Water Quality

- Q-Value Assessment
- SSRS Assessment

Biological analysis is used to rapidly assess water quality and investigate the sources of pollution. This is done in accordance with the EPA's Q-value system or the Western River Basin District's Small Stream Risk Score (SSRS), and ISO standards.

These tests involve the analysis of macroinvertebrate populations and provide a rapid and accurate assessment of ecological water quality. For this reason, a Q-Value is frequently used where impacts to a water course may occur as a result of a proposed development. (http://www.openfield.ie/biological_analysis.html)

Q- Value Assessment

- The Kick Sample and stone wash https://www.youtube.com/watch?v=yoFK4hCu42c

IRELAND'S environment | River Monitoring - Aquatic Invertebrates | epa

What are aquatic invertebrates?

Aquatic invertebrates are small animals that lack a backbone and live under water. In our rivers they can be found attached to, and amongst, stones and gravel, logs, leaf material and vegetation, or burrowed into the bottom sand and mud. They include juvenile (larvae) and adult insects, crustaceans, mites, snails, mussels, leeches, and worms.

Aquatic invertebrates inhabit all rivers from small mountain streams to large systems entering the sea. They are food for fish and aquatic birds and are vital for healthy rivers. Most invertebrates are present in rivers all year round and are easy to collect and they are used as 'indicators' of pollution in rivers and lakes around the world.

How do we survey aquatic invertebrates in rivers?

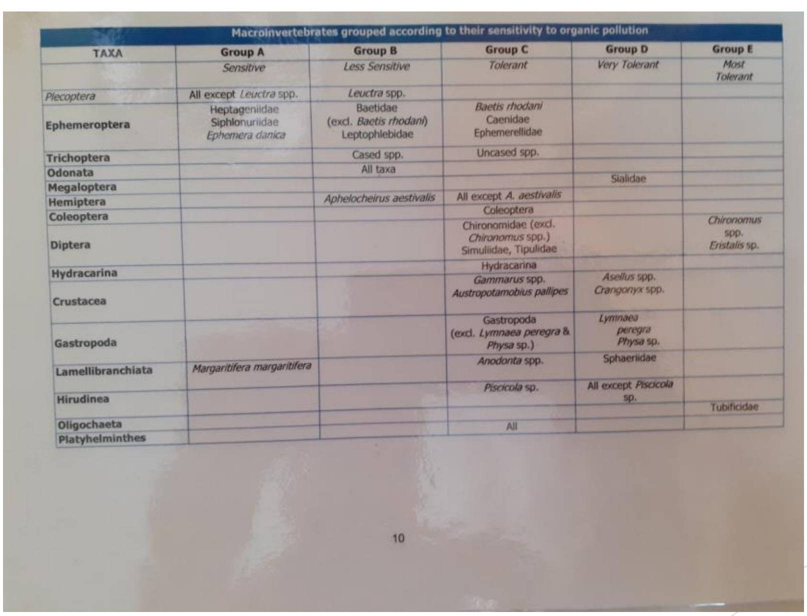
Aquatic invertebrates are collected by the Environmental Protection Agency (EPA) from rivers across the country each year in summer when flows are likely to be relatively low and the impact of pollution is likely to be at its worst. The sampler places a pond net downstream of where they are standing and then agitates stones and gravel on the riverbed with their foot for a minimum of two minutes in a method known as 'kick-sampling'. The process loosens the invertebrates from the riverbed and allows them to be collected in the net as they drift downstream in the river flow. Samples are preferably collected from the shallower, faster flowing habitats called 'riffles'.

EPA ecologist kick-sampling for aquatic invertebrates

Sample put in large tray and searched

Invertebrates identified

1



Macroinvertebrates grouped according to their sensitivity to organic pollution

TAXA	Group A *Sensitive*	Group B *Less Sensitive*	Group C *Tolerant*	Group D *Very Tolerant*	Group E *Most Tolerant*
Plecoptera	All except *Leuctra* spp.	*Leuctra* spp.			
Ephemeroptera	Heptageniidae Siphlonuriidae *Ephemera danica*	Baetidae (excl. *Baetis rhodani*) Leptophlebidae	*Baetis rhodani* Caenidae Ephemerellidae		
Trichoptera		Cased spp.	Uncased spp.		
Odonata		All taxa			
Megaloptera				Sialidae	
Hemiptera		*Aphelocheirus aestivalis*	All except *A. aestivalis*		
Coleoptera			Coleoptera		
Diptera			Chironomidae (excl. *Chironomus* spp.) Simuliidae, Tipulidae		*Chironomus* spp. *Eristalis* sp.
Hydracarina			Hydracarina		
Crustacea			*Gammarus* spp. *Austropotamobius pallipes*	*Asellus* spp. *Crangonyx* spp.	
Gastropoda			Gastropoda (excl. *Lymnaea peregra* & *Physa* sp.)	*Lymnaea peregra* *Physa* sp.	
Lamellibranchiata	*Margaritifera margaritifera*		*Anodonta* spp.	Sphaeriidae	
Hirudinea			*Piscicola* sp.	All except *Piscicola* sp.	
Oligochaeta					Tubificidae
Platyhelminthes			All		

