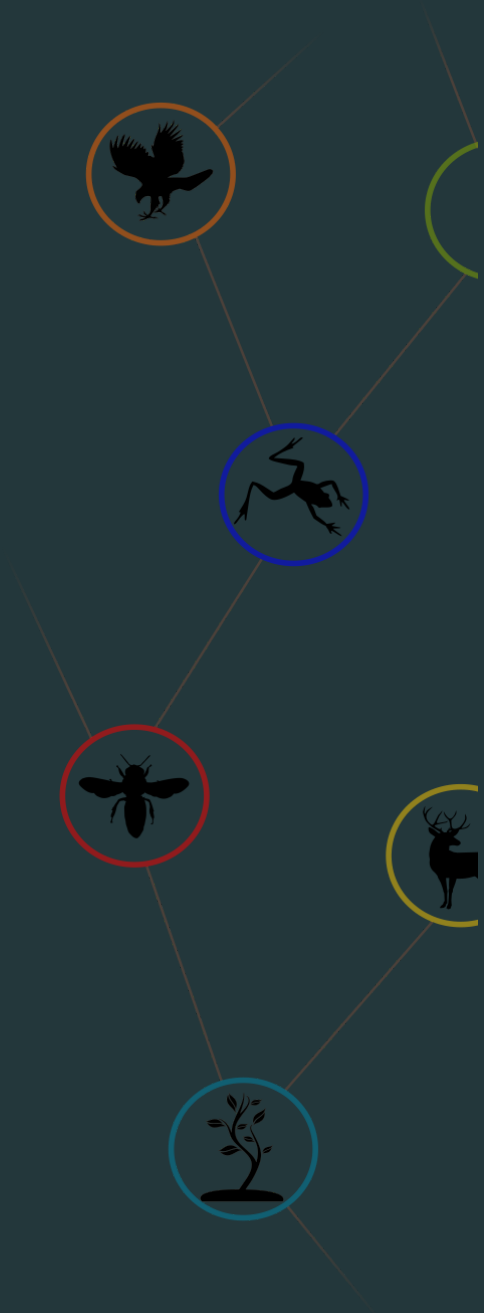
Laboratoire d'écologie intégrative | Integrative Ecology Lab [IE]

Centre for Biodiversity Theory and Modelling

Title of my talk template

My talk subtitle

Azenor Bideault, PhD candidate
+ Collaborators



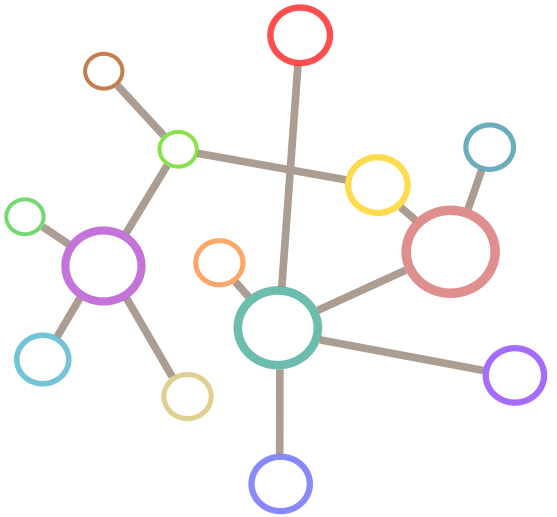
Azenor/talk_seminar2UdeS

@Azenor_Bideault

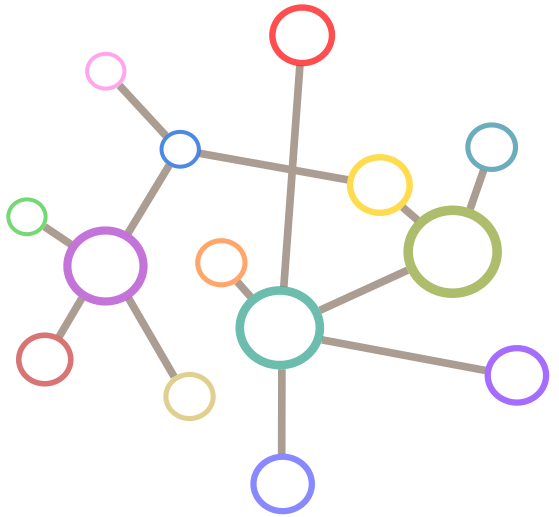
Spot the differences

- Species identity
- Species richness
- Interactions
- ...

Communities vary across space and time

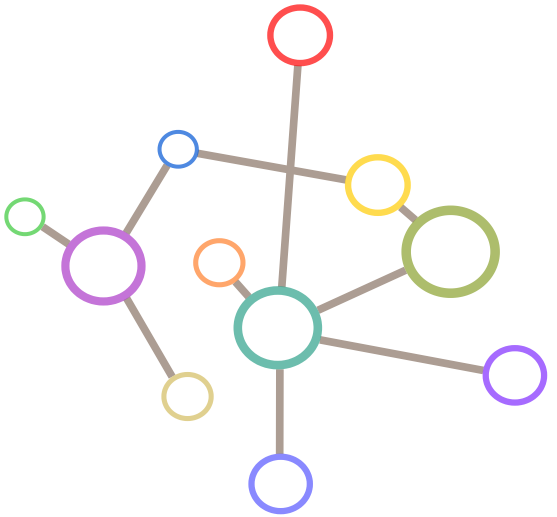


Communities vary across space and time



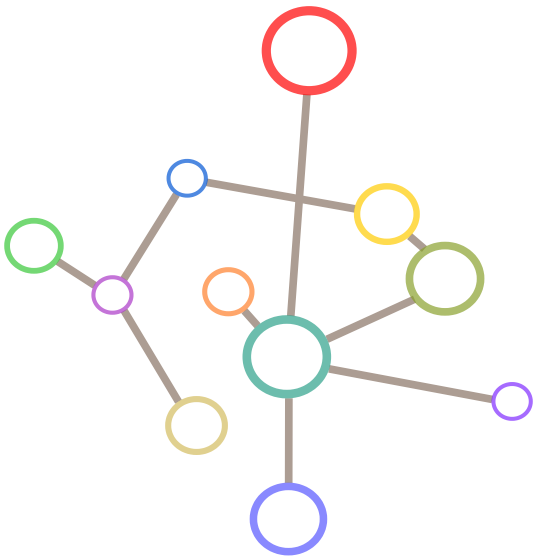
- Identity of species

Communities vary across space and time



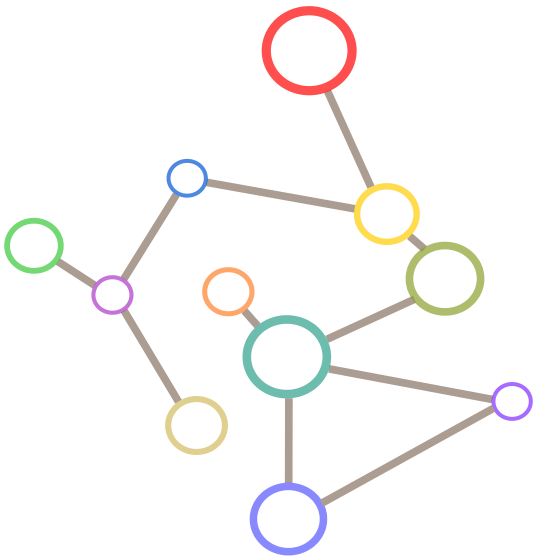
- Identity of species
- Number of species

Communities vary across space and time



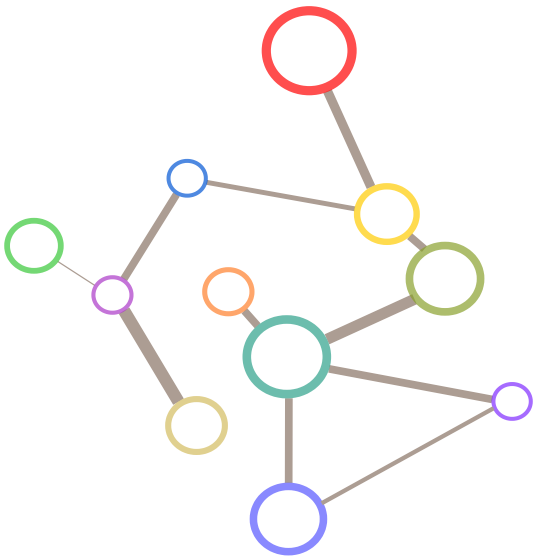
- Identity of species
- Number of species
- Biomass

Communities vary across space and time



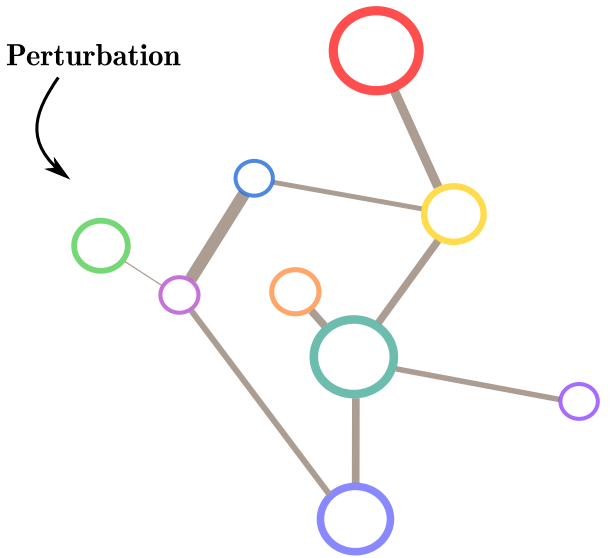
- Identity of species
- Number of species
- Biomass
- Interactions

Communities vary across space and time



- Identity of species
- Number of species
- Biomass
- Interactions
- Interaction strength

Communities vary across space and time



- Identity of species
- Number of species
- Biomass
- Interactions
- Interaction strength
- Stability

Food webs vary across space and time

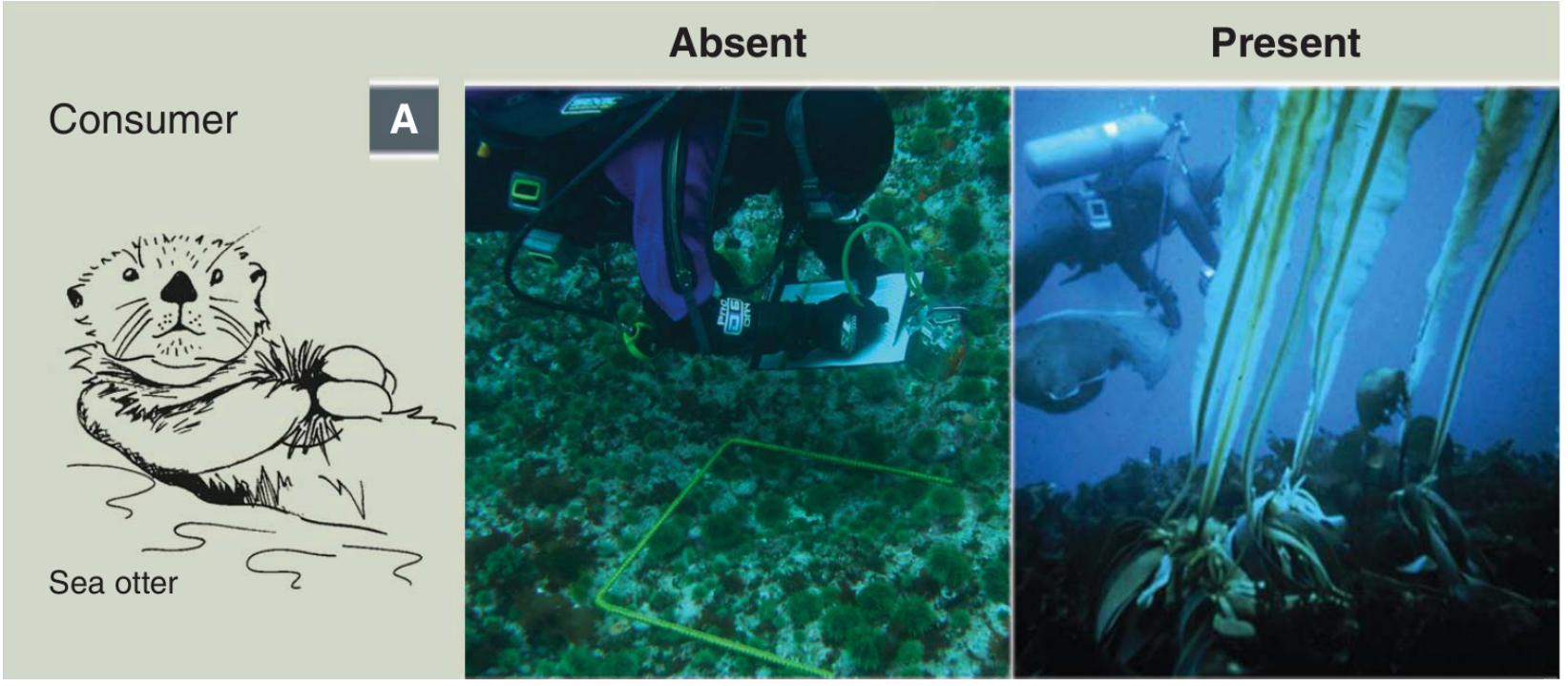
Trophic interactions

- Identity of species
- Number of species
- Biomass
- Interactions
- Interaction strength
- Stability

Variation in structure and dynamic

Trophic interactions

Are at the core of ecological systems



Trophic cascade : Sea otters indirectly enhance kelps abundance by consuming herbivorous sea urchins

Estes et al. [2011] Science

What shapes community structure and dynamic ?

