

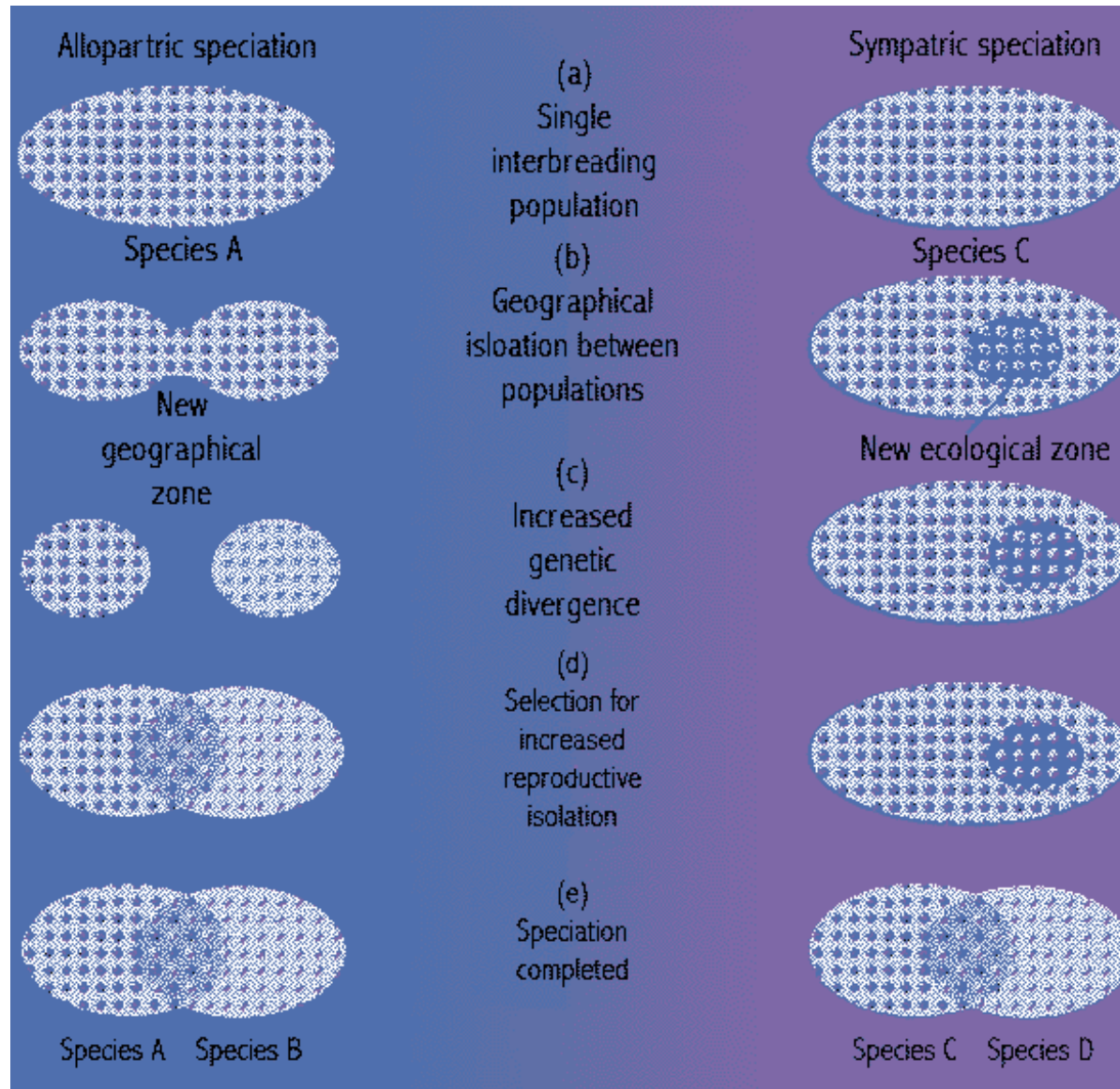
The macrozoobenthos fauna of lake Baikal
an extraordinary case study for limnic radiation and
speciation processes

> 1770 endemic animal species

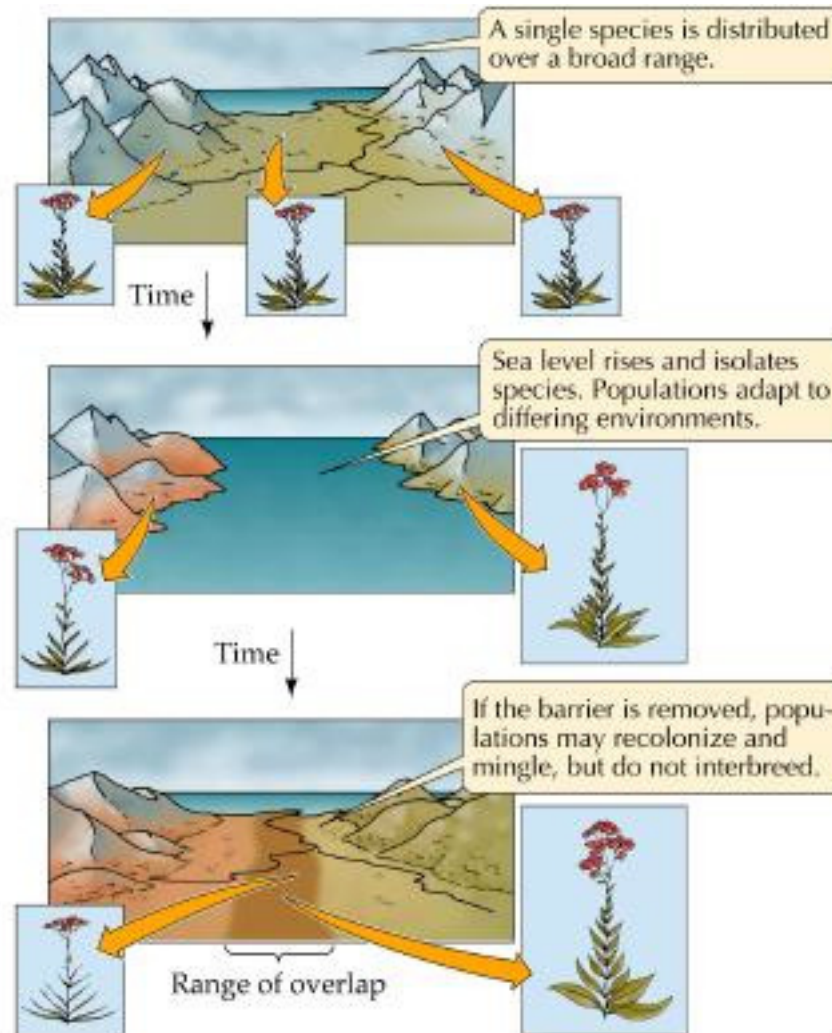
**biodiversity is the result of speciation and radiation
processes since about 25 million years**

**Lake Baikal is probably the best natural laboratory for
studies of biological speciation**

What is speciation?



