-consuming work and different methods

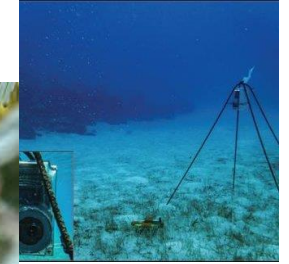
Species sampling



Taxonomic determination



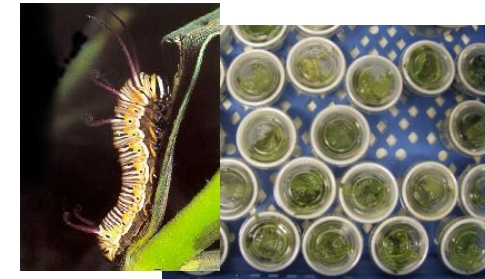
Direct observation



Gut content



*Determining
interactions
between species*



Experimental
tests

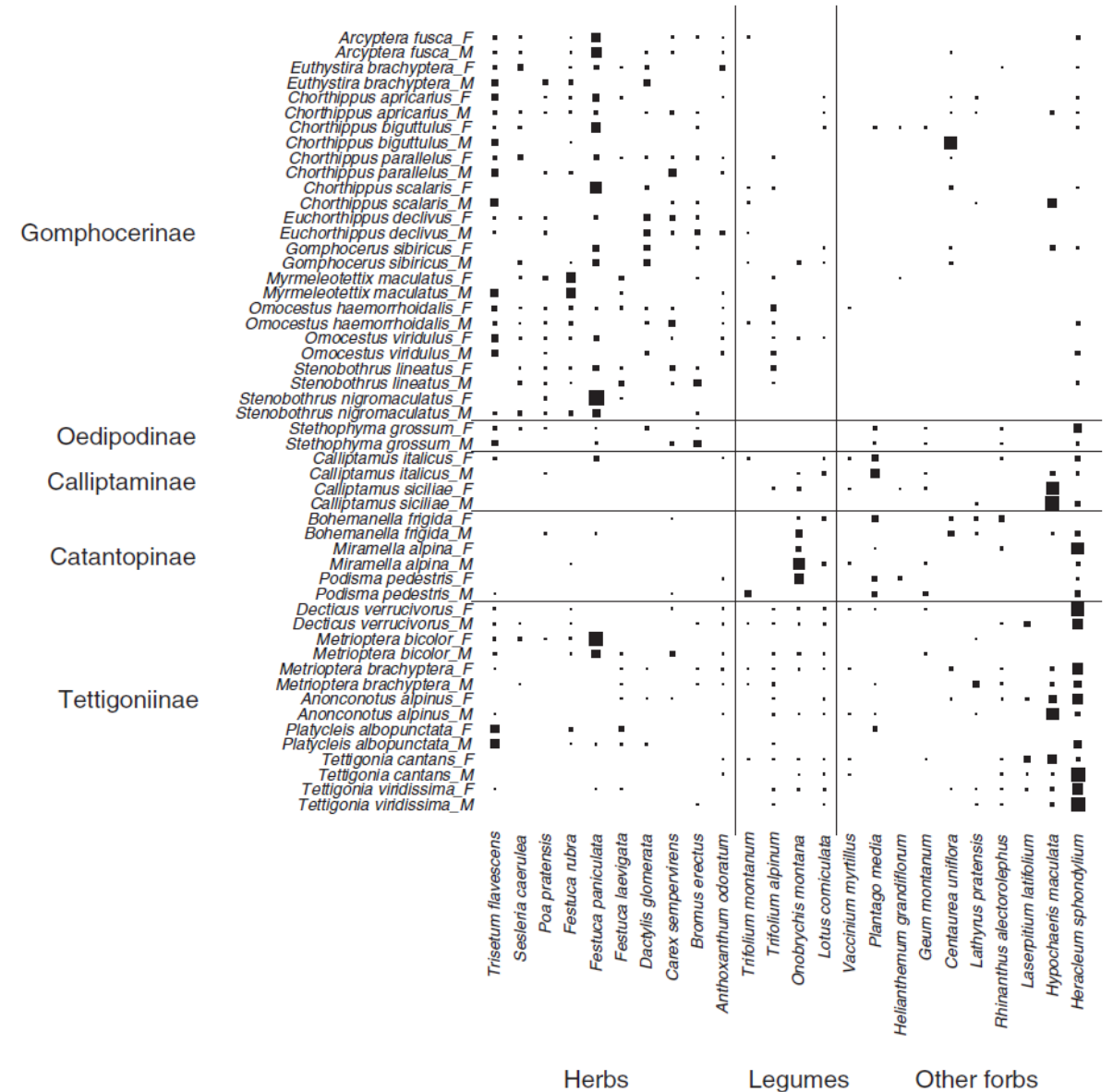
Using experimental tests: an example

Functional Ecology 2013, 27, 479–489

doi: 10.1111/1365-2435.12058

Herbivory mediated by coupling between biomechanical traits of plants and grasshoppers

