Introduction to Ecological Assessment of Marine Environments

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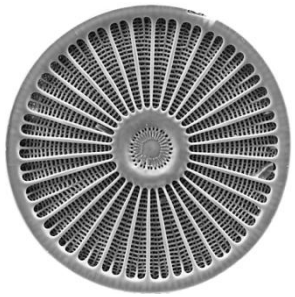
Presentation 2

To understand better ideas behind ecological assessment we should also define the concept of ecological tolerance…

…and to step back to the beginings of ecological studies.



In 1840 Justus von Liebig suggested:

…a growth of a plant depends on that one required nutritional factor that is in the shortest supply.

Under „nutritional factor” are hidden: water, nitrogen, phosphorus, potassium and othr macro- and microelements.

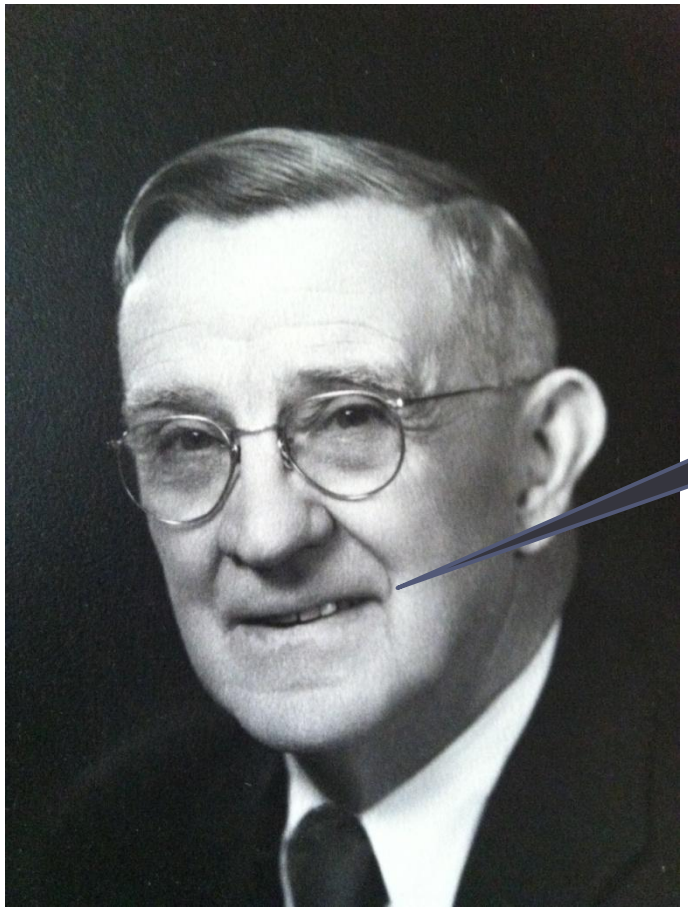
This is known as a „Liebig’s Low of the Minimum”

In 1911 Victor Ernest Shelford stated that:

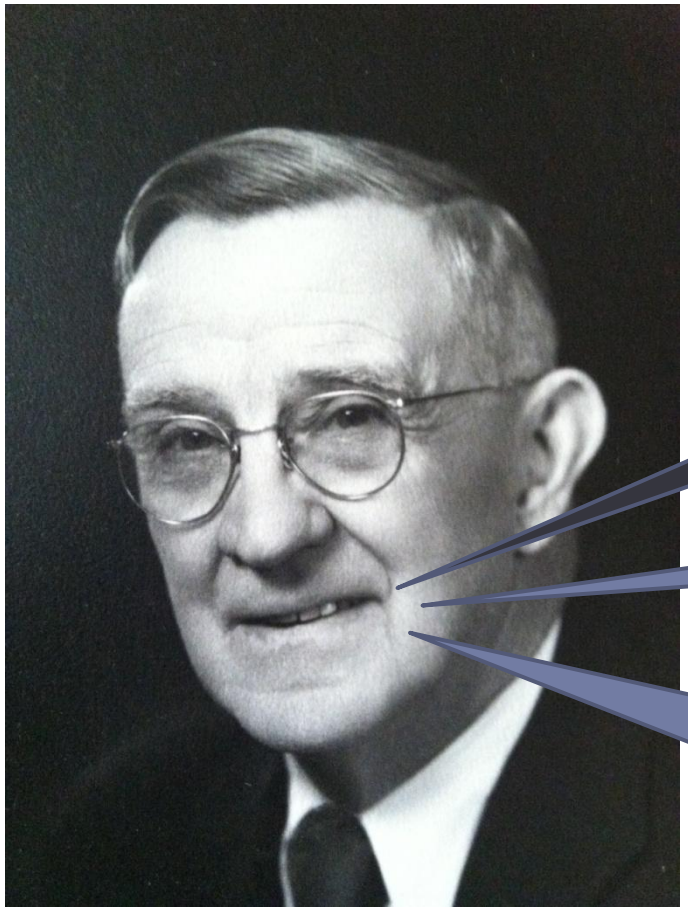
… any excess od environmental factor may reduce an organism's ability to survive, just as the scarcity of a required factor may do.