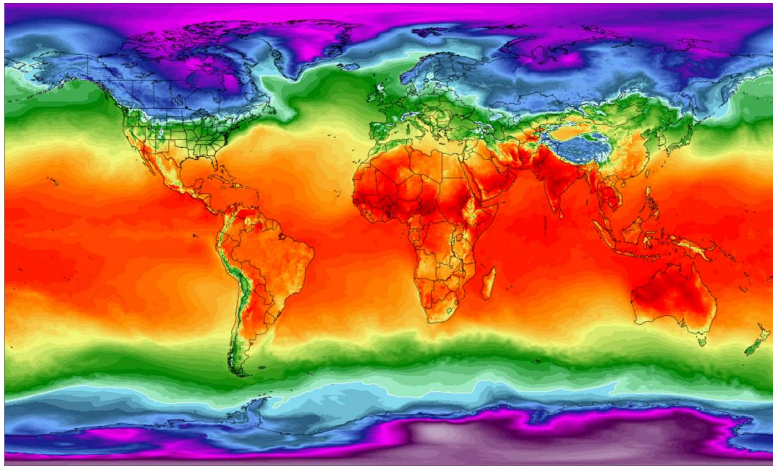
Back to the x differences

Environmental drivers?

- Temperature
- Precipitation

Temperature

A major environmental gradient

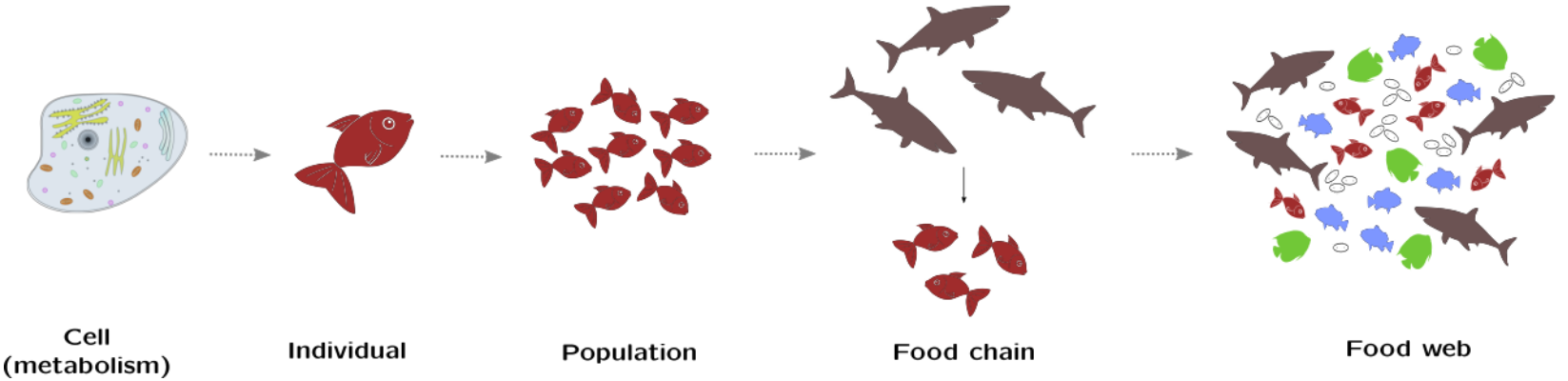


Global warming

What are the effects of temperature ?

Effects of temperature

From the individual to the community



Effects of temperature

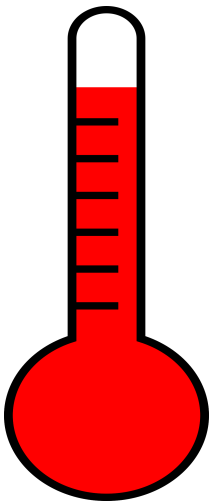
Effects of temperature

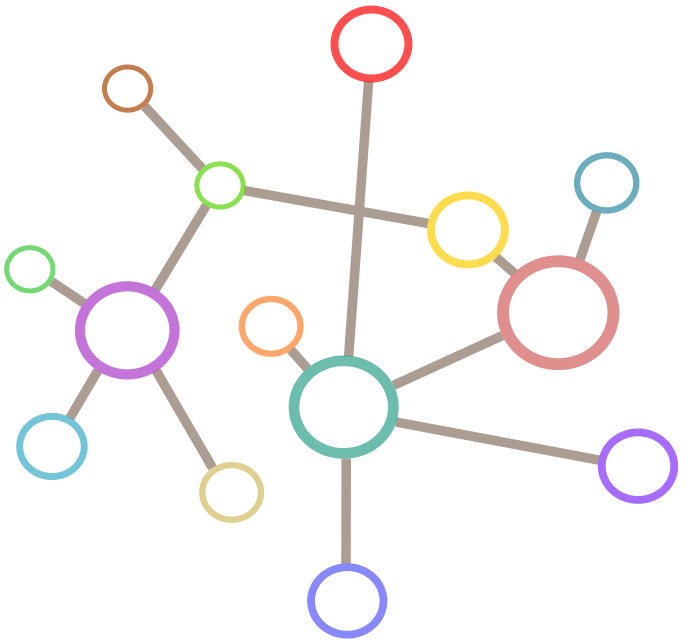
Effects of temperature

Effects of temperature

Effects of temperature

On food webs





- Structure
- Dynamic
- Stability

Lack of consensus

- Hard to disentangle the various effects of temperature
- Effect of the temperature gradient $\neq$ effect of warming?

Most studies explore :

- One particular ecological system
- One process at a time

with different

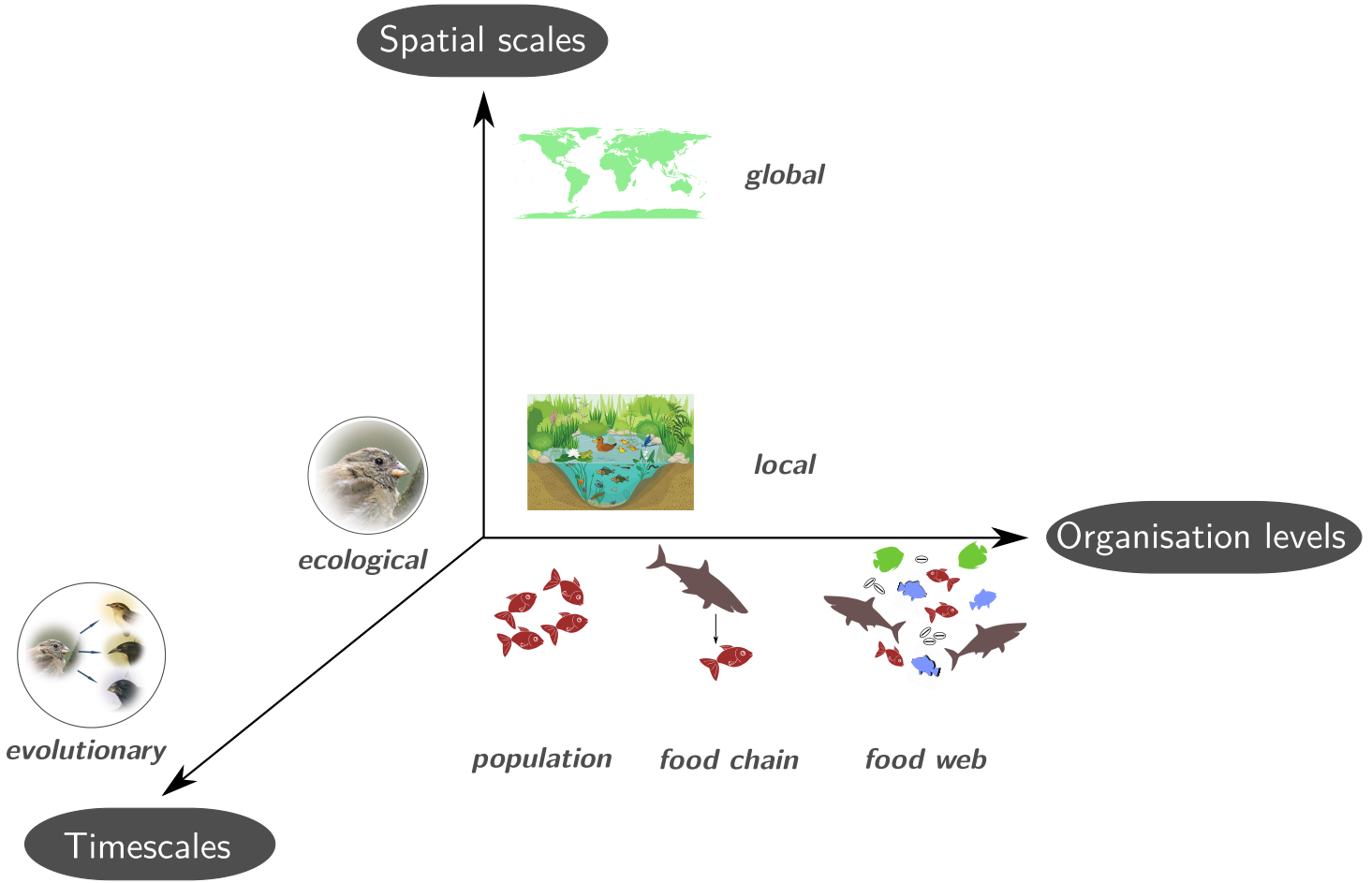
- experimental design
- study system
- theoretical framework
- model assumptions

No mechanistic understanding yet

How does temperature shape communities ?

An across-scales perspective

An across-scales perspective



An across-scales perspective

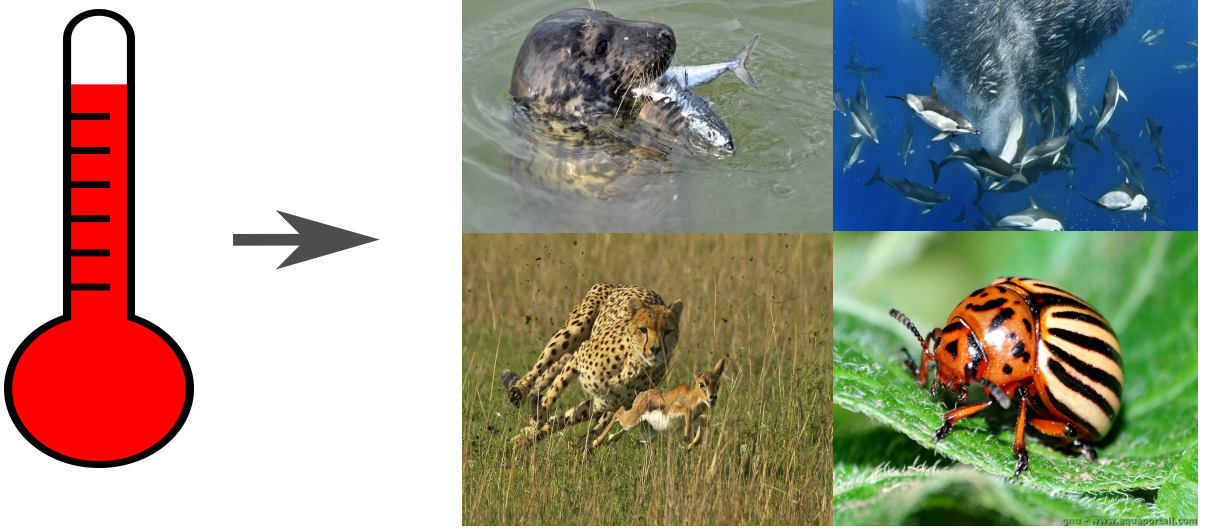
schema phd

- Thermal mismatches in biological rates determine trophic control and biomass distribution under warming
- Effects of temperature on fish food webs
  - Estimating self-regulation
  - Large scale dynamics and structure of food webs
- Short-term thermal adaptation of growth rates in wild bacteria strains

Thermal mismatches in biological rates determine trophic control and biomass distribution under warming

