



**Croatian Science Foundation**



**Accumulation, Subcellular Mapping and Effects of Trace Metals in Aquatic Organisms  
(AQUAMAPMET)**

Gammarids - suitable bioindicators of a contaminant accumulation and mobilization across diverse freshwater habitats

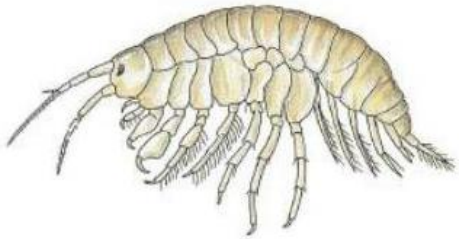


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# Choosing and using crustaceans

- Crustaceans are frequently used as **bioindicators** and **biomonitors** in various aquatic systems.
- They are a very successful group of animals, distributed in a number of different habitats including marine, terrestrial and freshwater environments.
- *Gammarus/Asellus* ratio; *Daphnia magna* test;...



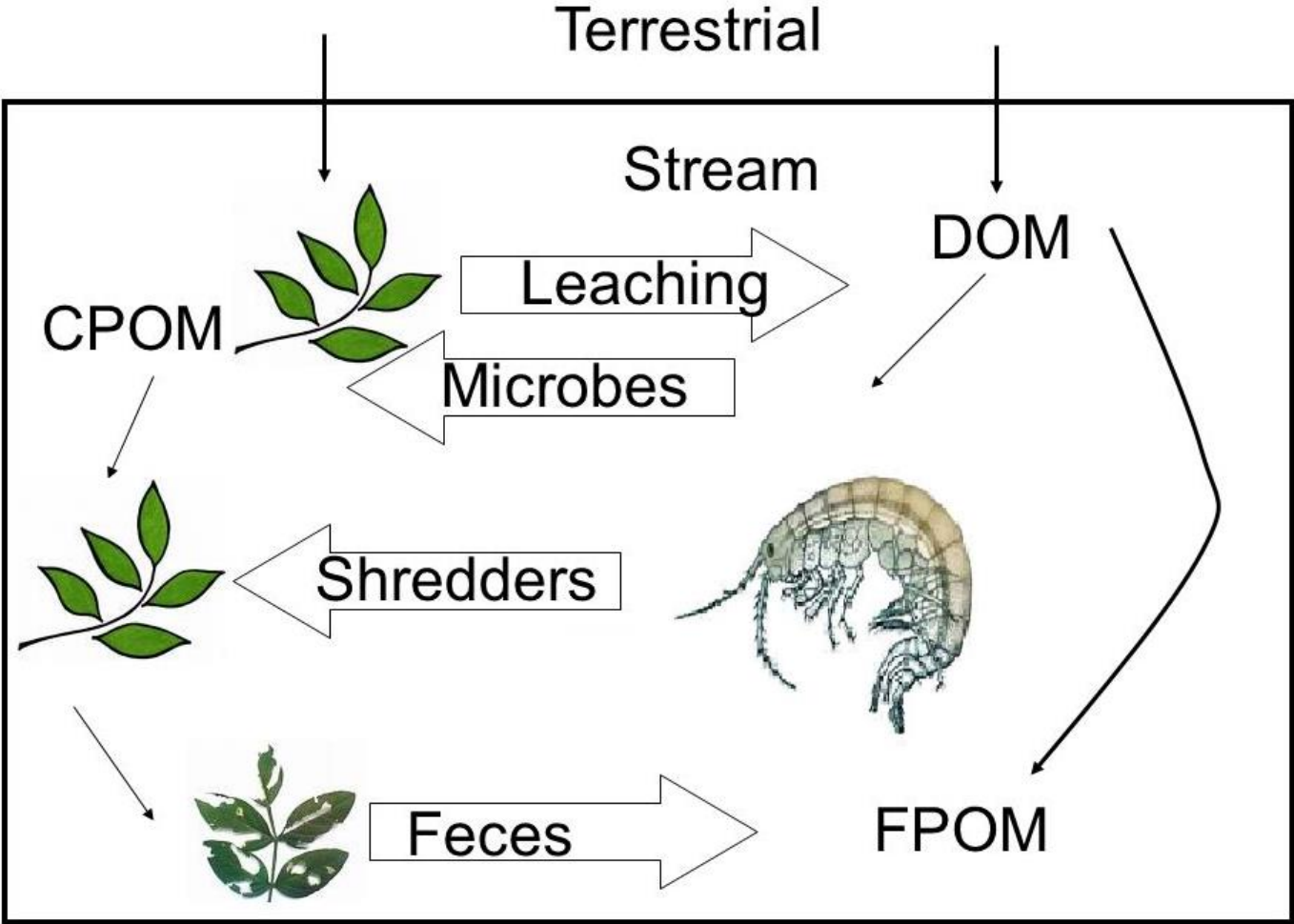
# Why gammarids?



