

Assessment of the Water Quality of Ash Lane Stream, Co. Sligo using the Q. Biotic Index and its relevance to Forensic Science.

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Introduction

This study was conducted to determine the water quality of a freshwater stream in County Sligo by utilising the Q. Biotic Index system. Identification of aquatic macroinvertebrates is a step toward an understanding of the role these organisms play in death scene investigations^[1] and highlighted in this study are key findings and their relevance to forensic science.



Figure 1: Sampling location chosen, Ash Lane Stream, close to the footbridge Droichead Na Milaioise

The water quality was assessed by applying the Q. Biotic Index system to results obtained over a seven-week sampling period, between February and April 2023. The Q. Biotic Index system is the most sensitive ecological assessment method available for detecting organic pollution and nutrient enrichment impact on Irish rivers.^[2] It is a technique used to identify the quality of an environment by the abundance of organisms present.

Death investigations differ in aquatic environments to those found in the terrestrial environment, and the nature of the colonisation process is valuable information within forensic entomology.

Methodology

Sampling was conducted by using the kick sampling collection method by disturbing the substrate once for a duration of 3 minutes each sampling day. This collection method was done over a period of five weeks with the use of a D-shaped pond net.

The sample collected was then sorted and each species identified by their physical characteristics with the use of a Dichotomous key. All samples were returned to the stream after sorting.

- Electrochemical parameters, pH, temperature, conductivity, oxygen saturation and dissolved oxygen readings were collected from the freshwater source.

The regional climate in this study is characterised as being mild, humid with regular rainfall and does not experience temperature extremes.