10

Quality Classes	Class A		Class B	Class C	Class D	
Quality Ratings (Q)	Q5	Q4	Q3-4	Q3	Q2	Q1
Pollution Status	Pristine, Unpolluted	Unpolluted	Slight Pollution	Moderate Pollution	Heavy Pollution	Gross Pollution
Organic Waste Load	None	None	Light	Considerable	Heavy	Excessive
Maximum B.O.D.	Low (< 3 mg/l)	Low (< 3 mg/l)	Occasionally elevated	High at times	Usually high	Usually very high
Dissolved Oxygen	Close to 100%	80%-120%	Fluctuates from <80% to >120%	Very unstable Potential fish-kills	Low, sometimes zero	Very low, often zero
Annual Median ortho-Phosphate	~0.015 mg P/l	~0.030 mg P/l	~0.045 mg P/l	~0.070 mg P/l	usually > 0.1 mg P/l	usually > 0.1 mg P/l
Siltation	None	May be light	May be light	May be considerable	Usually heavy	Usually very heavy and anaerobic
'Sewage Fungus'	Never	Never	Never	May be some	Usually abundant	May be abundant
Filamentous Algae	Limited development	Considerable growths Diverse communities	*Cladophora* may be abundant	*Cladophora* may be excessive	May be abundant	Usually none
Macrophytes	Diverse communities Limited growths	Diverse communities Considerable growths	Reduced diversity Luxuriant growths	Limited diversity Excessive growths	Tolerant species only. May be abundant.	Usually none or tolerant species only.
Macroinvertebrates (from shallow riffles)	Diverse communities. Normal density. Sensitive forms usually numerous.	High diversity. Increased density. Sensitive forms scarce or common.	Very high diversity. Very high density. Sensitive forms scarce.	Sensitive forms absent. Tolerant forms common. Low diversity.	Tolerant forms only. Very low diversity.	Most tolerant forms. Minimal diversity.
Water Quality	Highest quality	Fair quality	Variable quality	Doubtful quality	Poor quality	Bad quality
Abstraction Potential	Suitable for all	Suitable for all	Potential problems	Advanced treatment	Low grade abstractions	Extremely limited
Fishery Potential	Game fisheries	Good game fisheries	Game fish at risk	Coarse fisheries	Fish usually absent	Fish absent
Amenity value	Very high	High	Considerable	Reduced	Low	Zero
Condition	Satisfactory	Satisfactory	Transitional	Unsatisfactory	Unsatisfactory	Unsatisfactory

11

September 2018

7 Appendix

Biological Assessment of Water Quality in Eroding Reaches (Riffles & Glides) of Rivers and Streams*

Biotic Indices (Q Values) and typical associated macroinvertebrate community structure. See overleaf for details of the Faunal Groups.

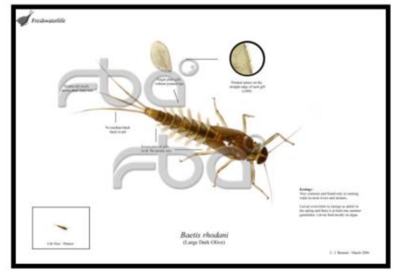
Macroinvertebrate Faunal Groups**	Q5	Q4	Q3-4	Q3	Q2	Q1
Group A	At least 3 taxa well represented	At least 1 taxon in reasonable numbers	At least 1 taxon Few - Common	Absent	Absent	Absent
Group B	Few to Numerous	Few to Numerous	Few/Absent to Numerous	Few/Absent	Absent	Absent
Group C	Few	Common to Numerous *Baetis rhodani* often Abundant Others: never Excessive	Common to Excessive (usually Dominant or Excessive)	Dominant to Excessive	Few or Absent	Absent
Group D	Few or Absent	Few or Absent	Few/Absent to Common	Few/Absent to Common	Dominant to Excessive	Few or Absent
Group E	Few or Absent	Few or Absent	Few or Absent	Few or Absent	Few / Absent to Common	Dominant
Additional Qualifying Criteria						
***Cladophora* spp.** Abundance	Trace only or None	Moderate growths (if present)	May be Abundant to Excessive growths	May be Excessive growths	Few or Absent	None
Macrophytes (Typical abundance)	Normal growths or absent	Enhanced growths	May be Luxuriant growths	May be Excessive growths	Absent to Abundant	Present/Absent
Slime Growths (Sewage Fungus)	Never	Never	Trace or None	May be Abundant	May be Abundant	None
Dissolved Oxygen Saturation	Close to 100% at all times	80% - 120%	Fluctuates from < 80% to >120%	Very unstable. Potential fish-kills	Low (but > 20%)	Very low, sometimes zero
Substratum Siltation	None	May be light	May be light	May be considerable	Usually heavy	Usually very heavy and anaerobic

