



Signals from the Bay: Seal behaviour in a changing ecosystem

Animal Care and Management

Linking to Level 3 (T Level) Environmental Science, Applied Science and Biology

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Ecological monitoring for conservation focuses on indicators such as population size and species richness. Yet changes in these measures are only apparent after individuals, or entire species, have been lost. Before animals die from disturbance, there is often a change in their behaviour that indicates they are under stress. In response to change, animals alter behaviours such as feeding, vigilance (looking out for predators), aggression or social interactions. Students will explore how we can use these sub-lethal changes as early indicators of ecosystem disruption, offering the opportunity to stop disturbance in its tracks and prevent widespread mortality.

To use behaviour as an early warning system, we need to be able to effectively categorise, quantify and interpret what animals do in natural systems. Approaches for structured observations often use ethograms, which are catalogues of clearly defined behaviours that allow observations to be recorded consistently and analysed quantitatively. This approach enables behavioural observations to be turned into data that can be compared across individuals, locations or environmental conditions. Once we have these data, we can look for anything unusual (i.e., anomalies) that might indicate disruption. This new frontier could be game-changing for conservation, moving it from reactive monitoring of ecological decline towards proactive detection of behavioural disruption as an early signal of environmental change.

Grey seals (*Halichoerus grypus*) at Walney Island provide an excellent model species for students to explore these ideas. As large marine predators that regularly haul out on land, seals link marine and terrestrial environments, allowing behavioural responses to reflect changes occurring across

both systems. Their behaviour is also relatively easy to observe and interpret, with clear postures and movements, as well as vocalisations and social interactions that can be detected in video and audio recordings. Changes in seal behaviour are not only of interest as direct indicators of environmental disturbance but could also drive behavioural and population change in their prey species. As large and charismatic animals, they also provide an engaging entry point for students to explore ecological research.

Students will use a bank of videos filmed at Walney Island to develop ethograms, extract behavioural data, and analyse and interpret their findings in the context of environmental change. Our resource includes an optional field trip to South Walney Nature Reserve to see the seals in their natural environment with Cumbria Wildlife Trust.

One major challenge for this new frontier comes when we attempt to scale up across multiple locations and species. Although modern ecological monitoring systems can collect large volumes of video data, manually extracting behavioural information from these recordings requires extensive, and unfeasible, human time and effort. Artificial Intelligence (AI) could offer a solution by detecting animals and classifying behaviours automatically from video footage. However, the use of AI in conservation raises important questions about transparency, accountability and trust. We include resources to enable critical and balanced discussion on the use of AI in conservation, focusing not only on new opportunities, but also on the need to ensure that these systems are used responsibly.



Curriculum aims and objectives

This resource is designed for Year 12–13 learners, aligning with core Level 3 (T level) expectations around working scientifically, collecting and analysing data, applying evidence to real-world contexts, and evaluating the strengths and limitations of methods (e.g. Animal Care and Management, Applied Science, Environmental Science, Biology and related vocational pathways). It is particularly relevant where ecology, behaviour, data analysis or environmental change are taught. It could also be useful provide an application to inspire data science/ computing students.

Head

Students develop analytical and data-handling skills by learning how behavioural observations are defined, structured, and analysed, and how interpretation depends on methodological choices.

Heart

By focusing on a local, charismatic species and real monitoring contexts in Morecambe Bay, students build a sense of connection to place and consider why changes in behaviour matter for conservation, management, and environmental decision-making.

Hands

Students work actively with South Walney “sealcam” footage to create an ethogram, extract behavioural information from video, and quantify patterns, variation, and anomalies in behaviour.

Learning outcomes

- Apply structured observation methods to record animal behaviour.
- Construct and use an ethogram to categorise behaviour consistently.
- Extract, record and analyse behavioural data from video footage.
- Identify patterns, variation and anomalies, and evaluate how sampling and methodological choices influence interpretation.
- Explain how behaviour may respond to environmental pressures and how behavioural changes can scale to population or ecosystem processes.
- Critically discuss how emerging technologies, including AI-based approaches, may support future monitoring and interpretation of animal behaviour.




Examples in practice

These lessons connect local ecology, emerging technologies, and environmental decision-making. By using Walney's grey seals as a real-world case study, students explore how scientific observation, data analysis, and new technologies are shaping the future of conservation in their local environment.


Session 1

Observing Behaviour

The first session is an introduction to observing behaviour in animals, it walks you through the process of observing an animal, collecting the data, analysing and then interpreting what you have captured. The focus is on observing Grey Seal behaviour in Morecambe Bay.



WHAT IS AN ETHOGRAM?