In other words, an organism has a limit of tolerance for any of environmental factors.

This is known as a „ Shelford's Law of Tolerance"



Can you give any example of environmental factor essential in aquatic environment?

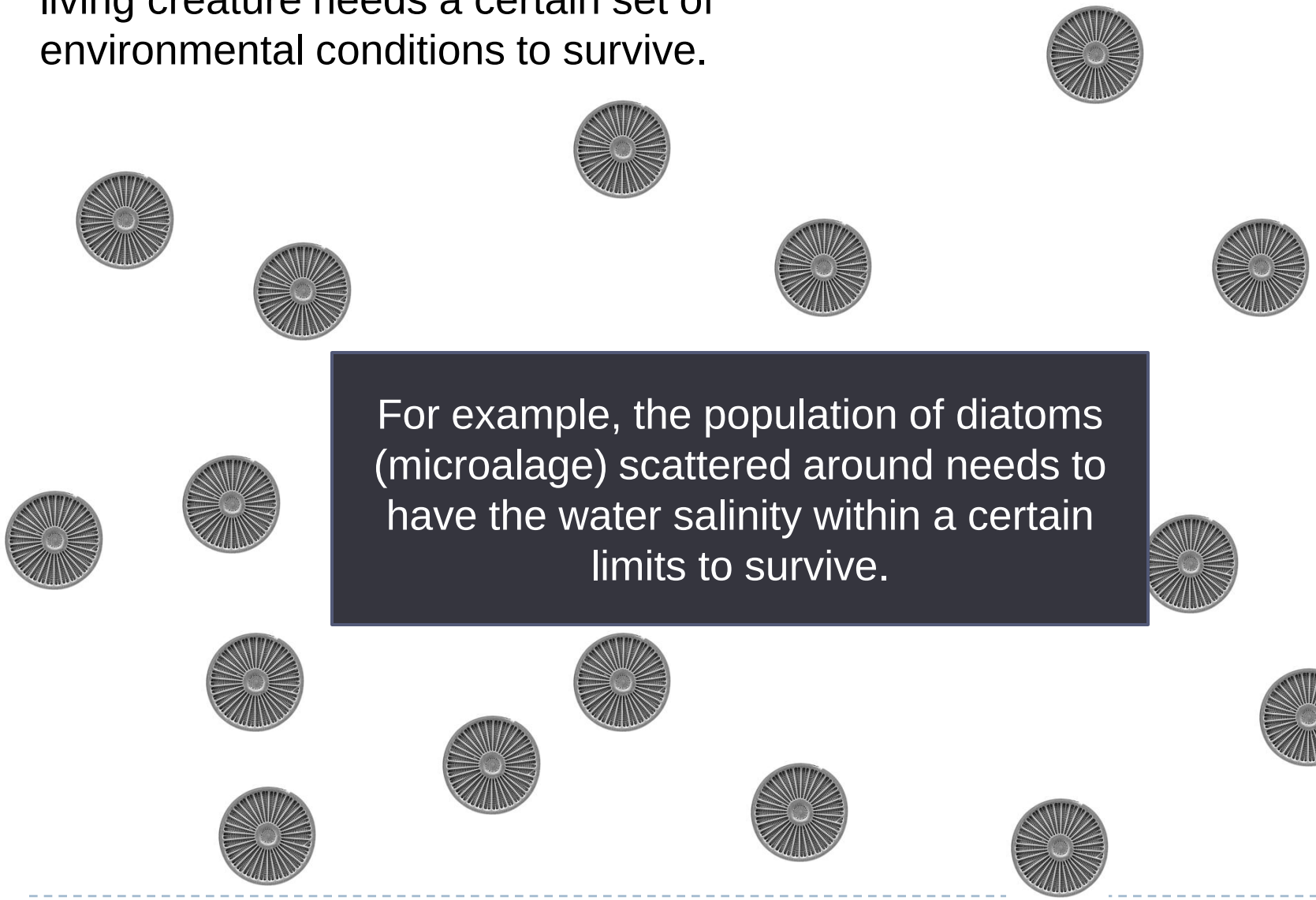


That is right, it can be: temperature, salinity, pH, oxygen content, nutrients content etc.