They are:

- Common, abundant, diverse and ubiquitous
- Easy to collect and identify
- Species differ in their tolerance to pollution
- Individuals show cumulative impacts of pollution
- Often constitute a substantial amount of secondary production in aquatic ecosystems
- important in ecosystem processes because of their role as **consumers** in detrital or herbivore food webs and as a major **food source** for higher-level consumers

# THEIR ROLE AS CONSUMERS



# Why gammarids?

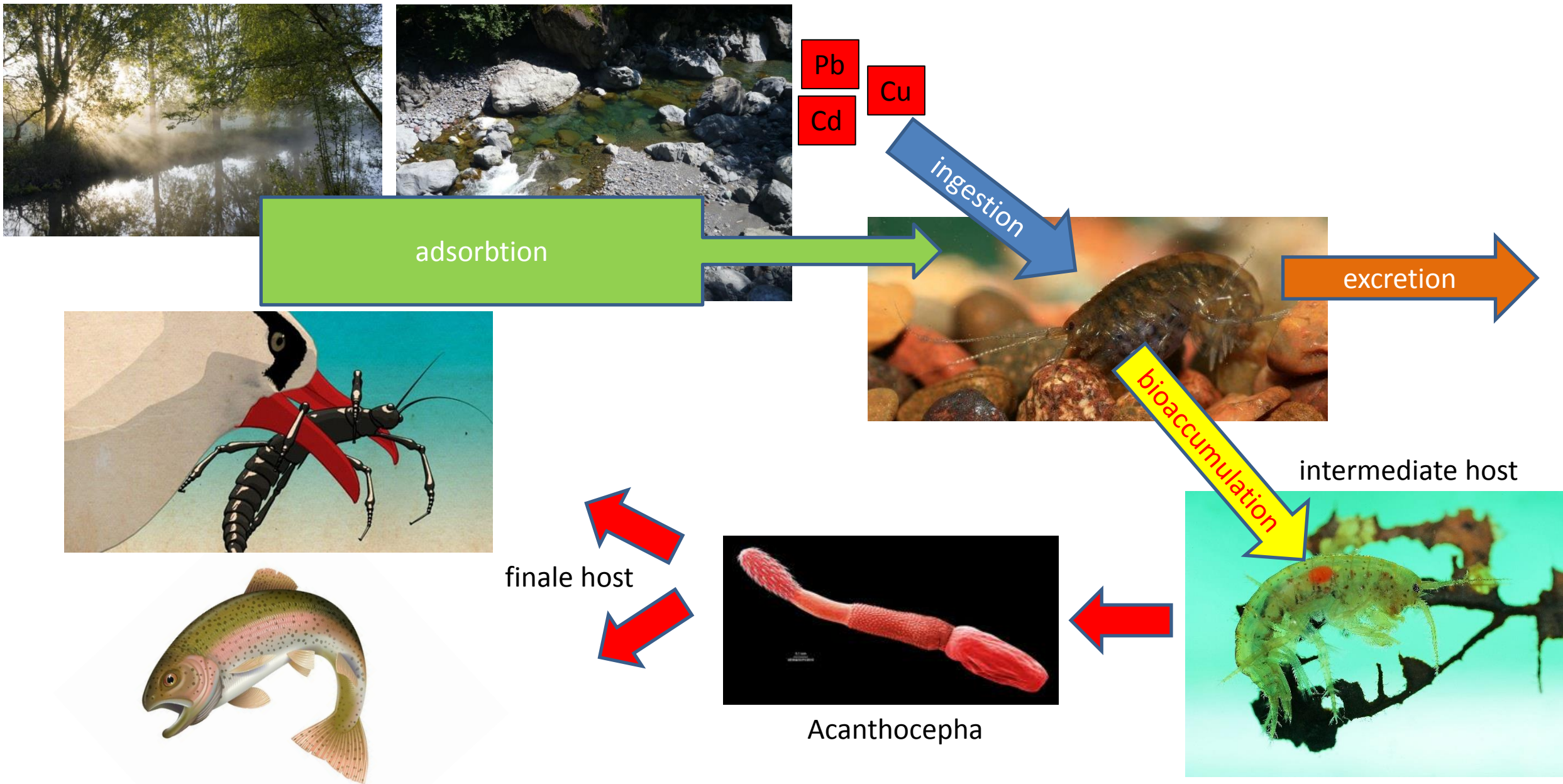


They are:

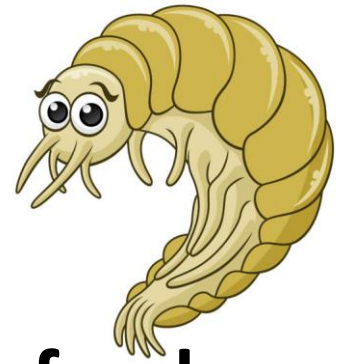
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- important in ecosystem processes because of their role as consumers in detrital or herbivore food webs and as a major food source for higher-level consumers
