



National Certificate of Educational Achievement
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2003

SUBJECT REFERENCE: BIOLOGY 2.4

Internal assessment resource reference number:
Bio/2/4 – B version 3

“What’s lurking below?”

Supports internal assessment for:

Achievement Standard 90460

Investigate an interrelationship or pattern in a population or
community

Credits:3

Date version published:

30 January 2003

**Ministry of Education
quality assurance status**

For use in internal assessment
in 2003.

Teacher Guidelines:

The following guidelines are supplied to enable teachers to carry out valid and consistent assessment using this internal assessment resource.

Context/setting:

Task 1 of this assessment requires the collection of field data on the distribution of organisms in a stream. Task 2 and 3 involve the processing, presenting and interpretation of this field data.

Conditions:

Task 1

This task is to be carried out in the field in groups of no more than three students with each student recording their own data. The students will not be given instructions on what to do but are to use their knowledge of sampling, sample size and field work techniques to determine the most appropriate method to gather and record the field data.

A range of equipment must be provided so that students are able to **SELECT** a sampling method appropriate for the type, size and number of organisms being sampled and the type of habitat.

Data loggers could be used if available. Identification sheets or keys should be provided. Data will be collected from students as they leave the field and returned to them to complete Tasks 2 and 3.

Task 2

This task is to be done individually in class. Students will have their work from task 1 returned to them.

Task 3

This task is to be done individually in class. It is not expected that the students are familiar with the way of life of the organisms being studied so references or resources will be provided to assist students to discuss the distribution of the organisms with reference to environmental factors and the way of life of the organism. Alternatively, a whole class discussion in general terms on the biotic and abiotic factors, which might be causing the distribution of the organisms in the stream could occur when at the field site.. Specific information on the way of life of a number of the organisms present could also be discussed.

Resource requirements:

Identification sheets or keys, quadrats of varying sizes, 1 m rules/10 m tape measure, transect lines, point sample, polystyrene blocks, nets, ice-cream containers, magnifying glasses, equipment for measuring abiotic factors eg thermometers, data loggers, lux meters.

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Investigate an interrelationship or pattern in a population or community

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Student Instructions Sheet

Aim:

To collect, process and interpret field data on the distribution of the following organisms in a stream community: <<insert the names of the organisms to be studied>>.

Conditions: <<insert information about conditions of the investigation including time available>>

Task 1: Collecting and recording data

1. Collect data to enable you to draw a profile diagram of a suitable part of the stream. Your profile should include depth measurements, substrate information, sampling areas and environmental conditions such as temperature and rate of flow.
2. Decide on the most appropriate method to collect data on the distribution of six organisms identified in the stream. Use this method to collect sufficient data to enable the distribution pattern to be described.
3. Record your data in a format that will allow you to use it when you return to school.
4. Write down the final method you used to collect the data.

Task 2: Processing and presenting data

1. Briefly describe the method you used to collect the data.
2. Process your collected data into a table.
3. Draw a profile diagram of the stream.
4. Graph the data you collected in the most appropriate way to show the distribution of the organisms.

Task 3: Interpreting Data

1. Use the information in your table and graphs to describe the pattern of distribution of your five chosen organisms.
2. Discuss the reasons why the distribution pattern you have identified occurs. Use the environmental data you collected, the profile diagram and information about the way of life of the organisms. You will need to consider a range of ideas in your discussion.

Exemplar for Excellence – What’s lurking below?

Task 1

Method- transect line across stream. Quadrats taken every 50cm. Quadrat size 25cm². Actual counts of following organisms: horn caddis, mayfly nymph, stone caddis, stone fly, Caddis fly nymph, mosquito larvae, dobson fly.