It is time for the next question…

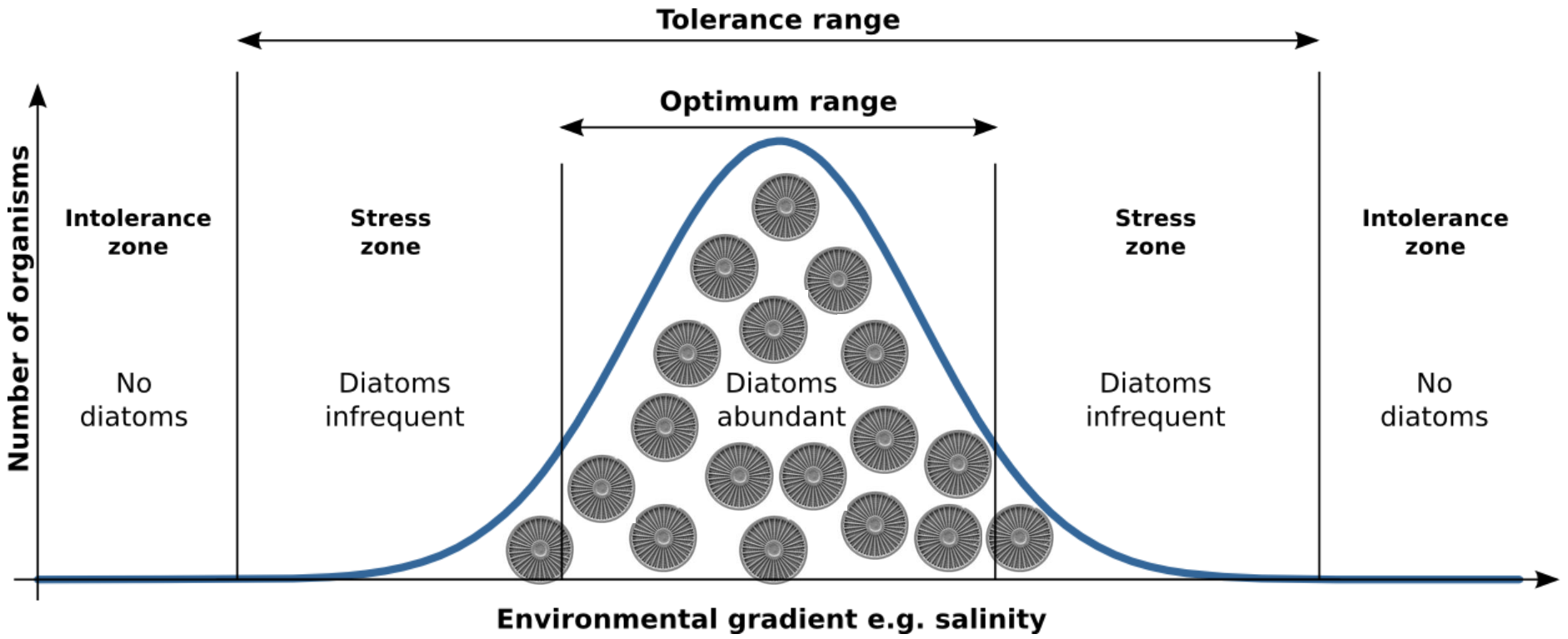
Do you know how range of organisms' tolerance is described and illustrated?

Each species of animal, plant, or any living creature needs a certain set of environmental conditions to survive.