Results

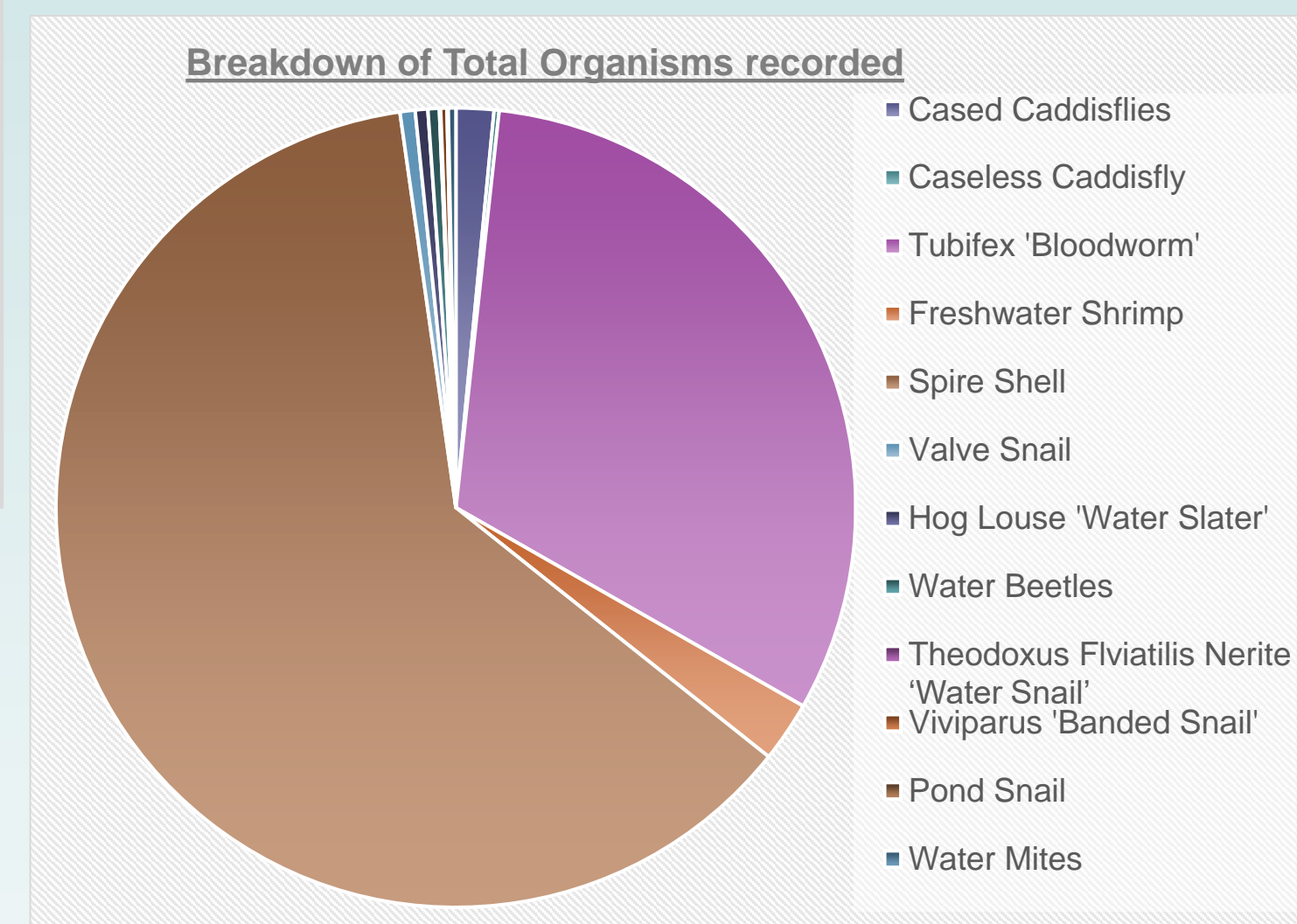


Figure 2: A total of 1966 organisms were counted with 12 different classifications of species identified.

Discussion

The Q. Biotic Index was applied to the data collected and gave the water sampled at Ash Lane stream in County Sligo a Biotic Index value of Q3. Species are assigned by their taxonomy order relevant to how sensitive or tolerant they are to pollution.

Results were compared with the most recent published reports on the water quality of Lough Gill, (the primary source of water for Ash Lane stream) by the Environmental Protection Agency (EPA), who gave the water a Q3 value for moderately polluted and in unsatisfactory conditions.^[3] In 2016 the water of Ash Lane stream was given a Q. Biotic Index value of Q3 by the consultancy firm Eco Fact while carrying out an environmental assessment on the stream.^[4]