- Often selected as **test organisms** for **ecotoxicological studies** because of their ubiquitous distribution, sensitivity to disturbance, and suitability for culture and experimentation.



# Gammarids as a bioindicator vs biomonitor



# GAMMARIDS AS BIOINDICATORS



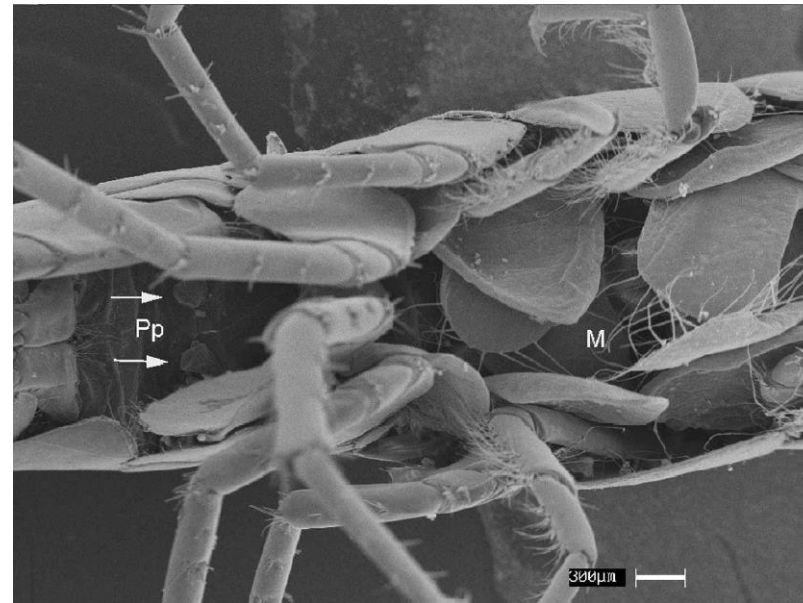
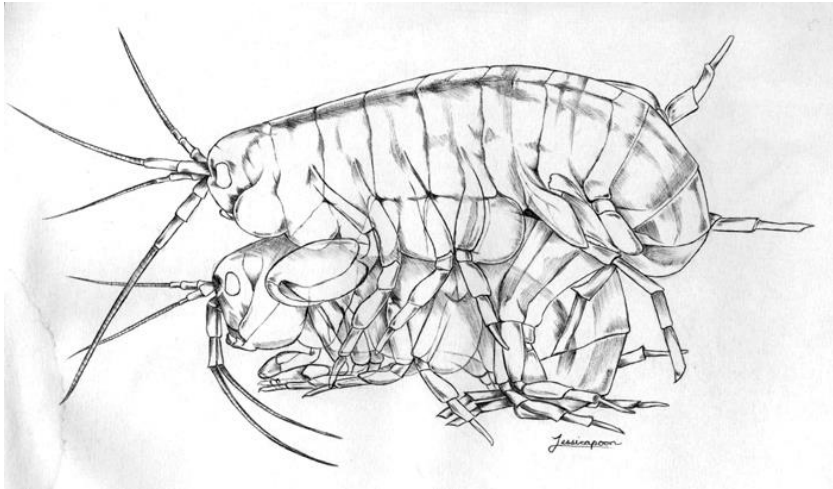
Due to their widespread distribution, significance in the food web, and sensitivity to a wide range of pollutants, gammarids are important *bioindicators* for water quality assessment and **good candidates for early warning of environmental stress.**