Isolation mechanisms



example: central american landbridge

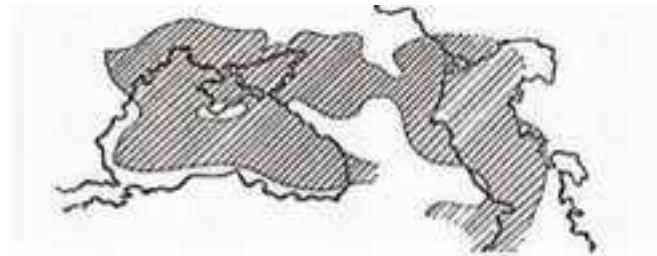
separated since 3,5 Mio years



example: Black and Caspian Sea



5-3 Mio years



3-1.5 Mio years



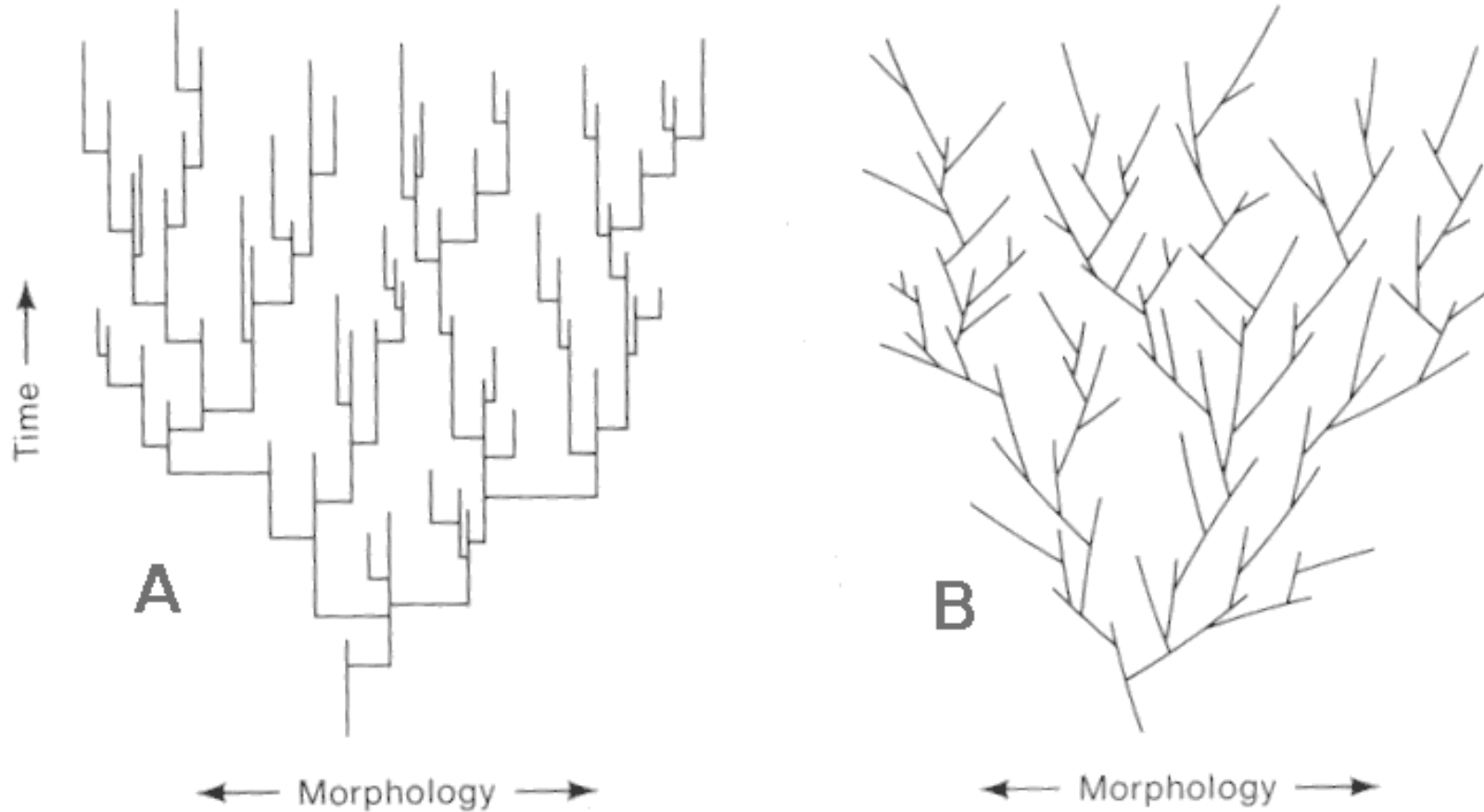
Quarternaty

Sympatric speciation



Gene flow has been reduced between flies that feed on different food varieties, even though they both live in the same geographic area.

Results of speciation processes



Hypothetical phylogenies representing extreme views. In A, all evolution is concentrated in speciation. In B, all evolution is phyletic.

(Stanley 1978)

Problems in studying speciation processes

It is often difficult to characterise isolation mechanisms

?

?

?

?