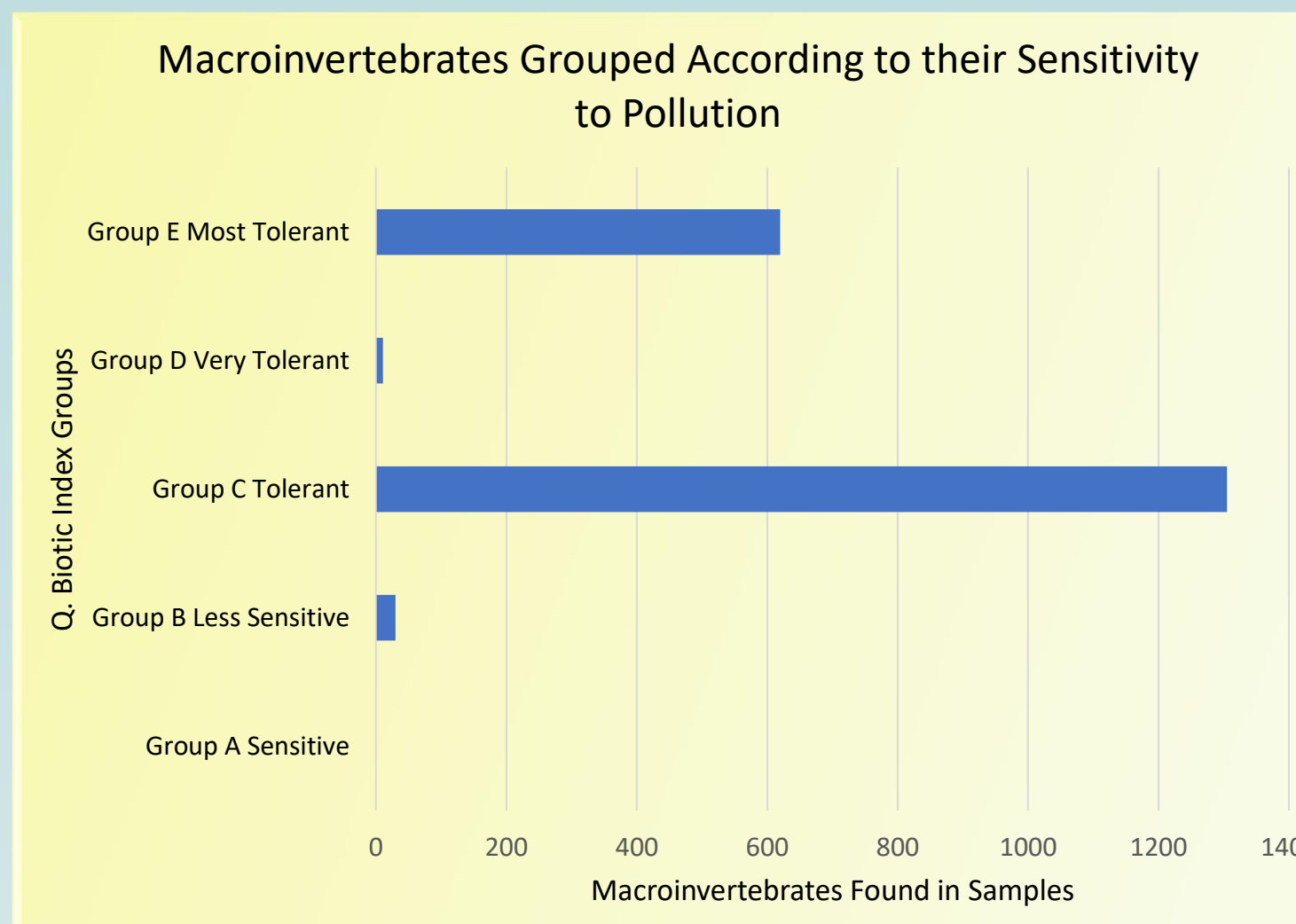


Figure 3: Graph of Macroinvertebrates grouped according to their sensitivity or tolerance to pollution present in the water

Important skills were acquired by the researcher in field sampling and the ability to identify aquatic macroinvertebrates in a freshwater stream.

Caddisflies (Trichoptera), with a total of 30 recorded and to a much lesser find water beetles (Coleoptera) of 9 recorded in total were the primary macroinvertebrates found of forensic significance and used in death scene cases to help establish the postmortem interval of a deceased body found in water.

Conclusion

The results of this study indicate that the water quality at Ash Lane Stream is slightly polluted with a Biotic Index value of Q3, identifying the water as being unsatisfactory and the diversity of organisms as being low.

From the macroinvertebrate data collected in this study, Caddisflies (Trichoptera) have been the most useful in previous aquatic cases, by observing the stage of their life cycle and presence on the remains of a dead body found in water along with the stage of decomposition of the body, investigators were able to estimate a postmortem submersion interval for the deceased person.^[5]

The published literature on studies focusing on terrestrial cases versus those in aquatic reflect an 80-20% difference^[6], therefore more investigation is required into this particular area especially in the Irish and British geographical climate.

There have been many studies conducted on the water quality of waterways in Ireland, however further studies are required within the context of forensic entomology, with consideration to the

- Time of year, as both the season and temperature are important parameters.
- Sampling different locations in the water, more upstream towards the river.
- Development of a biological database for use in medico criminal entomology.

