

# Field Work Using Several Ecosystems



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# Aboriginal Art and Sea Journeys

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## Level

2-8

## Key question

How can features of the environment and journeys through that environment be visually represented on a piece of paper?

## Key Outcome

Develop ideas for interpreting, mapping or telling a story about the environment using symbols.

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by Karen Wilson, Marine Discovery Centre, Woodbridge, Tasmania.

Art and maps and the marine environment seem to go together! Most of us have used maps to explain features of the coastline to our students, but using some of the techniques developed by Aboriginal people may provide an exciting challenge for students.

There are numerous ways of introducing children to Aboriginal art. Most states have an Aboriginal Education Unit that will assist with speakers, materials and references. Local Aboriginal communities may be able to provide a speaker. Pictures by Aboriginal artists in books can be useful reference and display resources. A pre- or post-activity visit to an art gallery displaying Aboriginal paintings and crafts may serve to show students alternative methods of drawing routes and mapping the coast. This activity has been developed in conjunction with Charmaine Wall of Tasmania, and is on trial at the Marine Discovery Centre. It can be used prior to, or following a field trip to a marine area.

## What you need

- Pencil or neo-pens or charcoal or paint or coloured pencils, paper (can be recycled)
- Sea chart of any area (can be local), navigational maps, or ortho-photo maps of a coastal area
- Satellite imagery of the same area can be used as an extension

## What you do

### (a) Looking at sea charts

Look at the sea charts or navigation maps of an area. These could be of the area to be visited later. Look at the symbols on the charts.

- What shapes and symbols are used?
- What do they mean?
- How are they made?
- Do we know of any stories (historical, geographical, exploring, treasure, shipwrecks) associated with this chart?
- How are ideas, rather than features, represented?
- What other ways of communication use symbols? (Remind students about music, science, semaphore, flashing lights from lighthouses and beacons, safety symbols, computers).

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# Aboriginal Art and Sea Journeys

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- What other perspectives use a 'bird's eye view'? (Aerial photos, satellite imagery, weather maps, Aboriginal art).
- Try to describe a journey from point A to point B on the map, referring only to the symbols (if you are Level 5 and above you should refer to compass directions, associations between features, etc).

## **(b) Looking at aboriginal art techniques**

1. Look at the examples of aboriginal art – greeting cards, books, posters and possibly some artifacts. You will see that different art styles are used in different regions, for example, X-ray styles, stick-like figures from Oenpelli, cross hatching from Arnhem Land, circles and dots from the Central Desert, and many modern interpretations.

2. Now identify:

- What patterns are used?
- What symbols are used?
- Where do these symbols come from (are they taught or ... )?
- What sort of environments are shown?

Can we identify the intended meaning from looking at this art? How would our European charts be seen from an Aboriginal perspective?

- good camp sites
- first contact with explorers or ships
- permanent water?

## **(c) Looking at our environment**

1. How can we map/tell a story about our environment using the ideas gained from looking at maps and Aboriginal art techniques?

### **Micro-journeys**

Visit the mud flats, foreshore, or any inter-tidal area, and look for patterns that could be used as symbols, for example, mollusc trails, bird prints, human foot prints, wave ripples, shell patterns. If you can't get there, think about areas you know.

- Create a micro journey of shore and inter-tidal animals using the symbols/patterns that you have found or make up symbols of your own.

Create a story/assumption/hypotheses about your micro journey. Draw this on paper using coloured pencils, crayons, charcoal or paint.

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# Aboriginal Art and Sea Journeys

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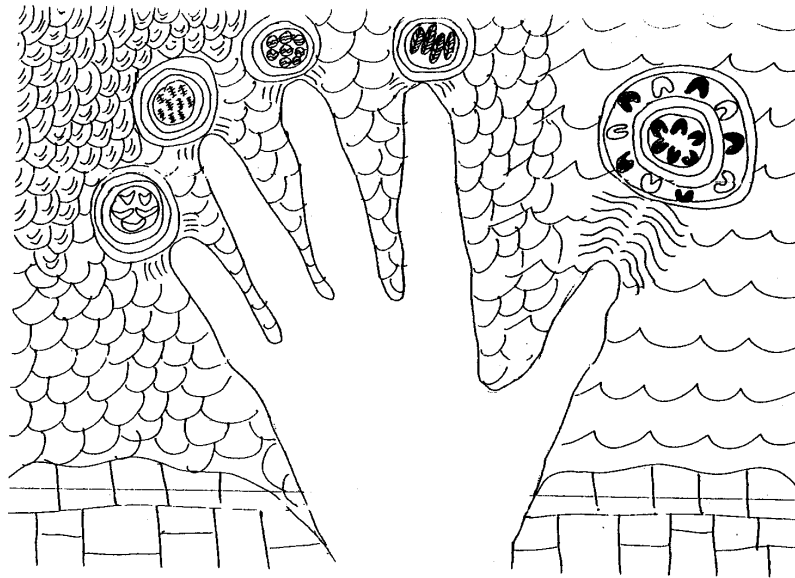
## Macro-journeys