best chance: islands, lakes and peripheric seas

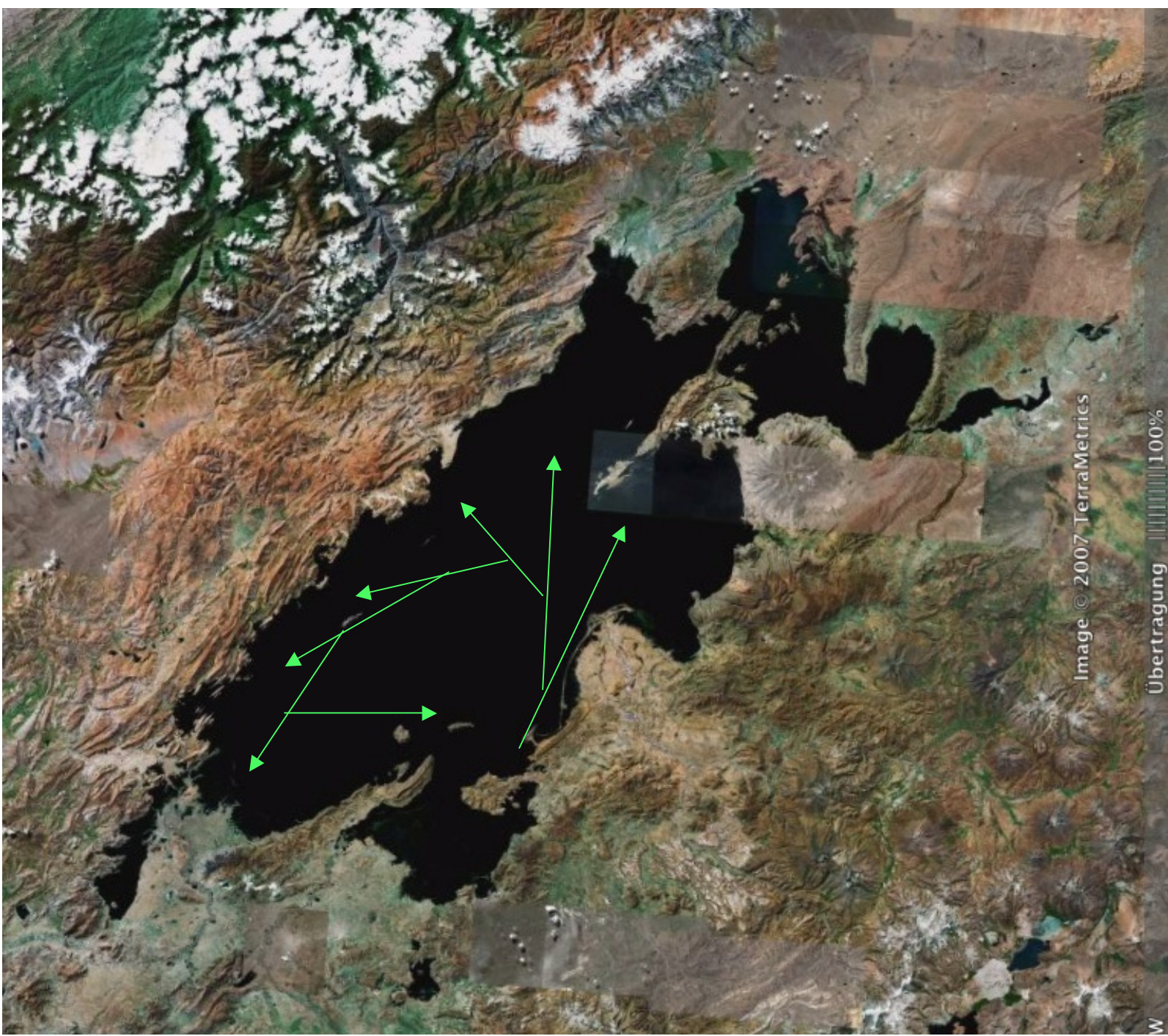


Image © 2007 TerraMetrics

Übertragung 100%

W

restricted range

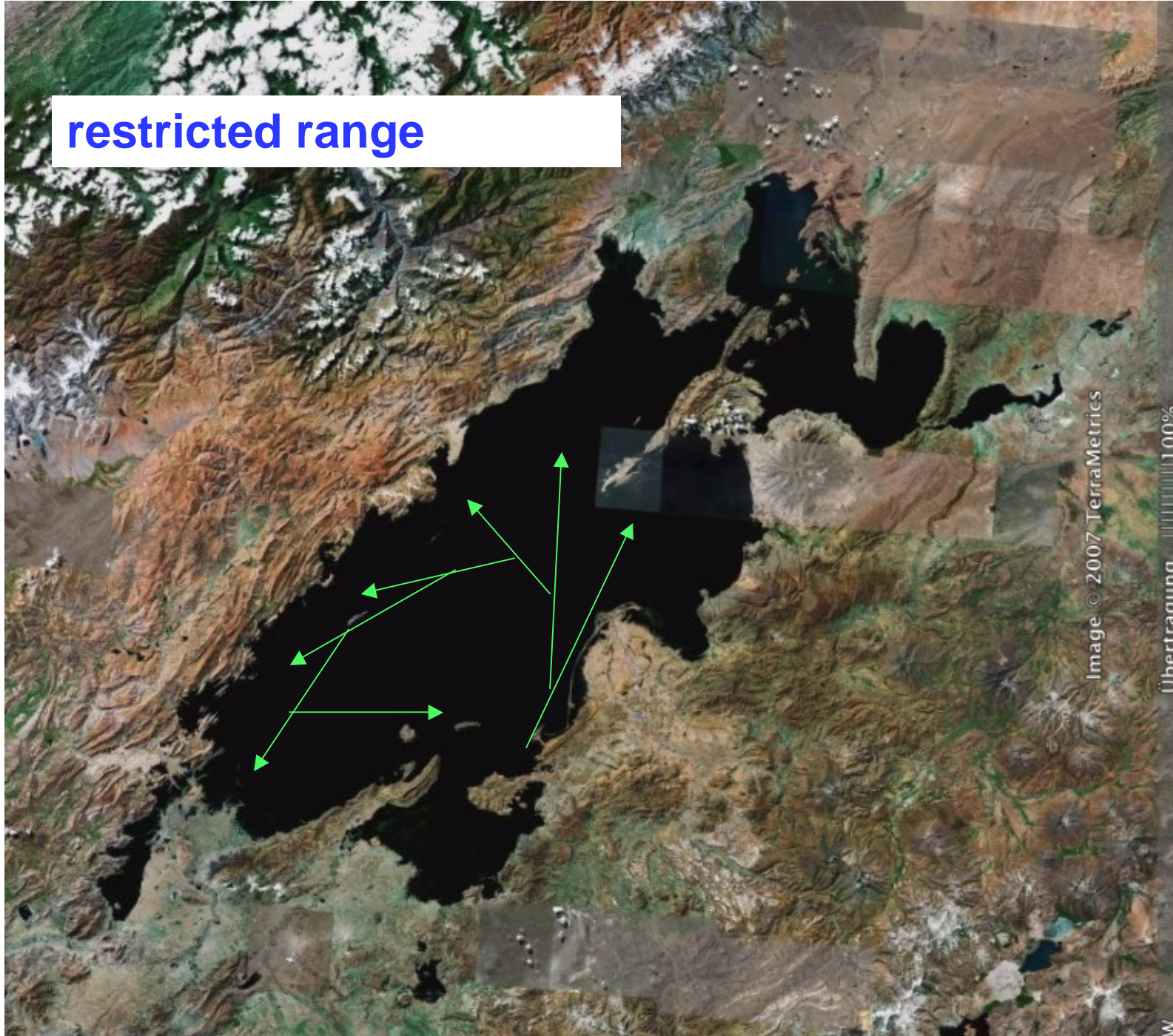


Image © 2007 TerraMetrics

Übertragung 100%

W

restricted range

limited connection to other waterbodies

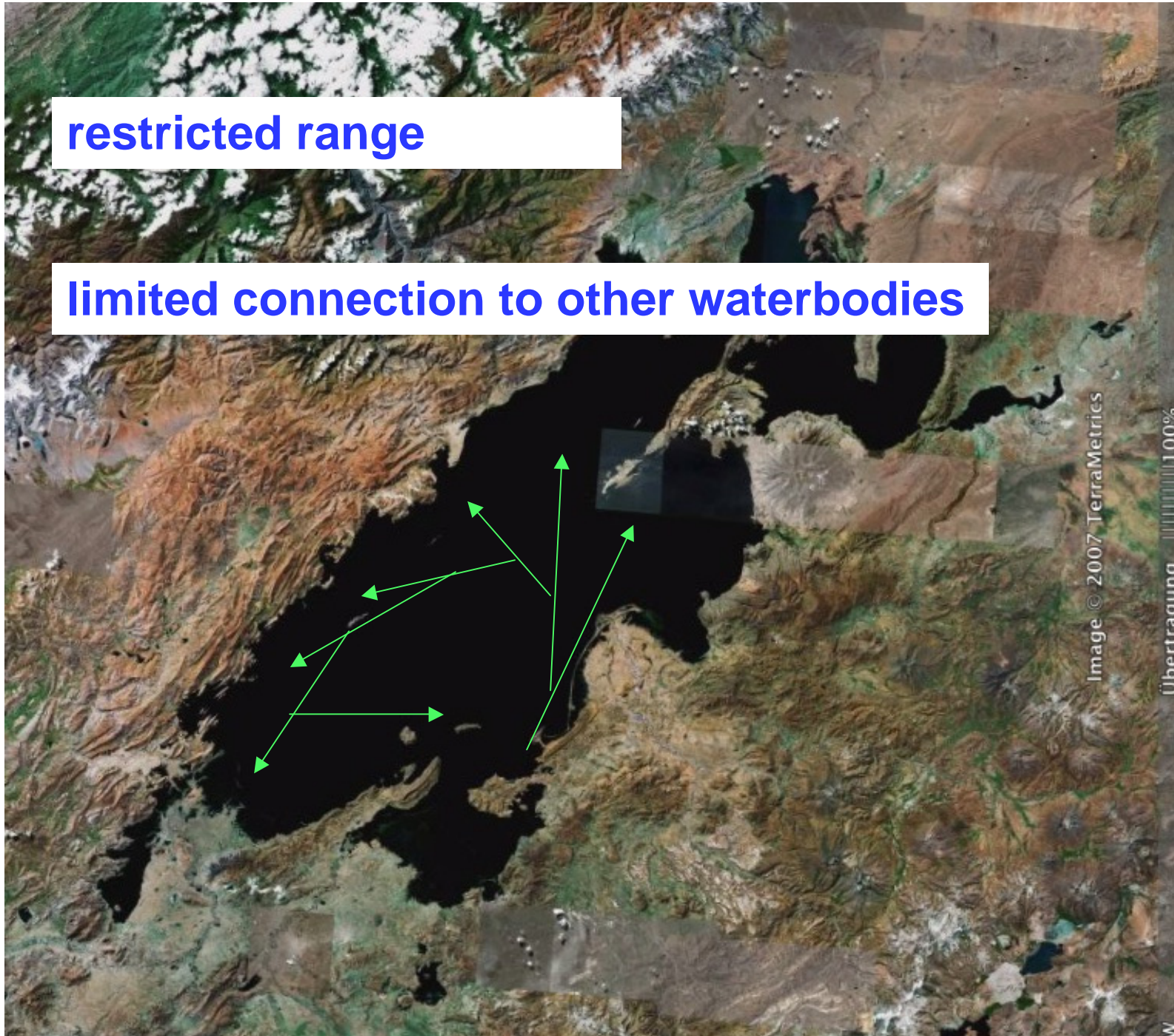


Image © 2007 TerraMetrics

Übertragung 100%

W

restricted range

limited connection to other waterbodies

history and age are mostly well known

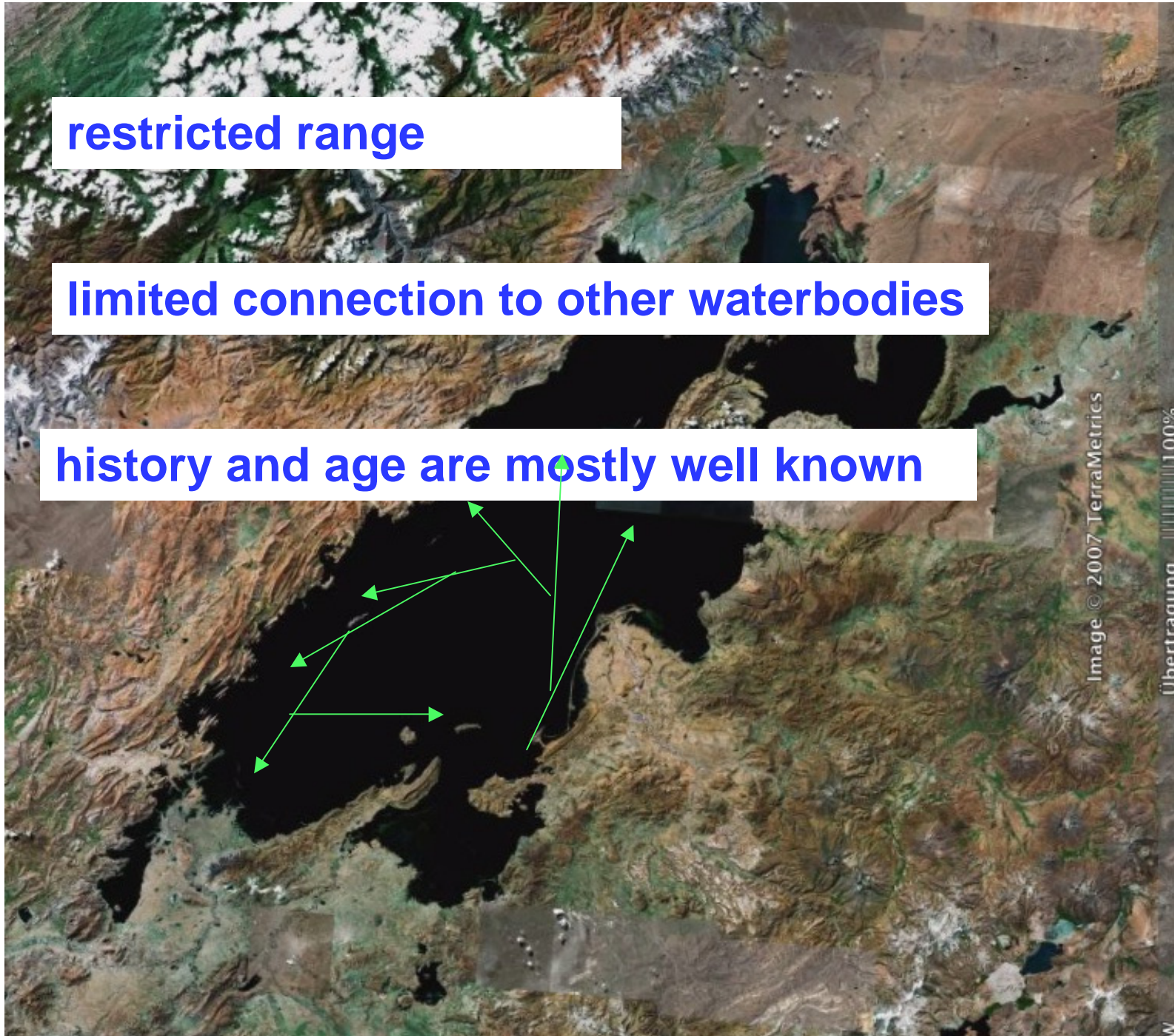


Image © 2007 TerraMetrics

Übertragung 100%

W

A satellite-style topographic map of the Mediterranean region, showing the sea and surrounding landmasses. The sea is dark, and the land is colored by elevation, with browns and tans for higher elevations and greens for lower elevations. Four white text boxes with blue text are overlaid on the map. Green arrows point from the 'restricted number of taxa' box to various parts of the Mediterranean basin. On the right side, there is vertical text: 'Image © 2007 TerraMetrics' and 'Übertragung 100%'. A small 'W' is in the bottom right corner.

restricted range

limited connection to other waterbodies

history and age are mostly well known

restricted number of taxa

Image © 2007 TerraMetrics

Übertragung 100%

W

A satellite map of the Mediterranean region, showing the sea and surrounding landmasses. The map is overlaid with several white text boxes containing blue text. Green arrows point from the text boxes to specific locations on the map. The text boxes are: 'restricted range' (top left), 'limited connection to other waterbodies' (top middle), 'history and age are mostly well known' (middle), 'restricted number of taxa' (bottom middle), and 'isolation mechanisms are well characterisable' (bottom). On the right side of the map, there is vertical text: 'Image © 2007 TerraMetrics' and 'Übertragung 100%'. A small 'W' is visible in the bottom right corner of the map area.

