中国科学院南京地理与湖泊研究所
Nanjing Institute of Geography & Limnology.Chinese Academy of Sciences

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WET模型
模块化构建原理与应用

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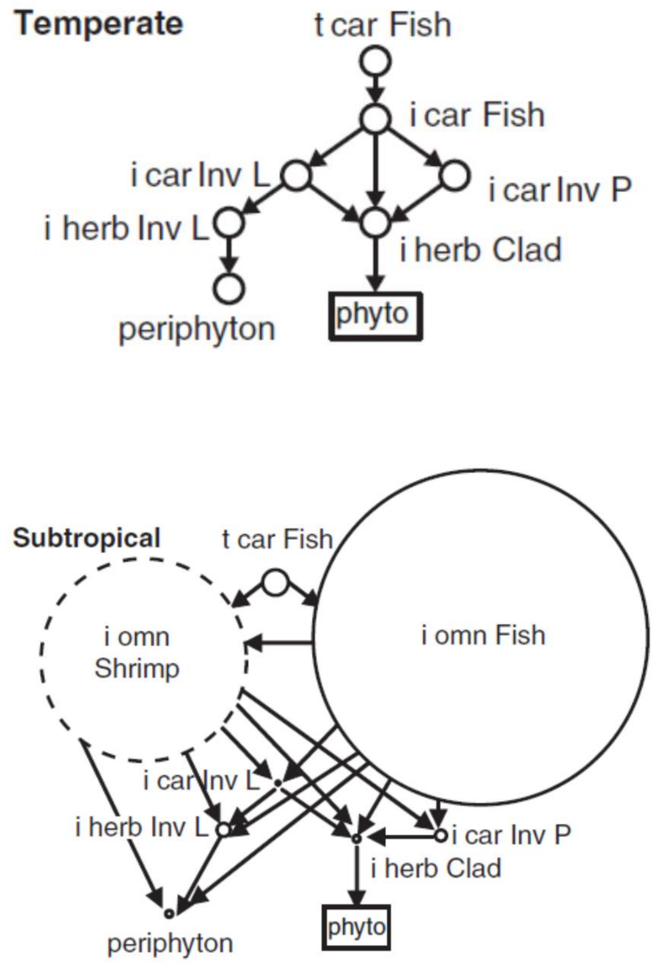
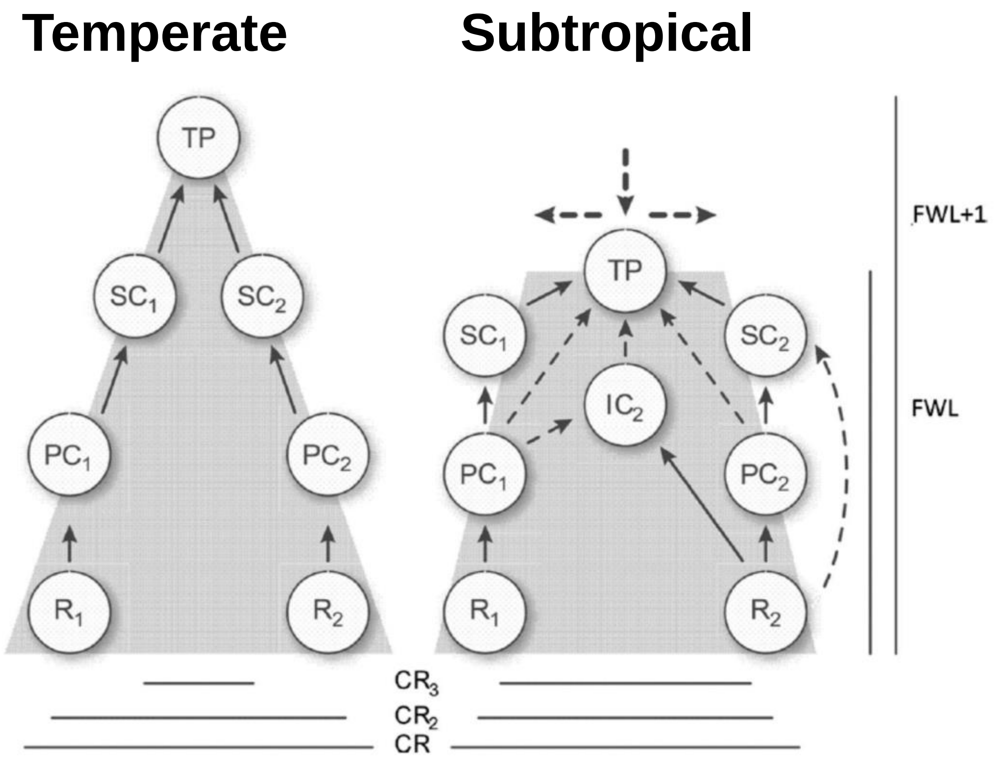
2024年10月14日-16日

江苏 南京



Meerhoff et al (2007) Global Change Biol.