- A catalogue of behaviours with descriptions of a specific species
- Used as a standardisation tool when collecting behaviour data
- Behaviours must be:
 - Observable** (you can clearly see it)
 - Measurable** (frequency, duration, occurrence)
 - Non-interpretive** (no emotions or assumptions)
- Example clarification:
 - ✗ "Playing"
 - ✓ "Rolling onto side and nudging another seal with flipper"

Code	Behaviour Name	Key Indicator	Category
MTL	Movement (on land)	Moves to a different position	Locomotion
MTW	Movement (in water)	In or moving through water	Locomotion
IN	Inactive	Remains still/stationary	Maintenance
AL	Alertness	Looking around, head is up	Alert
SC	Social Contact	Interaction with another seal through touch	Social
AG	Aggression	Chase, lunge, open mouth	Agonistic
SN	Sound/Noise	Sound made by the seal that can be heard or recorded e.g. vocalisation	Communication

Session 2

From Behaviour to Ecosystems



The second session looks at the environmental pressures within Morecambe Bay and the potential impact this can have on individual Grey Seals scaling up to the population and ecosystem processes.





OBSERVATION SUBJECT

Grey Seals @ Walney Island

- Grey seals (*Halichoerus grypus*)
 - UK's largest seal species
 - 40% of the global population (approx. 120,000–180,000 individuals) found in British waters.
 - Distinguished by a long, "horse-like" muzzle and parallel nostrils, they are larger than common seals.
 - Grey seals are a **protected species**
 - Monitoring behaviour supports:
 - ✓ population health checks
 - ✓ breeding success
 - ✓ impact of human disturbance
- Walney Island is a **key haul-out site**, making it ideal for ethical remote observation





Behaviour to Ecosystems Worksheet

T Level Animal Management & Science

Section 1 – Key Terms

Fill in the blanks:

- Behaviour:** _____
- Environmental Pressure:** _____
- Ecosystem:** _____

Section 2 – Match the Method

Method	Description
Bioacoustics	Listening to animal sounds to track changes in breeding or activity.
Biologging / Telemetry	Using sensors or trackers to monitor movement, depth, and heart rate.
Camera Trapping / Drones	Observing animals remotely to record feeding and social behaviour.
Ethograms	Listing behaviours to compare before and after environmental changes.

Section 3 – Grey Seal Case Study

Describe how environmental pressures affect grey seal behaviour in Morecambe Bay:

- Climate Change** → _____
- Pollution** → _____
- Human Activity** → _____
- Ecological Changes** → _____

Section 4 – Ecosystem Impact


Explain how changes in grey seal behaviour affect the ecosystem:

- Prey Balance** → _____
- Nutrient Cycling** → _____
- Competition** → _____
- Ecosystem Health** → _____

Section 5 – Reflection

List **three actions** people can take to reduce environmental pressures in Morecambe Bay:

- _____
- _____
- _____

Lesson 2 – Behaviour to Ecosystems 

Optional Session

Behaviour in the Age of AI

The optional session looks at how we could use AI to assist in identifying and interpreting behaviour, why this is important for conservation and the potential benefits and problems of using AI in ecology.

MORECAMBE BAY CURRICULUM

Behaviour in the Age of AI

Optional Lesson — T Level Year 12/13

Animal Care & Management - Applied Science - Environmental Science

What you'll explore today:

- | What AI actually is, and how it learns
- | How AI can identify and interpret animal behaviour
- | Why this matters for conservation
- | The promises and problems of using AI in ecology

ETHICS OF AI IN CONSERVATION

Should we trust AI to protect wildlife?

Transparency	Accountability	Trust
<p style="font-size: x-small; margin: 0;">Key question: Can we explain how the AI reached its conclusion? Can wildlife managers audit the decision?</p> <p style="font-size: x-small; margin: 0;">Scenario: Our model flags a group of seals as "highly stressed", triggering a boat exclusion zone. But nobody can explain why.</p>	<p style="font-size: x-small; margin: 0;">Key question: Who is responsible if the AI model is wrong? The researcher? The software company? The policymaker?</p> <p style="font-size: x-small; margin: 0;">Scenario: Our model misclassifies normal behaviour as distress. Funding is diverted away from a species that needed help urgently.</p>	<p style="font-size: x-small; margin: 0;">Key question: How do we build confidence in AI tools among conservation practitioners, the public, and regulators? What might go wrong?</p> <p style="font-size: x-small; margin: 0;">Scenario: A wildlife trust relies on AI monitoring alone, but the model was trained on a different seal population.</p>

Discuss these scenarios, which capture real debates in conservation science and management.

Adaptations to extend impact

Behavioural observation tasks can be simplified for younger learners by reducing the number of behavioural categories and focusing on basic observation and description. The same approach can be applied using student-generated videos of animals in gardens, homes, school grounds or local nature reserves (birds and squirrels are good options!) providing a more accessible and locally relevant entry point. This allows the resource to be adapted across key stages, locations, and species while retaining the core idea of turning behaviour into data.