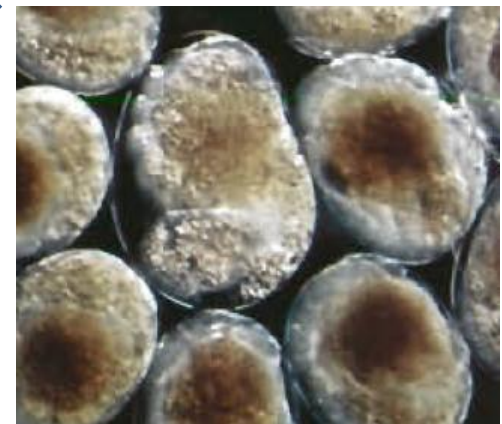
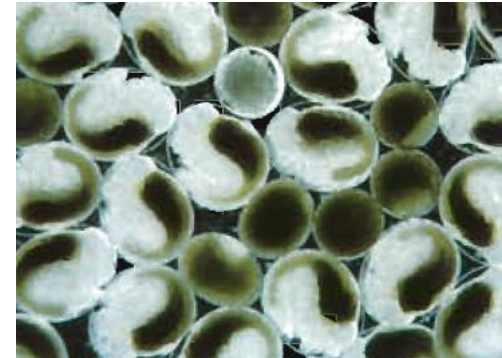
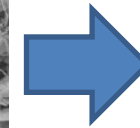


# GAMMARIDS AS BIOINDICATORS

- Reproduction strategies, may be highly important for the interpretation of data from bioindicator studies using these organisms



intersex



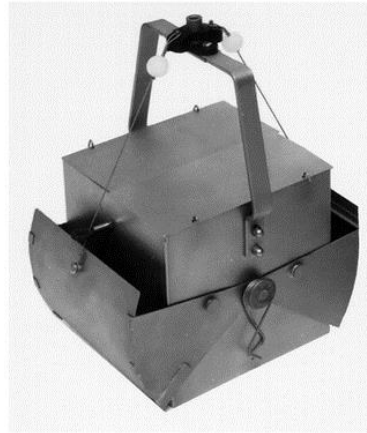
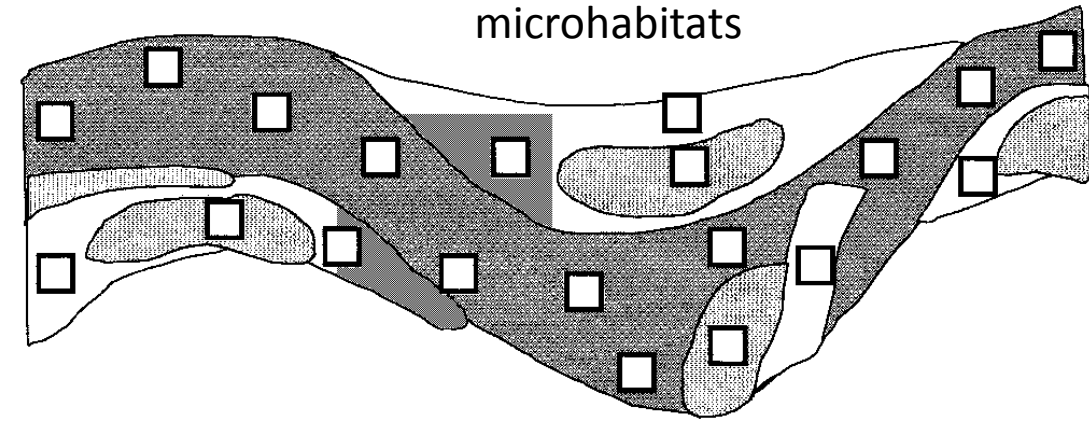
malformed embryos



