

# BIOMONDO



## Towards Earth Observation supported monitoring of freshwater biodiversity

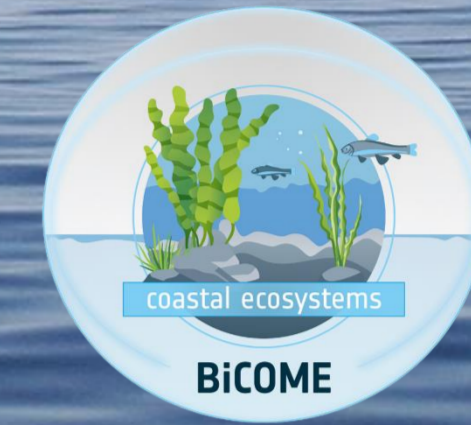
The European Space Agency (ESA) activity called Biodiversity+ Precursors is a contribution to the joint EC-ESA Earth System Science Initiative launched in February 2020 to jointly advance Earth System Science and its response to the global challenges that society is facing at the onset of this century. BIOMONDO is the ESA Biodiversity+ Precursor project focused on freshwaters and biodiversity in lakes and rivers.



Project partners



ESA Biodiversity+ Precursors



## BIOMONDO Pilots

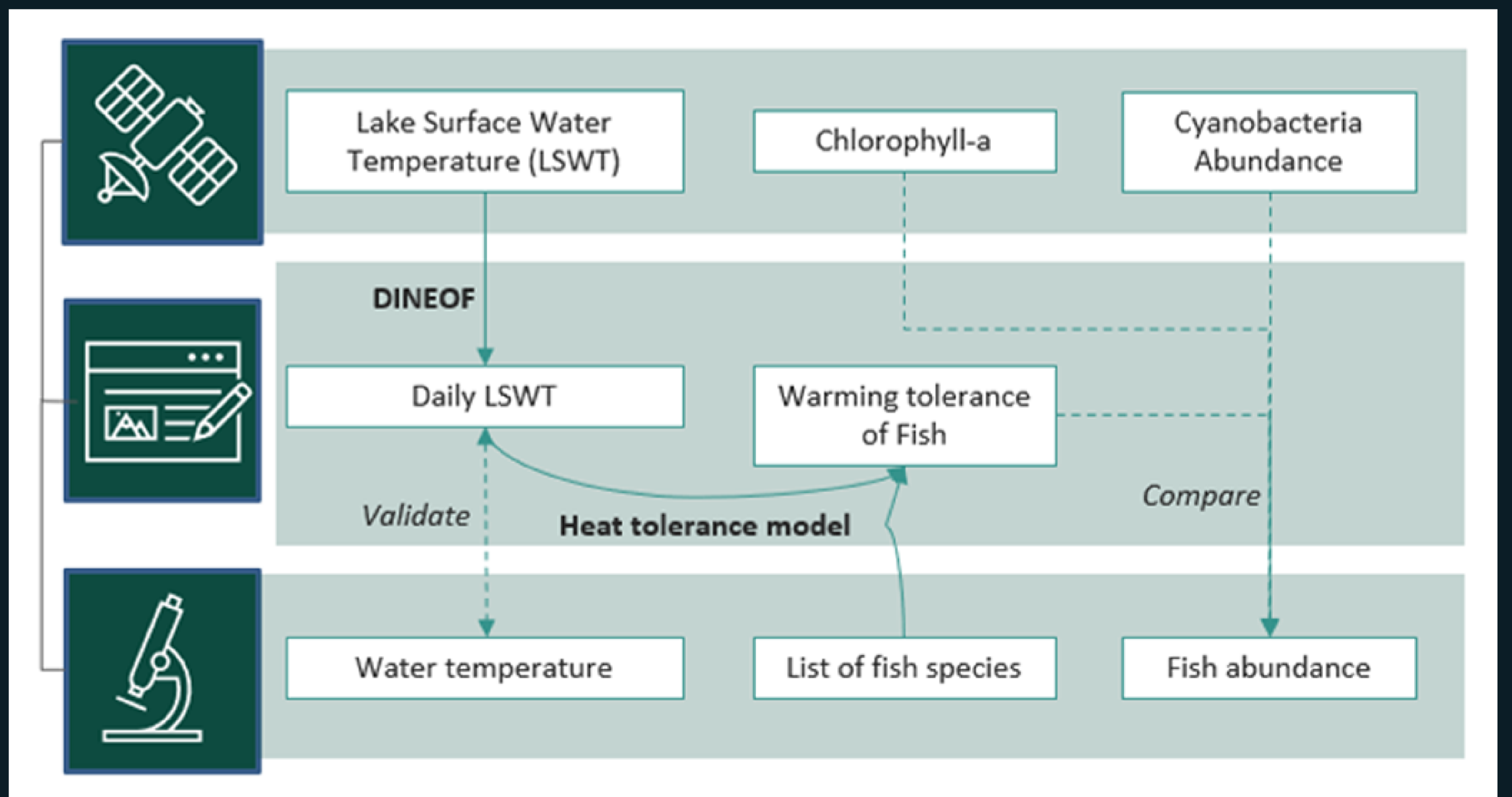
The purpose of the biodiversity pilot studies is to explore if Earth Observation products in combination with models and in situ data can support freshwater biodiversity monitoring and management.