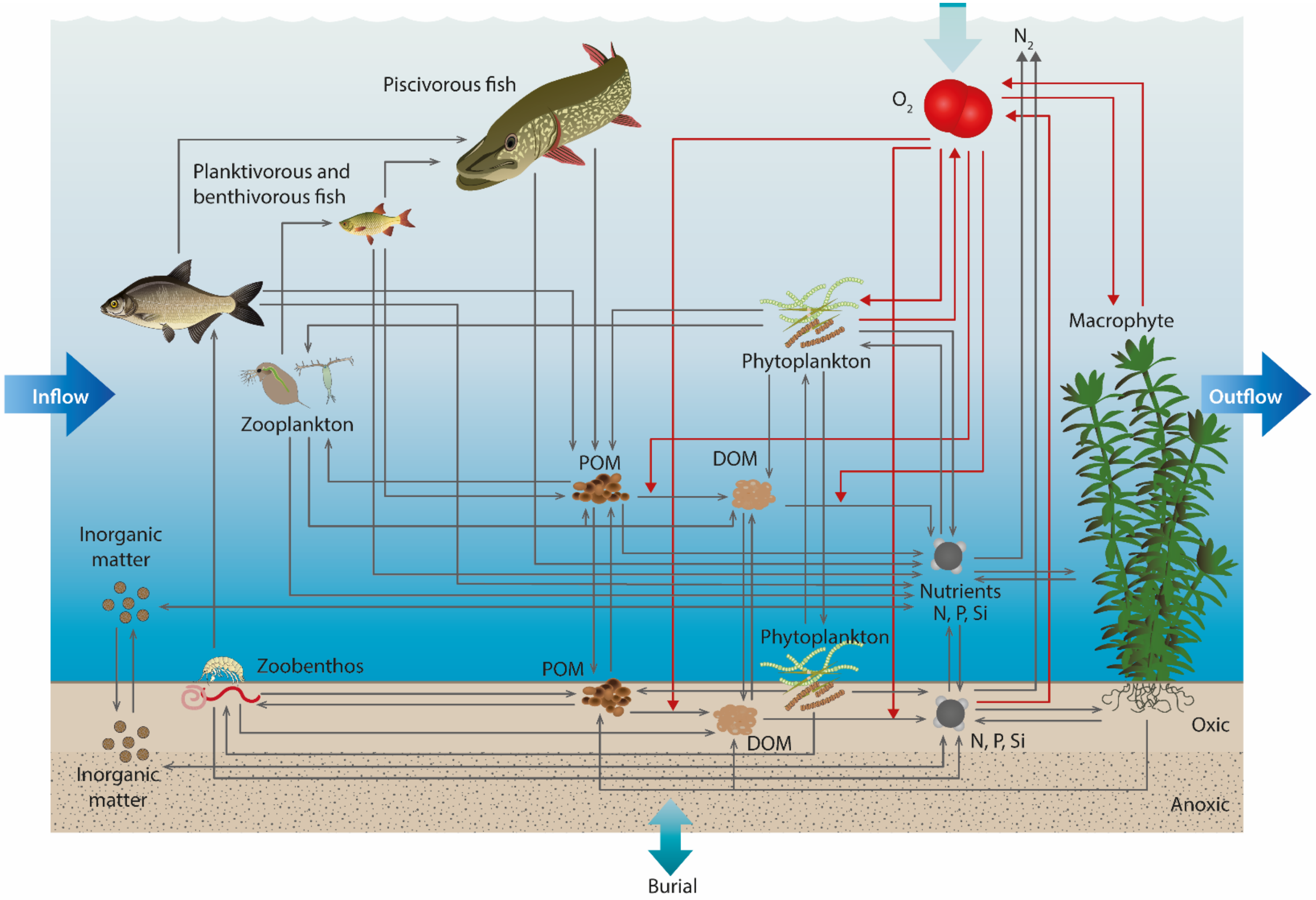


Conceptual model from stable isotope analysis

Iglesias et al (2016) Hydrobiologia

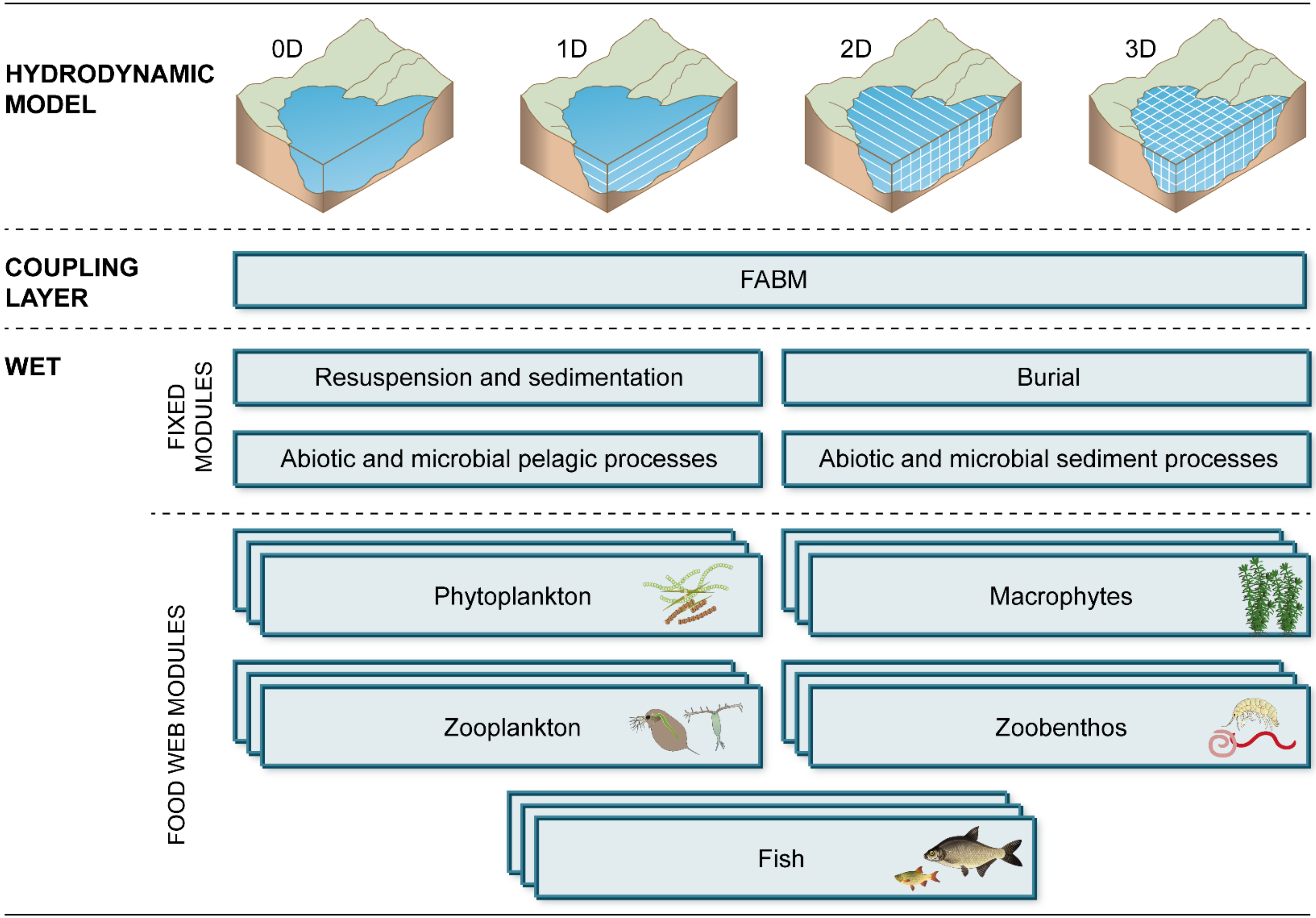
WET (Water Ecosystems Tool)