Sébastien Ibanez^{*1}, Sandra Lavorel², Sara Puijalon³ and Marco Moretti¹



Data collection: a time-consuming work and different methods

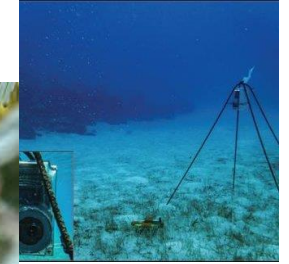
Species sampling



Taxonomic determination



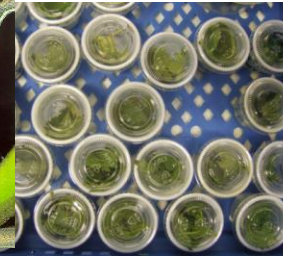
Direct observation



Gut content



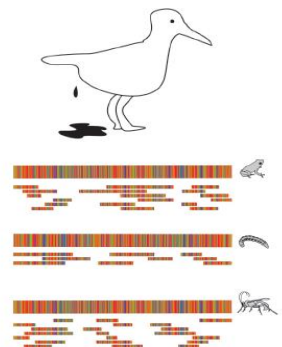
Determining interactions between species



Experimental tests



Molecular methods

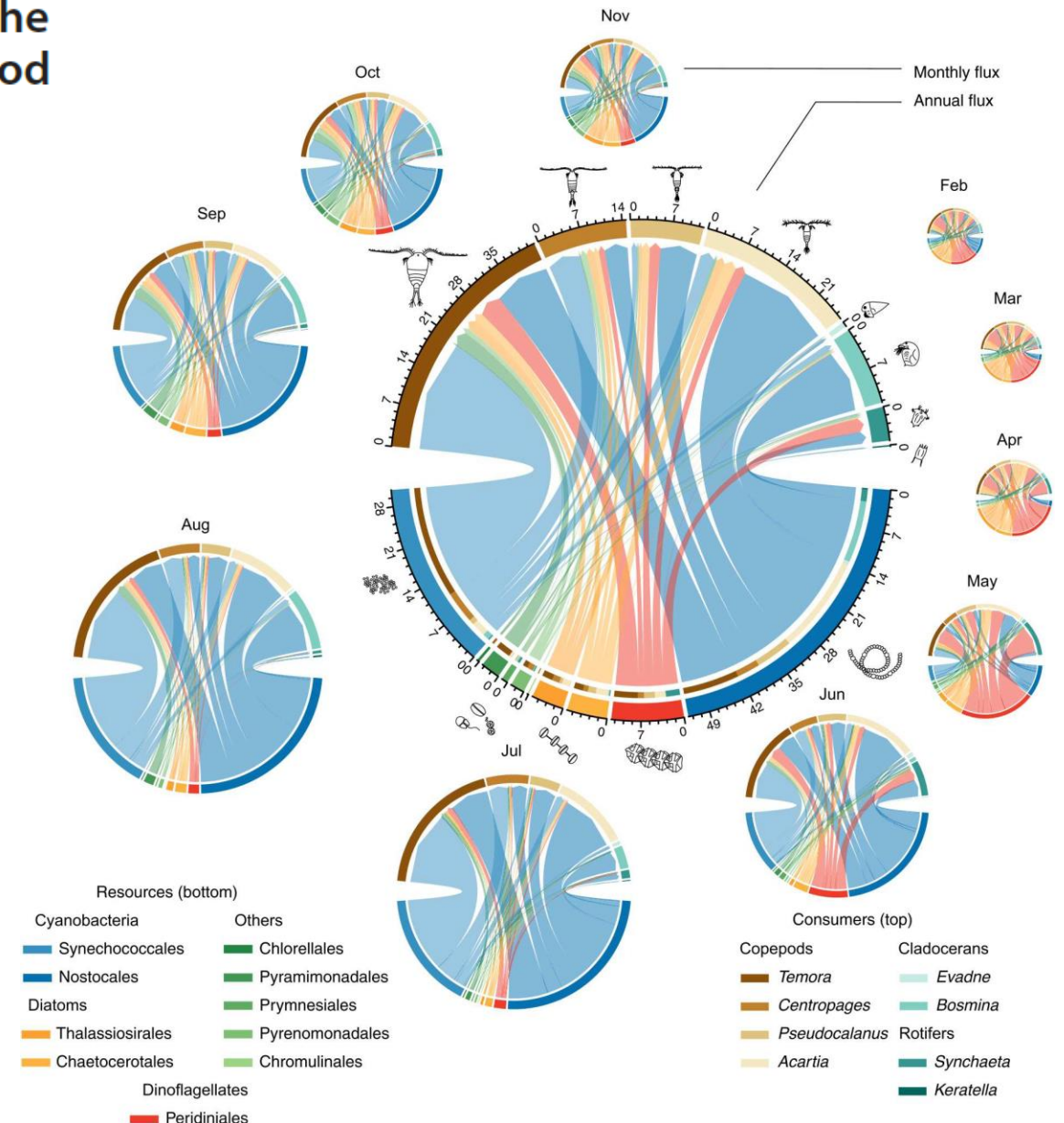
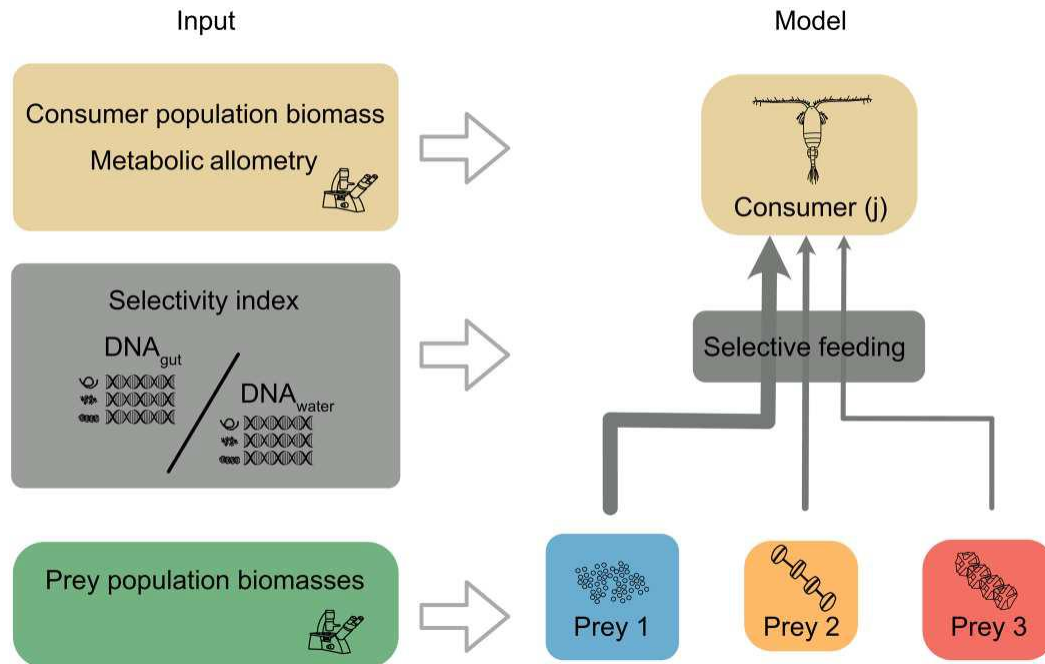