### ► Pilot 1 – Eutrophication

Exploring the impact of eutrophication and other habitat changes on the water quality.

### ▼ Pilot 2 – Heat tolerance

Exploring the impact of changes in water temperature and heat waves on freshwater fish diversity.



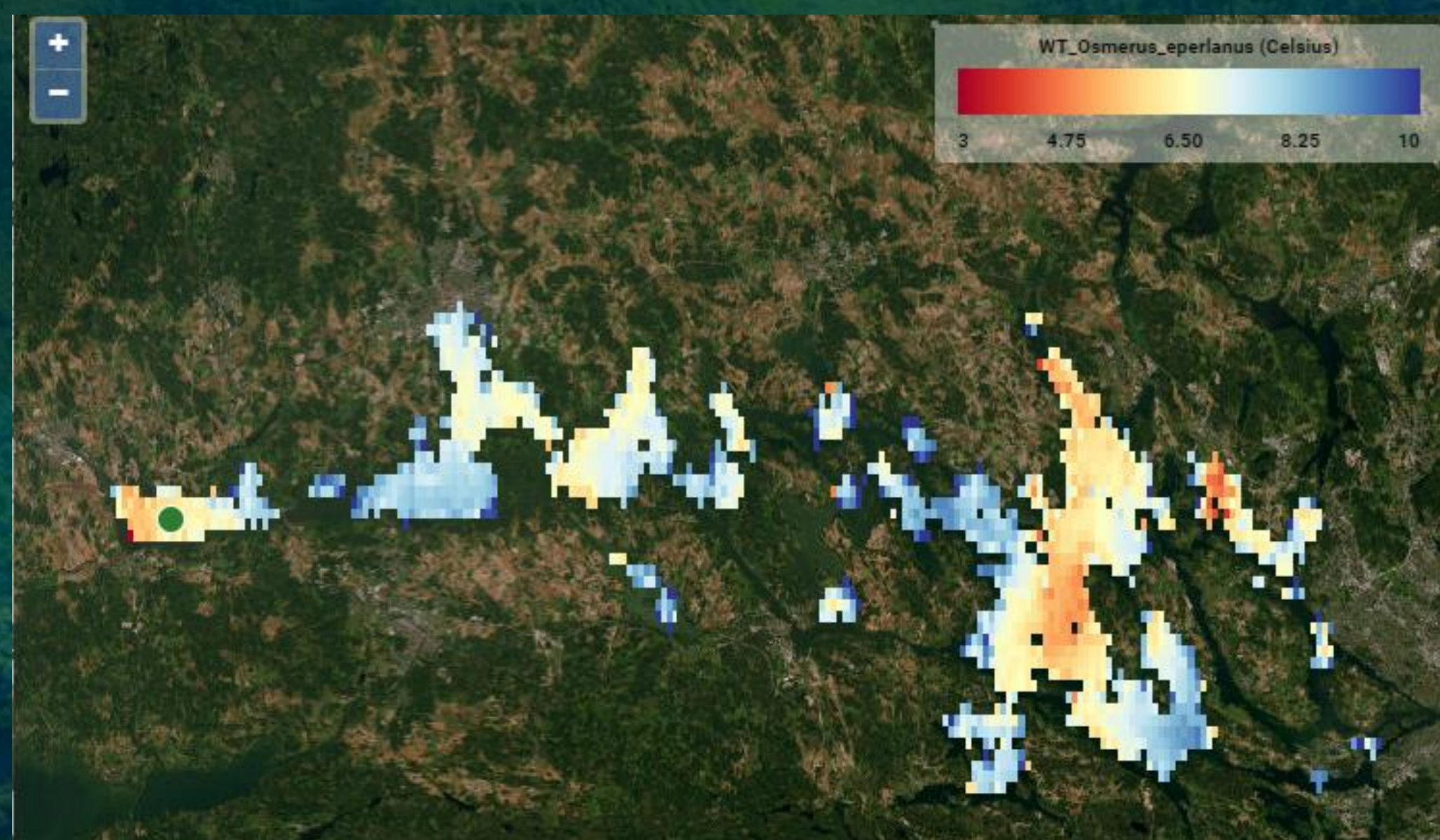
### ► Pilot 3 – Connectivity

Monitoring river connectivity effect by dams, and their changes and impact on biodiversity.