The configuration of the conceptual ecosystem model is flexible, but by default it describes interactions between multiple trophic levels, including piscivorous, zooplanktivorous and benthivorous fish, zooplankton, zoobenthos, phytoplankton and rooted macrophytes. The ecosystem model also accounts for oxygen dynamics and a fully closed nutrient cycle for nitrogen and phosphorus.



WET conceptual model from Schnelder-Meyer et al. in prep.
Model developed by AU.

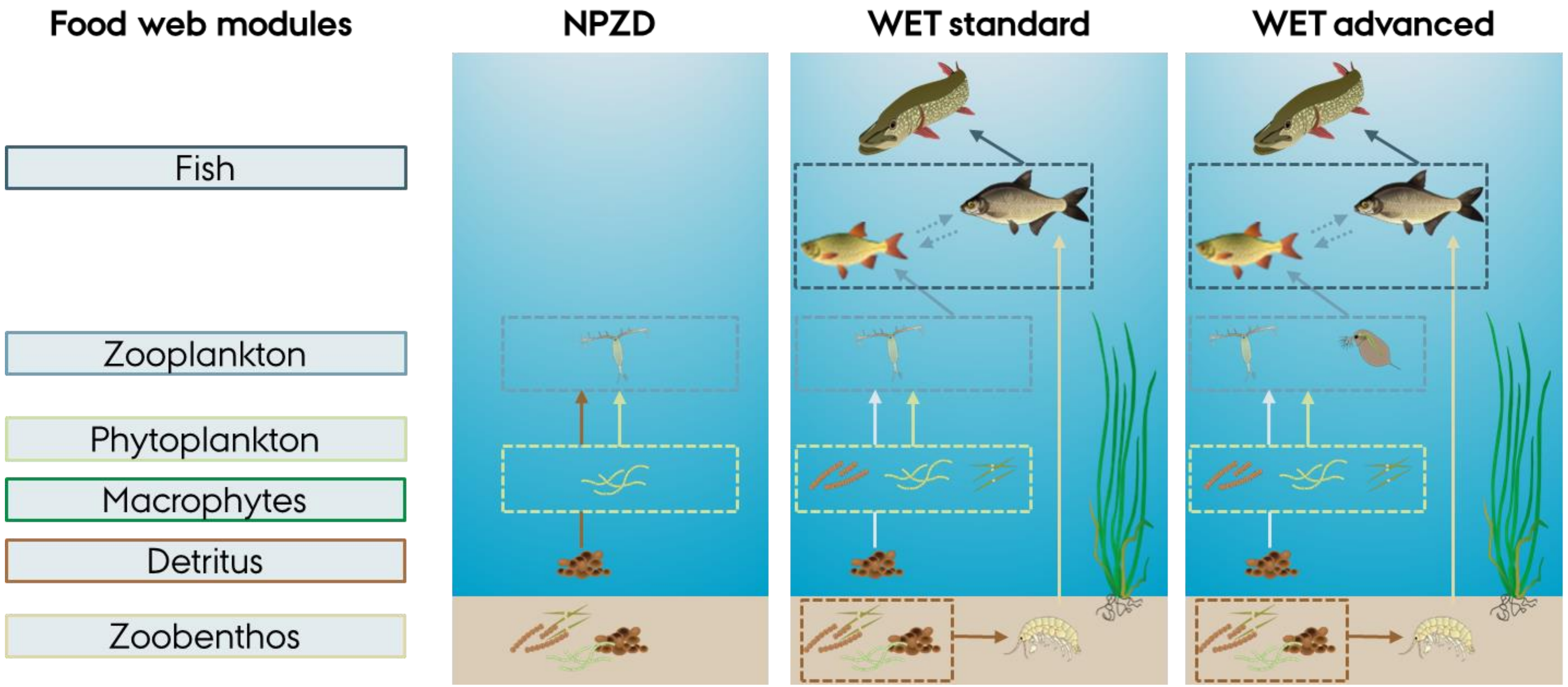
WET allows for flexible model configuration



