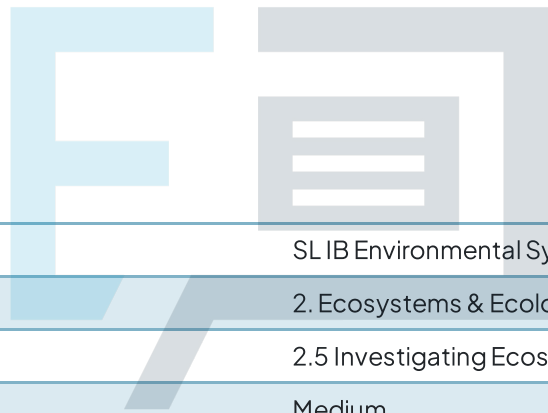




# 2.5 Investigating Ecosystems

## Mark Schemes



Course	SL IB Environmental Systems & Societies (ESS)
Section	2. Ecosystems & Ecology
Topic	2.5 Investigating Ecosystems
Difficulty	Medium

# Exam Papers Practice

To be used by all students preparing for  
SL IB Environmental Systems & Societies (ESS)  
Students of other boards may also find this useful



1a

### Indicative Content

*The population size of large mammals can be estimated using a range of methods, including:*

Any **one** from the following:

- Using the Lincoln index **OR** capture-mark-release-recapture / capture-mark-recapture / capture-mark-release; [1 mark]
- Counting the wolves in one smaller area and then extrapolate to the whole area; [1 mark]
- Counting the density of faecal material / droppings; [1 mark]
- Using aerial photography / satellite imagery; [1 mark]

Model Answer	Commentary
The wolf population size could be estimated using the Lincoln index, which involves the capturing, marking, releasing and then recapturing of wolves [1 mark].	<p>The command word 'suggest' requires you to propose a solution, hypothesis or other possible answer</p> <p>You should try and make sure your answer uses the terminology from the question</p> <p>This model answer adds some extra detail to demonstrate an understanding of the Lincoln index</p> <p>There are a range of other reasonable suggestions that could also gain a mark here, including radio tagging, camera trapping and infrared/thermal imaging</p>

1b

Indicative Content
<p><i>Collection population data on wolves could be difficult for a variety of reasons, including:</i></p> <p>Any <b>two</b> from the following:</p> <p>Wolves are difficult to observe/identify; [1 mark]            Dense forest/vegetation can cover/hide wolves; [1 mark]            Wolves are large/strong/dangerous mammals so using the Lincoln index/capture-mark-release (method) is difficult/dangerous; [1 mark]            Wolves may lose their tags/marks; [1 mark]            Wolf habitat may be very remote/difficult to access; [1 mark]            The same wolf may be counted/recorded more than once in a count/census; [1 mark]            The method could cause injury to the animal (e.g. if wolves are tranquilised); [1 mark]            Wolves migrate/move (quickly) over long distances; [1 mark]</p>

Model Answer	Commentary
<p>If using the Lincoln index to estimate wolf population size, this requires wolves to be marked or tagged in some way, which can be dangerous as wolves are large, strong predators and may need to be tranquilised [1 mark]. In addition, it is possible that marked wolves may lose their marks or tags over time, which will affect the population estimate when wolves are recaptured [1 mark].</p>	<p>The command word 'outline' requires you to give a brief account or summary</p> <p>The answer does not make simple statements (e.g. "wolves are dangerous", which would not gain a mark)</p> <p>Instead, each factor is <b>outlined</b> so it is clear why that factor makes collecting data on wolves challenging</p>

2a

Indicative Content	Commentary
<p><i>The results shown in the table can be explained as follows:</i></p> <p>Any <b>two</b> from the following:</p> <ul style="list-style-type: none"> <li>• As the distance from city centre increases, percentage coverage by lichen increases <b>OR</b> there is a (positive) correlation between distance and lichen coverage; [1 mark]</li> <li>• There are more cars in city centre / is more car pollution in city centre; [1 mark]</li> <li>• There is more sulfur dioxide in city centre; [1 mark]</li> </ul>	<p>You would also gain marks for the converse answers for marking points 2 and 3, e.g. "there are fewer cars further away from the city centre" and "there is less sulfur dioxide further away from the city centre"</p>