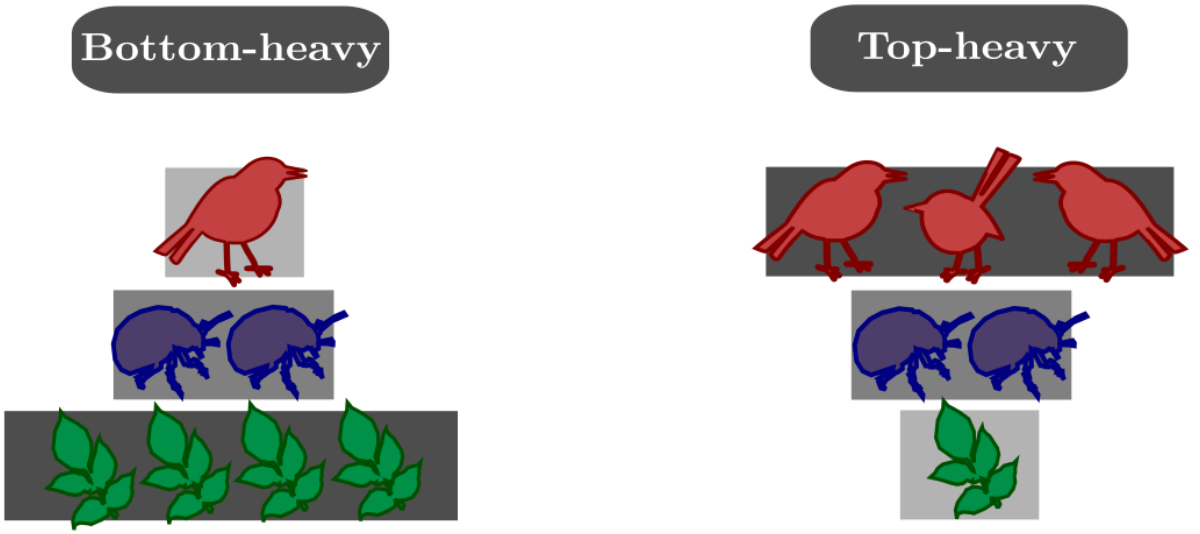
A cross-ecosystem comparison

Effects of temperature on trophic interactions



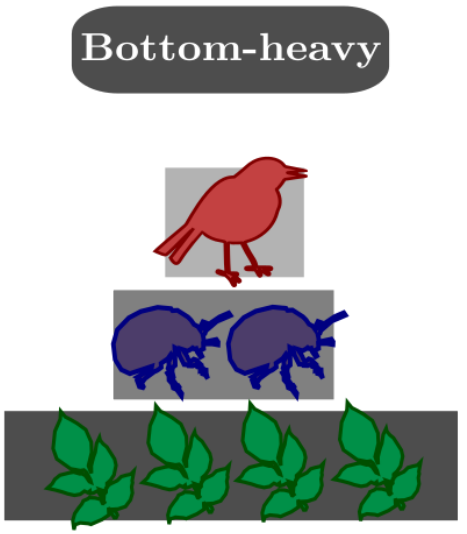
Food chain structural properties

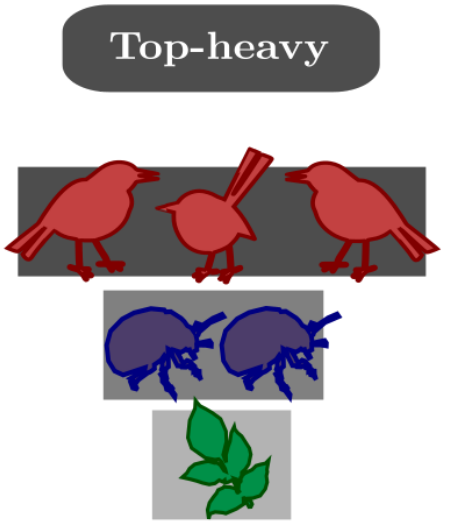
Biomass distribution



Food chain structural properties

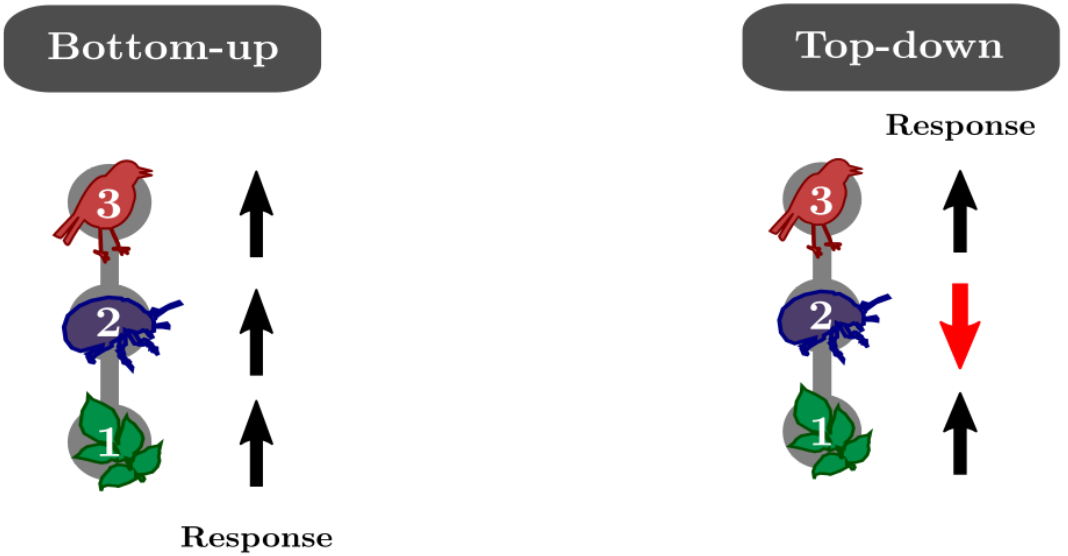
Biomass distribution





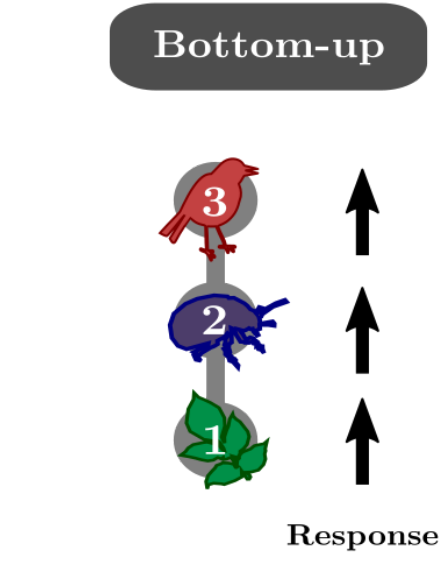
Food chain dynamical features

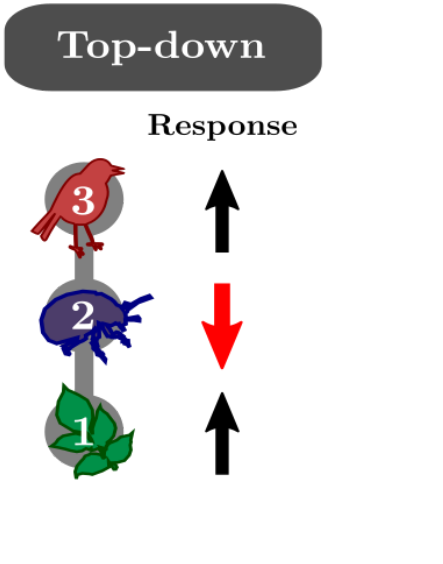
Trophic control



Food chain dynamical features

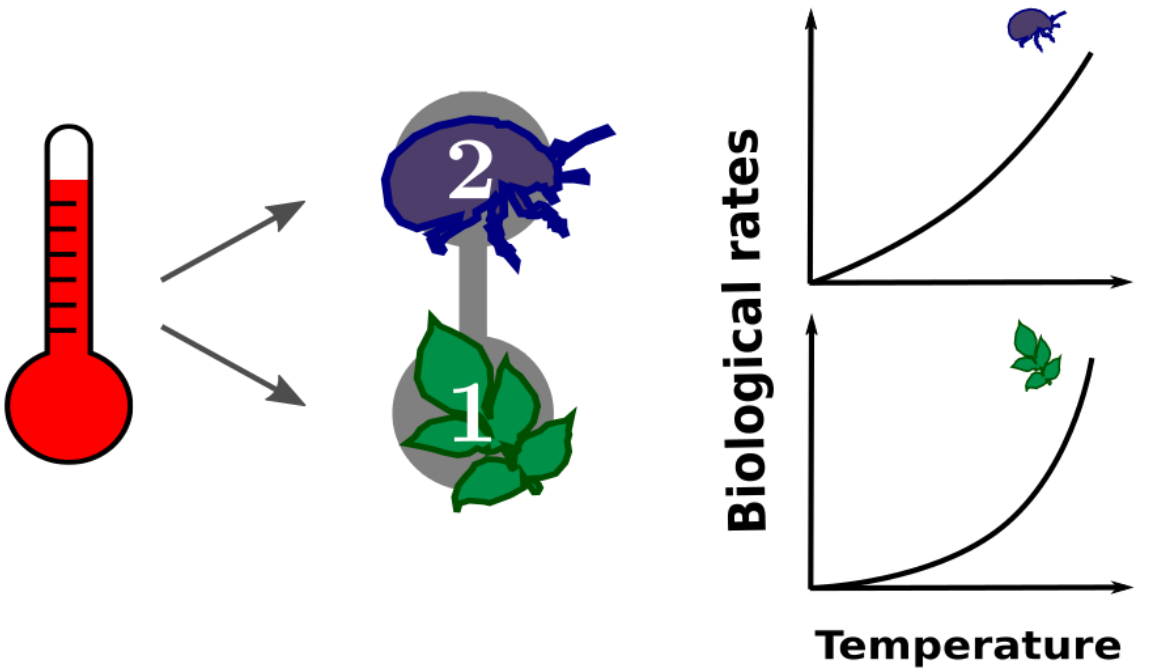
Trophic control





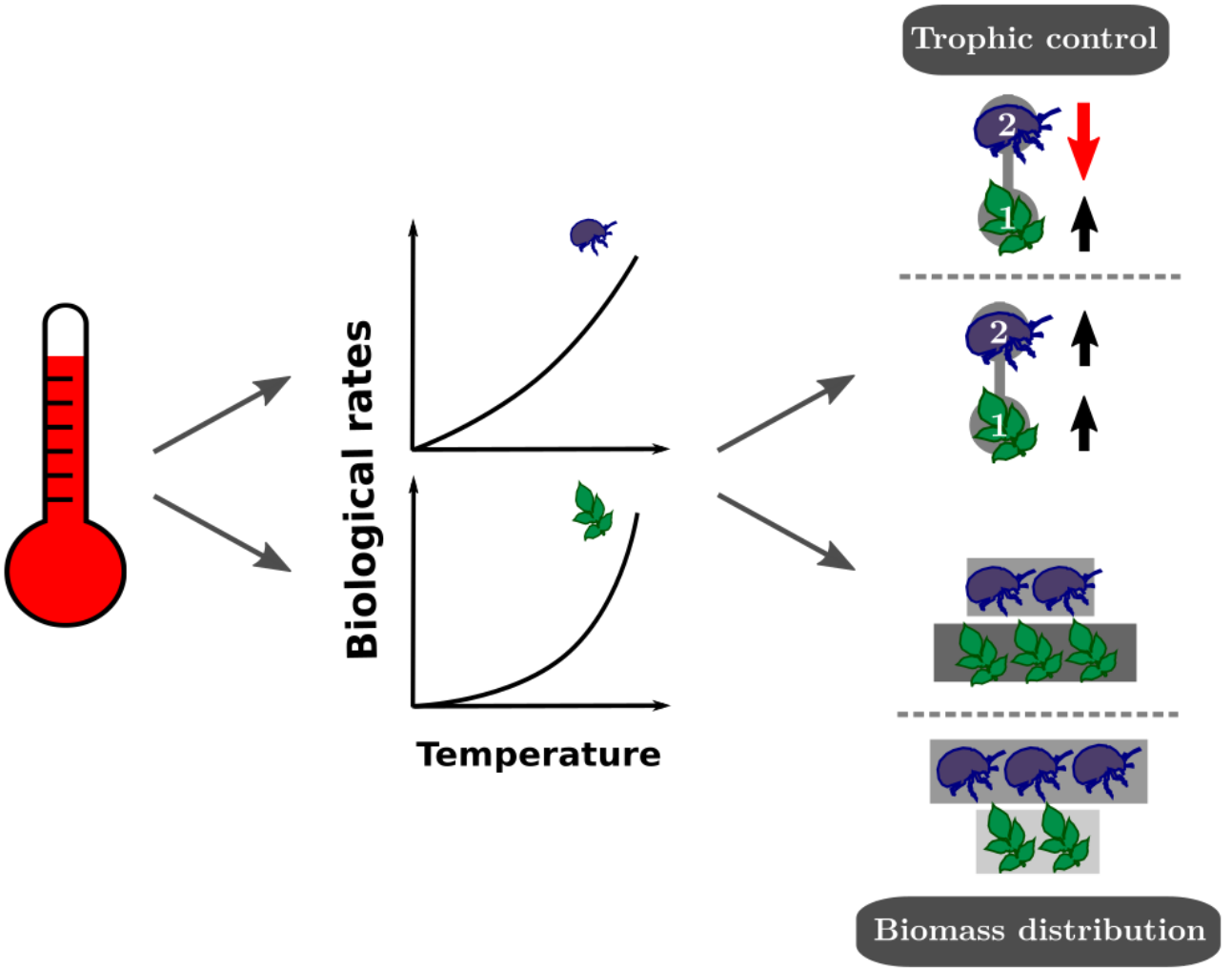
Temperature effects at the individual level

