



National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TĀEA

Internal Assessment

Subject reference: Biology 1.4

Internal assessment resource reference
number: **Bio/1/4 – B version 3**

“Diversity: an ecological pattern”

Supports internal assessment for:

Achievement Standard 90164 version 2

Describe an ecological similarity or difference in two biological
communities

Credits: 3

Date version published:

January 2004

**Ministry of Education
quality assurance status**

For use in internal assessment
from 2004

Subject reference: Biology 1.4

“Diversity: an ecological pattern”

Supports internal assessment for:

Achievement Standard 90164 version 2

Describe an ecological similarity or difference in two biological communities

Credits: 3

Student Instructions Sheet

Aim: To collect, process and interpret data on the diversity and abundance of species in two biological communities. The two communities are the intertidal (between the high tide and low tide marks) and the subtidal (beyond the low tide mark). You will also need to collect information about the non-living (abiotic) factors of each community.

| |
|---|
| <p>The number of different types of species in a community is called diversity. The number of individuals of each species determines its abundance.</p> |
|---|

Conditions

Field data will be collected from intertidal and subtidal communities at Matauri Bay during this scheduled field trip using randomly placed quadrats. Students will collect data in groups of 4. Two students will collect data from the intertidal community and the other two will collect data from the subtidal community while snorkelling. Data processing and analysis will be done individually in class over 2 periods.

Task 1 Field work that will be repeated for both communities (day trip)

- a) One pair in the group does the following in the intertidal community, while the other pair (with mask and snorkel) does the following in the subtidal community. Randomly place the quadrat on the **rocky shore** between low tide and high tide for the intertidal community and beyond the low tide mark for the subtidal community. For each quadrat and for each species - count the number of individuals for the animal species and the percentage cover of each algae species. Do at least 10 quadrats for each community. Use datasheet B which is provided. For the pair collecting from the subtidal community the datasheet will need to be copied onto a slate.
- b) Record abiotic environmental factors found in each quadrat. Use data sheet A provided.
- c) Ensure you have done steps a) and b) for EACH community.
- d) Ensure that you EACH have a copy of ALL the data collected from both communities *before leaving Matauri Bay.*

Data sheet A: Abiotic (non-living) factors

Student name _____

| COMMUNITY A: _____ | | | | | COMMUNITY B: _____ | | | | |
|---------------------------|------------------|-----------------------------------|--------------------------|---------------------------------|---------------------------|------------------|------------------------------------|--------------------------|---------------------------------|
| Quadrat number | Temp (°C) | Substrate Type (rock/sand) | Wave action (Y/N) | Water availability (Y/N) | Quadrat number | Temp (°C) | Substrate Type (rock /sand) | Wave action (Y/N) | Water availability (Y/N) |
| 1 | | | | | 1 | | | | |
| 2 | | | | | 2 | | | | |
| 3 | | | | | 3 | | | | |
| 4 | | | | | 4 | | | | |
| 5 | | | | | 5 | | | | |
| 6 | | | | | 6 | | | | |
| 7 | | | | | 7 | | | | |
| 8 | | | | | 8 | | | | |
| 9 | | | | | 9 | | | | |
| 10 | | | | | 10 | | | | |

Data sheet B: Biotic (living) **ALGAE SPECIES only**

Student name _____

| Community A: _____ | | | | | | | | | | Community B: _____ | | | | | | | | | |
|--------------------|--|--|--|--|--|--|--|--|--|--------------------|--|--|--|--|--|--|--|--|--|
| Species name | | | | | | | | | | | | | | | | | | | |
| Quadrat 1 | | | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | |
| Average | | | | | | | | | | | | | | | | | | | |

Data sheet B: Biotic (living) **ANIMAL SPECIES only**

Student name _____

| Community A: | | | | | | | | | | Community B: | | | | | | | | | |
|--------------|--|--|--|--|--|--|--|--|--|--------------|--|--|--|--|--|--|--|--|--|
| Species name | | | | | | | | | | | | | | | | | | | |
| Quadrat 1 | | | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | |
| Average | | | | | | | | | | | | | | | | | | | |

Task 2 Processing the data from the two communities (1 class period)

This is individual work so you need *your* complete copy of all the data from your group.