2b

Indicative Content	Commentary
<p><i>A method to measure the percentage of a stone wall covered by lichen is as follows:</i></p> <ul style="list-style-type: none"> <li>• Measure the area of wall covered by lichen / use a grid/quadrat to measure the percentage cover / count the number of squares with lichen; [1 mark]</li> <li>• Measure the (total) area of stone; [1 mark]</li> <li>• Divide (lichen) cover by total area and x 100; [1 mark]</li> <li>• Repeat (to calculate a mean); [1 mark]</li> </ul>	<p>Remember you're not being asked to count individual lichen organisms here, just to measure the area covered by them as a percentage of the total area of the wall</p>

3a

**Indicative Content**

*The organisms should be identified as follows:*

- A = *Mytilus edulis*; [1 mark]
- B = *Buccinum undatum*; [1 mark]
- C = *Planorbis planorbis*; [1 mark]
- D = *Nautilus pompilius*; [1 mark]
- E = *Limax flavus*; [1 mark]

3b

**Indicative Content**

*Limitations of using dichotomous keys for identifying organisms include:*

Any **three** from the following:

- Some features (of organisms) can change with season/gender/age/genetic variety; [1 mark]
- Using dichotomous keys often requires detailed/specialised knowledge (of anatomical parts etc.) / may not be suitable for beginners/non-specialists who don't have detailed/specialised knowledge; [1 mark]
- Judgement (when using keys) is subjective/difficult **OR** it is easy to make a mistake (when using keys); [1 mark]
- It can be difficult to distinguish between similar species; [1 mark]
- Using keys is (often) time consuming / can involve a lot of time (eliminating other possible groups to find the required organism/species/name); [1 mark]
- Only previously discovered/documented species can be identified / keys cannot be used for organisms/species that are new to science; [1 mark]
- Keys are based on physical features only / not all attributes taken into account (e.g. internal anatomy / behaviour / habitat etc.); [1 mark]

- Dichotomous keys are typically designed to identify a limited number of species / may not be comprehensive enough to identify all organisms in a given ecosystem; [1 mark]
- Organisms from the same species can exhibit variability in their physical characteristics, which can make it difficult to accurately identify them using a dichotomous key; [1 mark]

4a

Indicative Content	Commentary
<p><i>i) Random samples can be obtained in the following way:</i></p> <ul style="list-style-type: none"> <li>• Use random number tables/computer/generator; [1 mark]</li> <li>• To generate coordinates in the field <b>OR</b> place tape measures along the edge of the field / split the area into a grid; [1 mark]</li> </ul> <p><i>ii) The mean number of dandelions per quadrat in field B can be calculated as follows:</i></p> <ul style="list-style-type: none"> <li>• <math>(7+3+2+1+2) \div 5 = 3</math>; [1 mark]</li> </ul> <p><i>iii) As each quadrat is <math>0.25 \text{ m}^2</math>, the number of dandelions per <math>\text{m}^2</math> can be calculated as follows:</i></p> <ul style="list-style-type: none"> <li>• <math>3 \times 4 = 12</math>; [1 mark]</li> </ul>	<p>Collecting random data is fundamental in collecting representative samples in ecological data</p> <p>When using a quadrat, the random generation of sample sites is important</p> <p>There are no marks for the calculations here, only for obtaining the correct answers</p> <p>You can still gain marks for errors carried forward from part (ii)</p> <p>Each quadrat is <math>0.5 \text{ m} \times 0.5 \text{ m}</math>, so each has a total area of <math>0.25 \text{ m}^2</math></p> <p>So to give your answer in 'dandelions per <math>\text{m}^2</math>', you need to multiply your mean by four (as <math>1 \text{ m}^2 \div 0.25 \text{ m}^2 = 4</math>)</p>

4b

Indicative Content	Commentary
<p><i>The differences in species distribution in field A and field B can be compared as follows:</i></p> <p>Any <b>three</b> from the following:</p> <ul style="list-style-type: none"><li>• More plants / named plants in field A / more plants per quadrat / more of each species <b>OR</b> field A has 39 plants and B has 16; [1 mark]</li><li>• More species in field A <b>OR</b> A has 4 species and B only has 2; [1 mark]</li><li>• There is a higher (species/bio)diversity in field A; [1 mark]</li><li>• More species evenness / even distributions (in field A); [1 mark]</li></ul>	<p>You would gain marks for converse statements for field B</p>

# Exam Papers Practice