Using molecular methods: an example

DNA metabarcoding highlights cyanobacteria as the main source of primary production in a pelagic food web model

Andreas Novotny^{1†*}, Baptiste Serandour¹, Susanne Kortsch^{2,3}, Benoit Gauzens^{4,5}, Kinlan M. G. Jan¹, Monika Winder^{1*}

Novotny et al. 2023



Data collection: a time-consuming work and different methods

Species sampling



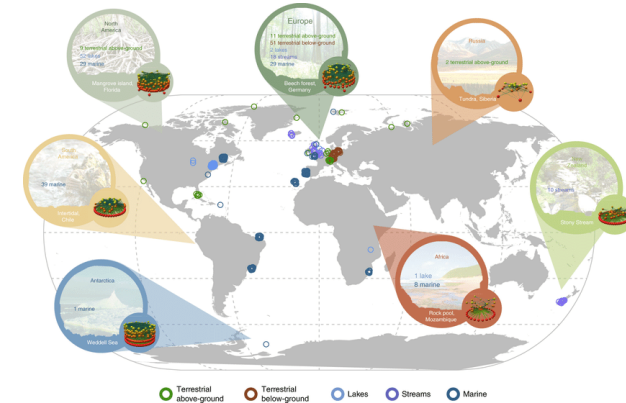
Taxonomic determination



Expert knowledge and use of databases



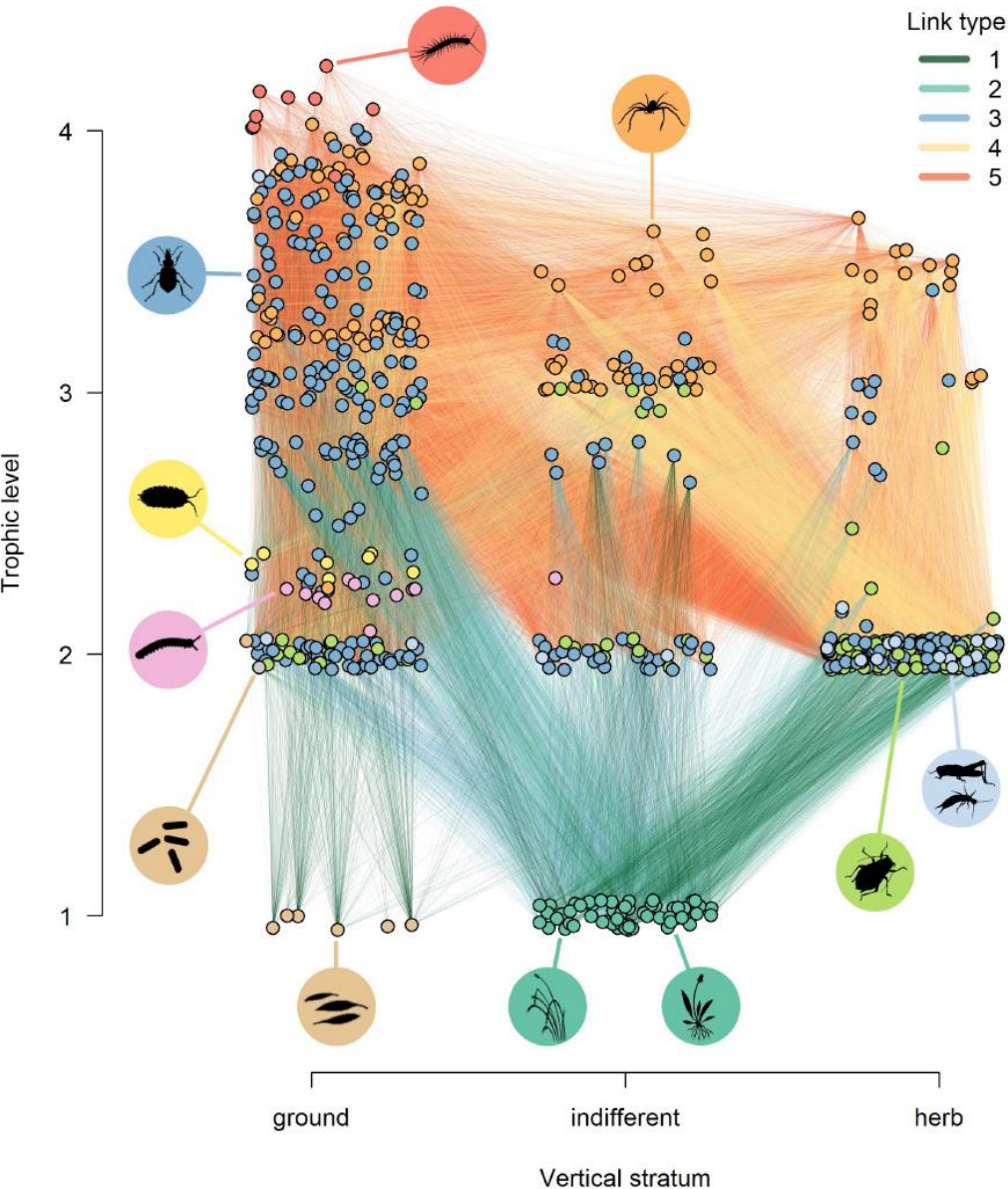
Determining interactions between species