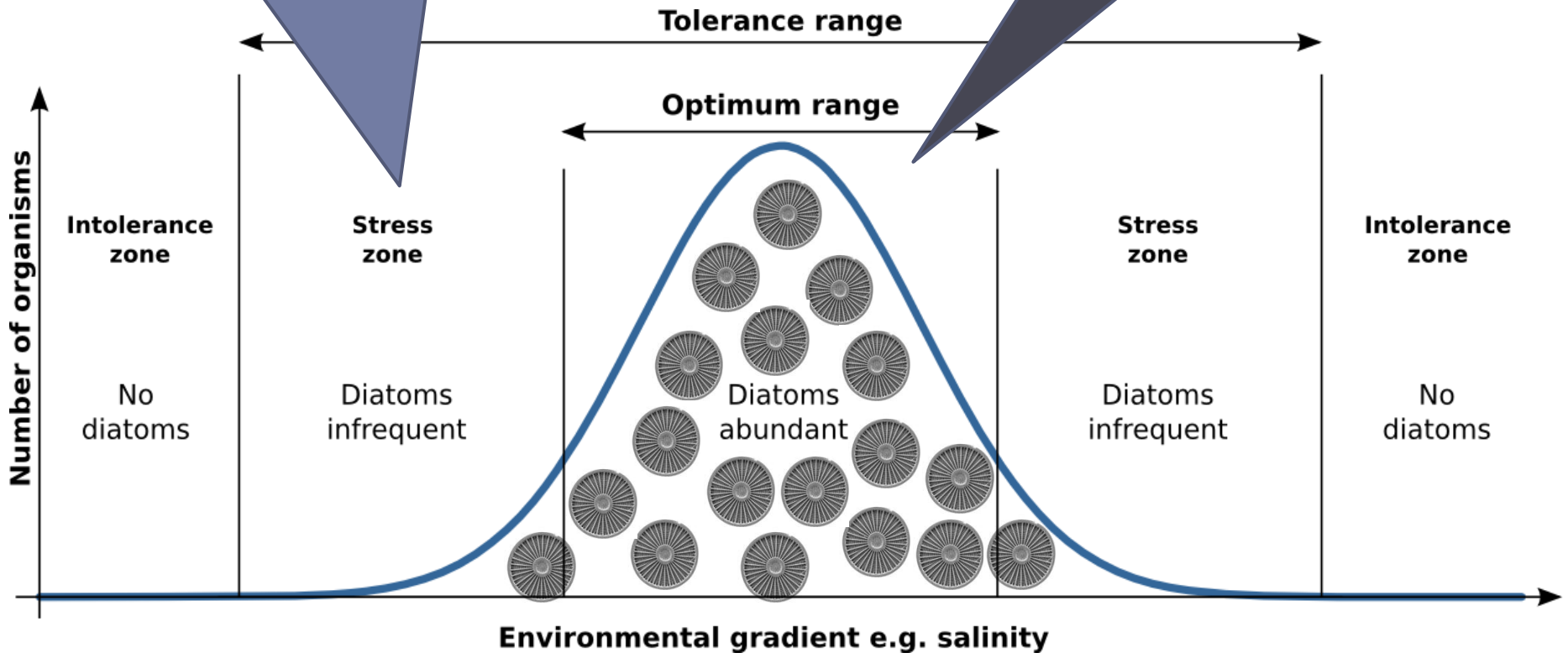
For example, the population of diatoms (microalage) scattered around needs to have the water salinity within a certain limits to survive.

The range of tolerance describes the conditions needed for the population, not the individual. Because, just like people, not every diatom in the population likes exactly the same salinity. And not every diatom can survive extreme salinities at the edge of the range of tolerance.