restricted range

limited connection to other waterbodies

history and age are mostly well known

restricted number of taxa

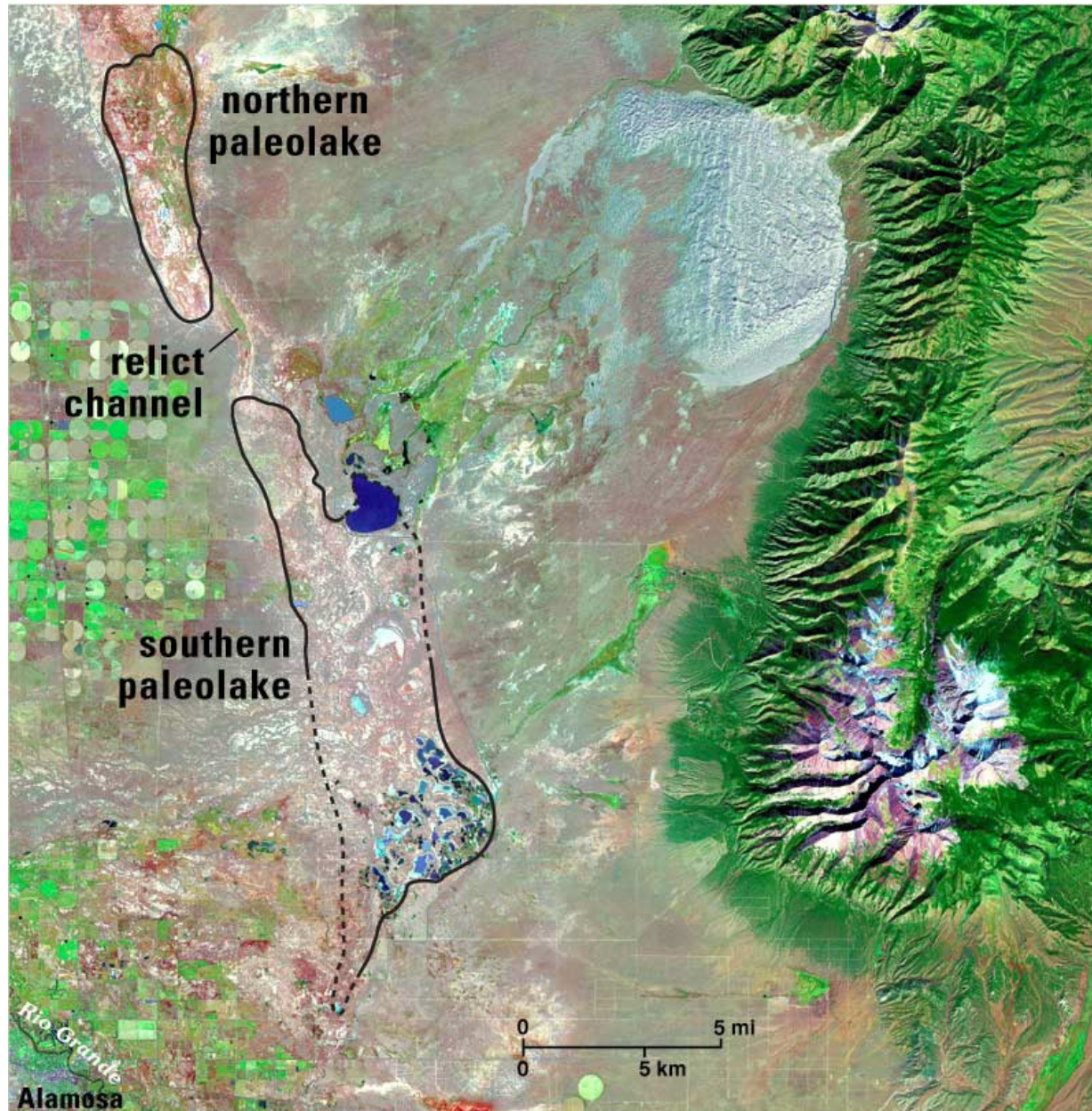
isolation mechanisms are well characterisable

Image © 2007 TerraMetrics

Übertragung 100%

W

Problem: Aggradation



Problem: Antropogenic introduction of new species

the Victoria-lake

Haplochromis



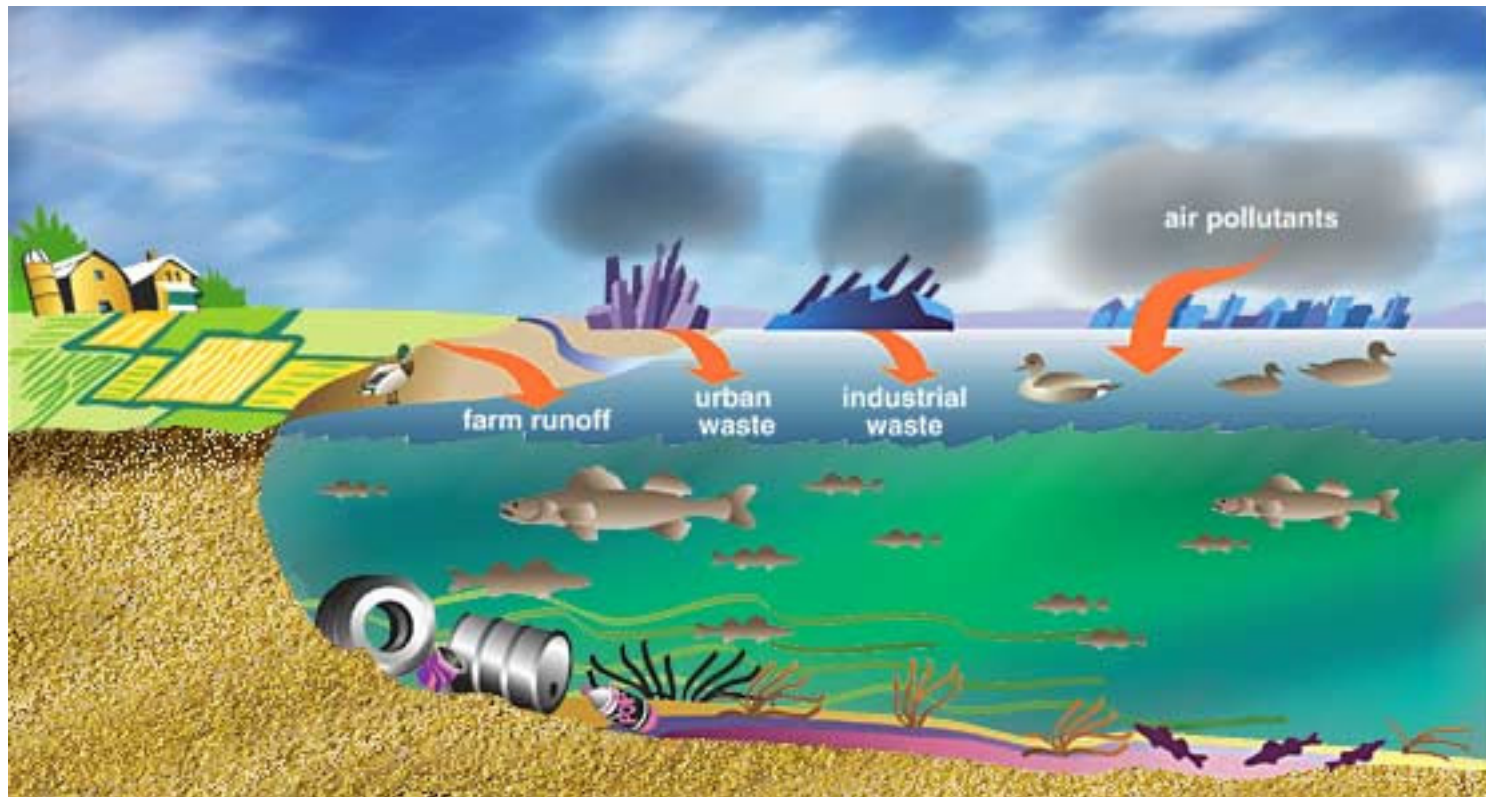
Problem: Antropogenic introduction of new species