Biological rates



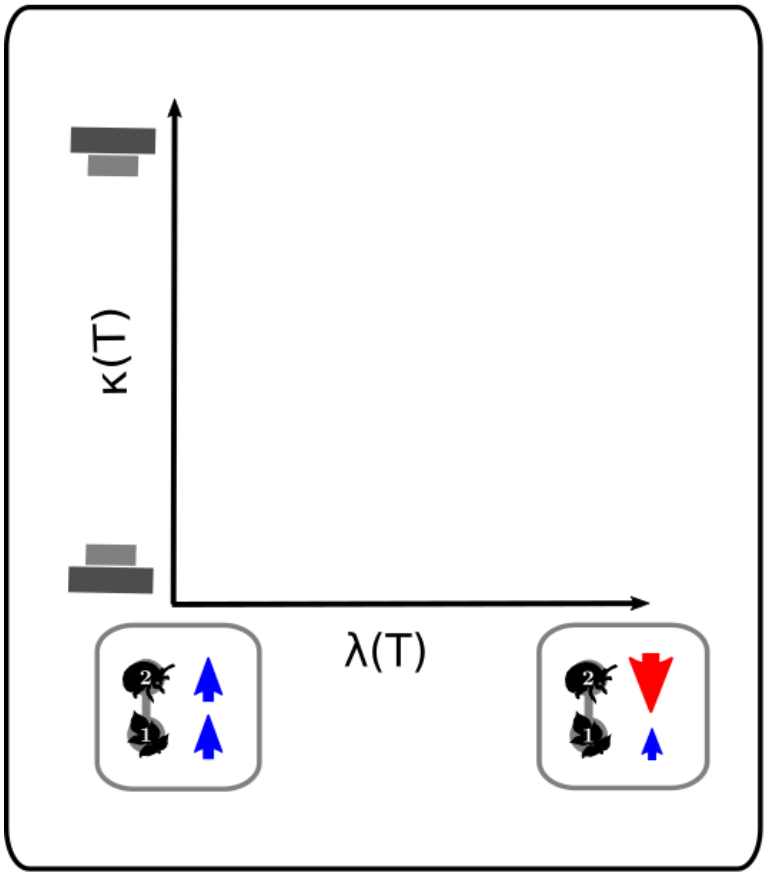
Temperature effects

On food chain structure and dynamic



Theoretical framework

Synthetic parameters describing food chain properties



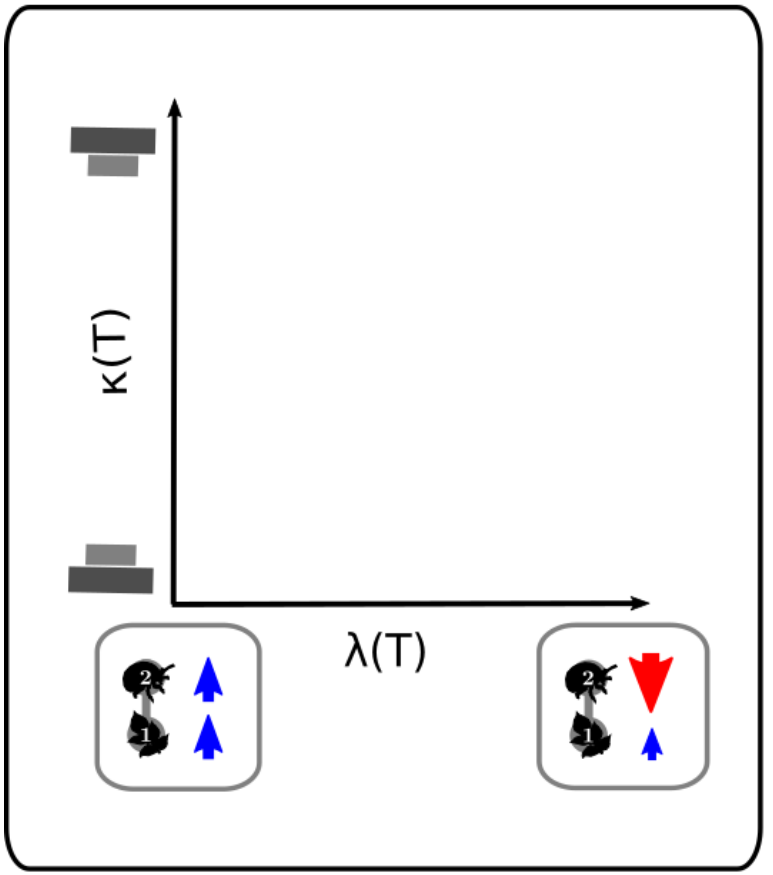
$$\kappa = \frac{\varepsilon D_1}{D_2}$$

$$\lambda = \frac{\varepsilon A_{21}^{\,2}}{D_1 D_2}$$

D = self-regulation
ε = biomass conversion efficiency
A = attack rate

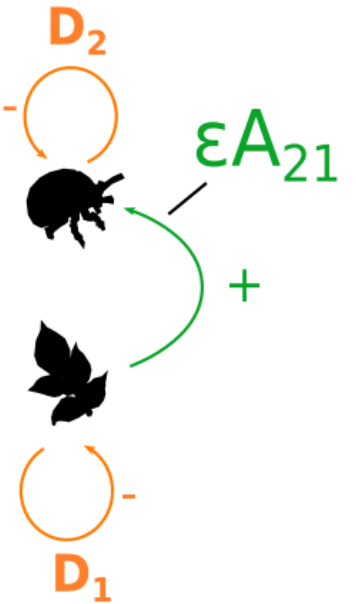
Theoretical framework

Synthetic parameters describing food chain properties



$$\kappa = \frac{\varepsilon D_1}{D_2}$$

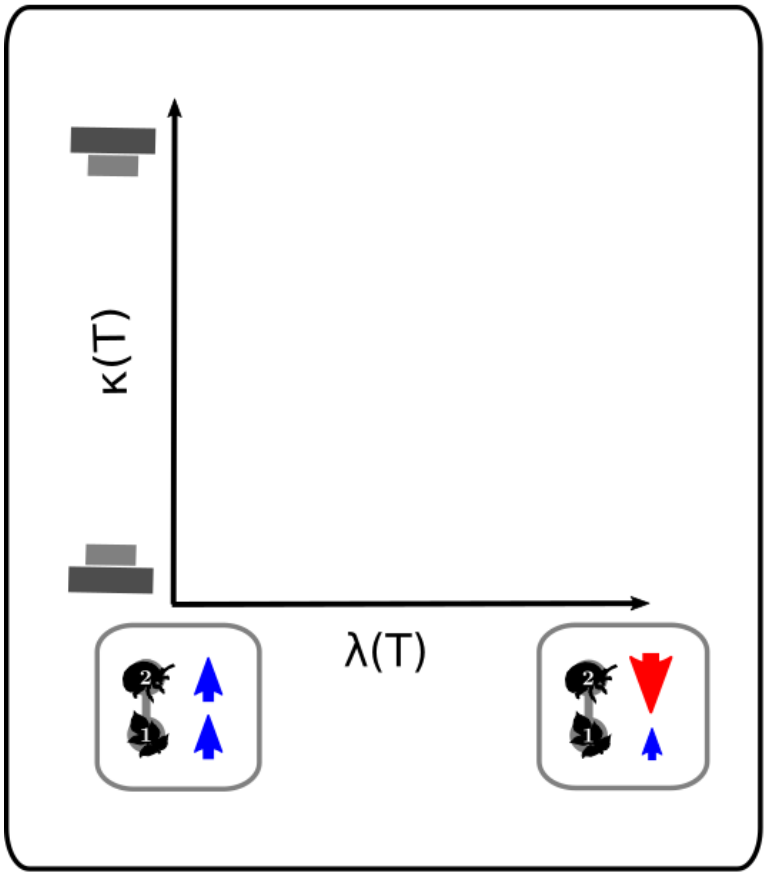
$$\lambda = \frac{\varepsilon A_{21}^{\,2}}{D_1 D_2}$$