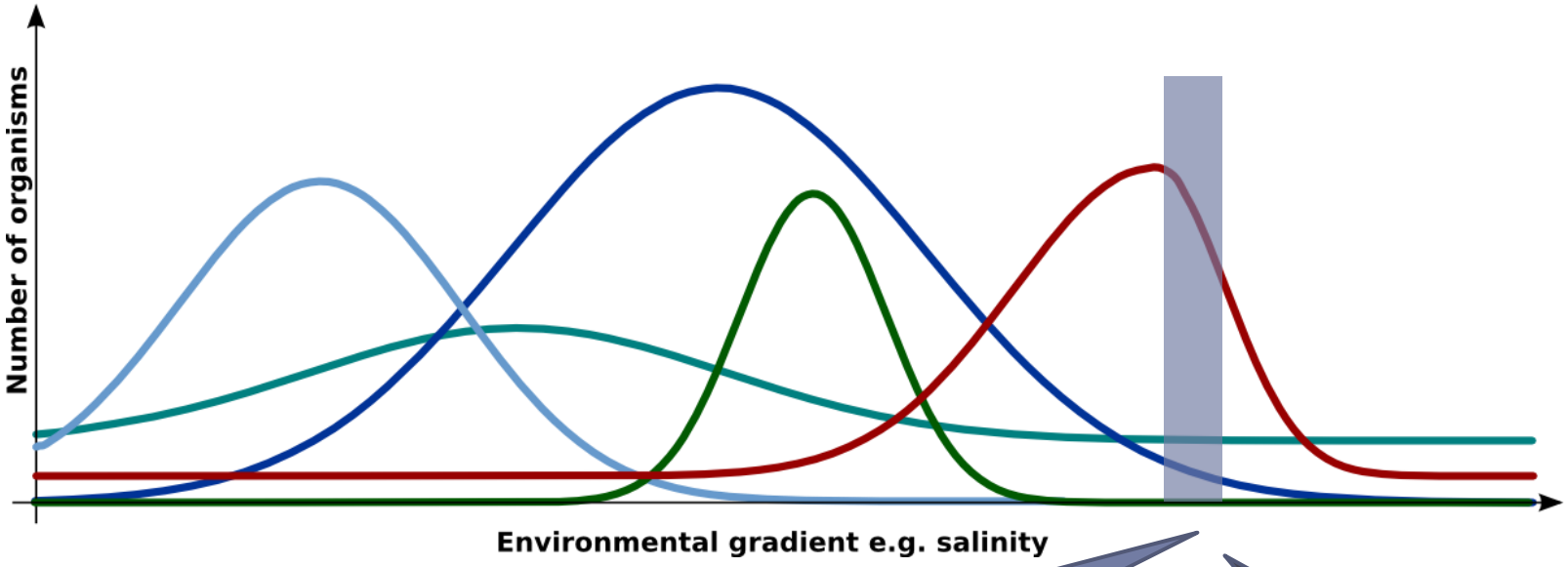


Near the edges of the range of tolerance some organisms can survive but because of physiological stress they do not function properly and reproduce.

In the optimum range many diatoms find the most comfortable salinity. Here, they live and reproduce successfully.



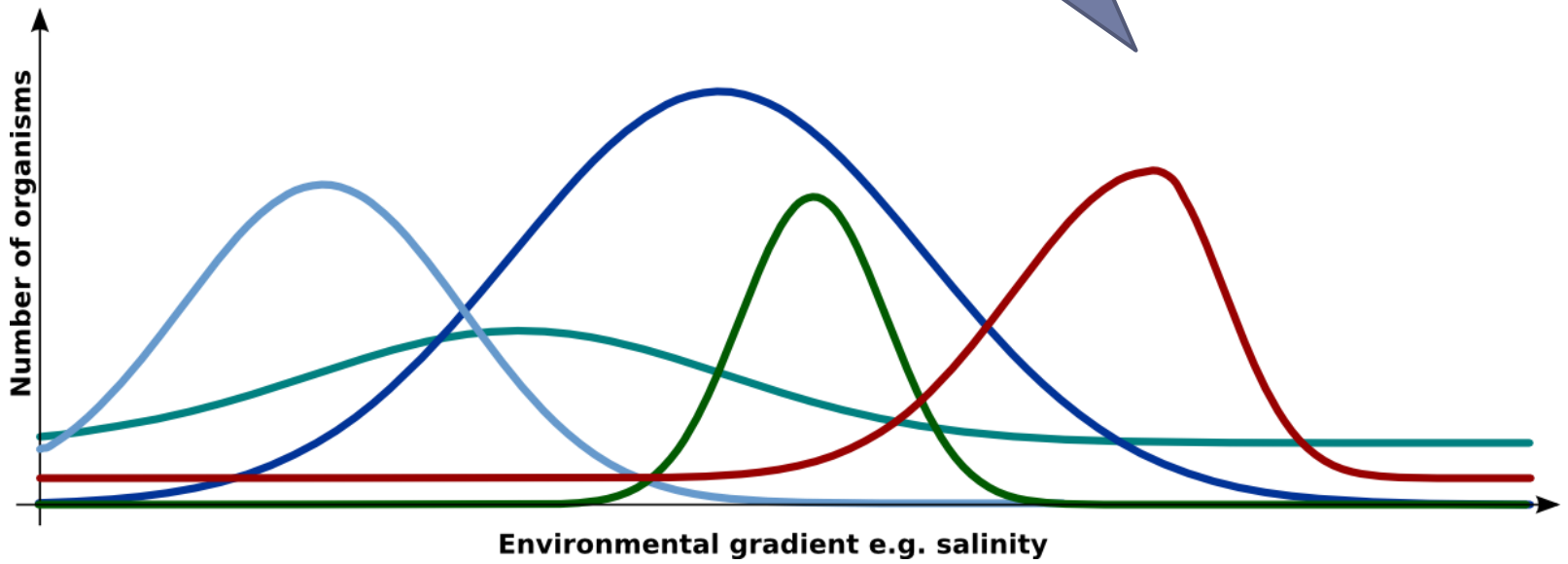
If we put together several species' range in one graph, their tolerance ranges simply overlap and we can observe how the community is formed in the gradient of particular environmental variable.