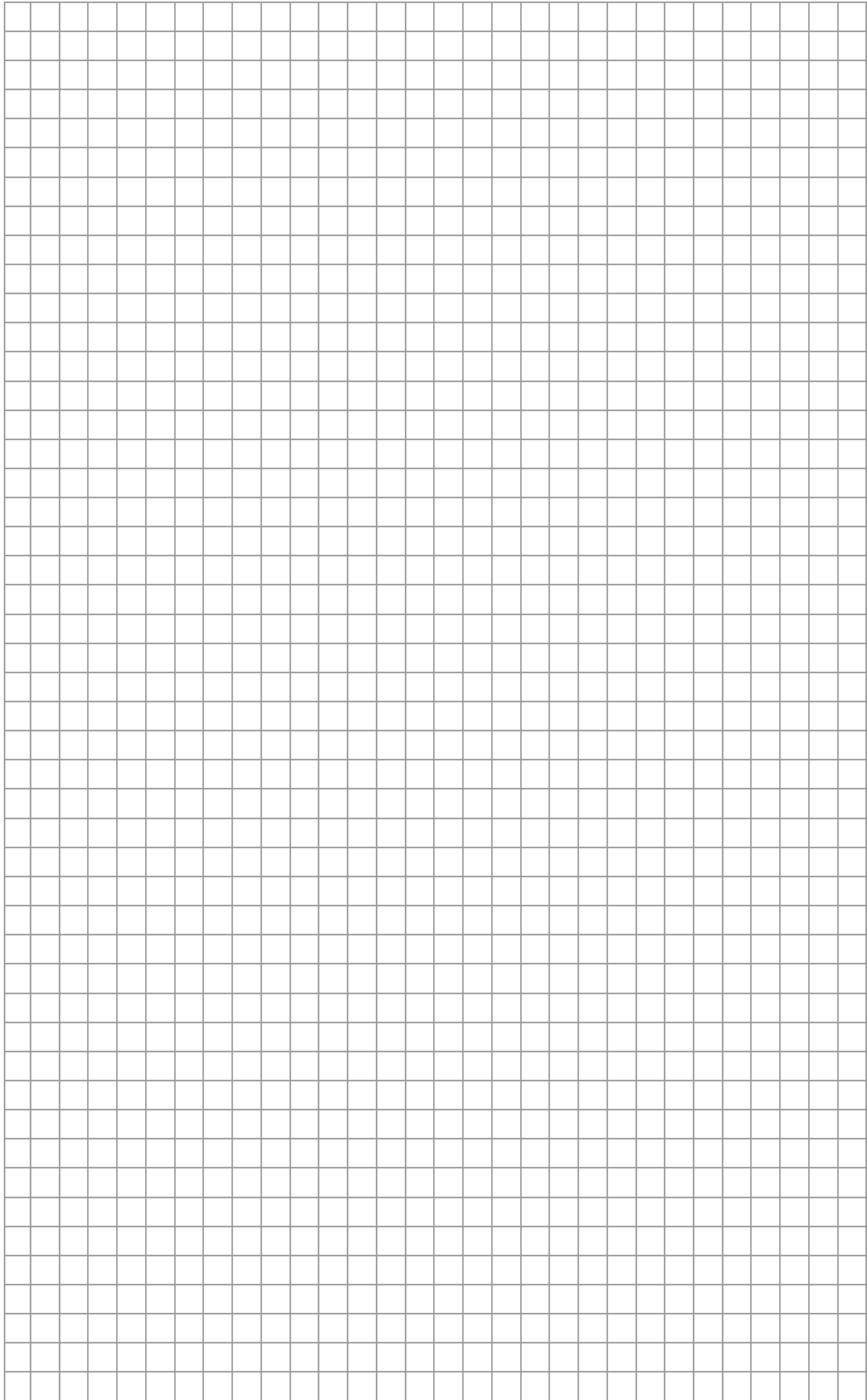
Abiotic (non-living) data from Datasheet A