# METHODS



BENTHOS NET



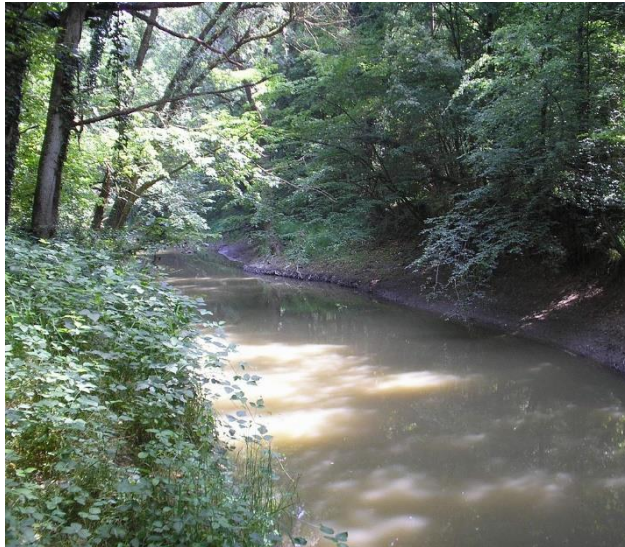
EKMAN GRAB





# STUDY SITES AND PROTOCOL IN AQUAMAPMET

The assessment of the ecosystem quality was made through parameters of a high level of integration



Maslenjača  
Selo Ilova  
Trebež

November 2017  
May 2018

K1 – spring brook  
K2 – downstream  
of the Knin

November 2015  
May 2016



# STUDY SITES



1



Maslenjača

2



Selo Ilova

3

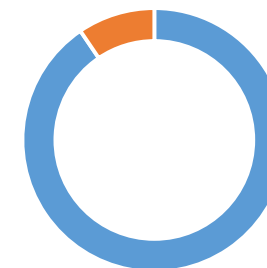


Trebež

# GAMMARID COMMUNITY STRUCTURE IN THE ILOVA RIVER

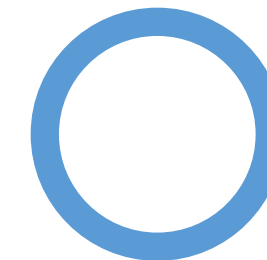


1



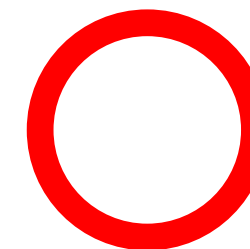
■ *Gammarus fossarum* ■ *Gammarus roeselii*

