



Innovative diagnosis of the quality of aquatic environments

Assessment of chemical contamination of aquatic environments in the biota

Analysis of the toxic effects of contaminants directly in aquatic environments



BIOMÆ's expertise

A high-value service provided to our clients

BIOMÆ provides tools to diagnose aquatic environments based on 10 years of research conducted by IRSTEA (Lyon-Villeurbanne Ecotoxicology Laboratory).

BIOMÆ S.A.S., a young innovating company, is positioned in the sector of active biomonitoring of continental surface waters (rivers, canals, and lakes).

BIOMÆ proposes the first active in situ bioassays designed to measure bioavailable chemical contamination and toxicity using a sentinel shrimp, Gammarus fossarum, transplanted and exposed in the receptor environment by direct caging. Combined with modeling approaches, the measurements taken are comparable in space and time.

BIOMÆ's offer targets:

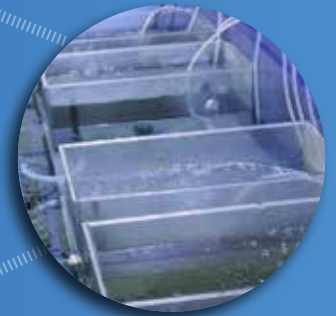
- ▶ *Public sector water managers (water agencies, towns and cities, departmental councils, river associations, etc.) to conduct their campaigns monitoring the quality of aquatic environments.*
- ▶ *Industries involved in installations classified for environmental protection to carry out their impact studies on the receptor environment.*

Our objective: diagnose the effects of micropollutants directly in aquatic envi-



Active bioassays performed using a ubiquitous and relevant pollutant-sensitive species, the gammarid

Genotyped gammarids raised in aquaculture and confined to the laboratory before caging



Calibration of organisms to control biological confusion factors

A reproducible transplantation and immersion *in situ* protocol for greater environmental realism

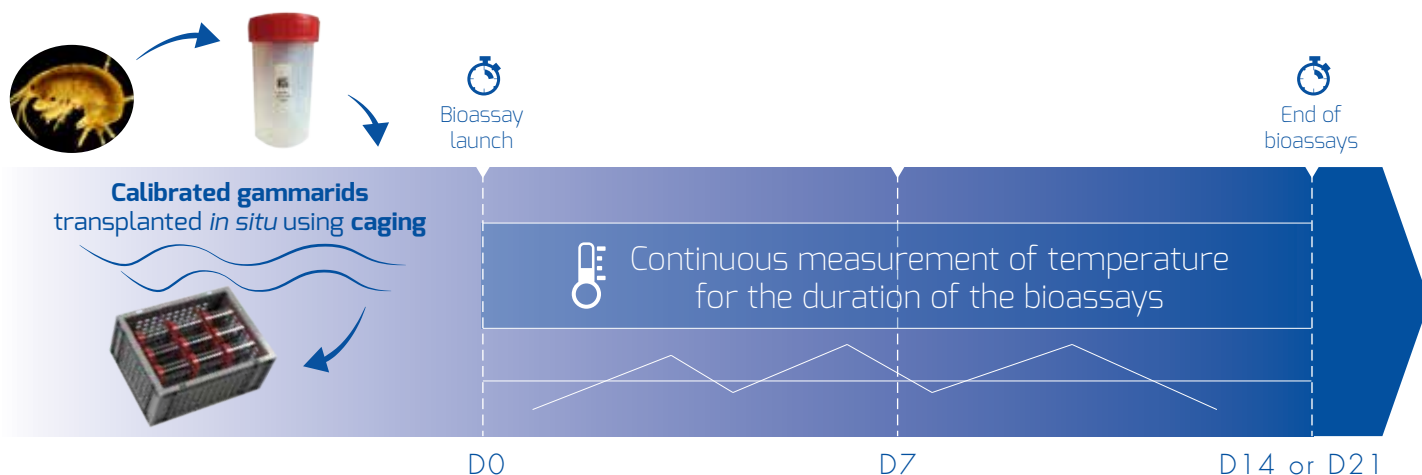


Early, robust, and sensitive biomarkers (bioaccumulation and toxic effects)