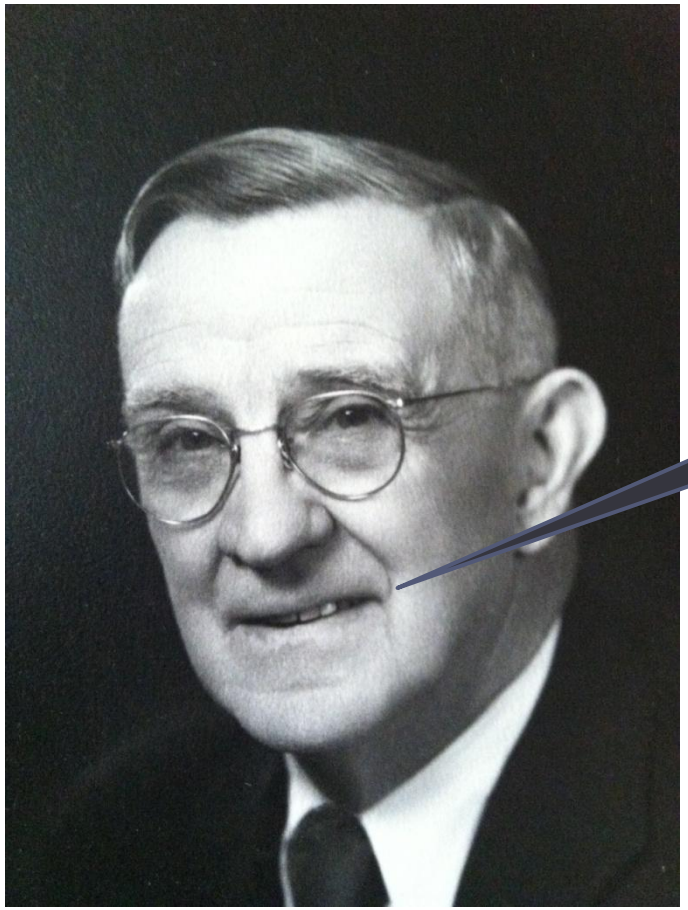


On the other hand, if we have only information on the abundance of particular species we can predict exactly in what values of gradient they existed in the environment.

This approach is used in the ecological assessment of environments.

On the basis of the low of tolerance can you explain why in biological assessments of environment indicator species were replaced by analysis of whole communities?





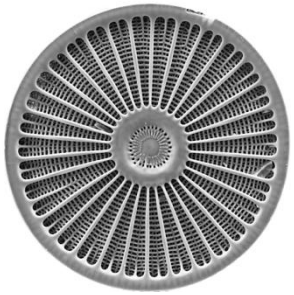
That is right, community gives more detailed information on the state of the environment than single species.

The Shelford's Law of Tolerance lie at the basis of biological assessments

But the term „tolerance" used in ecology is defined differently in the field of biological assessments.

Do you know what I mean?

To understand the difference between the term *„tolerance”* used in ecology and the use of the term in biological assessments visit a webpage: http://www.epa.gov/caddis/pecbo_intro4.html



By exploring materials presented at the US Environmental Protection Agency you can learn more about analyzing biological data to infer environmental conditions at a site. In the educational module different methods for computing relations between organisms and environmental variables are described. You can even perform some of the computations on your own!

Resources used:

Creative Commons

Fred Montague blog: http://www.mountainbearink.com/news/

Slide 4-6, 12: http://www.snipview.com/q/Victor_Ernest_Shelford
Slide 7-9: http://dtc.pima.edu/blc/105/503/tutor/tutor31.html