4 fixed modules

5 food web modules

WET food web configurations



如何增加一个变量

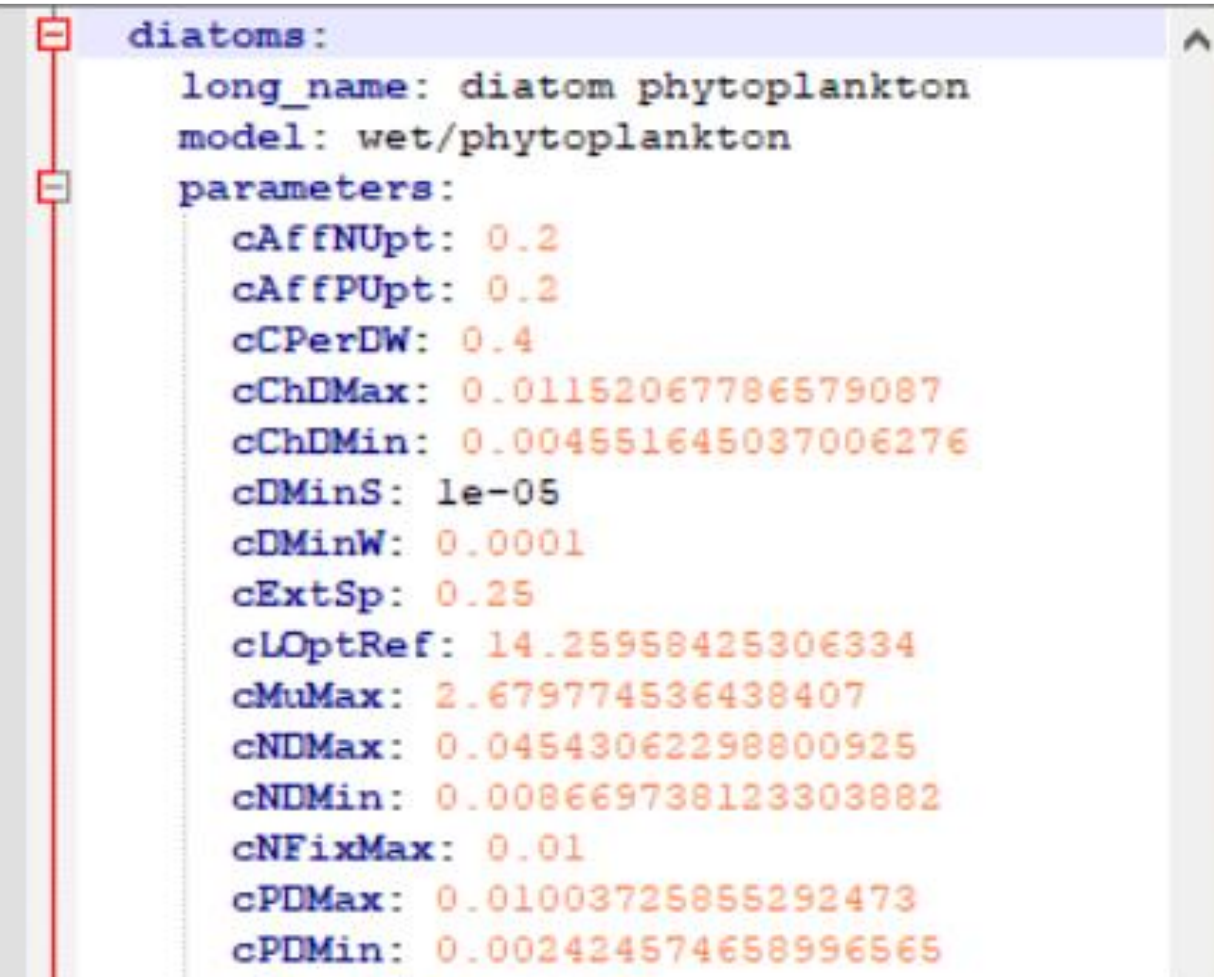
1. First, copy the lines for an existing species in the configuration file and then change the name of the copy instance.

2. Secondly, one would go through the **couplings and parameters sections** in the new instance, modifying these to fit the desired organism.

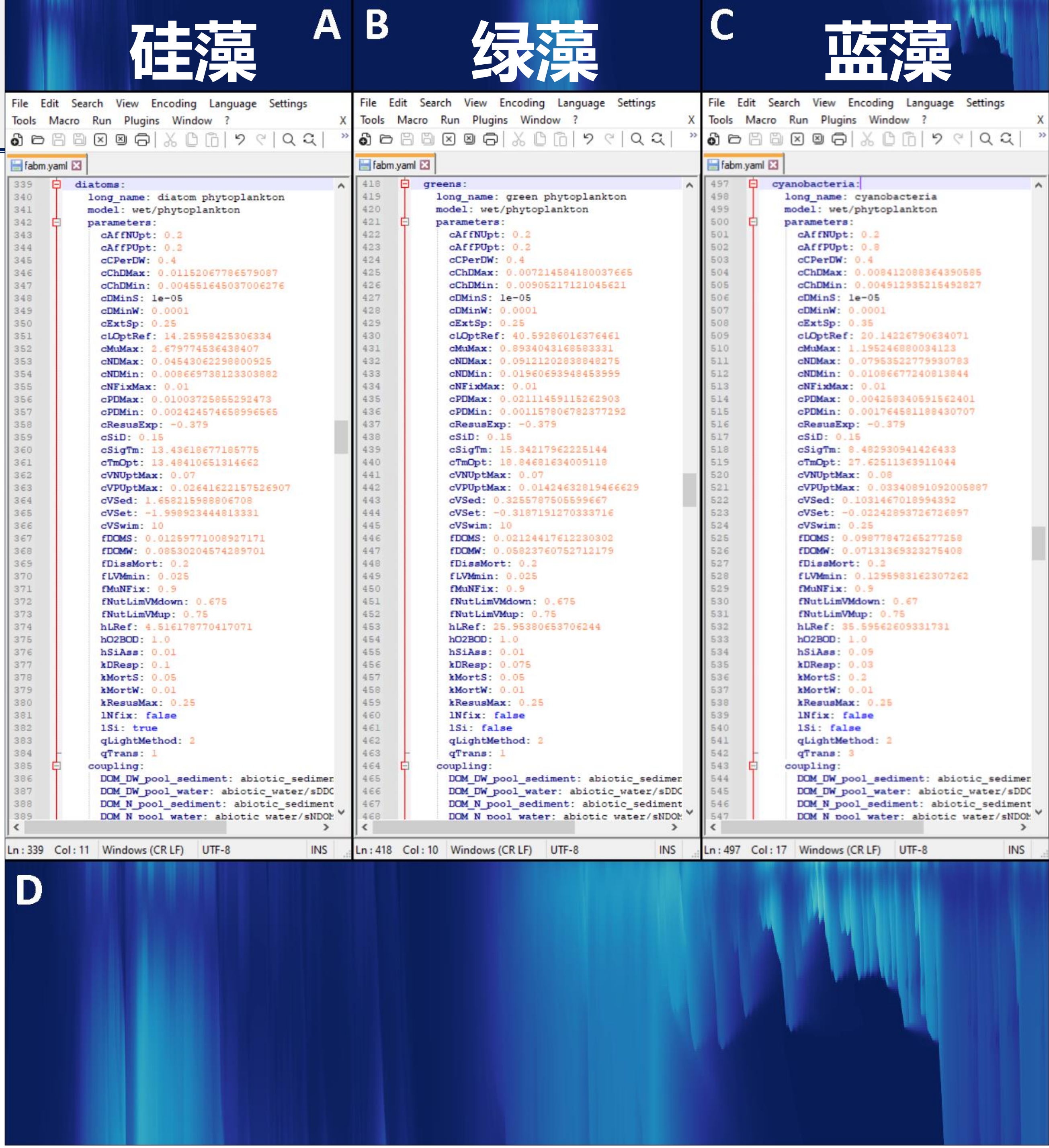
3. Finally, one would modify the instances of any predators to include the new instance in their diets.