GlobalWeb, GATEWAY...



Expert knowledge, use of databases: an example



Data Papers

Ecology, 100(6), 2019, e02679
© 2019 The Authors. *Ecology* © 2019 The Ecological Society of America

A meta food web for invertebrate species collected in a European grassland

JES HINES,^{1,2,6} DARREN P. GILING,^{1,2,3} MICHAEL RZANNY,⁴ WINFRIED VOIGT,³ SEBASTIAN T. MEYER,⁵
WOLFGANG W. WEISSER,⁵ NICO EISENHauer,^{1,2} AND ANNE EBELING³

1
Specific feeding interaction
reported in the literature

2
Generalized feeding interaction reported in the literature
(Taxa that are reported to feed on all species in a given taxonomic group)

3
Trophic level
(Taxa feed on resources based on trophic group)

4
Trait-based rule
(Links based on taxonomic identity and matching single trait)

5
Combined trait-based rules
(Links based on taxa, body size, vertical stratification and/or trophic level)

Data collection: a time-consuming work and different methods

Species sampling



Taxonomic determination

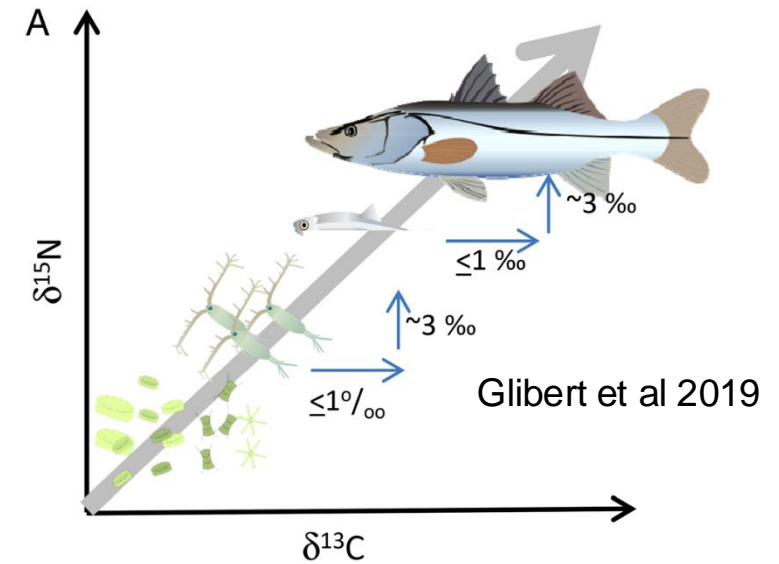
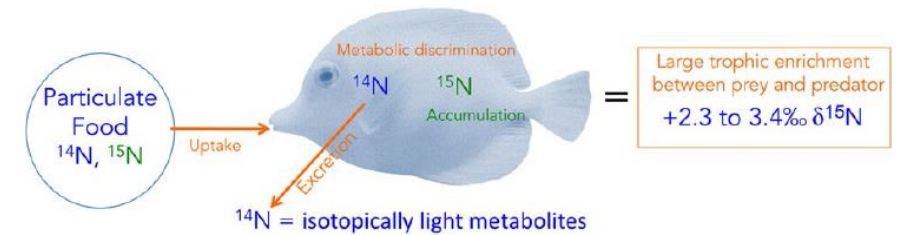