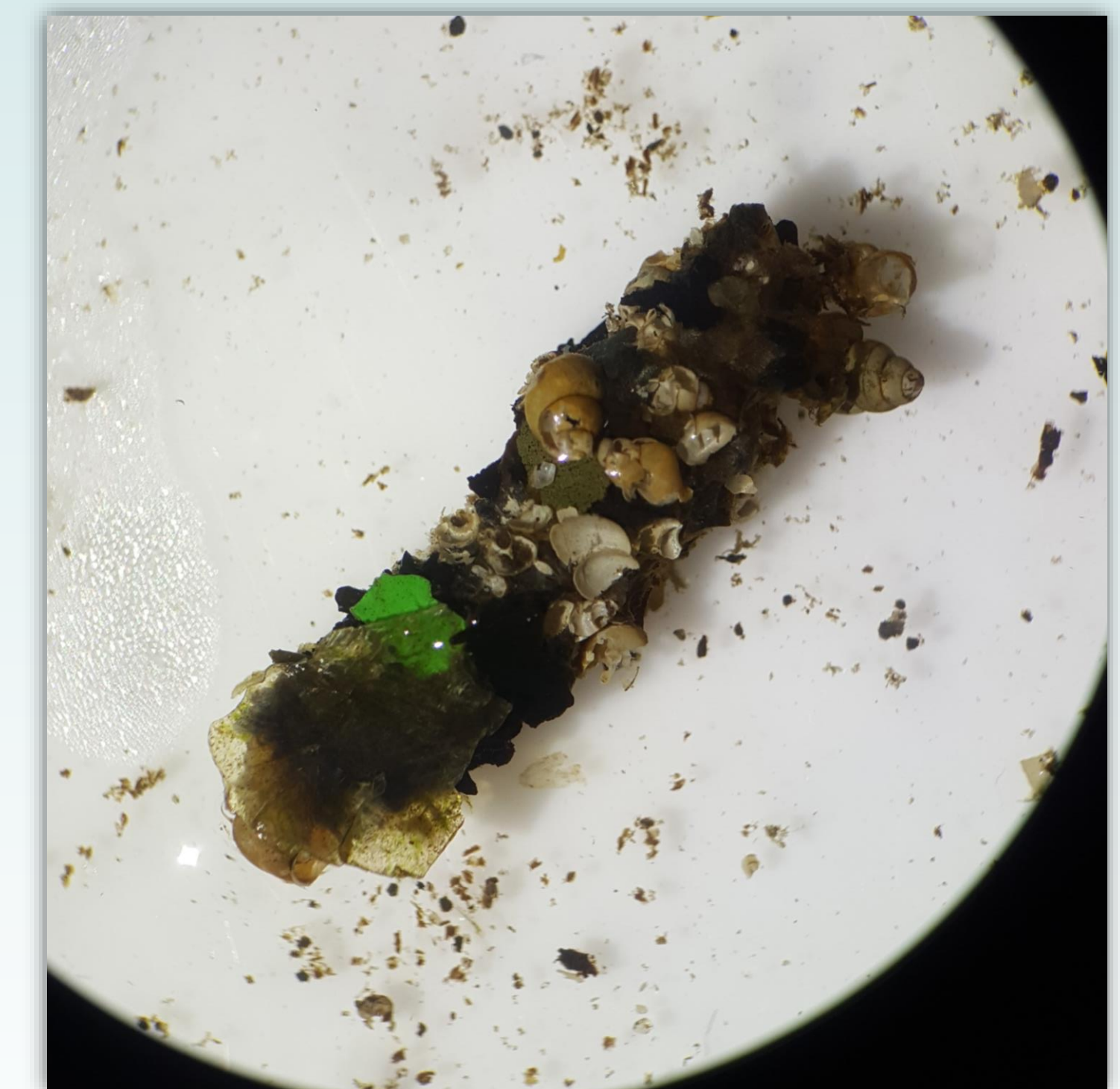


Figure 4: Cased Caddisfly (Trichoptera), retrieved at Ash Lane stream, Co. Sligo

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