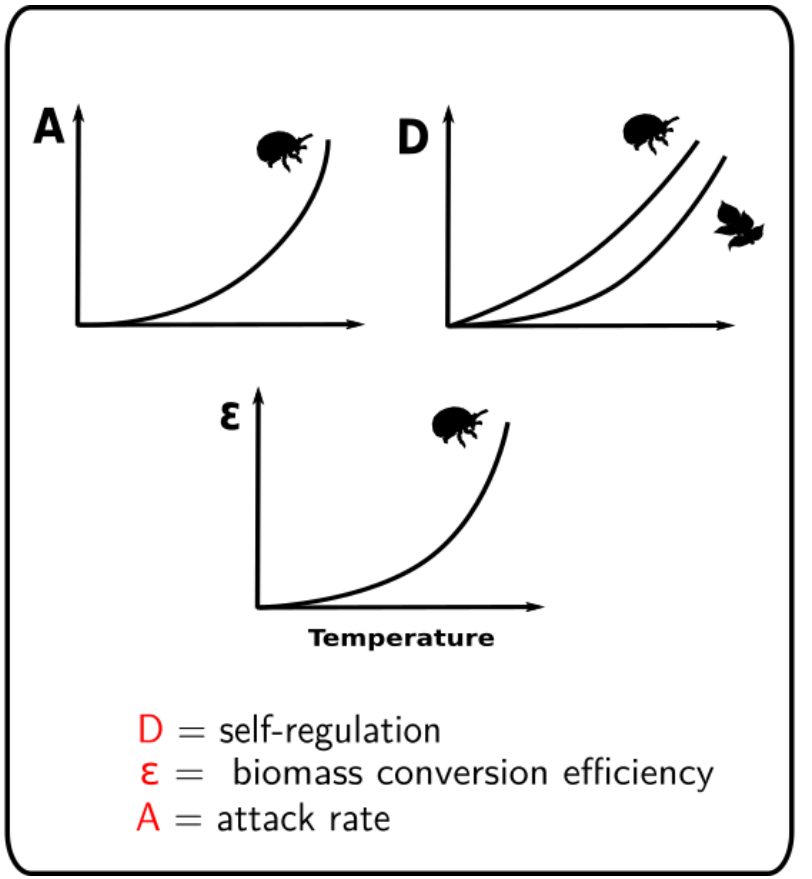


D = self-regulation
ε = biomass conversion efficiency
A = attack rate

Theoretical framework

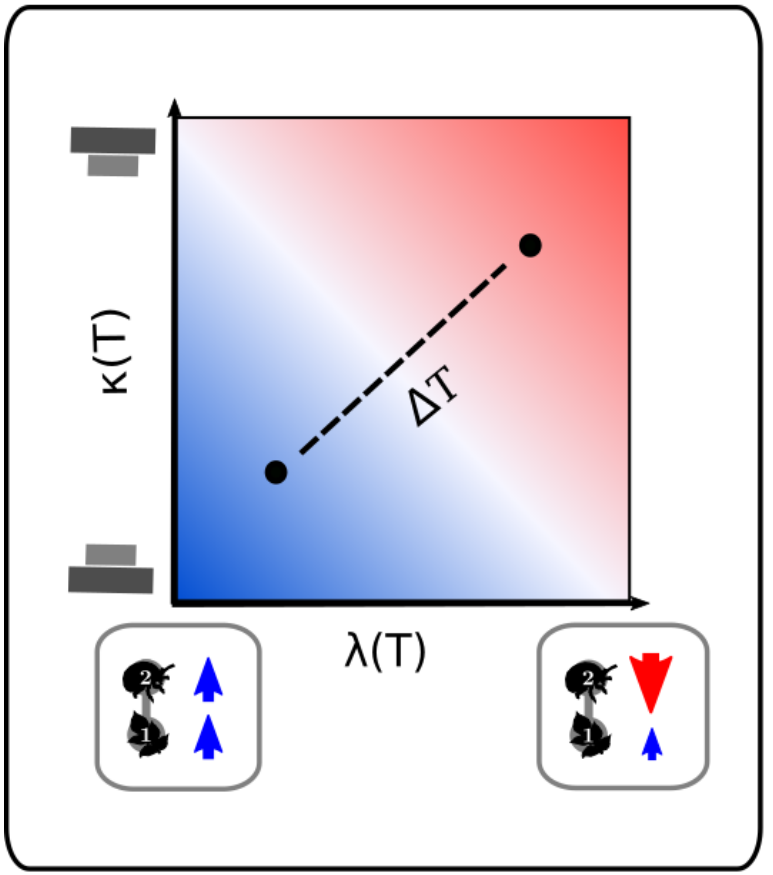
Temperature dependence

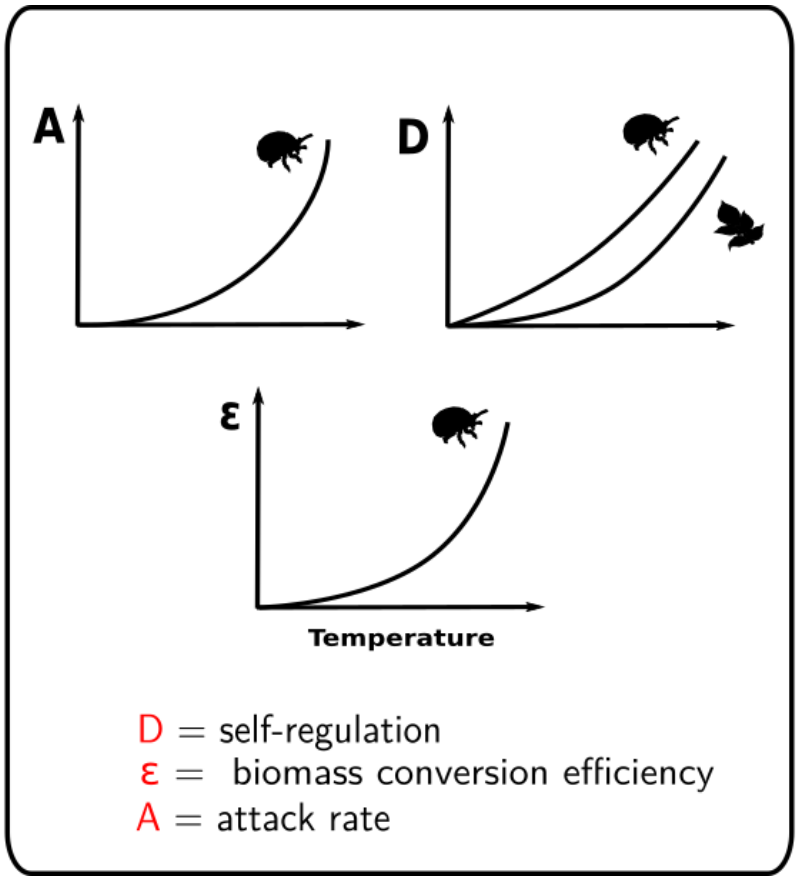




Theoretical framework

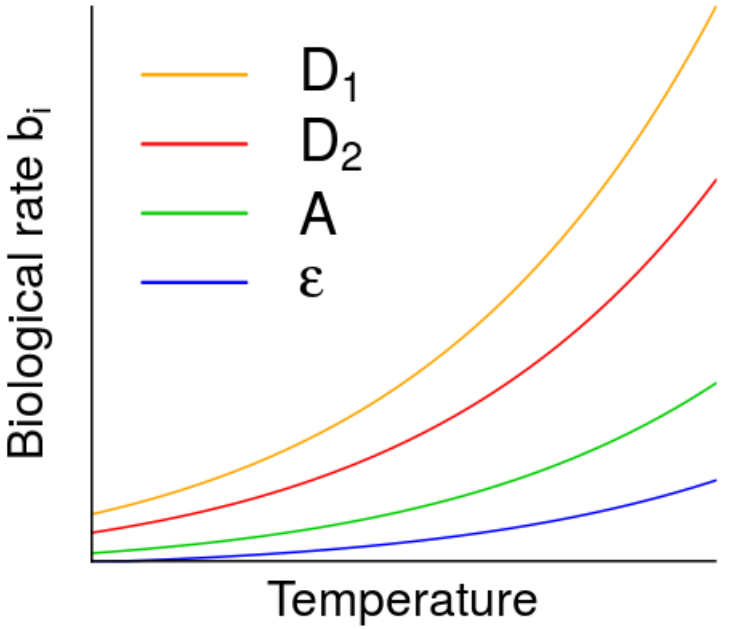
Temperature dependence





Theoretical framework

Temperature dependence of biological rates



$$b_i = b_0 e^{-E/kT}$$

- b_0, k constants
- T temperature
- **E activation energy**

The activation energy defines the rate's thermal sensitivity

Theoretical framework

Temperature dependence of the synthetic parameters

Synthetic parameters :

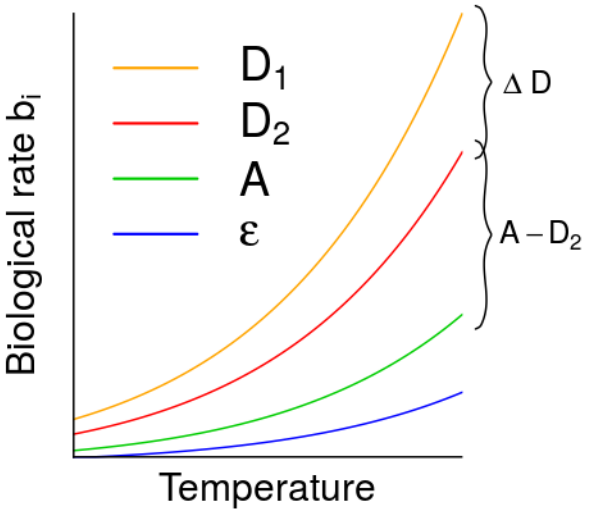
$$\kappa = \frac{\epsilon D_1}{D_2}$$

$$\lambda = \frac{\epsilon A_{21}}{D_1 D_2}$$

Their activation energies :

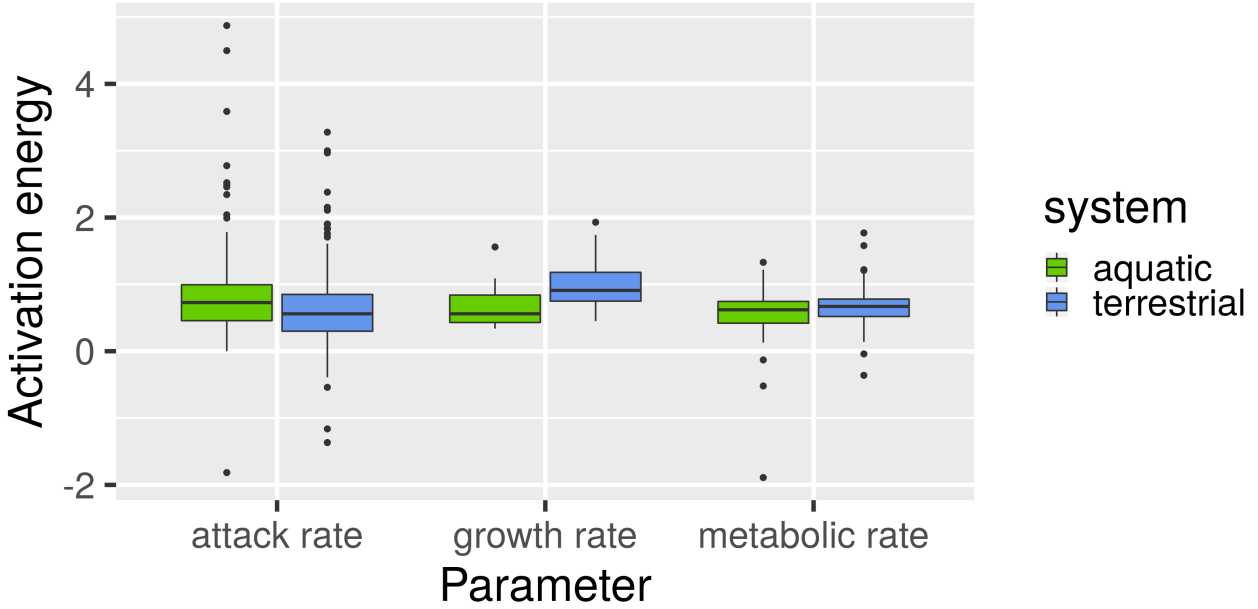
$$E_\kappa = E_\epsilon - E_{\Delta D}$$

$$E_\lambda = E_\epsilon + 2E_{A-D_2} + E_{\Delta D}$$



Database of activation energies

For different taxonomic groups and habitats



- Various species (ectotherm)
- Taxonomic groups
- Habitat
- Diet

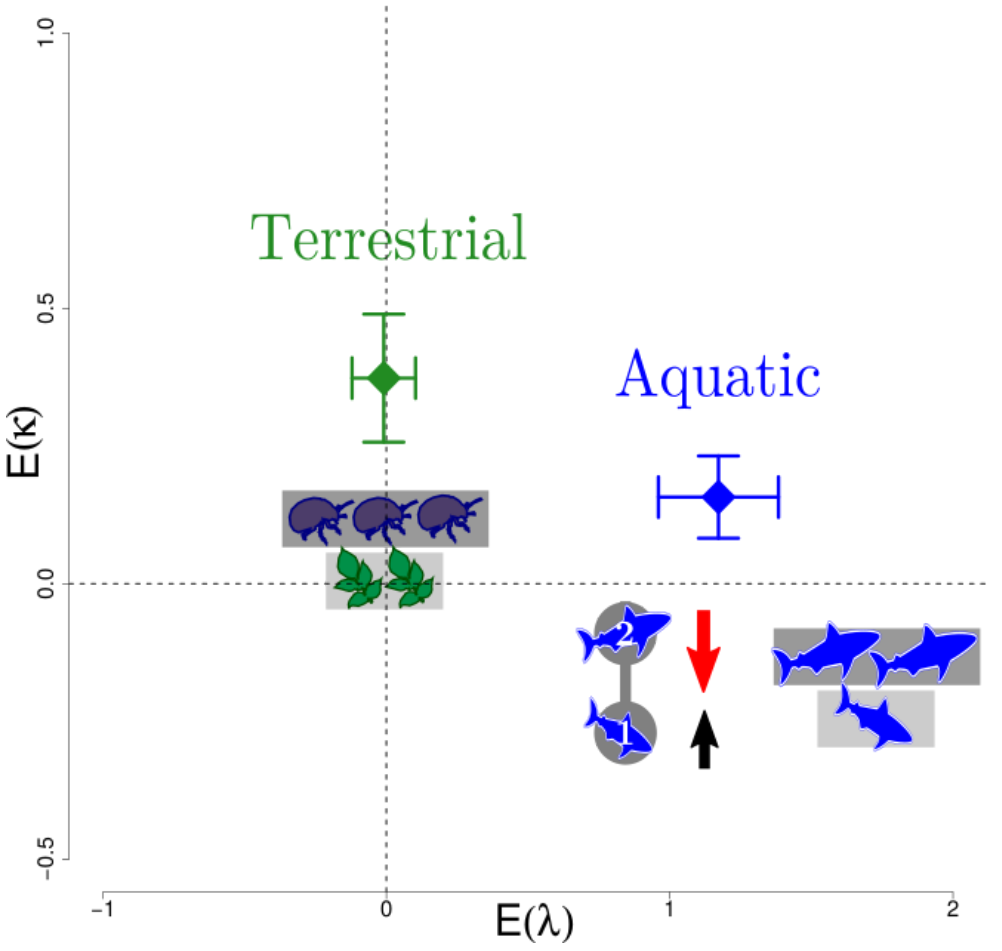
Dell et al [2011], Burnside et al [2014], Fussman et al [2014]

Effects of temperature on biomass structure and trophic control in consumer-resource interactions

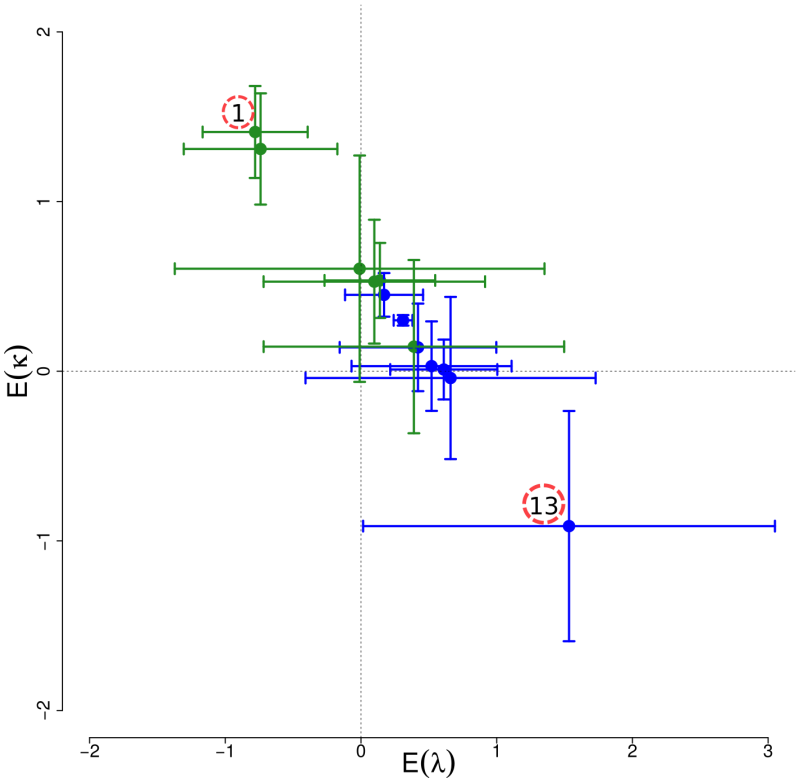
- Temperature dependence of λ and κ
  - Aquatic vs terrestrial organisms
  - Across taxonomic groups
- Shift in λ and κ for herbivores-primary producers at the global scale