Determining interactions between species

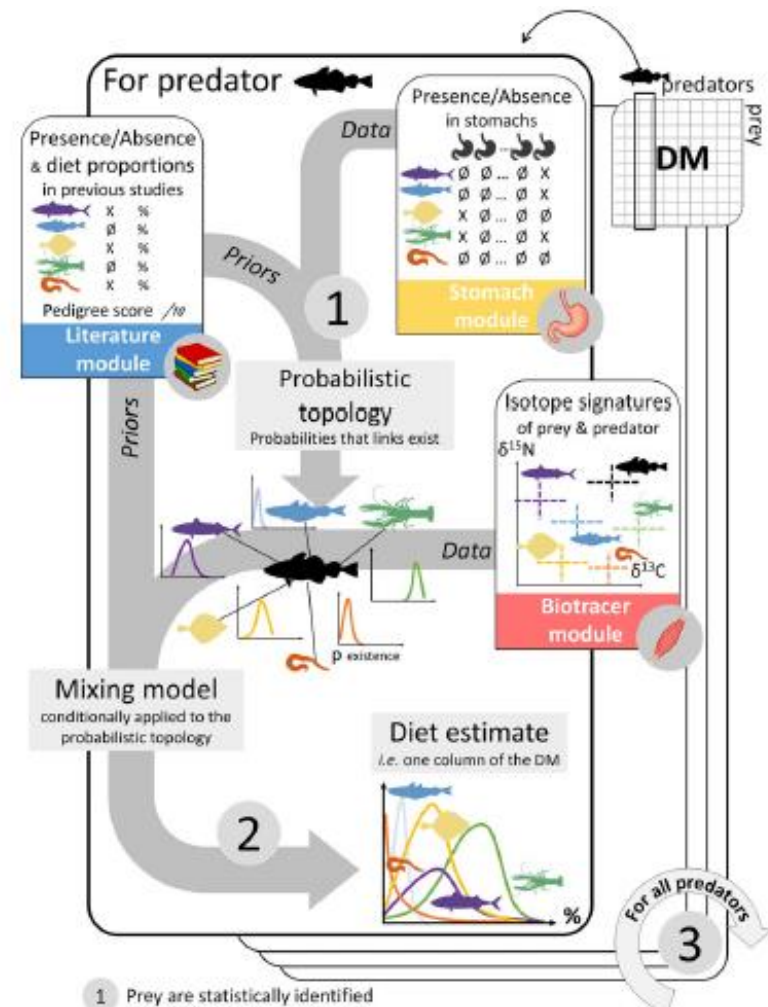


Indirect methods

Methods based on stable isotope ratios



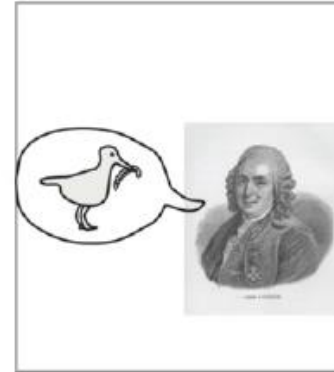
Data collection: a time-consuming work and different methods



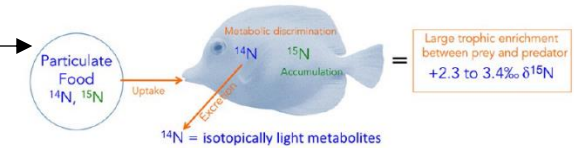
Gut content



Expert knowledge and use of databases



Methods based on stable isotope ratios



Received: 17 March 2021 | Accepted: 26 May 2021
DOI: 10.1002/eap.2521

ARTICLE

EcoDiet: A hierarchical Bayesian model to combine stomach, biotracer, and literature data into diet matrix estimation

Pierre-Yves Hervann^{1,2,3} | Didier Gascuel² | Dorothee Kopp¹ |
Marianne Robert¹ | Etienne Rivot²

ECOLOGICAL
APPLICATIONS
ECOLOGICAL SOCIETY OF AMERICA

Effects of sampling methods on network structure

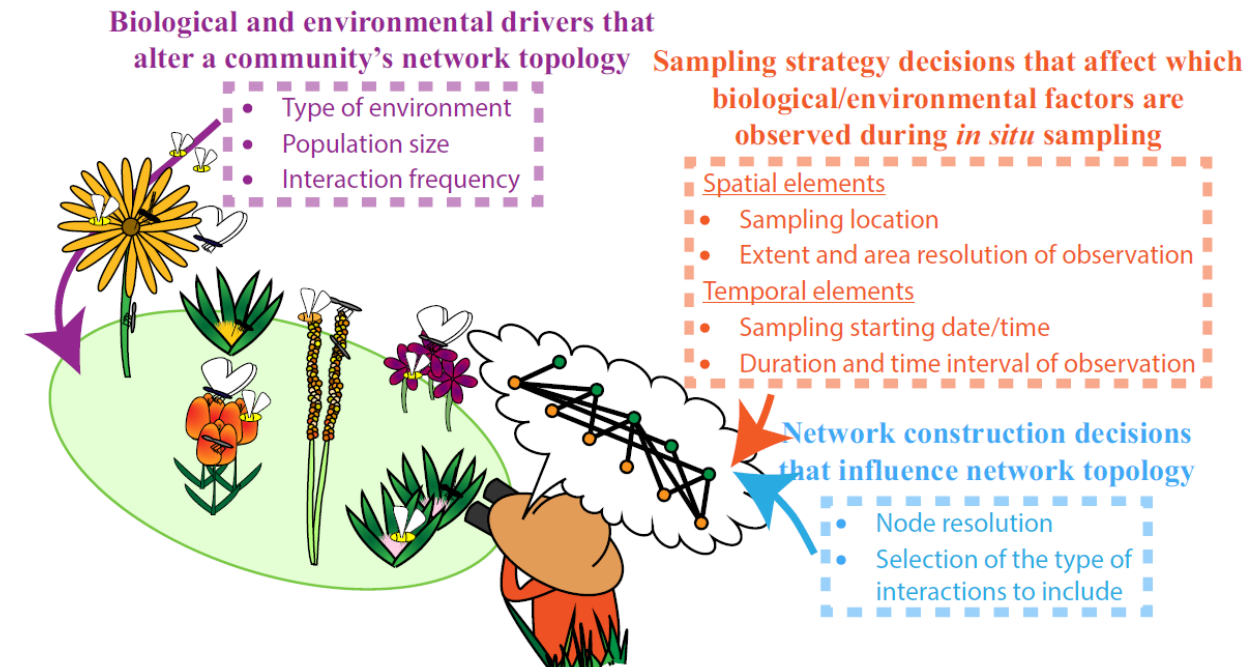
- Sampling methods strongly affect node resolution, measure of interaction strength, etc.
- Need to be careful when comparing network structure between different ecological communities

