Limnology Practical
Macroinvertebrate Identification and Small Stream Risk Score (SSRS) Assessment

Introduction

Today we will examine the benthic macroinvertebrates of the Lough River Kip and River Cross using the Small Stream Risk Score (SSRS) which assesses their potential levels of pollution.

The **Small Stream Risk Score (SSRS)** is a biological risk assessment system for detecting potential sources of pollution in 1st and 2nd order streams. It was developed by the EPA and Western River Basin District (WRBD) in 2005. The main aim of the SSRS is to support the programme of measures for the Water Framework Directive (WFD) which has as its main objective the achievement of "Good" water status in all water bodies by 2015. SSRS surveys assist in the identification of diffuse sources of pollution. The SSRS methodology is not a full bio-assessment of water quality, it is a measurement of risk based on macroinvertebrate sampling.

Freshwater macroinvertebrates can be found in the benthic environments of rivers and lakes. Macroinvertebrates live in the water for all or part of their lives and therefore their survival is directly related to the quality of the water in which they live. A change in the physical or chemical environment may change the composition and abundance of macroinvertebrate species (this makes them a good indicator species of diffuse water pollution). Macroinvertebrates are important components of the aquatic food web been preyed upon by tertiary consumers such as fish and birds.

Macroinvertebrates have become important in bio-assessment because of the following characteristics:

- Each macroinvertebrate taxa has a sensitivity value on the basis of their tolerance or intolerance to certain environmental conditions such as water quality and river morphology
- Macroinvertebrates have limited mobility and therefore are considered to be representative of the portion of stream they are found
- Macroinvertebrate species composition and abundance can be related to some hydrochemical parameters including dissolved oxygen, temperatures, conductivity, pH, phosphorus, nitrogen and alkalinity

SSRS only uses certain indicator species to calculate the pollution risk to a stream such as:

Groups 1: **Mayfly nymphs** (Ephemeropteran):
Mayfly nymphs have joined legs, in three pairs. They have **three long tails**, short antennae, six legs and gills down the side or back of the abdomen.

Group 2: **Stonefly nymphs** (Plecopteran):
Stonefly nymphs have joined legs, in three pairs. They have **two long tails**, long antennae, six legs with claws, gills if present are located on the thorax or abdominal tip – NOT on the sides of the abdomen.

Group 3: **Caddis fly larvae** (Trichopteran):
Caddis fly larvae have distinctive cases and some are caseless with a "maggot" like appearance. They have long abdomens and three pairs of legs. They have a hard surface to the head and parts of the thorax. The abdominal tip has a pair of terminal hooks.

Group 4: **G.OI.D.** (**Gastropods, Oligochaetes and Dipteran larvae**):
Gastropods: soft bodied and usually a hard shell. Also include molluscs that travel on a single, muscular foot and often secrete a one-piece shell for protection. E.g. snails (spiral coiled shell) or limpets
Oligochaetes: segmented bodies with bristles borne singly along the length of the body. They are cylindrical and thin. Oligochaetes move by stretching and pulling their bodies.
Dipteran larvae: look similar to caterpillars.

Group 5: ***Asellus*** (water hog louse):
Asellus is an aquatic woodlouse which looks like a woodlouse with a flattened dark brown body with light spots. It crawls and does not swim. It has no legs and long antennae.

**Gammarus* and *Baetis* are not included as they are poor indicator species and relatively tolerant*

Understanding the characteristics that identify one group from another is an important part of the SSRS identification requirements. Separating the invertebrates into their respective groups and then recognising different taxa within a group is more important than identifying individual species

Objectives

- To become familiar with some of the key organisms found in SSRS groups
- To examine adaptations of freshwater invertebrates to their environment
- To compare and contrast the community structure of two river systems using the SSRS assessment

Method

1. Spend at least 20-30mins studying the contents of each river sample in order to ensure that all macroinvertebrate are identified to the taxonomic level required (genus or species).
   Failure to spend sufficient time examining the tray is the main cause of error in the final risk score. Typically, 15-20 different taxa will be found in a small stream sample. If you find less than 10 the stream is either quite seriously polluted or you have missed quite a few taxa.
2. Place the macroinvertebrates you identified into their assigned SSRS groups for each river. Start by identifying the Group 1 (Mayfly) taxa according to their presence or absence. Add up the relative abundances of each taxon. You should now have a **total score** and a **total relative abundance** for taxa 1. Continue until all five groups have been counted and you have a total taxa score and a total abundance score of each of the five groups. * *Asellus* is calculated slightly differently*
3. **Calculate the SSRS scores**. Explain the results. Comment on the similarities and differences between the two communities.