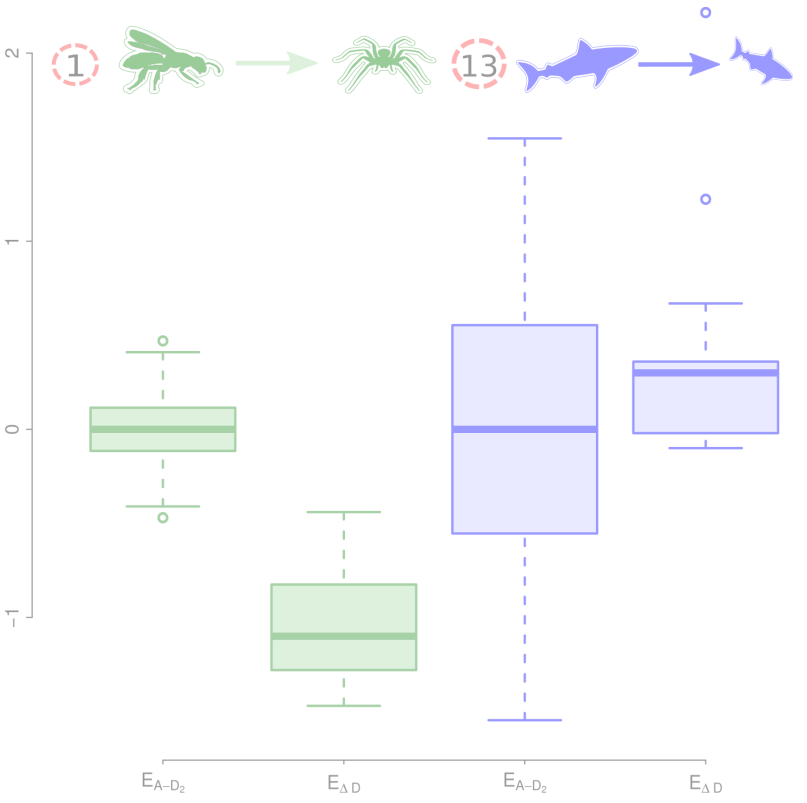
Results

Thermal dependence of λ and κ

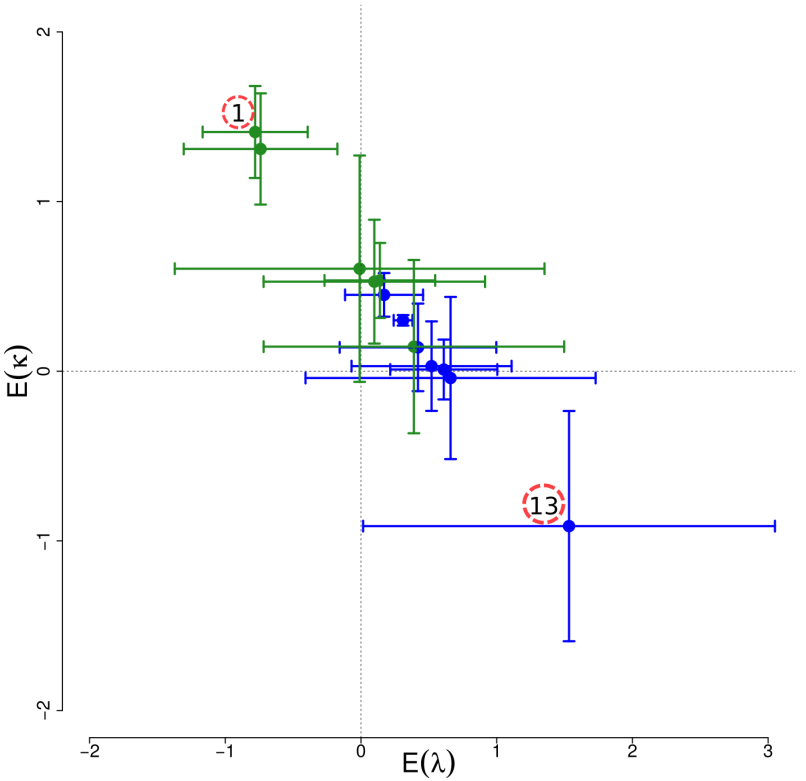


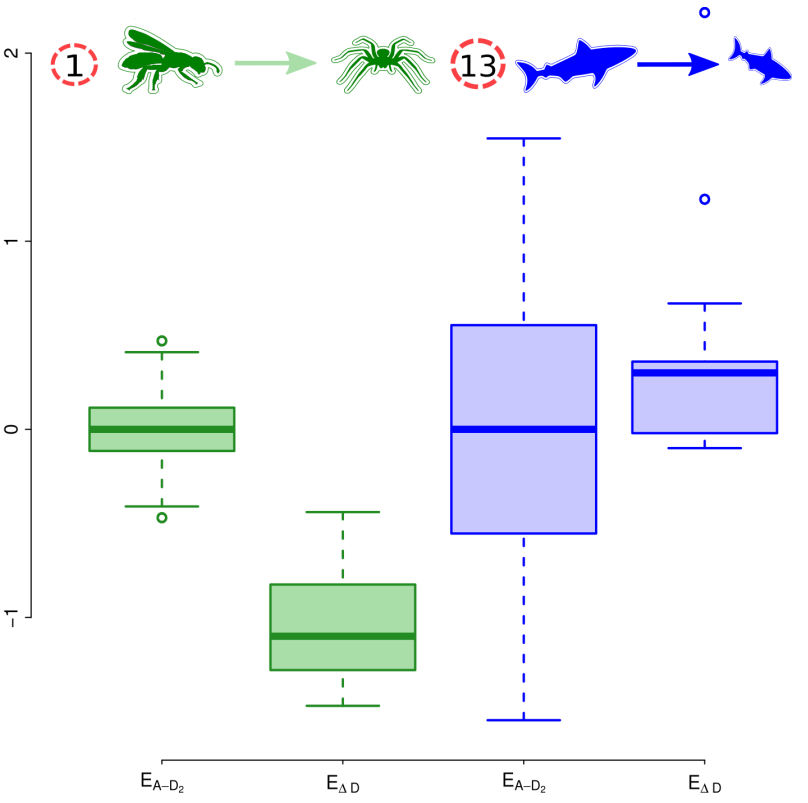
Thermal dependence of λ and κ across taxonomic groups





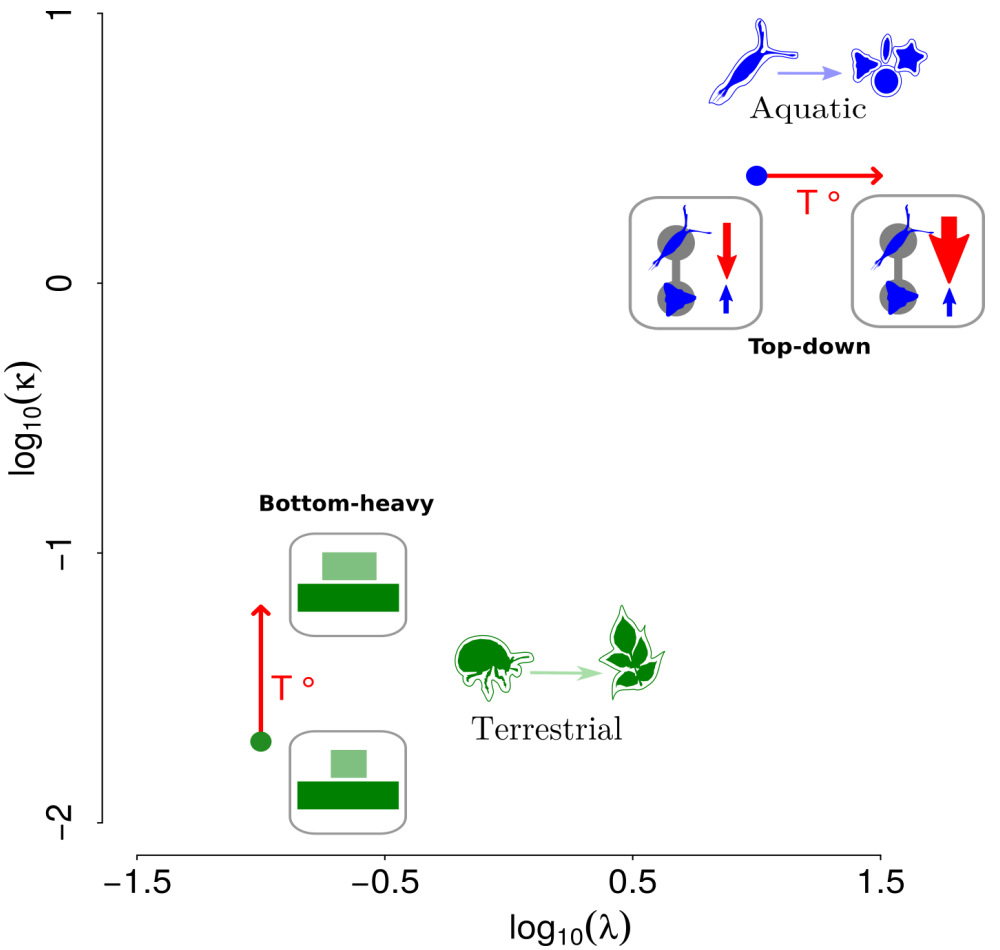
Thermal dependence of λ and κ across taxonomic groups