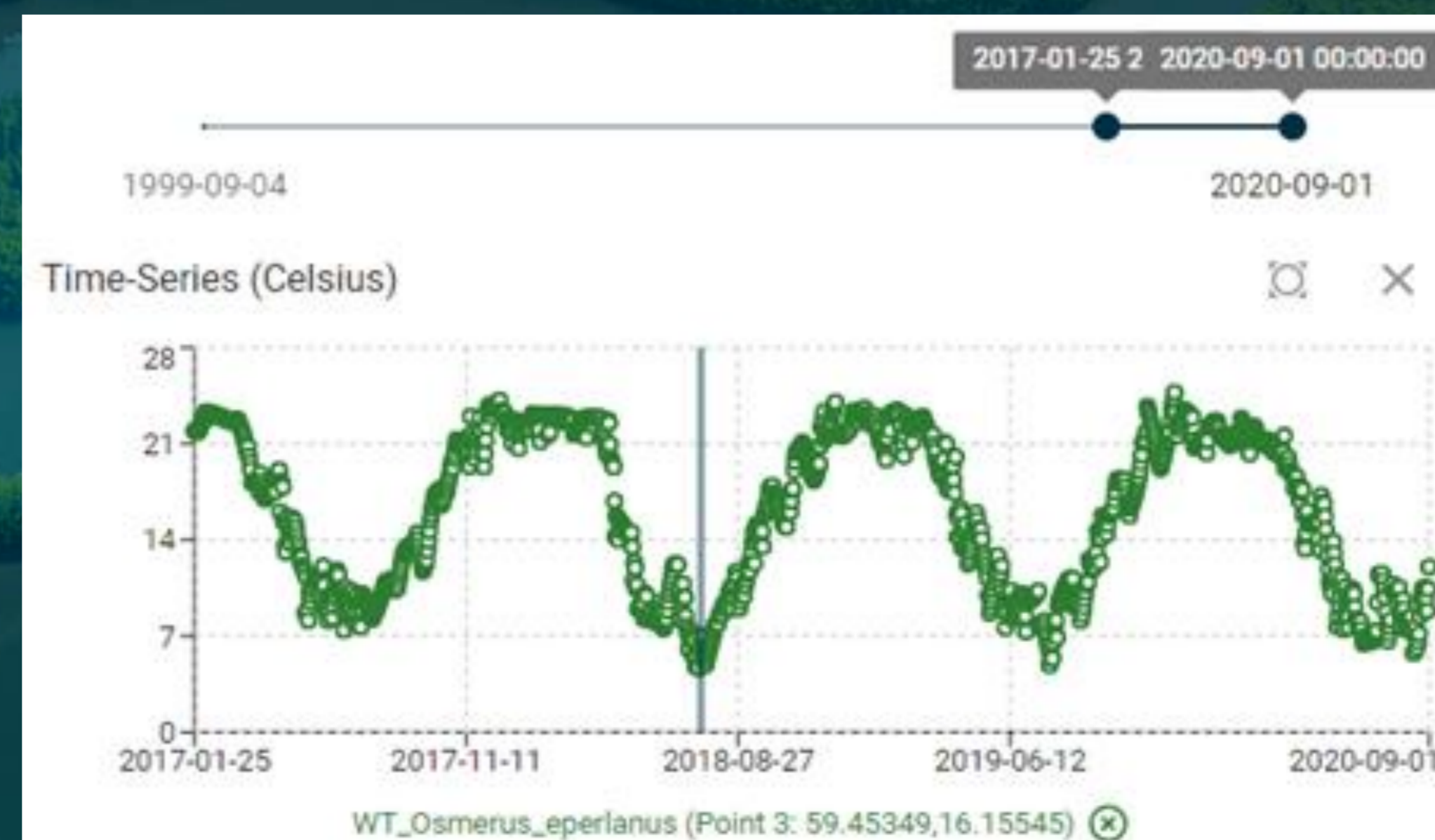
## EO products for estimation of fish warming tolerance