Thus, adding or subtracting instances to a model setup is relatively easy, and testing for the optimal food web configuration in a specific case is possible, if not usually feasible, by **calibrating several different module setups and comparing their performance.**

Phytoplankton



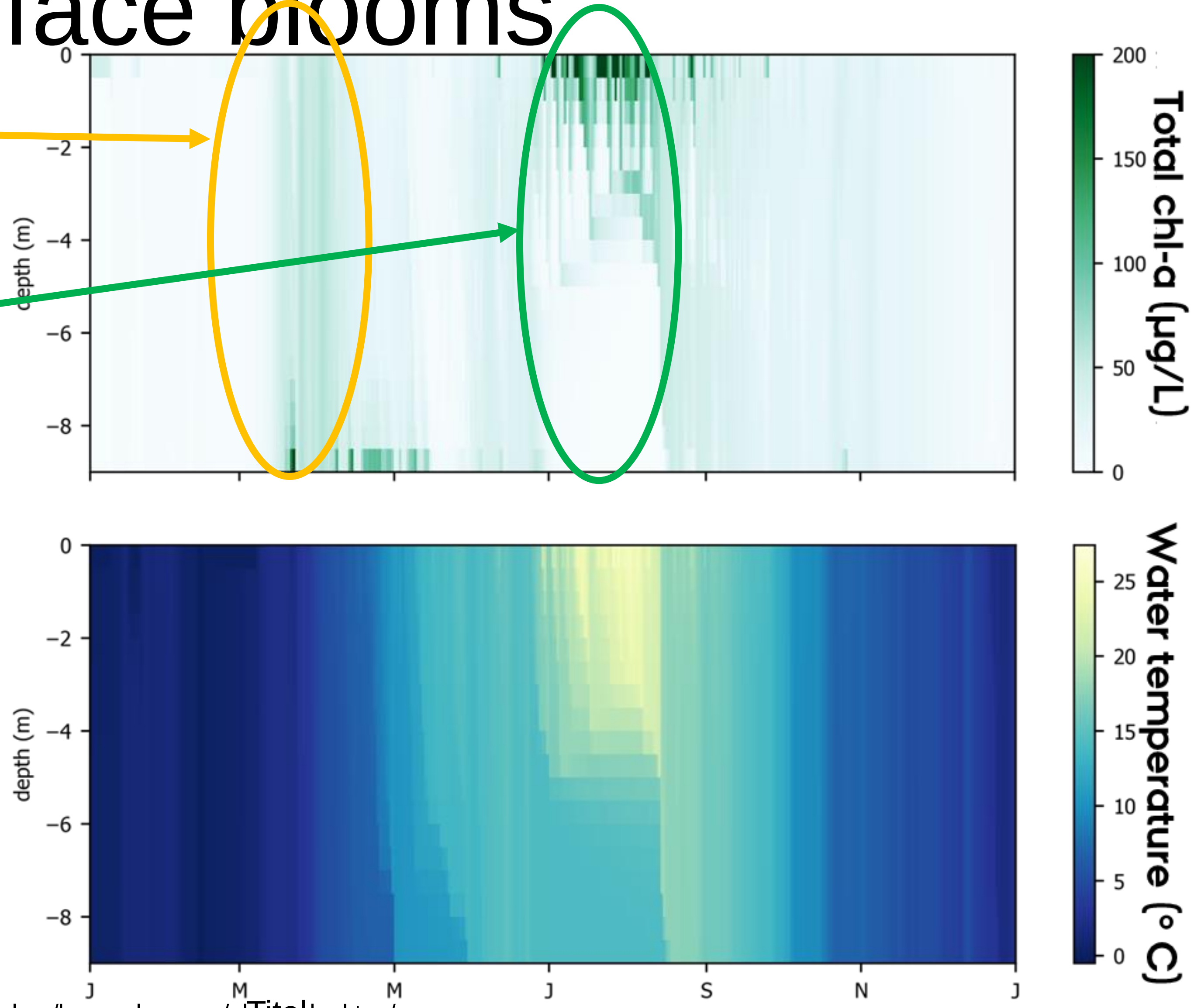

```yaml
diatoms:
  long_name: diatom phytoplankton
  model: wet/phytoplankton
  parameters:
    cAffNUpt: 0.2
    cAffPUpt: 0.2
    cCPerDW: 0.4
    cChDMax: 0.01152067786579087
    cChDMin: 0.004551645037006276
    cDMinS: 1e-05
    cDMinW: 0.0001
    cExtSp: 0.25
    cLOptRef: 14.25958425306334
    cMuMax: 2.679774536438407
    cNDMax: 0.04543062298800925
    cNDMin: 0.008669738123303882
    cNFixMax: 0.01
    cPDMax: 0.01003725855292473
    cPDMin: 0.002424574658996565
```