META-RESEARCH ARTICLE

Shortcomings of reusing species interaction networks created by different sets of researchers

Chris Brimacombe^{1*}, Korryn Bodner², Matthew Michalska-Smith^{3,4}, Timothée Poisot^{5,6}, Marie-Josée Fortin¹

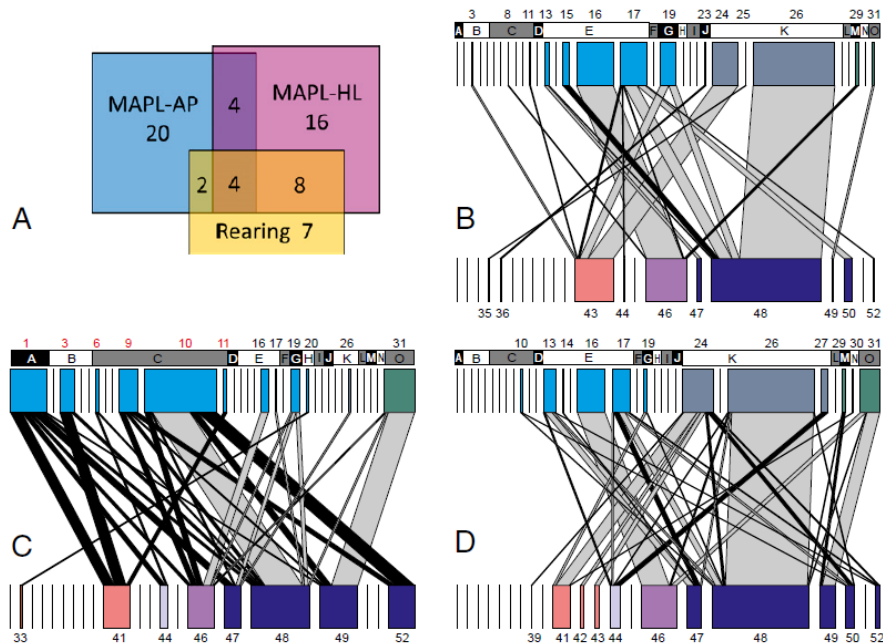
Brimacombe et al. 2023



Effects of sampling methods on network structure

Rearing
method vs.
molecular

Wirta et al. (2014)



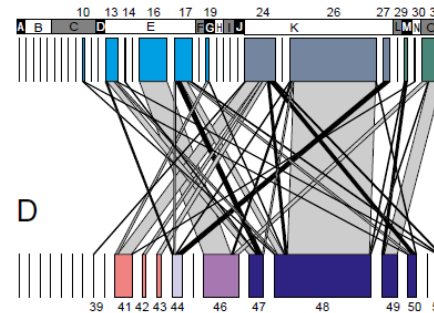
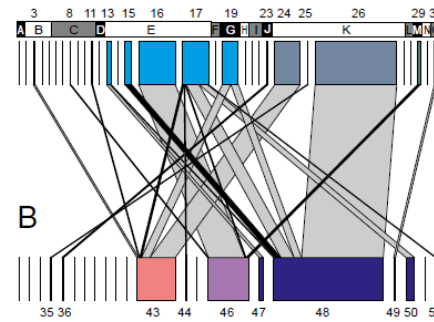
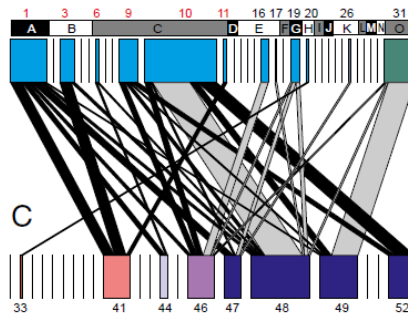
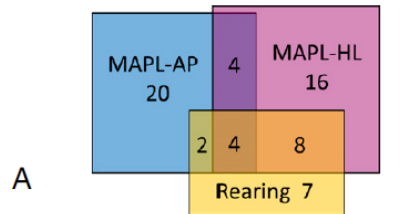
Effects of sampling methods on network structure