1. Comment on how similar or different each abiotic factor is between the two communities A and B.

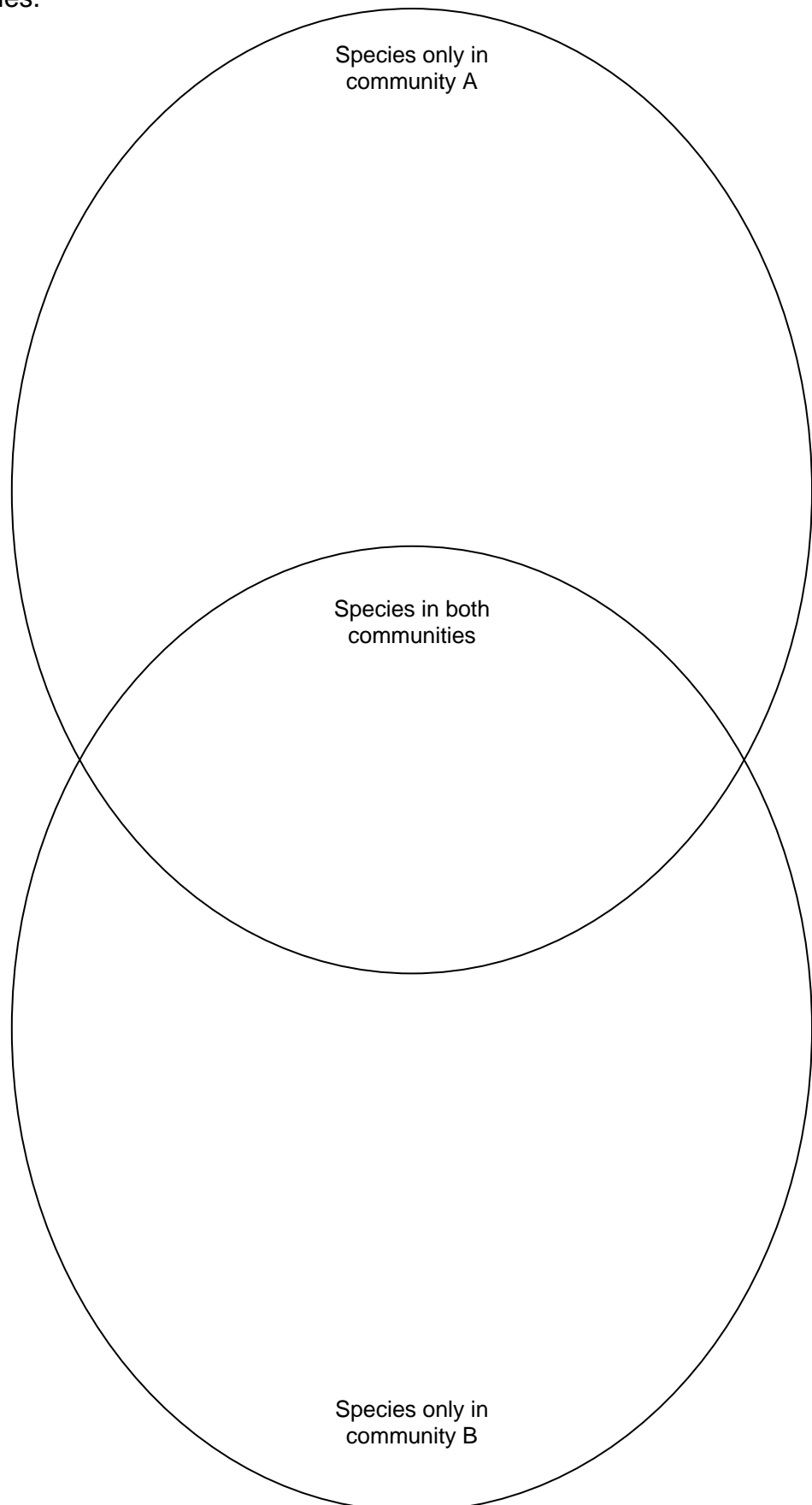
| Abiotic factor | Comment on how similar or different the abiotic factor is between the two communities |
|--------------------|---|
| Temp (°C) | |
| Substrate type | |
| Wave action | |
| Water availability | |

Biotic (living) data from Datasheet B

2. For *each species* calculate an average for community A and community B. Record this at the bottom of the table.
3. Using the averages from your table draw a bar graph for the algae species and another one for the animal species to show the average in *each* community. Remember you want to use the graph to show any difference between the two communities.