the Victoria-lake

Lates niloticus



Problem: Pollution



Lake Titicaca (S-America): 2-3 Mio years old



Hyalella -radiation: > 100 endemic species



Orestias (Cyprinodontidae): 23 endemic species



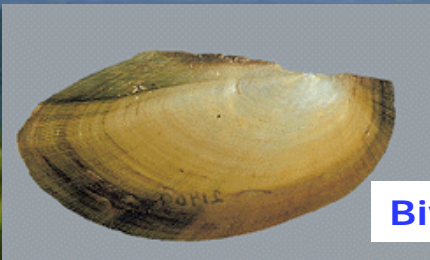
Lake Tanganjica (E-Africa): 9-12 Mio years old

Seventh biggest lake in the world: 34,000km²

second deepest lake of the world: 1.5km depth but lower depth anoxic



Gastropoda: 44 species et 2 subspecies



Bivalvia: 5 families, 10 genera and 15 species



Cichlidae: > 200 endemic species

Lake Baikal: 25 Mio years old



Gastropoda: about 117 species



Amphipoda: about 300 species



Cottoidea: about 33 species

Aim of our study

Study at least a part of the famous macrozoobenthos biodiversity of the lake Baikal -species composition and their distribution

Find out basic results regarding speciation and environmental adaptation based on morphology and ecological preferences

First step: Sampling



sampling by hand

sampling by ship



Diving, if possible



Treatment - conservation of samples

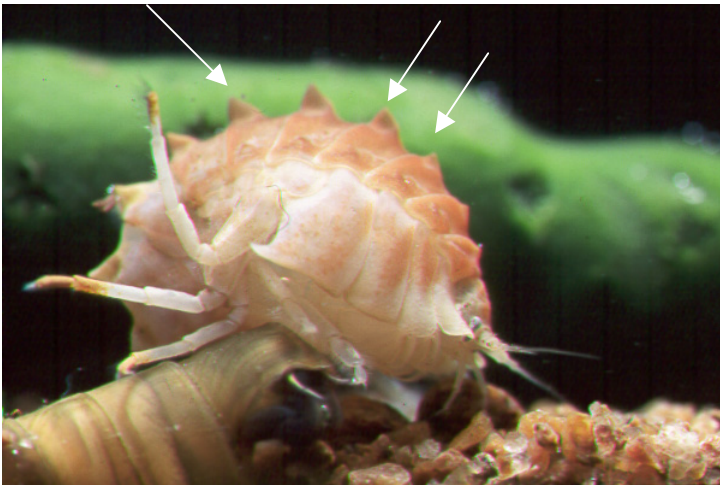


IMPORTANT: Collecting as much as possible background info about sampling site, water temperature, bottom structure and quality (eg sand, mud, pebbles, vegetation)

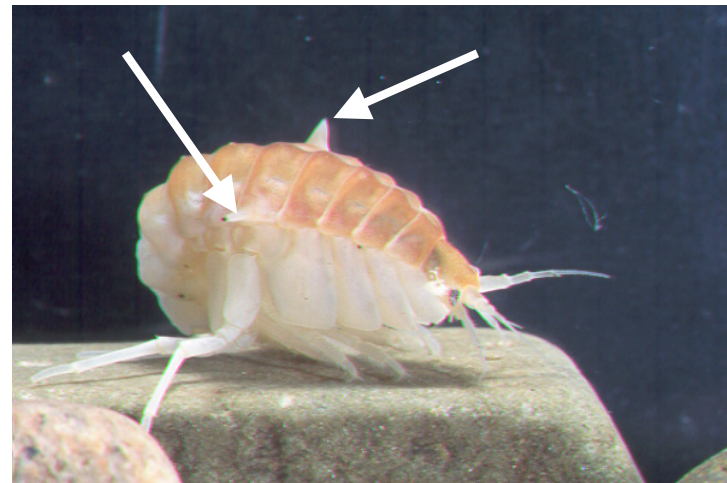
Second step: Analyse of samples

1. Get knowledge on the fauna:
Determination and taxonomy (become experts)

result: Developing determination keys for collected species

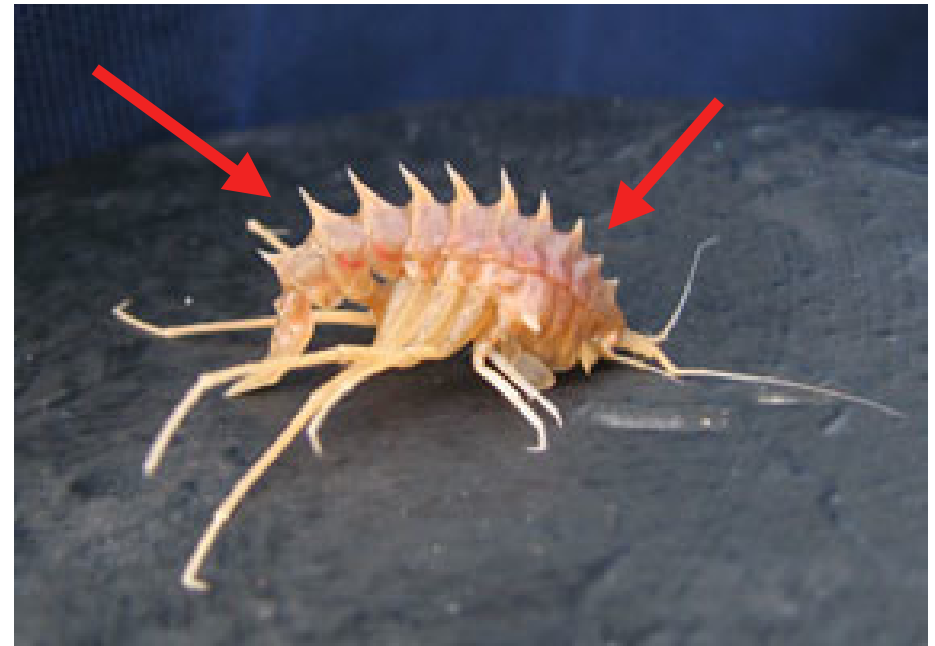
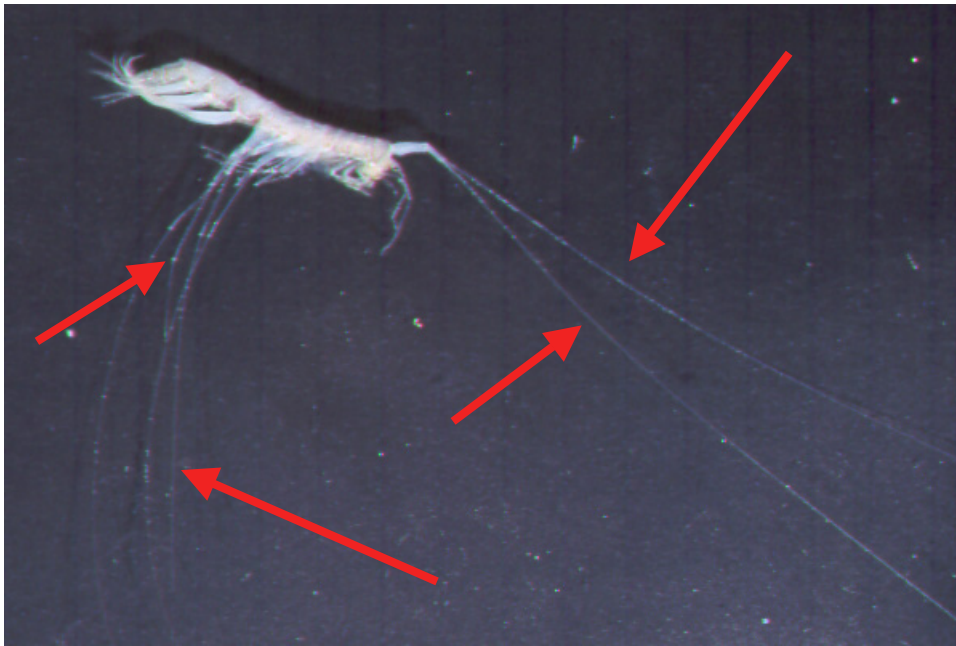


