What makes the Wadden Sea so valuable – Interpretation ideas for the Wadden Sea World Heritage Site

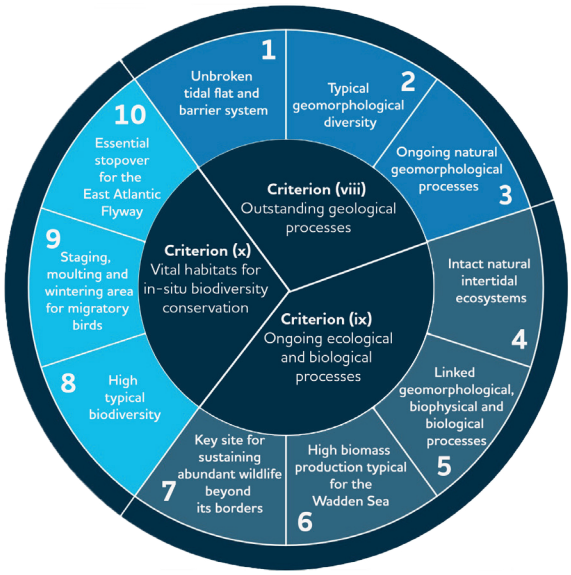
This collection of activity ideas is designed to support Wadden Sea guides and nature educators in communicating the "Outstanding Universal Value" (OUV) of the Wadden Sea in a lively and engaging way. It invites you to enrich guided tours with new impulses and to show visitors what makes the Wadden Sea so valuable.

For an area to be designated a World Heritage Site, it must meet three criteria: it must fulfil one or more UNESCO criteria, be intact and authentic – and be under long-term protection.

The Wadden Sea meets all three conditions.

Pillars of the OUV. © CWSS

Its OUV is based on three UNESCO criteria (viii, ix and x) and is described through 10 key values – from dynamic natural processes and immense biomass production to its significance as a stopover along the East Atlantic flyway. Each of the 20 ideas vividly illustrates one of these values.



Key values. © CWSS

Notes on using the interpretation ideas

The interpretation ideas are designed in a modular format, allowing them to be flexibly and effectively integrated into mudflat walks – regardless of the route, group composition or time constraints.
Each idea is structured around five key elements:

Knowledge

The core knowledge is conveyed briefly and clearly. The focus is on explaining ecological relationships or geoscientific processes – and highlighting the role of the respective topic within the Wadden Sea ecosystem.

Introduction to the topic

The introduction sparks curiosity: how do I introduce the topic to the group? A question, observation or striking image provides an initial point of access – closely linked to what guests can currently see, hear or experience.

Visualisation

The topic is brought to life with practical examples, analogies or observation tips. The aim is to make the invisible visible or the complex understandable – directly on site, using simple means.

World Heritage reference

This section explains how the respective topic is linked to one of the ten key values of the Wadden Sea (highlighted in blue), and how it helps explain the "Outstanding Universal Value" (OUV). The relevant UNESCO criterion or OUV pillar is shown in the top right-hand corner of each card..

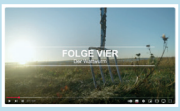
Interacation

Questions, small tasks or thought experiments encourage the group to actively engage with the topic. Thinking, feeling, participating – this makes the subject matter tangible and leaves a lasting impression.

Whether it's a quick "aha!" moment or an in-depth topic focus – each idea helps bring the Wadden Sea World Heritage Site to life.

There are currently five interpretation ideas with accompanying video tutorials, including subtitles in English, Danish and Dutch, available at:

iwss.org/resources



The pages can be printed in A4 format (select "borderless PDF") and folded or cut in half if needed, making them suitable for use as A5 laminated cards.

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Current in the tidal creek

The power of water shapes the mudflats.
Tidal creeks are river and stream valleys in the middle of the sea – constantly reshaping themselves and revealing how alive and changeable the Wadden Sea is.

Tidal creeks form due to the constant rhythm of ebb and flow: twice a day, around 15 cubic kilometres of seawater flow into the Wadden Sea and back out again.

A unique feature of these creeks is their regularly reversing flow direction – they drain during ebb tide and fill during flood tide, like a branching network of veins. This behaviour doesn't occur in any other type of watercourse.