4. Complete the Venn diagram below to compare the species present in the two communities.



Task 3 Discussion of the diversity and abundance in the two communities (1 class period)

This is individual work using the information you have on diversity and the pattern of diversity shown in the two communities from your processed field data.

Compare the *diversity* between the two communities.

1. **Describe** any similarities or differences in the diversity of the communities. Use your results (Venn Diagram and bar graphs). Using your abiotic (environmental factors) data **discuss** WHY these similarities or differences may occur between the two communities.

Compare the *abundance* between the two communities.

2. **Describe** any similarities or differences in the abundance of the communities. Use your results (Venn Diagram and bar graphs). Using your abiotic (environmental factors) data **discuss** WHY these similarities or differences may occur between the two communities.

Your discussion must be based on how abiotic (environmental) factors effect the diversity and abundance of the species in the two communities. Factors to consider could include: food availability, predation, desiccation (drying out), wave action, temperature, water availability, substrate type and possible harvesting.

When finished hand in:

- this handout – all filled out!
- your raw data from the field

Assessment schedule: Bio/1/4 – B version 3: “Diversity: an ecological pattern”

| Judgement for achievement | Judgement for achievement with merit | Judgement for achievement with excellence |
|---|--|---|
| <p>An accurate description of the diversity and abundance of species shown in the two communities.</p> | <p>Explanation of similarities or differences in the diversity and abundance of species shown in the two communities is linked to at least 2 environmental factors.</p> | <p>Discussion of similarities or differences in the diversity and abundance of species shown in the two communities is linked to at least 2 environmental factors.</p> |
| <p>Eg The bar graph shows that the bush area had a lot more types of insects than the pine forest. There were higher numbers of each type of insect in the bush. The Venn diagram showed that the pine forest had low diversity but the bush had lots of different species. Only one plant, the hounds tongue fern was found in both.</p> | <p>Eg The ranger told us that the pine needles made the soil acidic so we measured it and it was more acidic than the soil under the leaf litter in the forest. Not as many types of species are able to live in the acidic soil under the pine forest. Not as many individuals live in the needles and soil under the pine forest so abundance is low. In the pine forest there was more wind because there are less trees than in the bush. Millipedes become dehydrated from wind so there were fewer in the pine forest.</p> | <p>Eg The reason for the similarities and differences in the diversity in the two communities is that the pine trees change the environment for the other species. Fewer types of species can live in the more acidic soil conditions under the pine forest. Species, such as basket fungi, that can live in the conditions were found in high numbers. The trees in the pine forest are further apart than the trees in the bush. Therefore the forest floor in the bush is more sheltered, darker, with a higher humidity and steadier temperature than the floor in the pine forest. The bush floor is a good environment for animals that get dehydrated easily eg worms, springtails, millipedes. Millipedes get dehydrated although they have a thick cuticle because it doesn't have a waterproof cover.</p> |

Assessment schedule: Bio/1/4 – B version 3: “Diversity: an ecological pattern”

| Judgement for achievement | Judgement for achievement with merit | Judgement for achievement with excellence |
|---|--|--|
| <p>An accurate description of the diversity and the abundance of species found in the intertidal and subtidal communities.</p> | <p>Explanation of similarities or differences in the diversity and abundance of species found in the intertidal and subtidal communities and is linked to at least 2 environmental factors.</p> | <p>Discussion of similarities or differences in the diversity and abundance of species found in the intertidal and subtidal communities and is linked to at least 2 environmental factors.</p> |
| <p>Students will describe bar graphs and summarise which community is most diverse and which species is most abundant.</p> <p>TEACHERS</p> <p>Email me for the examples which go here</p> <p>kiwitide@yahoo.co.nz</p> | <p>As for Achieved and . . .</p> <p>Students will explain reasons for the similarities or differences in diversity and abundance as shown in their data and link these to at least 2 environmental factors.</p> <p>TEACHERS</p> <p>Email me for the examples which go here</p> <p>kiwitide@yahoo.co.nz</p> | <p>As for Merit plus . .</p> <p>Students will discuss reasons for the similarities or differences in diversity and abundance as shown in their data and link these to at least 2 environmental factors.</p> <p>TEACHERS</p> <p>Email me for the examples which go here</p> <p>kiwitide@yahoo.co.nz</p> |