Expertise to provide operating systems allowing reliable interpretation and comparisons of results at large scale



ACTIVE BIOASSAY PROTOCOLE



Micropollutant bioaccumulation (7 days)

- Organic
- Metals

Toxicity bioassays

- Feeding (7 days)
- Neurotoxicity (7 days)
- Reprotoxicity and molting (14 or 21 days)

End of bioaccumulation

End of feeding bioassays and neurotoxicity

End of reproduction and molting bioassay

MEASUREMENT OF BIOAVAILABLE CHEMICAL CONTAMINATION

Measurement of bioaccumulation (Bioavailable fraction of contaminants)



Freeze-drying of gammarids after exposure to environment and chemical analysis using mass spectrometry

DOSAGE OF MICROPOLLUTANTS

heavy metals, pesticides, hydrocarbons, drugs, ...

- ✓ A reproducible and robust bioassay
- ✓ COFRAC-accredited analysis methods
- ✓ Gross concentrations bioaccumulated in the gammarid
- ✓ Interpretation of concentrations based on a field reference developed by IRSTEA researchers (notion of bioavailable contamination threshold for each substance)



MEASUREMENT OF TOXIC EFFECTS OF MICROPOLLUTANTS

directly in aquatic environments

ANALYSIS OF MARKERS AT 7 DAYS

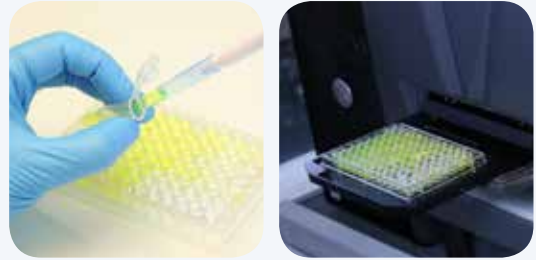
Effect on feeding



Measurement of leaf consumption, correcting for size and temperature effect

Neurotoxic effect

(acetylcholine esterase, AChE)



Biochemical dosage of enzyme activity of AChE

GENERAL TOXICITY

SPECIFIC TOXICITY

(carbamate and organophosphorus insecticides)

ANALYSIS OF MARKERS AT 14 OR 21 DAYS

Effect on reproduction and molting



Biometric measurements
(fertility, molting cycle, ovocyte growth)

GENERAL TOXICITY

Desynchronization of molting cycle and ovocyte growth

SPECIFIC TOXICITY

(Endocrine disruption*)

- ✓ Reproducible and robust bioassays
- ✓ Markers of sensitive effects used to characterize toxic impact
- ✓ Unique expertise in interpreting markers based on toxicity thresholds developed by IRSTEA researchers

BIOMÆ's offer

at our clients' side for...

In situ bioassays that can be routinely used for...



Monitoring aquatic environments

- Qualification and prioritization¹ of sites depending on their bioavailable contamination & toxicity
- Follow-up of bioavailable contamination & toxicity trends
- Measurement of priority substances in the biota (DCE -2013) and/or specific substances upon request

(1) IRSTEA/Biomæ field reference 



Checking pollution in the receptor environment

- Assessment of corrective actions (investigative monitoring, etc.)
- Structure inspection (dam, storm spillway, construction work, etc.)
- Environmental impact study (potential polluting installations: industrial sites, WWTP, etc.)

Protocols adapted to our clients' needs...

IN SITU MEASUREMENTS

UPSTREAM / DOWNSTREAM (close or far downstream)	UPSTREAM / DOWNSTREAM	MULTIPOINTS	BEFORE / AFTER a specific event
from industrial, mining, WWTP, etc.	rainwater outlet or storm drainage	monitoring campaign or large-scale assessment	dam release, canal dredging, etc.



Biomonitoring Aquatic Environment

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A structuring ecosystem for development

Scientific and institutional partners