Visits vs. pollen based

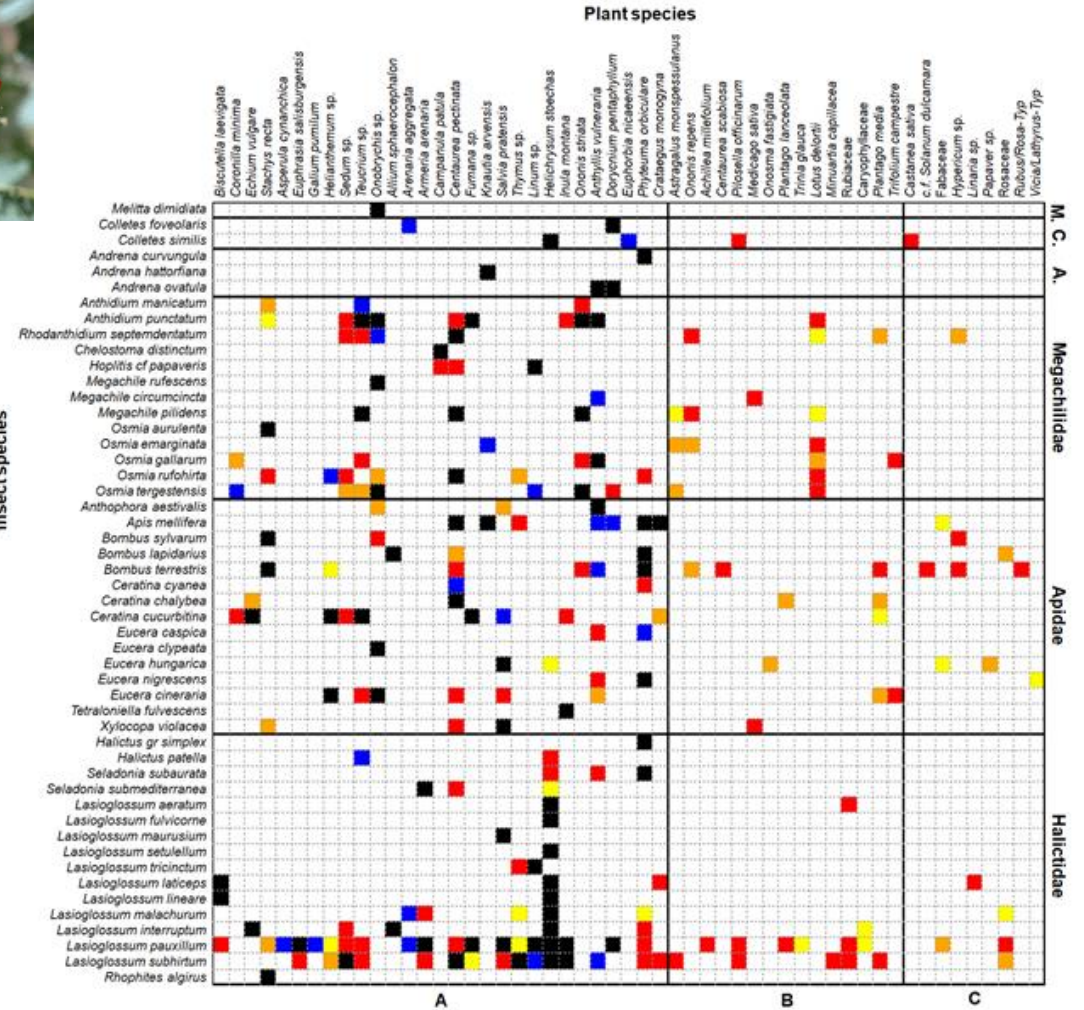


Rearing
method vs.
molecular

Wirta et al. (2014)



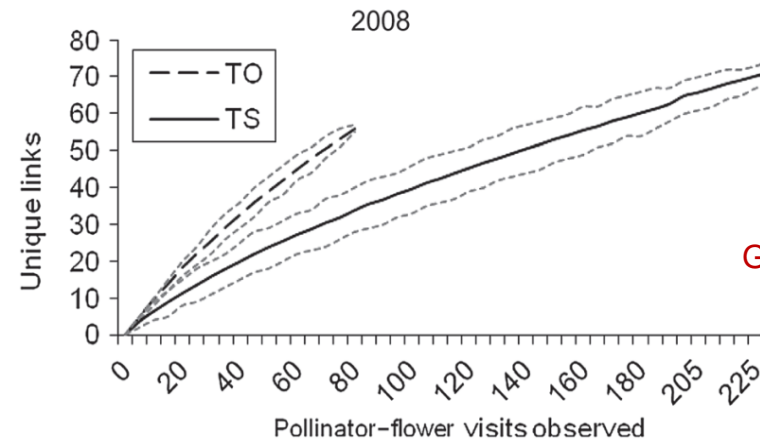
Insect species



De Manincor et al. (2020)

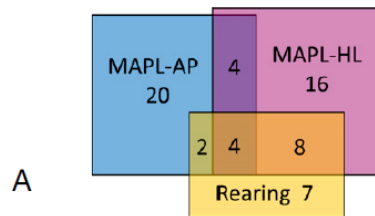
Effects of sampling methods on network structure