WET can simulate cyanobacteria surface blooms

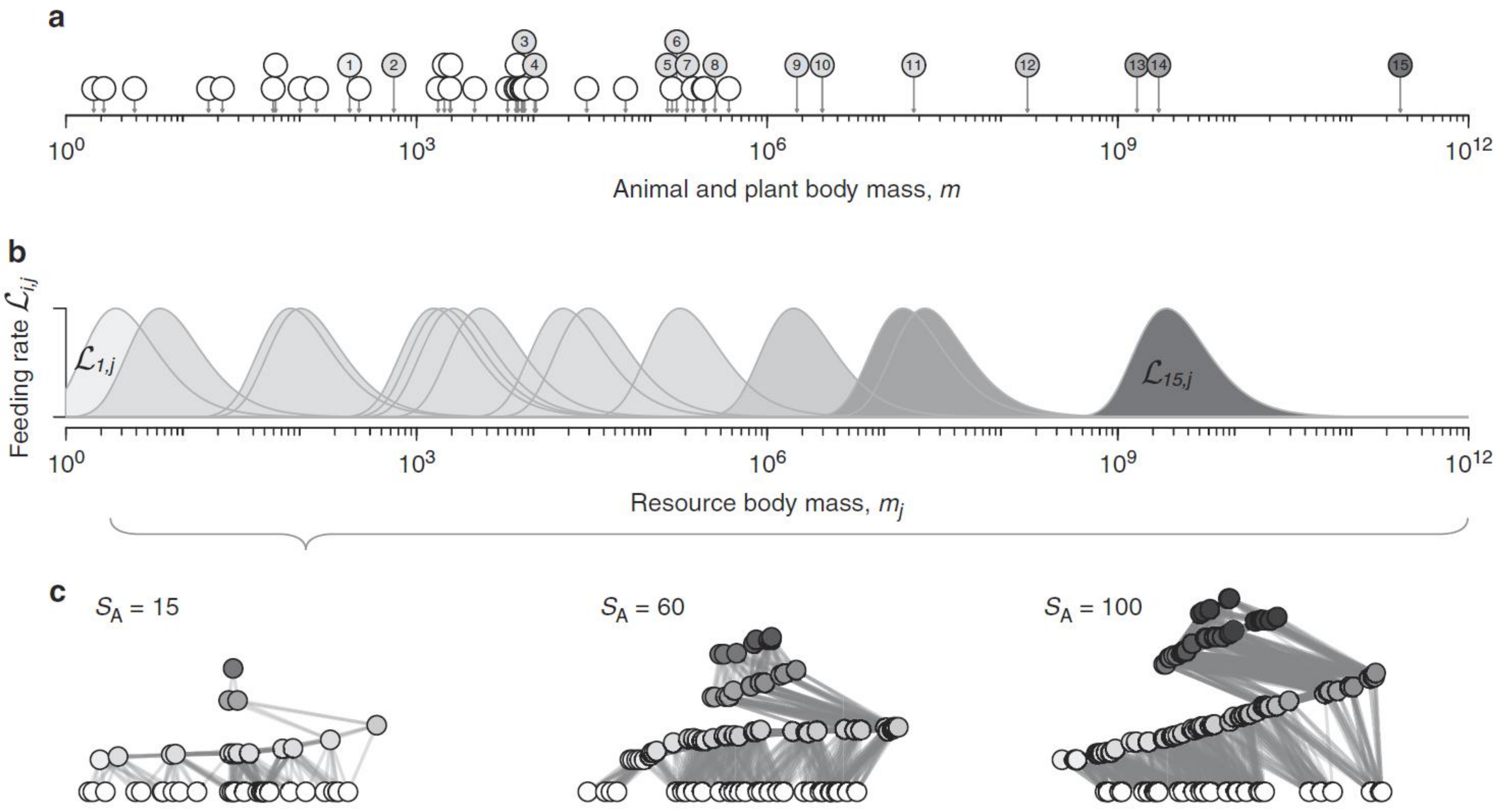
Diatom bloom
Passive settling

Cyanobacteria surface bloom
Active upward swim



Cyanobacteria surface blooms occur frequently in Danish Lake Bryrup.

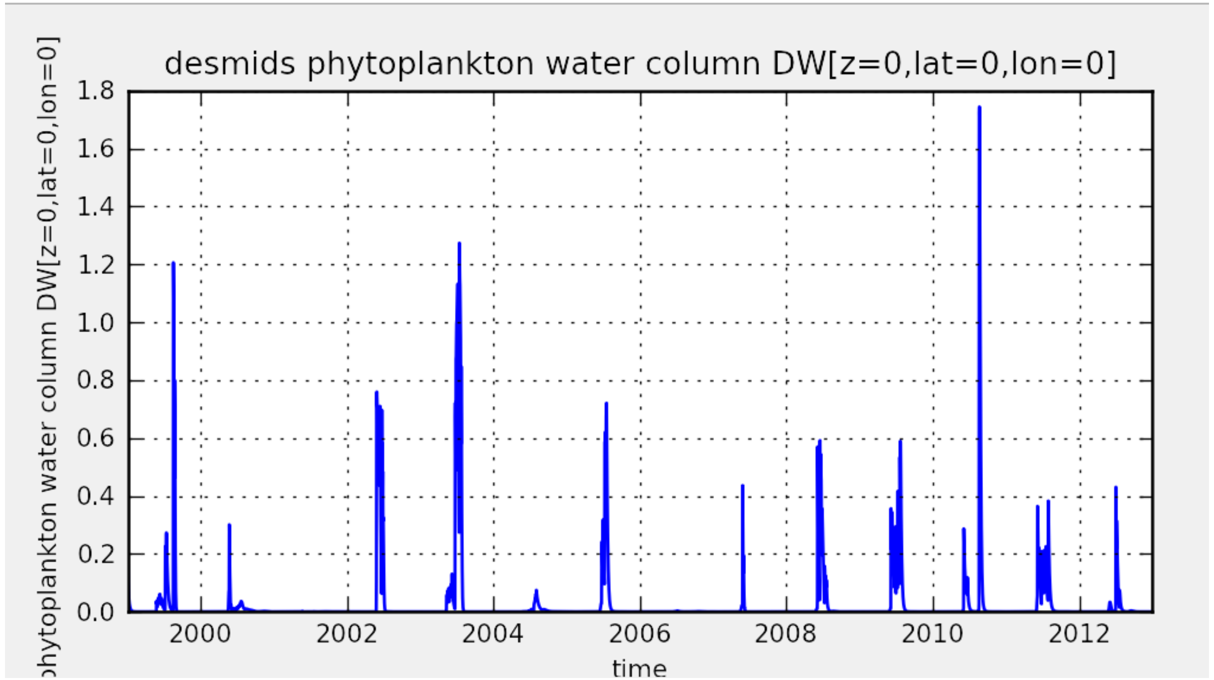
Photo by the Danish EPA.
https://mst.dk/natur-vand/overvaagning-af-vand-og-natur/lokalitetsbeskrivelser/bryrup-langsoe/planteplankton/