Use a longer journey for this next activity. This art will represent the bigger picture of a longer journey of a student from home, say, to a seashore. Use another piece of paper and do the following:

- Think about the symbols you would like to use; these can come from the environment or they can be creative or inspired by aboriginal techniques.
- Begin from home ending up at the local beach, and include any side trips made or things of significance to you.
- Use a key to explain the symbols drawn (see Figure 1 for an example).
- Language and other images/textures, for example, things that may have been found on the beach or inspire creation can also be incorporated. There are no best or correct maps either!

2. Now give your journey story to a classmate to read, so that the process of retelling is incorporated. Explain your journey, referring to your 'map'. Journey art maps can be displayed in the classroom later.

# Aboriginal Art and Sea Journeys



Land bordering the D'Entrecosteaux channel



Hand represents the Marine Discovery Centre – the hand is used as a symbol in a lot of Aboriginal art. It represents meeting others



The fresh water coming into the channel from the Derwent river



The channel water



Side journeys to Snake Island, the oyster farm, the salmon farm, and to site of the water experiments



**Figure 1.** Illustration, in part, of a key to represent a sea journey

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# Diversity Indices as an Educational Tool

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## Level

10

## Key question

What can a diversity index tell us about an ecosystem?

## Key outcome

Understanding of biodiversity. Use qualitative scientific methods to evaluate biodiversity.

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by Brian Trench, Camden Education Centre, NSW.

Biodiversity includes all life forms not just a list of species but also the genes and gene combinations they contain as well as the diversity of the ecosystems and habitats to which they belong.

Biodiversity is not just a measure of how many species are present but also the relative abundance of each species (also known as species evenness) and the overall number of individuals (species abundance). These three measures can be combined in mathematical formulae to produce indices of diversity for a certain habitat.

Different ecosystems can then be compared to determine the most valuable from a biodiversity point of view, as well as comparing the same ecosystems over time, to work out if that ecosystem is under stress or actually improving.

The quality of habitat is likely to have a major effect on animal diversity. Two characteristics of vegetation which are likely to affect animal diversity include vegetation structure (or physiognomy) and number of species. An indication of both will be gained using a transect sample.

This field study uses a standard transect to find out about different habitats and the bird species in these. Then, the bird species are used as indicator species to prepare an index of diversity to allow comparisons between different habitats. If time is short, the habitat (or vegetation) can be quickly assessed and two or more contrasting areas used to prepare the list of bird species.

## What each group needs

Bird field guide  
Binoculars  
Tape measure  
Calculator with log function  
Field sheets  
Clipboard, pencil

## What each group does

### 1. Habitat study

- Assemble your group and collect the required equipment.
- Each group works in a different vegetation type, for example, close to a water body, pond, seashore, a swamp, a ridge line or forest, low lying scrub and roadside verge.

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# Diversity Indices as an Educational Tool

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- Identify and mark in the location of the habitat on a map. Name and label each habitat according to the dominant species of plant(s). If no plants exist it might be named after the dominant physical characteristic, such as ‘clay pan habitat’ or ‘stony desert habitat’.
- On the table below, note the main species, approximate area and water levels for each habitat. Use general terms to describe water levels such as ‘shallow’, ‘deep’ or ‘below ground level’. Note that there could be more than one water level within a habitat.
- Describe the relationship between water depth and main plant species.

Location	Plant Species	Water Levels	Approx. Area

## 2. Transect Vegetation Survey

- Lay the tape measure out across terrain typical of the terrestrial habitat you have classified above (i.e. the habitat which occurs entirely on dry land). The spot may be indicated to you by your teacher.
- Using Table 1, record the type and height of plants which lie within one metre either side of the tape over a distance of 20 m. This information will be used to construct a profile of the vegetation. Plant type need only be a broad description such as grass, herb, reed, shrub or tree. Include dead trees and fallen logs and branches.
- Record the number of species as you do this (see next section).