?



2. Studying morphological characters-Correlating characters with structures/ body shape to background info about habitat

result: description of morphologic adaptations in relation to environment



Selected groups:

Sculpins



amphipods



Sponges



molluscs?



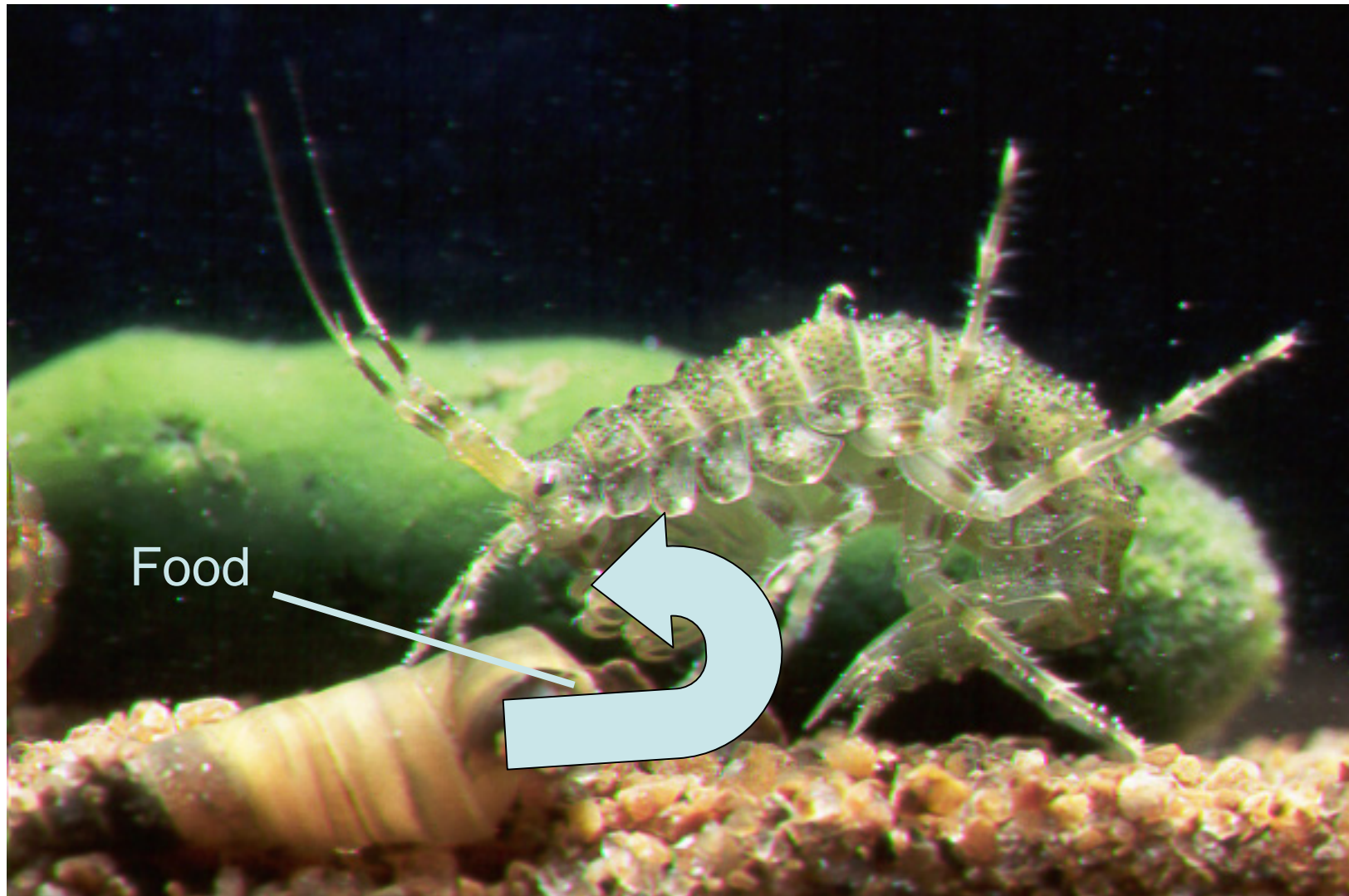
Third step: speciation and ecological adaptations