### Warming tolerance

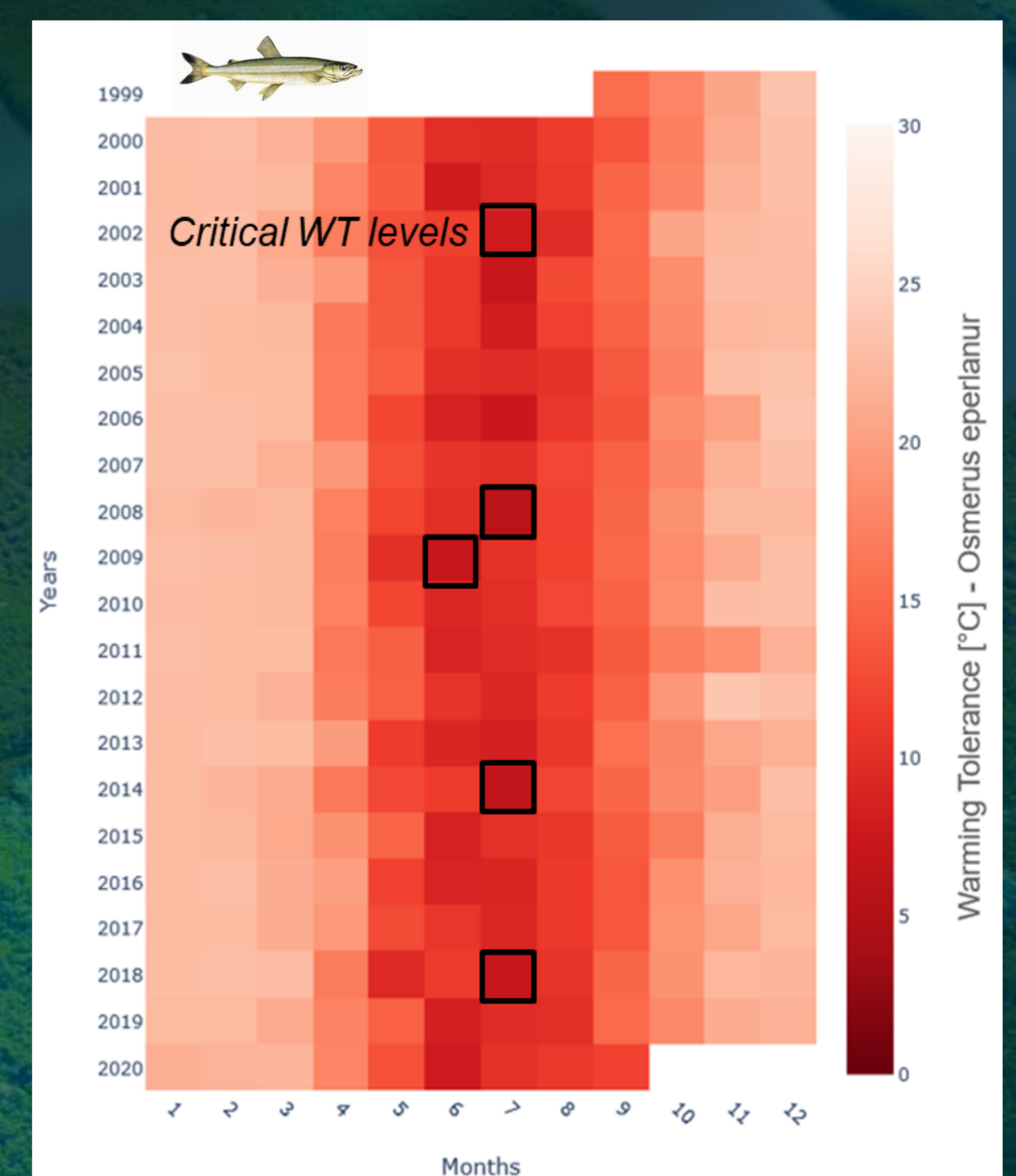
A novel phylogenetic *Heat Tolerance (HT)* model has been developed by Netherlands Environmental Assessment Agency (PBL). The model is based on published experimental data and estimates heat tolerance for listed species in a lake. The difference between the modelled HT and the current water temperature, given by EO based Lake Surface Water Temperature (LSWT) products, is called *Warming Tolerance*. Negative or low warming tolerance values indicates that critical temperature conditions prevail for the investigated species and that death can occur or that growth, reproduction, immunity, and the ability to cope with additional stressors can be affected.



Calculated warming tolerance for *Osmerus eperlanus* (European smelt) in Lake Mälaren, Sweden, on 2018-07-19.



4 yrs time series of warming tolerance for *Osmerus eperlanus* (European smelt) in Lake Mälaren, Sweden.



Heatmap showing the average monthly warming tolerance between 1999-2020 for *Osmerus eperlanus* (European Smelt) in Lake Mälaren, Sweden.