**Table 1.** Results of vegetation transect

Distance Along Tape	Plant Type	Plant Height

- The variety of species in a habitat usually has an effect on the diversity of other organisms. In the box below, tally the number of species in each habitat. For this study we are interested in the number of species, rather than which species they are, so there is no need to identify them.

In the space below tally the number of plant species you find 1 m either side of the tape.

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# Diversity Indices as an Educational Tool

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	Tally
Total	

Transfer your line transect data to a graph to produce the vegetation profile for that habitat. This gives a good indication of the complexity of the structure of that habitat. Your teacher will help you with this.

### 3. Using indicator species to measure diversity

Because of the difficulty and expense of surveying every species of animal in an ecosystem we often survey just one group of animals which we believe give a good indication of the diversity of a much wider selection of organisms. For this survey birds are used. Birds are a good indicator for other vertebrates (reptiles, mammals, frogs). When using indicator species to compare diversity of different habitats it is best to use only species in the same trophic level ( i.e. the same stage in the food chains) because organisms occurring higher up the food chain naturally occur in lower numbers (there must be fewer predators than there are prey, for example). If this level of accuracy is required for this study, research the diet of all the species you observe and use only insectivorous (insect eating) birds in the calculations for diversity.

Diversity is more than the number of species in an ecosystem – although that is part of it. It includes the total variation in the species of that system – in their structural characteristics as well as the variation in the genetic make-up of plants and animals.

Before starting this activity, discuss this. If you find a total of 20 birds, of whom 10 are golden whistlers, six are wrens and four are lorikeets, does the area have a higher diversity than one where you find 20 birds, 12 of which are individual species, three are wrens, three are lorikeets and two are honeyeaters?

One way the diversity of different habitats can be compared is by working out diversity indices. We can use a formula to assign a number to a habitat which gives an indication of the level of diversity in it.

$$\text{Shannon-Weiner Index} = -\sum p_i \log p_i$$

where:

$i$  = the species surveyed

$p$  = # each species ( $n_i$ ) divided by total # of species ( $N$ )

=  $n_i / N$



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# Diversity Indices as an Educational Tool

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## EXAMPLE

Habitat \_\_\_\_ No. 1

Species	Number (ni)	$pi=ni/N$	$pi \log pi$
Honey Eater	20	0.2	- 0.130794
Noisy Miner	20	0.2	- 0.130794
Silvereye	20	0.2	- 0.130794
Superb Fairy Wren	20	0.2	- 0.130794
Rainbow. Bee-Eater	20	0.2	- 0.130794
Total (N)	100		- 0.69897

Habitat \_\_\_\_ No. 2

Species	Number (ni)	$pi=ni/N$	$pi \log pi$
Honey Eater	92	0.92	- 0.133315
Noisy Miner	2	0.2	- 0.130794
Silvereye	2	0.2	- 0.130794
Superb Fairy Wren	2	0.2	- 0.130794
Rainbow Bee-Eater	2	0.2	- 0.130794
Total (N)	100		- 0.13591

Diversity Index Habitat 1 = -0.69897

Diversity Index Habitat 2 = -0.13591

The mathematicians will notice that this will give a higher value for diversity where the ecosystem is not dominated by any one species – that is, the more even the species are in numbers of individuals, the higher diversity is likely to be. This property is related to the extent of genetic diversity – the variability of all the characteristics in all the populations in an ecosystem.

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# Diversity Indices as an Educational Tool

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## 4. Bird count

(a) Identify any birds you observe from an area near your tape. The accuracy of the index depends on finding all the birds in that habitat, so look hard. Count the number of individuals of each species and include in Table 2. Calculate the index using the Shannon Weiner formula.

**Table 2.** Bird diversity

Habitat

Species	Number (ni)	$p_i = n_i/N_i$	$p_i \log p_i$
Total (N)			

(b) Share the data with other groups and complete the following notes.