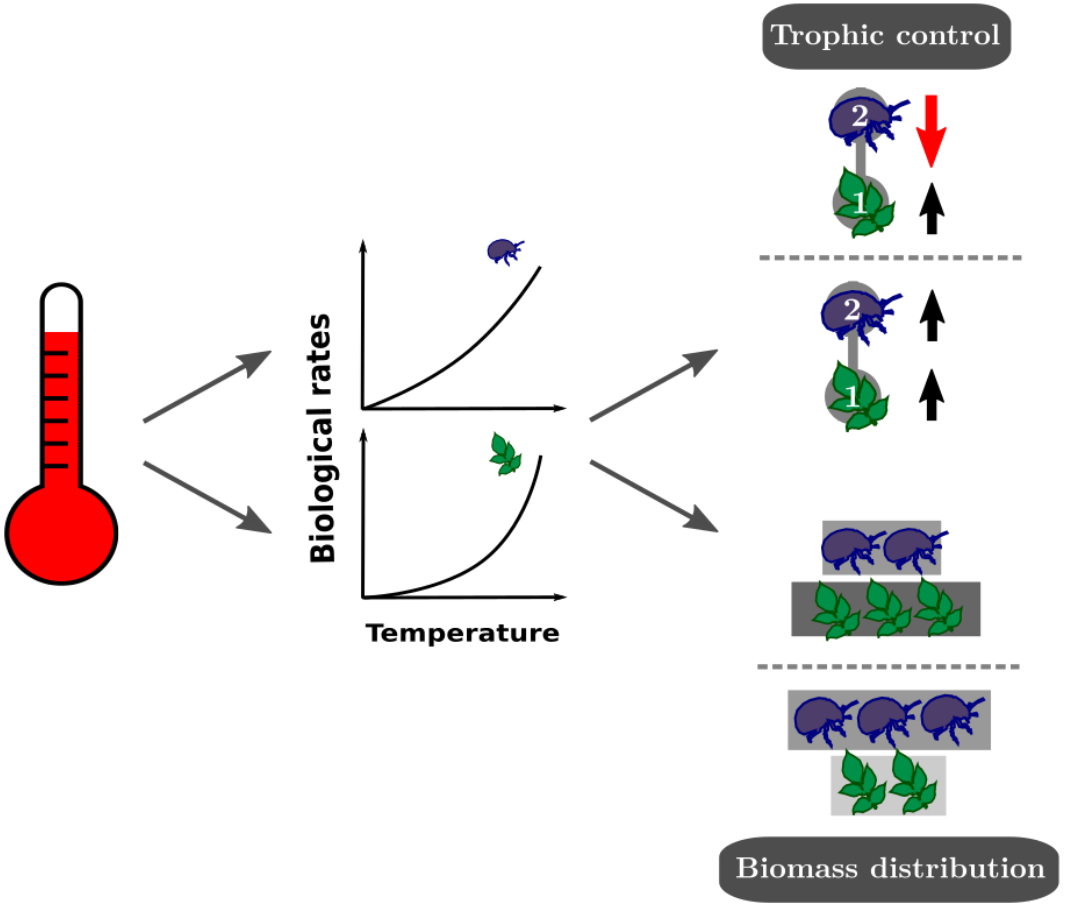
Mismatches between biological rates

Herbivory at the global scale

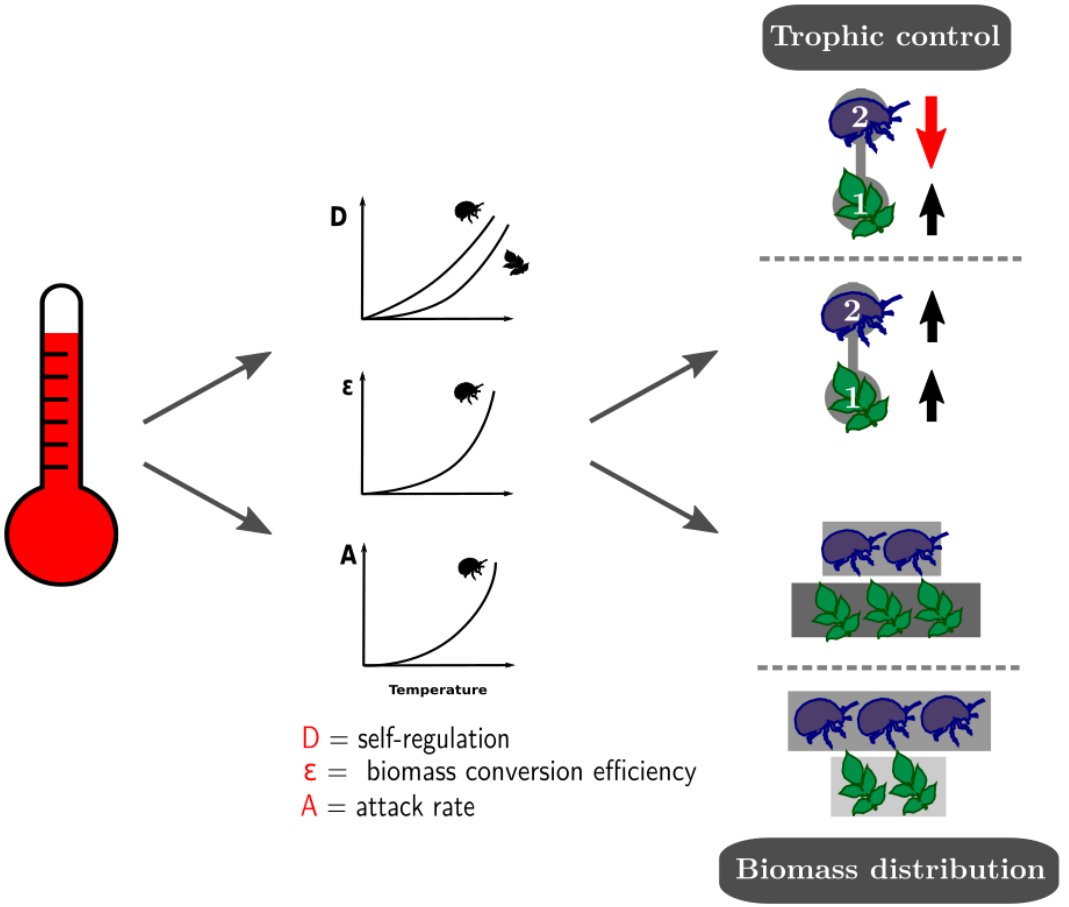


To conclude

To conclude

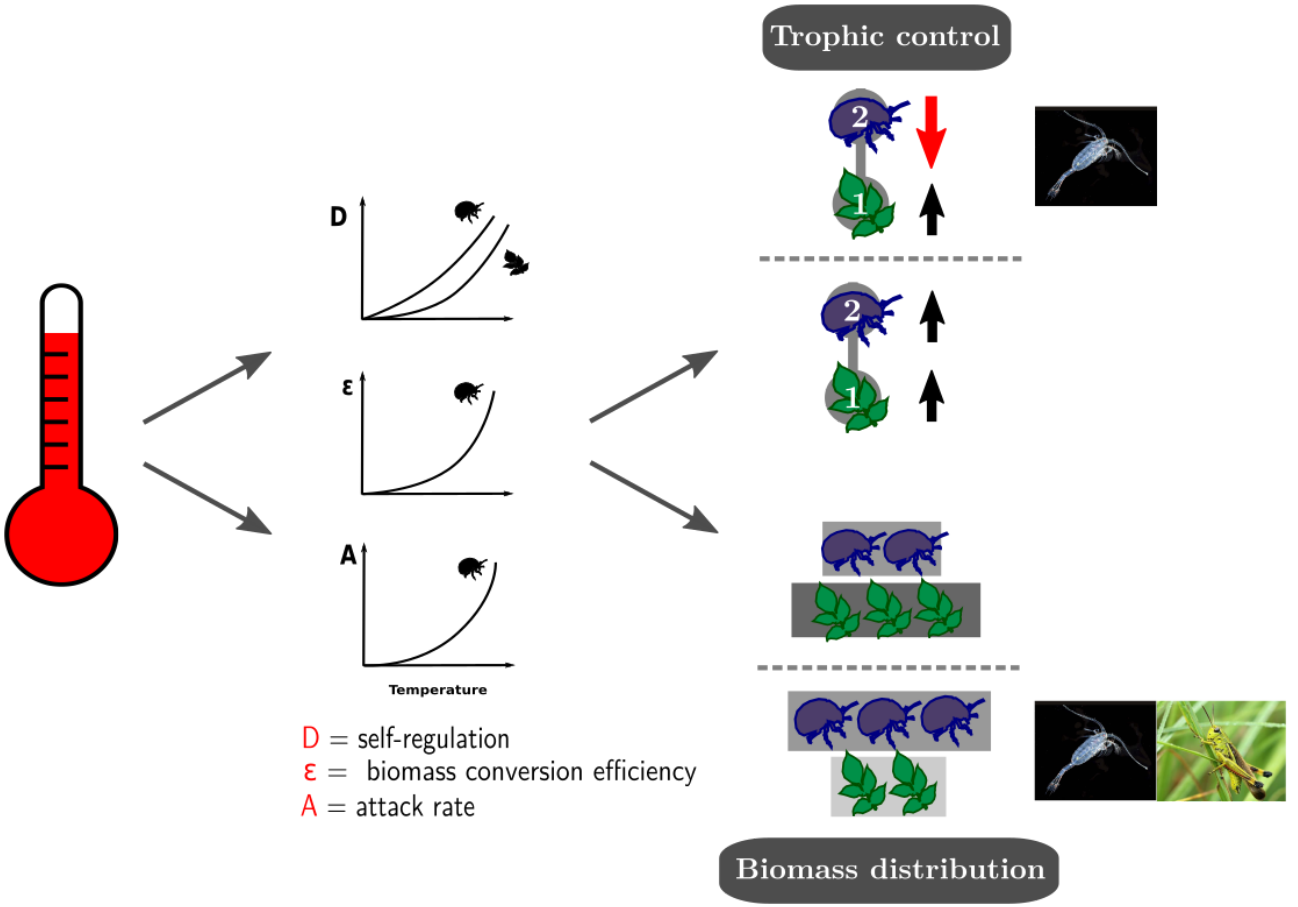

Biological rates
Temperature
Trophic control
2
1
2
1
Biomass distribution

To conclude



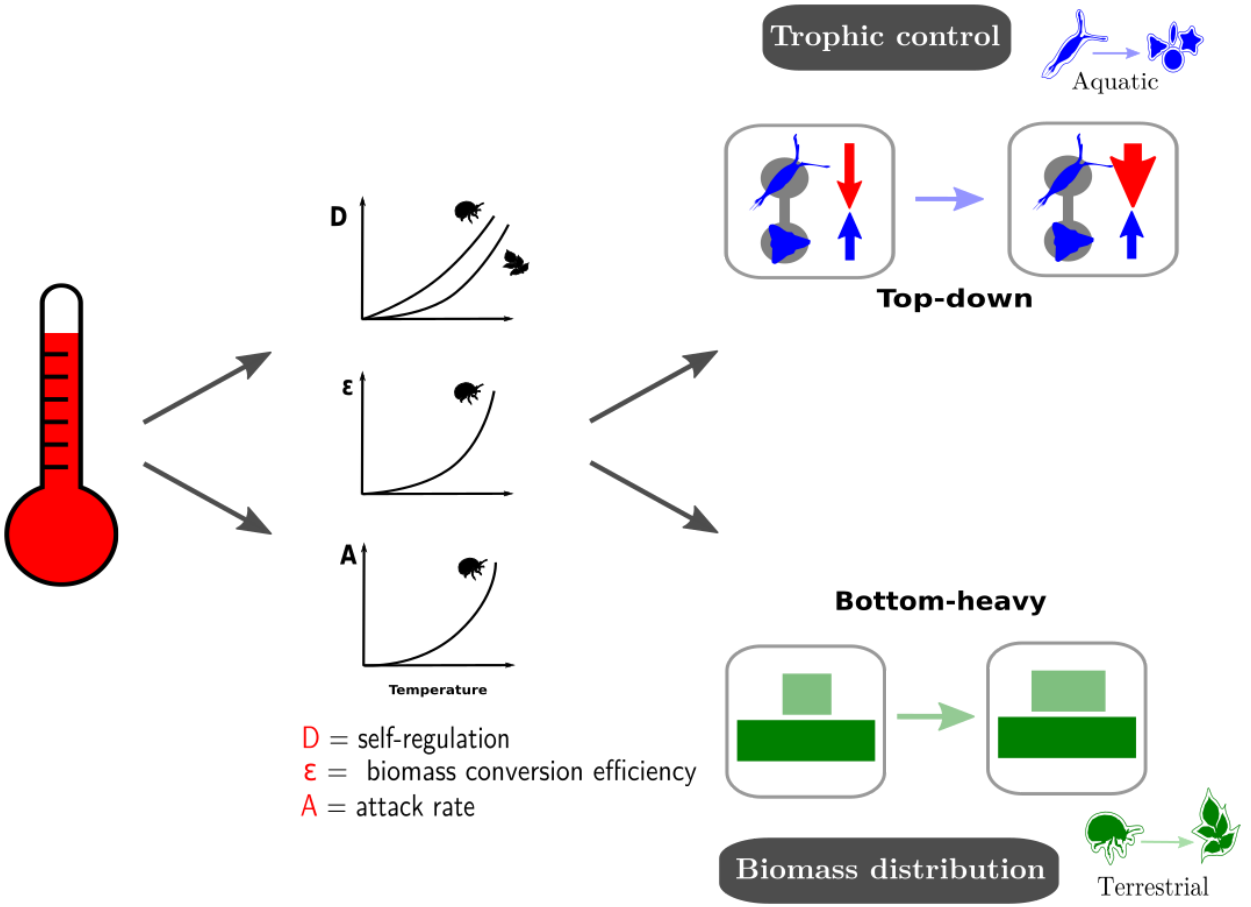
3 fundamental biological rates and their mismatches

To conclude



General trend : more top-down control in aquatic systems and top-heavier biomass distribution in terrestrial and aquatic ones

To conclude



Herbivory : more top-down control and less bottom-heavy biomass distribution

To conclude

- Mechanistic understanding
- Differences between aquatic and terrestrial communities
- Predictions
- Variation between taxonomic groups

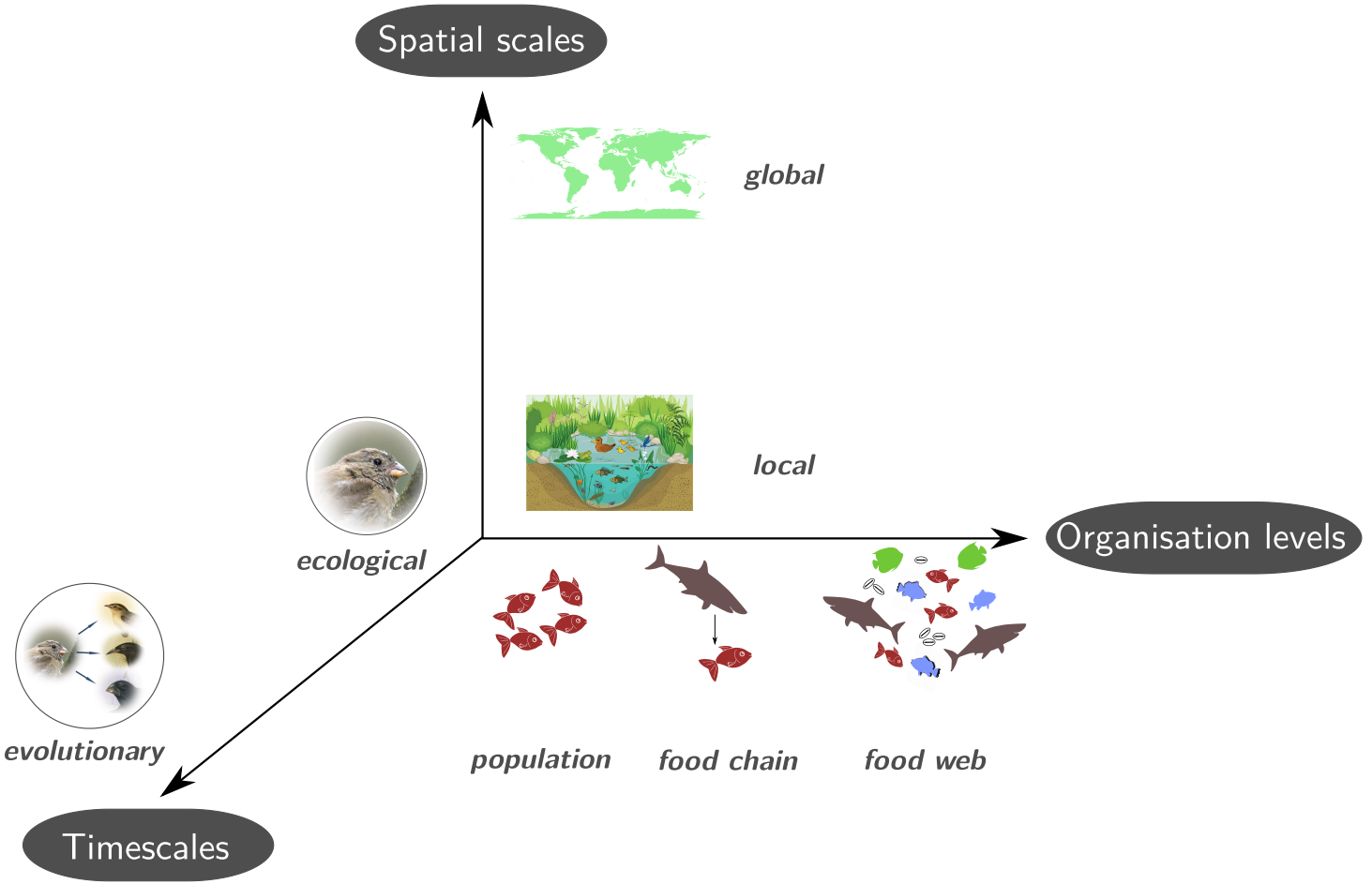
To conclude

- Mechanistic understanding
- Differences between aquatic and terrestrial communities
- Predictions
- Variation between taxonomic groups

But...