Quadrat 1

nearest east bank of stream. Partially covered by overhanging branches

Depth - 15cm

Substrate – small stones and mud

Temperature – 13⁰C

Rate of Flow – 0 ms⁻¹

Species abundance:

Horn caddis 3

Mayfly Nymph 3

Stone Fly 3

Caddis fly nymph 4

Mosquito larvae 4

Dobson fly 0

Quadrat 2

Depth - 42 cm

Substrate – small stones and large boulders

Temperature – 13⁰C

Rate of Flow – 0.3 ms⁻¹

Species abundance:

Horn caddis 6

Mayfly Nymph 5

Stone Fly 1

Caddis fly nymph 6

Mosquito larvae 0

Dobson fly 6

Quadrat 3

Depth - 45 cm

Substrate – small stones and large boulders

Temperature – 13⁰C

Rate of Flow – 1.0 ms⁻¹

Species abundance:

Horn caddis 2

Mayfly Nymph 9

Stone Fly 4

Caddis fly nymph 2

Mosquito larvae 0

Dobson fly 4

Quadrat 4

Depth - 41.5 cm

Substrate – small stones and large boulders

Temperature – 13⁰C

Rate of Flow – 0.7 ms⁻¹

Species abundance:

Horn caddis 3

Mayfly Nymph 5

Stone Fly 7

Caddis fly nymph 3

Mosquito larvae 0

Dobson fly 2

Quadrat 5

Depth - 35 cm

Substrate – small stones and rocks

Temperature – 13⁰C

Rate of Flow – 0.6 ms⁻¹

Species abundance:

Horn caddis 3

Mayfly Nymph 3

Stone Fly 3

Caddis fly nymph 5

Mosquito larvae 0

Dobson fly 4

Quadrat 6

Depth - 20 cm

Substrate – gravel and rocks with slime on them

Temperature – 13⁰C

Rate of Flow – 0.2 ms⁻¹

Species abundance:

Horn caddis 2

Mayfly Nymph 5

Stone Fly 5

Caddis fly nymph 3

Mosquito larvae 2

Dobson fly 0

Task 2

Method

This data was collected using a transect line across stream and 25cm² quadrats placed every 50cm. The numbers of the following organisms: horn caddis, mayfly nymph, stone caddis, stone fly, Caddis fly nymph, mosquito larvae, dobson fly were recorded.

Results

Species	Insect numbers in 25cm ² quadrat at 50cm intervals on a transect across a stream						Total
	1	2	3	4	5	6	
Horn Caddis	3	6	2	3	3	2	19
Mayfly Nymph	3	5	9	5	3	5	30
Stone Fly	3	1	4	7	3	5	23
Caddis fly nymph	4	6	2	3	5	3	23
Mosquito larvae	4	0	0	0	0	2	6
Dobson Fly	0	6	4	2	4	0	16
Temperature (°C)	13	13	13	13	13	13	
Depth (cm)	15.0	42.0	45.0	41.5	35.0	20.0	
Flow rate (ms ⁻¹)	0.0	0.3	1.0	0.7	0.6	0.2	
Substrate	Small stones mud	Stones boulders	Stones boulders	Stones boulders	Stones rocks	Gravel Rocks and slime	

Graphs: see next page.

Conclusion

Dobson fly larvae are found in greater numbers in the middle of the stream. Two abiotic factors that cause this are rate of water flow and dissolved oxygen. Dobson flies are active, fast moving animals that hunt for their food so they need lots of oxygen. Therefore they need a good supply of oxygen, which is found in water with faster flow rate. Also the food source of dobson fly larvae (caddis fly larvae and mayfly nymphs) is found in the faster flowing areas of the stream.

Mosquito larvae are found only at the edges of the stream where the water is barely moving. This because they must come to the surface at frequent intervals to obtain oxygen through a breathing tube called a siphon. The larvae eat algae and other small organisms, which are found in slower moving water.

The stonefly nymph is a herbivore or a detrital feeder. It scrapes algae from the rocks so it is found wherever there are large rocks. It can handle fast current because it has long legs with claws to hang on to the rocks.

Mayfly nymphs also graze on algae on rocks so they are also found where there are large rocks. As this stream has lots of rocks mayfly nymphs and stonefly nymphs are found in most areas of the stream.

GORMACK GRAPH PAPERS CHRISTCHURCH N.Z. COSTLY 18 cm x 25 cm x 2 mm

Stream Zonation.