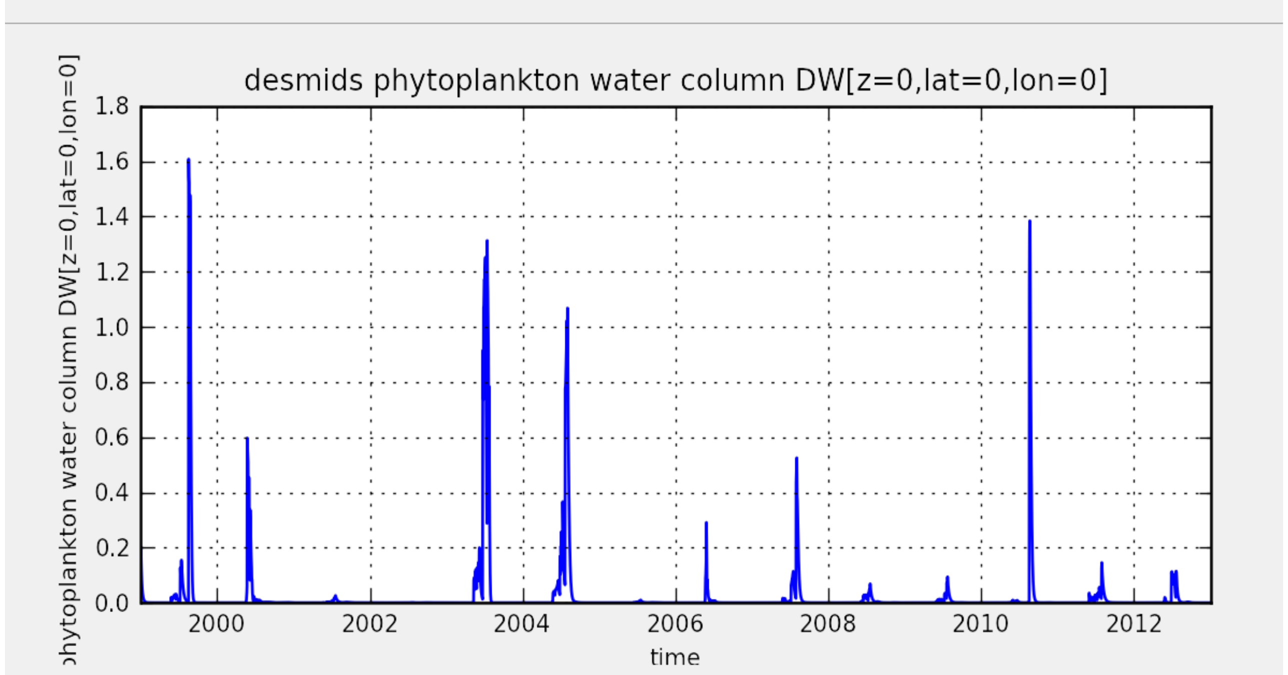
Schneider et al., 2016 Nat Comm.