➤ Type of sampling: transect vs. timed-observation

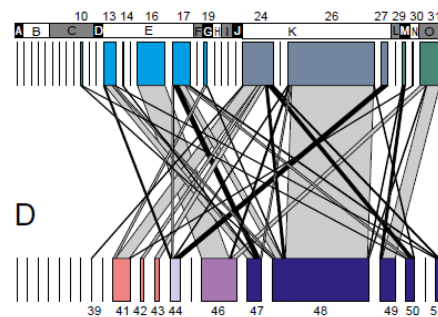
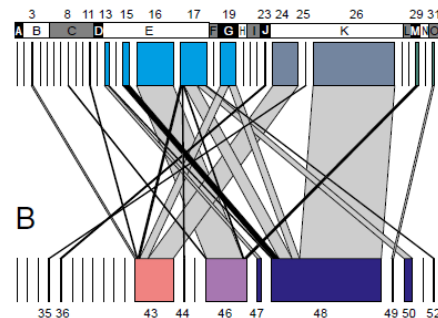
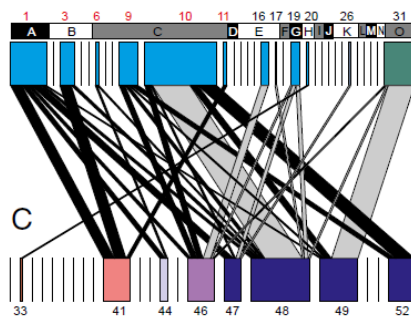


Gibson et al. (2011)

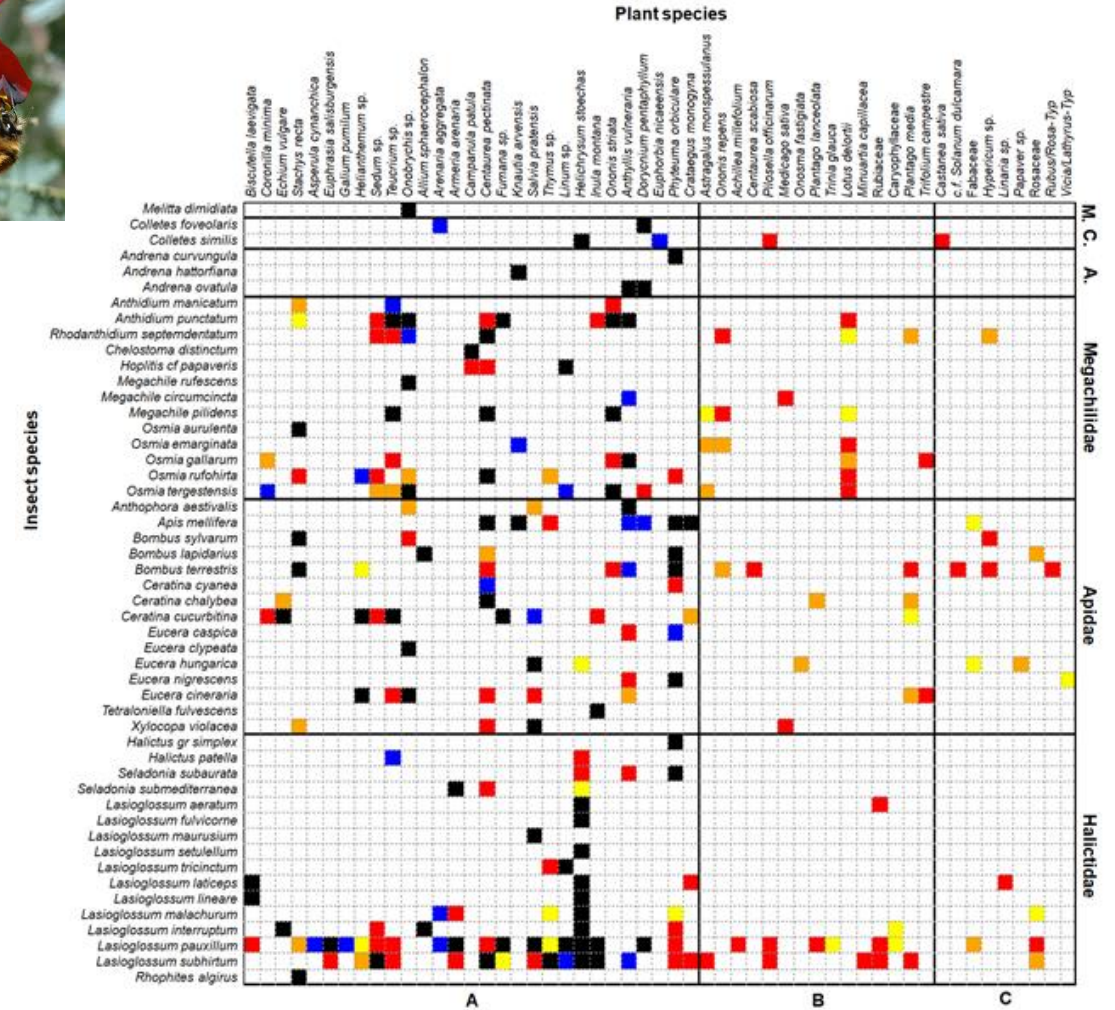
Rearing method vs. molecular



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