Note occurrence/abundance of groups in above table refers to some but not necessarily all of the constituents of the group. The Additional Qualifying Criteria apply in virtually all circumstances. Single specimens may be ignored. Seasonal and other relevant factors (i.e., drought, floods) must be taken into account.
* Macroinvertebrate criteria do not apply to rivers with mud, bedrock or sand substrata, very sluggish or torrential flow, head-water or high altitude streams and those affected by significant ground water input, excessive calcification, drainage, canalisation, culverting, marked shading etc.
** See Further Observations overleaf.

9

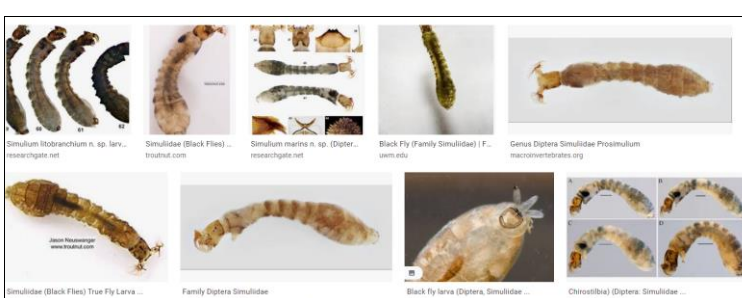
EPT

- Ephemeroptera
- Plecoptera
- Tricoptera

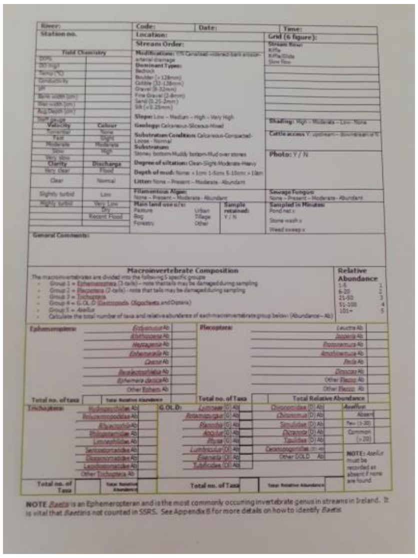


This picture shows a *Baetis rhodani* larva on a white background. Highlighted in the picture are some physical characteristics, such as seven pairs of gills, 1st and 7th similar size and pointed spines on the straight edge of each gill. When used together these characteristics help in the identification of this species.

Poor water quality indicators



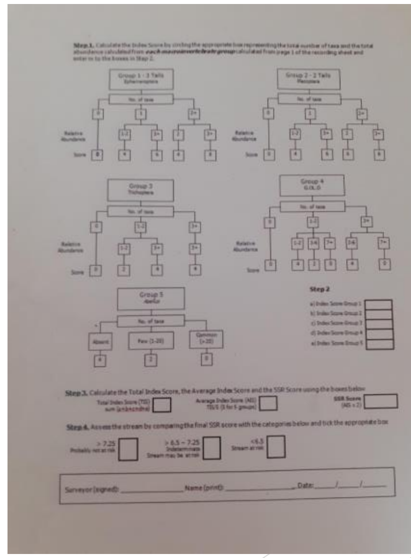
Small Stream Risk Score (SSRS)



Macroinvertebrate Composition

Relative Abundance

General Comments:



Step 2

Surveyor (signed) Name (print) Date

Worked example SSRS

- https://www.epa.ie/publications/compliance--enforcement/waste-water/SSRS-in-Enforcement-of-UWWDAs.pdf