Desmid （带藻）

Original

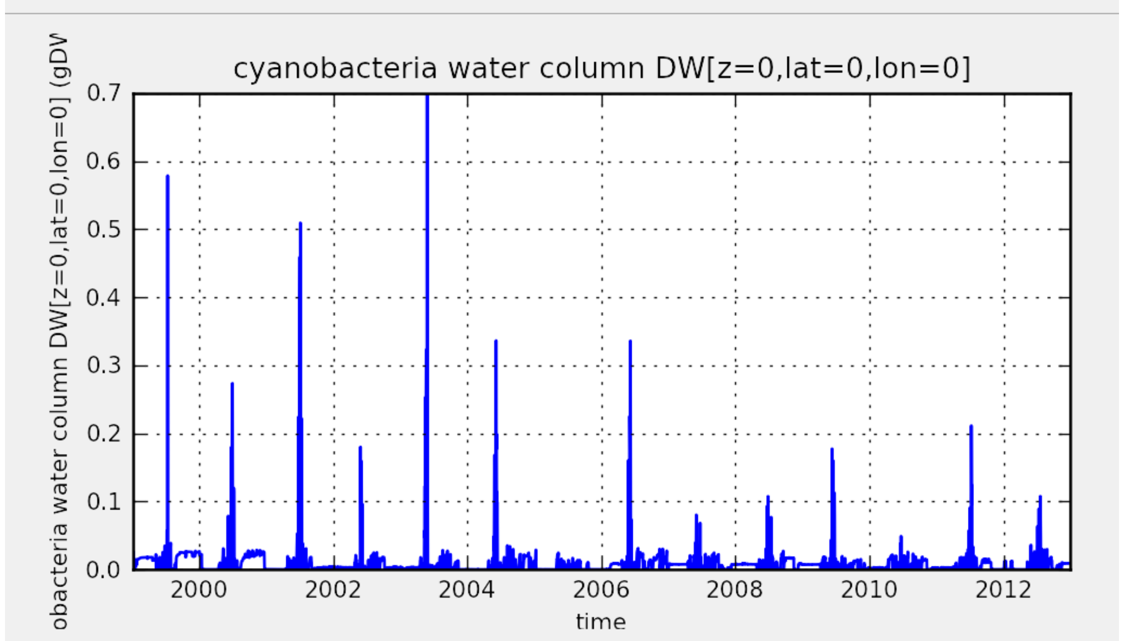


Add dinoflagellatas

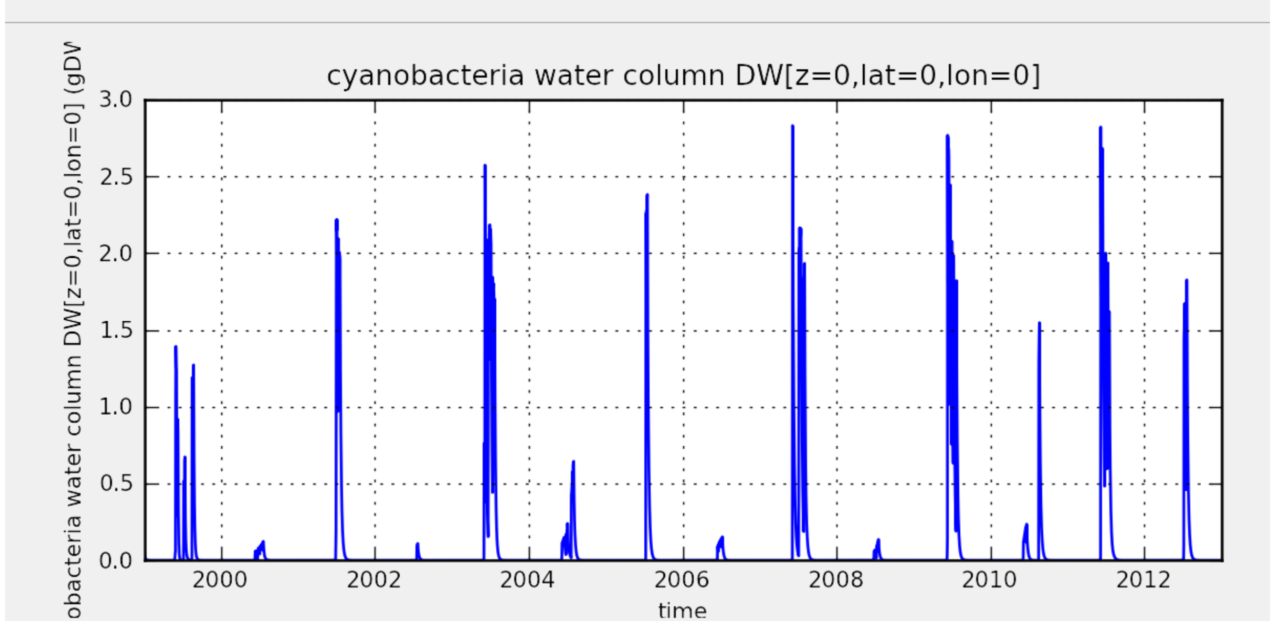


蓝藻

Original



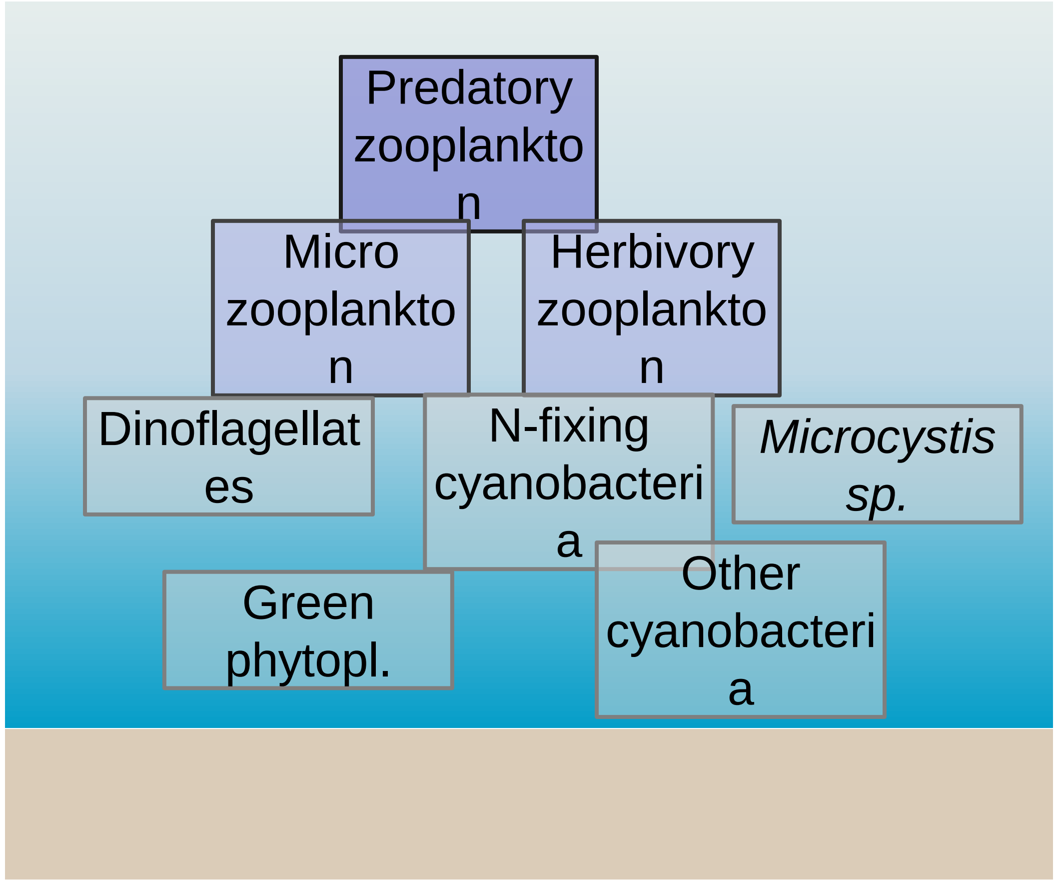
Fish removal



CSPS framework: a WET example

Regev, Carmel, Gal (2023)
Environ. Model. Softw.

Modelling Lake Kinneret (Sea of Galilee), a warm monomictic lake



GMD paper WET

Geosci. Model Dev., 15, 3861–3878, 2022
https://doi.org/10.5194/gmd-15-3861-2022

Geoscientific
Model Development
Open Access
EGU

Water Ecosystems Tool (WET) 1.0 – a new generation of flexible aquatic ecosystem model

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