1. analyse of selected species regarding their ecological preferences



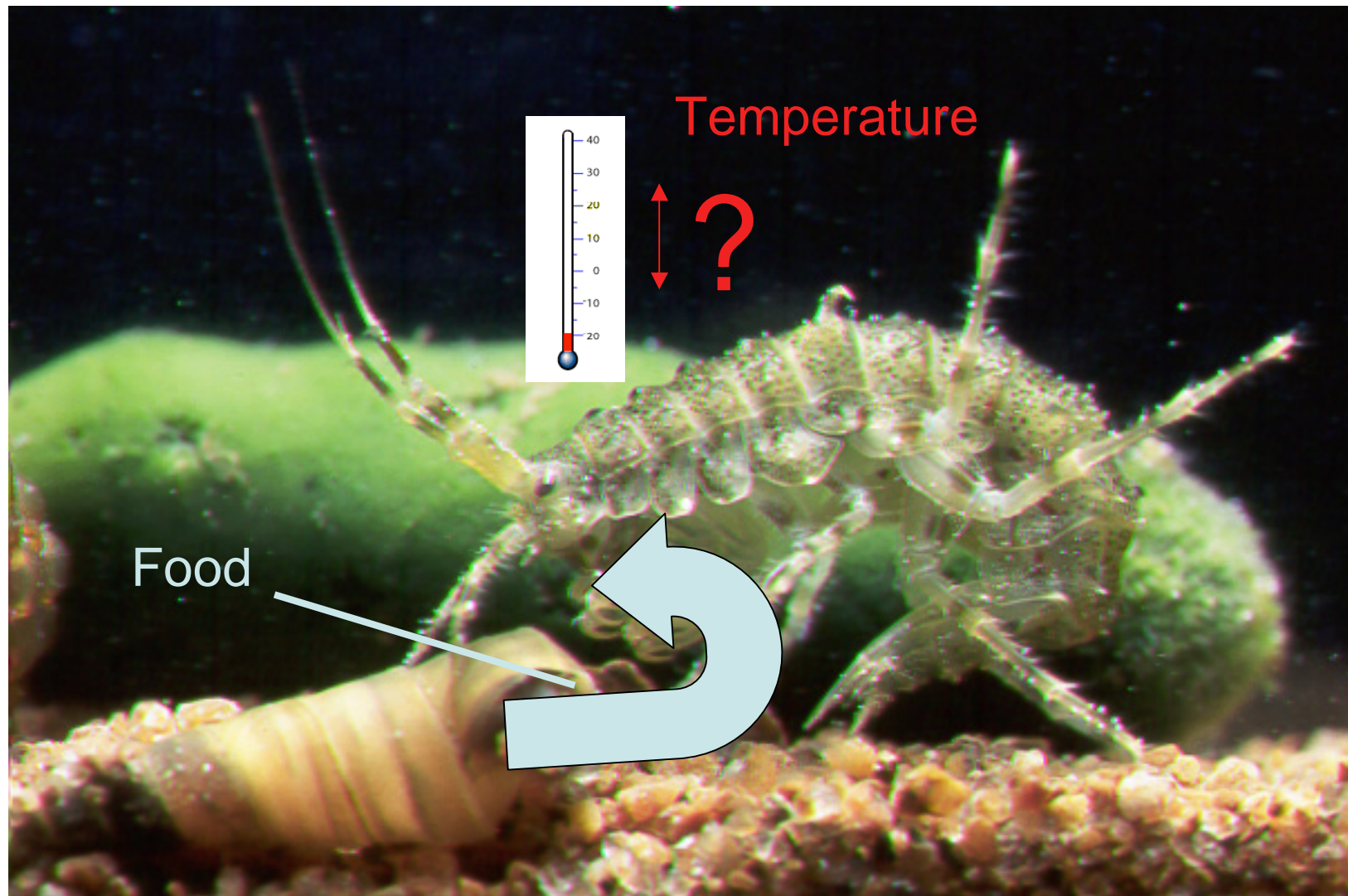
Third step: speciation and ecological adaptations

1. analyse of selected species regarding their ecological preferences



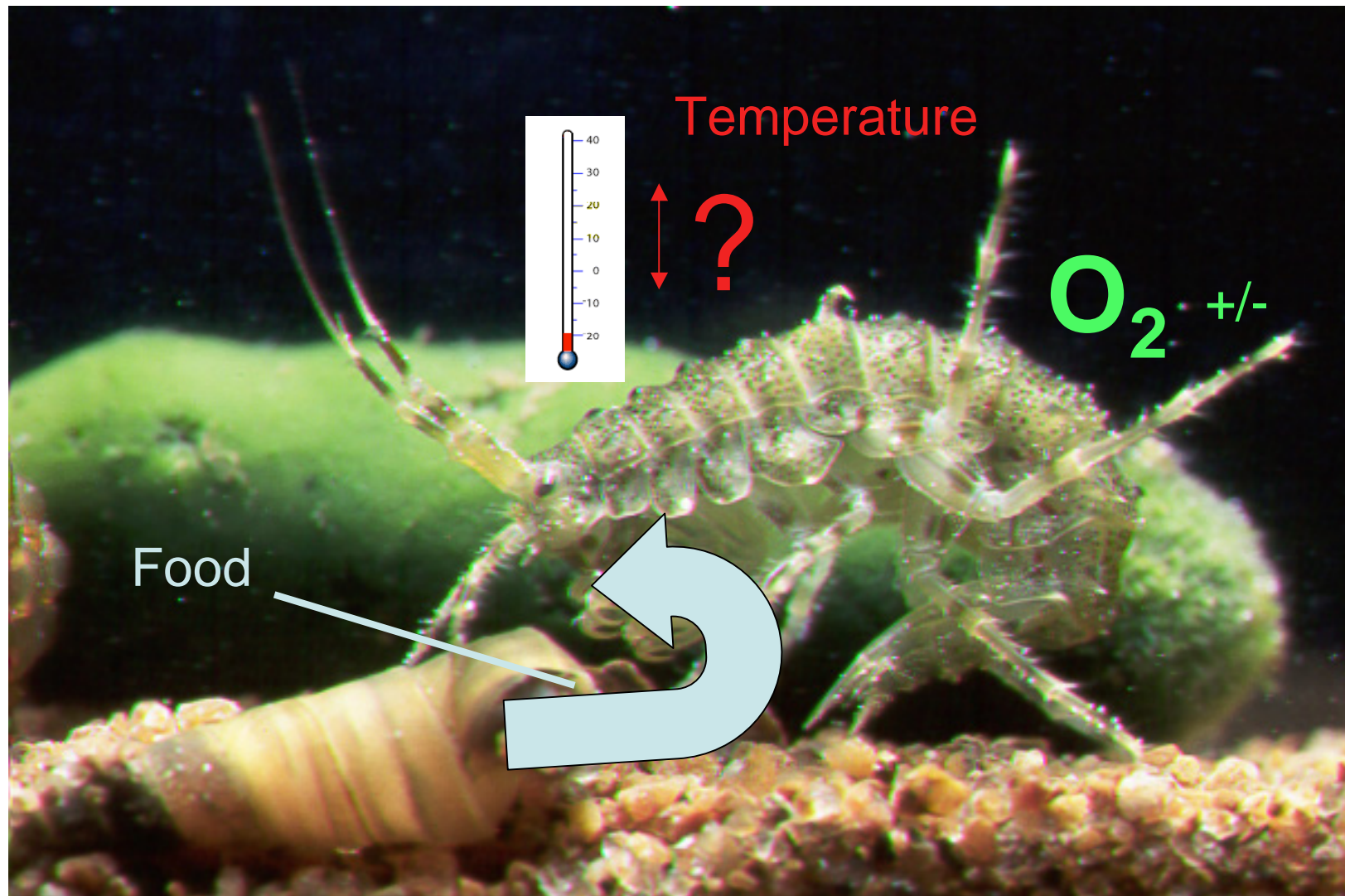
Third step: speciation and ecological adaptations

1. analyse of selected species regarding their ecological preferences



Third step: speciation and ecological adaptations

1. analyse of selected species regarding their ecological preferences



2. Study of special faunal communities as sponges and their inhabitants



**results of third step: Characterisation of potential barriers
niches**

Summary

Get a first idea of the spectacular fauna of lake Baikal, including

- **biodiversity**
- **speciation processes**
- **mechanisms of isolation and adaptation**
- **effects of pollution and anthropogenic activities**