- Lack of data
  - Self-regulation
  - Biomass conversion efficiency
  - Full thermal response
- Consumer-resource interactions

Upscaling to food webs at the global scale



Tables

You can simply insert a markdown table:

Tables	Are	Cool
col 1 is	left-aligned	$1600
col 2 is	centered	$12
col 3 is	right-aligned	$1

Or you can use the `DT` R package for dynamic tables:

```
DT::datatable(head(cars))
```

Show 10 entries

Search:

	speed	dist
1	4	2
2	4	10
3	7	4
4	7	22
5	8	16
6	9	10

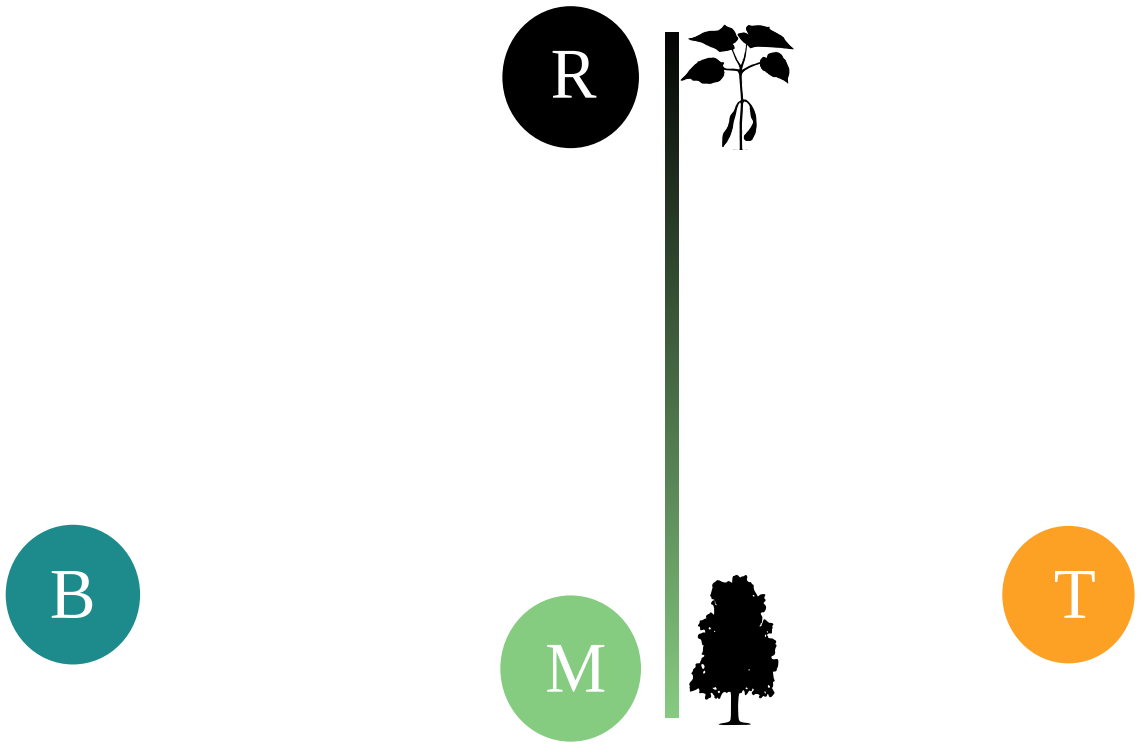
Showing 1 to 6 of 6 entries

Previous 1 Next

Figures

Insert an image:

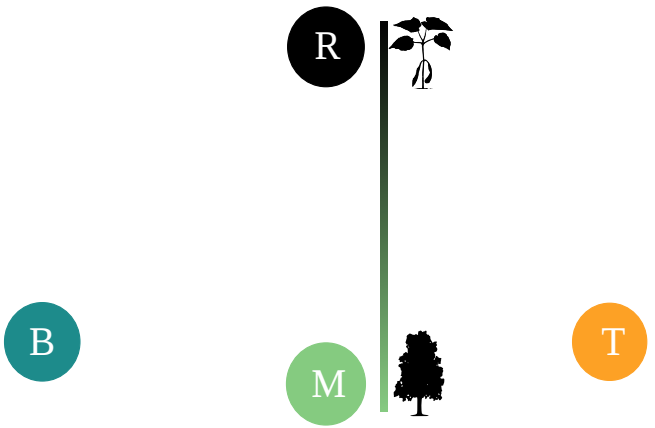
```
![](images/model1.svg)
```



Figures

Scale the size of an image:

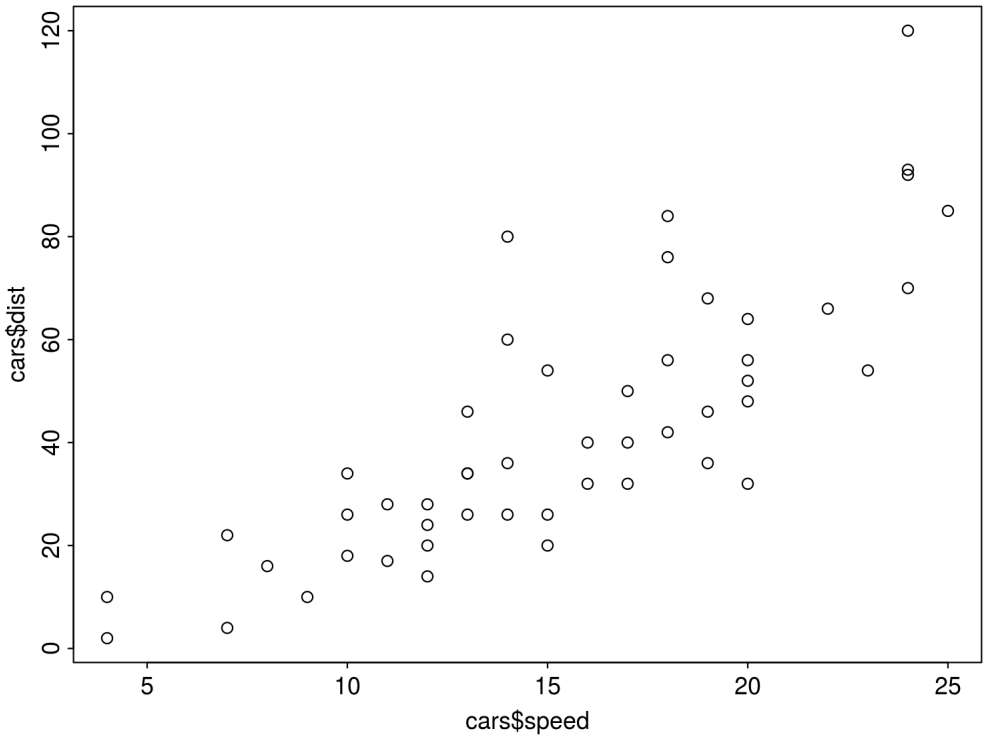
```
![:scale 60%](images/model1.svg)
```



Figures

Or simply code it:

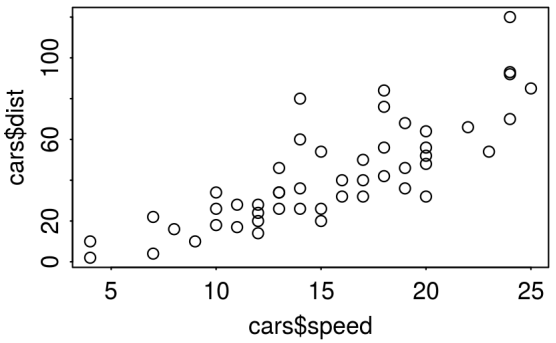
```
plot(cars$speed, cars$dist)
```



Figures

Use the code chunck options to change the size of a plot :

```
```{r, fig.width = 4, fig.height = 2.5}
plot(cars$speed, cars$dist)
```
```



You can check a full list of chunck options here

Columns

50/50 columns can be created with:

```
.pull-left[
  Content 1
]
.pull-right[
  content 2
]
```

For left larger columns:

```
.pull-left1[
  Content 1
]
.pull-right1[
  content 2
]
```

Or right larger columns:

```
.pull-left2[
  Content 1
]
.pull-right2[
  content 2
]
```

Text position

Instead of using columns, you can define the content position with:

Left aligned

```
.left[text here]
```

Center aligned

```
.left[text here]
```

Right aligned

```
.left[text here]
```

Text size

And also text size:

```
.fontX[
  Content here
]
```

Where `X` can be anything between `10` (tiny) and `200` (HUGE) by an increent of `10`:

```
print(seq(10, 200, 10))
#  [1]  10  20  30  40  50  60  70  80  90 100 110 120 130 140 150 160 170 180 19
# [20] 200
```

Animation

Using -- between lines

- you
- can
- animate

Math

$\LaTeX$ math expressions can be writen between `$$`:

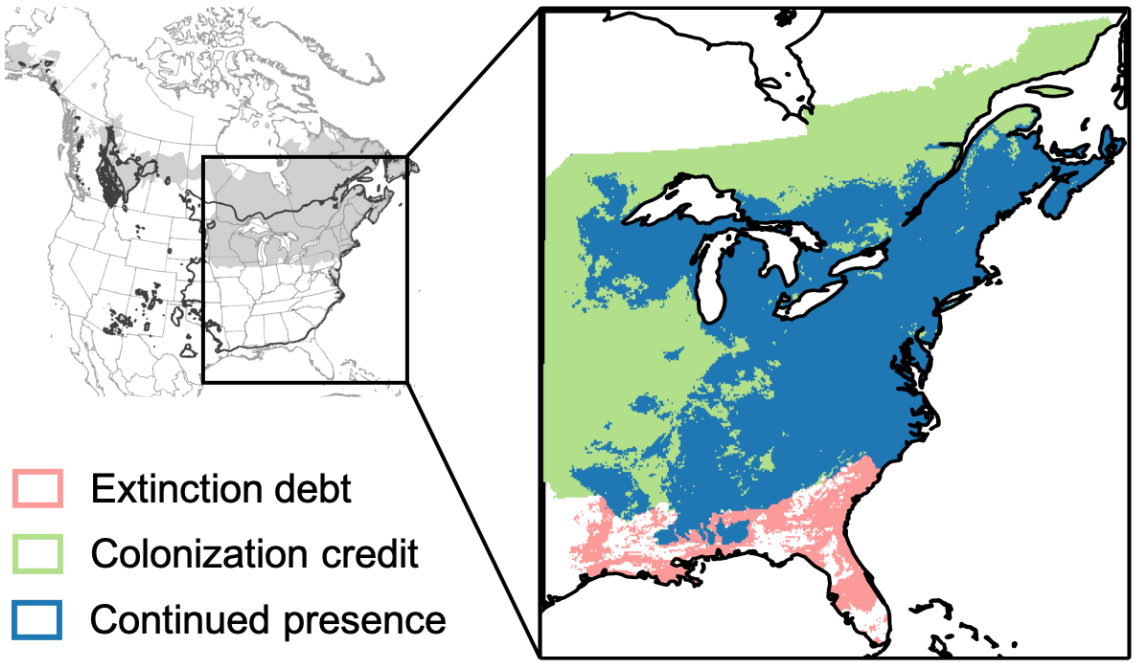
```
$$
  \bar{X}=\frac{1}{n}\sum_{i=1}^nX_i
$$
```

$$\bar{X}=\frac{1}{n}\sum_{i=1}^nX_i$$

Citation

This macro is just to easily insert text on the bottom of the slide:

```
.cite[Talluto et al. [2017](https://link) Nat. Ecol. Evol.]
```



Icons

You can use both Font awesome and Academicons icons

Font awesome icons (`faic`)

```
![:faic](pagelines)
```

Academic icons (`acid`)

```
![:acic](orcid)
```

You can also ajust their size with the following argument:

```
![:faic 2](pagelines)
```

{xaringanExtra}

{xaringanExtra}

This awesome R package provides enhancements for xaringan such as

> - Add an overview of your presentation with tile view
> - Make your slides editable
> - Announce slide changes with a subtle tone
> - Animate slide transitions with animate.css
> - Add tabbed panels to slides with panelset
> - Add a logo to all of your slides with logo
> - Use the Tachyons CSS utility toolkit
> - Add a live video feed of your webcam
> - Fit your slides to fill the browser window
> - Add extra CSS styles

Take a look in their full documentation here

I added some examples in the following slides...

`{xaringanExtra}` tile view

Press the letter "o" 😳

{xaringanExtra} Editable slides

Just use the following class:

```
.can-edit[ ... ]
```

What do you think?

-

{xaringanExtra} Panelset

Code Plot How?

```
x = rnorm(100, 10, 4)
y = rnorm(100, 2, 1)
```

libraries

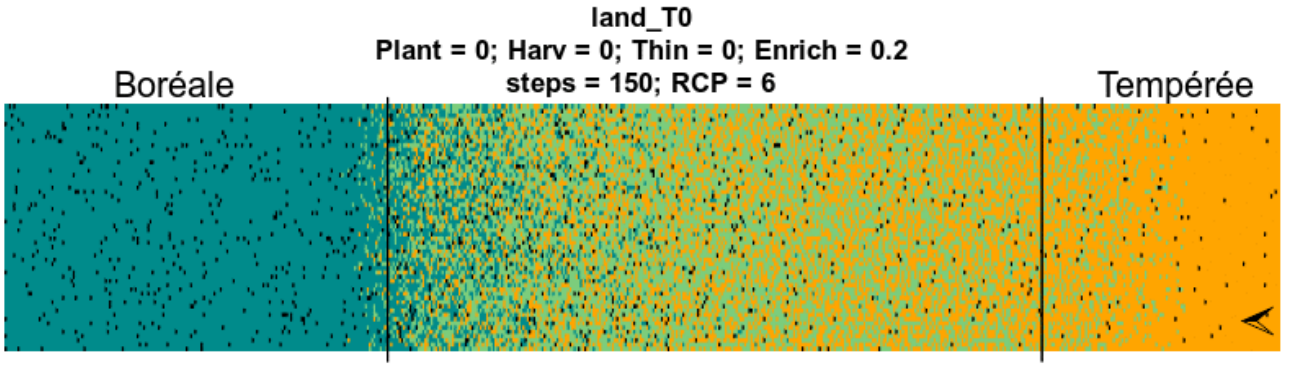
Gifffer

> Gifffer prevents the autoplaying of the animated Gifs

Instead of adding a gif with the same syntax of an image (which plays automatically), you can use the `giffer` JS macro:

```
![:giffer 80%](images/RCP6_enrich.gif)
```

Where `80%` is the width of the gif



More ressources

You can check the `xaringan` presentation (which this template relies on):

https://slides.yihui.org/xaringan/#1

And also check all remark.js fonctionalities available in this template:

https://remarkjs.com/#1

Key message here

Special thanks to

Nice people