2



*Gammarus fossarum*

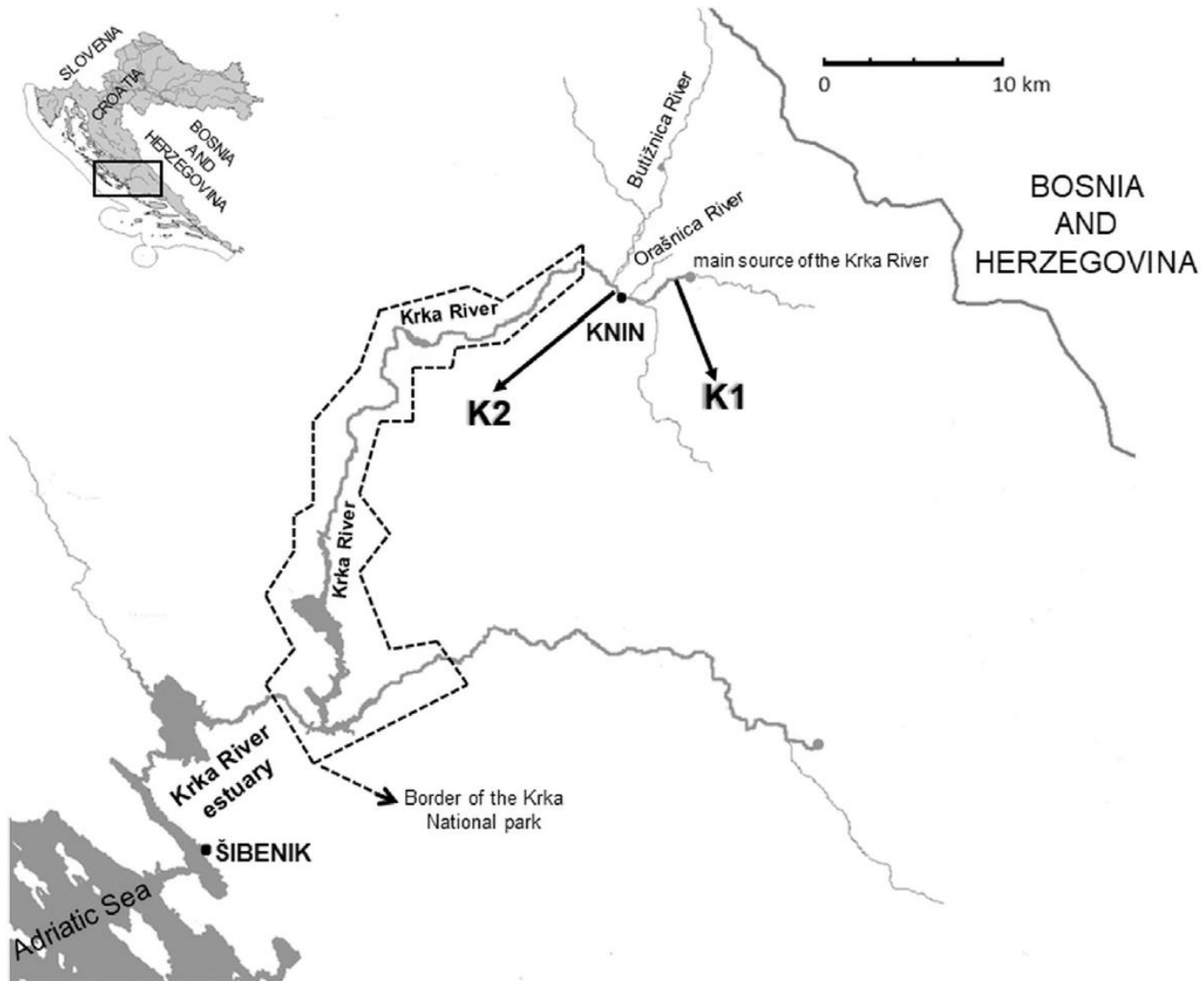
3



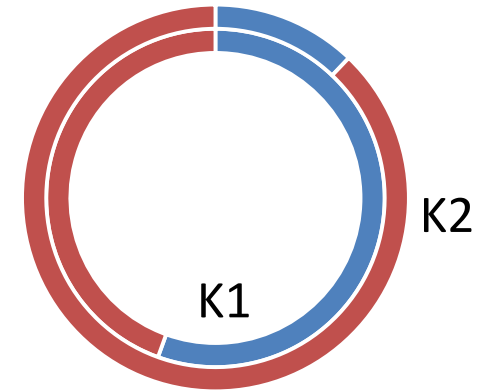
*Dikergammarus haemobaphes*



# GAMMARID COMMUNITY STRUCTURE IN THE KRKA RIVER

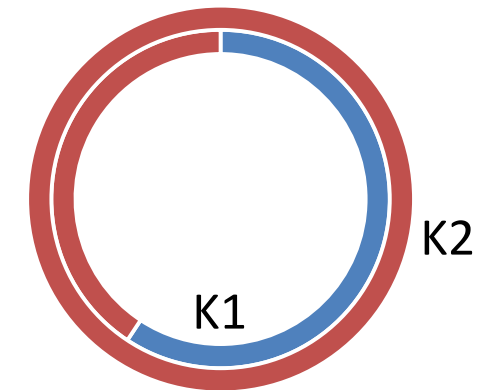


November 2015



■ *Echinogammarus acarinatus* ■ *Gammarus balcanicus*

May 2016



■ *Echinogammarus acarinatus* ■ *Gammarus balcanicus*