Habitat name \_\_\_\_\_

Plant species abundance \_\_\_\_\_

Bird Diversity Index \_\_\_\_\_

Habitat name \_\_\_\_\_

Plant species abundance \_\_\_\_\_

Bird Diversity Index \_\_\_\_\_

Habitat name \_\_\_\_\_

Plant species abundance \_\_\_\_\_

Bird Diversity Index \_\_\_\_\_

Habitat name \_\_\_\_\_

Plant species abundance \_\_\_\_\_

Bird Diversity Index \_\_\_\_\_

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# Diversity Indices as an Educational Tool

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Bird Diversity Index \_\_\_\_\_

(c) From the results above, discuss the relationship between plant species abundance and biodiversity of vertebrates

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Discuss how vegetation structure and the extent of variety of structure and environments (e.g. water depth) affects vertebrate diversity

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Discuss the relationship between number of plant species and vertebrate diversity

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Does the Index confirm the results of your original discussion

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From your findings outline a management strategy for this area which will increase diversity and safeguard fragile ecosystems

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# Bird Behaviour

## Level

2-3

## Key question

How does the behaviour of bird species differ?

## Key outcome

Observation of animals in their natural habitat.

Adapted from Moroney et al, *Coastal Activities for Primary Schools*, and the Australian Littoral Society's *Moreton Bay Kit*.

## What you need

Field sheet  
Clipboard, pencil  
Binoculars  
Field Guides, posters of birds

## What you do

### Survey of bird population

1. Before leaving the classroom, students should prepare their own bird survey sheets, following the suggestion below.
2. Each site or group of birds will become a separate survey. It is not necessary to name each bird unless students are especially interested in doing so. However, if certain birds are always observed on a beach, or collect close to a school, then field guides may be used to identify them.

### Survey sheet

	Survey 1	Survey 2	Survey 3
Where did I see it?			
What was it doing?			
What did it look like?			
Were there any other birds?			

### Silver gull behaviour

Most students will be familiar with the silver gull along the foreshores. As they become more expert at bird observation, they will be able to recognise certain behaviour and relate this to activities amongst the flock of seagulls (see sheet illustrating silver gull behaviour).

1. Select a suitable site and watch seagulls.
2. After making some observations, students could discuss what they have seen:
  - Are there apparent leaders?
  - Do some birds always give way?
  - Do certain birds always display aggressive characteristics?

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# Bird Behaviour

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- Do some birds hang round at the edge of the flock, apparently taking little interest in what is going on?
- What makes all the birds fly off together?
- What makes them all return to the one place?
- What happens if some food is found by one bird?

### 3. Discuss:

- Why do we often see flocks of gulls on playing fields, airports and parks?
- Why are we not encouraged to feed seagulls?







## References

*Project ReefEd* (Activities 88-94), mainly secondary and community level).

Ryan, F. and Ray, S. 1991, *The Environment Book, Activities and Ideas for Environmental Education*, Macmillan, South Melbourne.

Gould League of Victoria publishes numerous stickers, bird identification posters with appropriate activities on the reverse side of the poster, and also publishes survey forms and follow up activities.

# Silver Gull Behaviour

<p><b>"UPRIGHT ALARM POSTURE"</b>: Eyes wide open, neck stretched, feathers pressed against the body, wings held slightly out.</p> 	<p><b>"HUNCHED THREAT"</b> Threatening behaviour, body is hunched, feathers ruffled, bird makes quick walking movement at other bird.</p> 	<p><b>"OBLIQUE THREAT POSTURE"</b>: Neck is stretched up and head tilted down, wings may be lifted a little.</p> 	<p><b>"FORWARD POSTURE"</b> Head is dropped until it is lower than the tail with bill pointed upward – a sign of submission.</p> 	<p><b>"GRASS STABBING/ GRASS PULLING"</b>: Signalling territory (these are human interpretations of the birds behaviour, the birds may have different ideas!)</p> 
<p><b>1</b> Using food scraps gather a flock of gulls.</p>				
<p><b>3</b> Tick each gesture shown on this page as you observe an example of it.</p>				
<p><b>5</b> Notice that there is a characteristic call/sound for each gesture. Listen carefully – Try to imitate these sounds.</p>				
<p><b>7</b> What words would you use to describe the gulls feeding habit?</p>				
 <p>'AT REST'</p>				
<p><b>2</b> Hold back on the food for a moment and observe their behaviour.</p>				
<p><b>4</b> Notice how distant gulls keep on coming – What attracts their attention?</p>				
<p><b>6</b> Notice the distribution of young and older gulls. Comment on the position of the younger gulls.</p> <p>-----</p>				