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River Water Quality

Section **2d**: Hydrology & Ecology of Running Waters

Prof. Maria Lazaridou

School of Biology

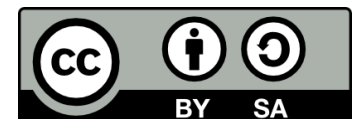


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Funding

- This educational material has been developed as part of the educational work of the teacher.
- The project "Open Academic Courses at Aristotle University of Thessaloniki" has only fund the remodeling of educational material.
- The project is implemented under the Operational Program "Education and Lifelong Learning" and co-funded by the European Union (European Social Fund) and national resources.





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Hydrology & Ecology of Running Waters

Temporary Waters

Section Contents

1. Introduction
2. Classification of Temporary Waters
3. Importance of Temporary Waters
4. Biota of Temporary Waters



Introduction

- Temporary ponds and streams are natural water bodies which experience a recurrent dry phase of varying duration
- Overlap between the abiotic and biotic nature occurs
- Drought in these habitats has cyclical nature. Cyclical temporary water bodies select for species which are adapted to these conditions
- Even permanent water bodies are capable of going dry in exceptional years. Most of the permanent water biota will be wiped out because it is not adapted to survive such conditions



Classification of Temporary Waters

Based on:

- Size
 - ✓ Microhabitats: tree hollows, tin cans, tire tracks, footprints etc
 - ✓ Mesohabitats: flood-plain pools, temporary streams, temporary ponds, snow-melt ponds
 - ✓ Macrohabitats: Large old river beds, shallow oxbow lakes, drying lakes & lakeshores
- Dry phase duration (periodical-cyclical)
 - ✓ Annual
 - ✓ Greater than annual
- Drought intensity
 - ✓ Different moisture-retaining capacities in substrate allows the survival of different biota



Classification of Temporary Waters

Physical factors affect the temporary waters formation

- The runoff cycle
- Subsurface water components

Abiotic features (physical chemical parameters) of temporary waters can be extreme (e.g water balance, water temperature, turbidity, D.O. & CO_{2,3})

Classification of small water bodies based on temperature:

- Puddles: 20cm deep, strongly heated bottom, no stratification, water temperature variation $\approx 20\text{ }^{\circ}\text{C}$
- Pools: 20cm deep, less heated bottom, daily thermal stratification upset, summer water temperature variation $\approx 15\text{ }^{\circ}\text{C}$ surface, $5\text{ }^{\circ}\text{C}$ bottom
- Small ponds: 100cm deep, little heat reaches the bottom, daily thermal stratification upset, summer water temperature variation $\approx 10\text{ }^{\circ}\text{C}$ surface, $2\text{ }^{\circ}\text{C}$ bottom



Importance of Temporary Waters

- Extremely important as they are populated by quite a wide variety of species with unique, physiological & behavioral properties
- Temporary waters are a neglected natural resource. After dried up, excrement left by the aquatic fauna make the bed really fertile. The terrestrial community, in turn, leaves a legacy of organic debris which can be used the following spring by the aquatic community
- Temporary waters can be source of contamination as breeding places for the vectors of disease organisms since they host snails (hosts of trematoda) & mosquitoes (malaria)



Biota of Temporary Waters

- Their inhabitants are bacteria, fungi, algae, macrophytes, protozoa, invertebrates & vertebrates (fishes, amphibians, reptiles)
- Little overlap of temporary water biota with permanent water biota.
- Temporary water systems have methods or special life cycle forms for surviving the dry phase:
 - ✓ in remaining pools (e.g. fishes, larvae dragonflies)
 - ✓ buried shallow (e.g. Copepoda, mites, mayfly eggs)
 - ✓ buried deep (e.g. amphipods, crayfishes, stoneflies)
 - ✓ under rocks (e.g. leeches, adult beetles)
 - ✓ under leaf litter (e.g. springtails, caddis-fly pupae)
 - ✓ In crayfish burrows (e.g. Ostracoda, Copepods, midges)
 - ✓ reinvasion from nearby permanent waters (e.g. true bugs, fishes)
 - ✓ as aerial adults (e.g. caddisflies, dragonflies, beetles, mosquitoes)



Biota of Temporary Waters

- Factors governing the dispersal:
 - ✓ Intrinsic properties of the organism (drought resistance, overland dispersal, frequency of natural occurrence)
 - ✓ External agencies of dispersal (wind, inflow streams, animal intermediation)
 - ✓ Local factors (Age & area of pond, distance from similar habitats)
- Factors governing the colonization:
 - ✓ Intrinsic multiplication powers
 - ✓ Habitat “Openness”
 - ✓ Destruction by others (predation)



Biota of Temporary Waters

In temporary Streams

- ✓ The lotic phase before the still water phase adds to the ecological diversity
- ✓ **Fall-Winter.** Animals (worms-flies-hydras-crayfish-amphipods) appear shortly after the stream starts flowing in the autumn and most reproduce successfully before the flow stops in the spring
- ✓ **Spring.** Other species wait until the stream has stopped flowing and only shallow ponds remain. Ponds & pools are excellent breeding environments due to the ease with which they warm up and the abundant plant food
- ✓ **Summer.** Riparian species enter these systems that move onto the streambed once it has dried (terrestrial worms, slugs, terrestrial snails, mud-loving beetles)