The current is constantly reworking the tidal landscape, eroding sediment in one place and depositing it in another. Even the creeks themselves can shift location within a short time – unpredictable and dynamic.

They show that the mudflats are alive, ever-changing, and shaped by movement.

The water in one of these small tidal creeks – and in the much larger tidal channels further out – has the power to move the entire Wadden Sea!

The current may look harmless – but anyone who has stood in a creek knows: the force of the water is real.

Let's take a closer look at how this force works.

Pause by a narrow creek or the edge of a larger tidal channel and observe the current.

Focus on sand and water: Is sand being washed away? Do small eddies or cloudiness appear?

Can you see the water carving hollows, shaping little channels, carrying away grains of sand?

Let participants feel it barefoot: the ground is "sucked" away underfoot.
Explain: whether large tidal currents or tiny rivulets – they are all powered by the same force: the movement of water.

The current in a tidal creek clearly demonstrates how water and waves shape and shift the surface. Add to that the sculpting force of the wind. In the loose sands, the action of water in creeks reveals, almost like a time-lapse, how landscapes are formed.

These **ongoing geomorphological processes**, which unfold here largely undisturbed, are a key reason why the Wadden Sea has been recognised as a UNESCO World Heritage Site.

Creek structures are like natural river landscapes, once widespread on land, but since straightened and controlled by humans in recent times.

Invite the group to throw small natural materials (e.g. a piece of seaweed, driftwood, or a feather) into the creek and observe how they move.

- Is the water flowing faster or slower than you expected?
- In which direction is it really flowing – is it still ebbing, or already flooding again?

Try to hold the sand in place with your feet: Who's stronger – the water or you?

What happens when a creek changes its course – what does that mean for animals, plants, or mudflat walkers?

Draw parallels with the wider landscape: look at creek patterns in satellite images – the shaping force of water becomes clearly visible.

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Outstanding geological processes

Tides & tidal range

Where we're standing at low tide will soon be sea again.
The tidal range is the great metronome of the Wadden Sea – shaping the landscape anew every single day.

Twice a day, the sea retreats – revealing a habitat that is usually hidden beneath the waves.

The tidal range – the vertical difference between high and low tide – is crucial in shaping the Wadden Sea:

- From 1.2 metres of tidal range (e.g. near Esbjerg in the north or Den Helder in the west), the tidal currents begin to cut the coastline into a chain of islands.
- From 3 metres, islands lose their stability, begin to drift, and may eventually transform into sandbanks.
- From 4 metres, the current leaves behind only bare mudflats – with no permanent islands.

The Elbe estuary acts as a kind of mirror axis within the Wadden Sea: this is where the tidal range is greatest, amplified by the funnel-shaped coast.

Right now we are walking on the seabed. Not along the sea – but within it.

This is because the mudflats are a marine habitat, with large areas underwater most of the time. The fact that we can walk here is thanks to a remarkable natural phenomenon: the tides.

Without the rhythm of ebb and flood, the Wadden Sea, as we know it, wouldn't exist.

Let's take a closer look at how powerful this movement really is – and how it shapes the entire landscape.

Point out the growth height of algae and mussels on a "Pricke", stone edge or harbour wall – where they live, there is regular water coverage.

On an open mudflat, observe the rising or falling water at the edge of a tidal creek.

The tides are the driving force behind the dynamics of the Wadden Sea.

Through ebb and flood, a constantly shifting transition zone between land and sea emerges. Water reshapes the surface here each day – creeks shift, mudflats appear, migrate, or vanish. These **ongoing geomorphological processes** happen here on a large scale, naturally and largely undisturbed.

It's exactly this dynamic that makes the Wadden Sea so special – and is a key reason for its designation as a UNESCO World Heritage Site.

Imagine this: in six hours, right where you're standing now, you could be swimming – or sailing in a boat.

If there are visible high-tide marks on posts or buoys nearby:

- Try to estimate or compare: how high does the water rise here at high tide?
- Who could still stand here during high tide?

Think about how tidal range affects the habitat:

- How does it shape life for animals and plants?
- What problems do fixed structures like jetties or harbours face in a landscape like this?
- What happens to islands if the tidal range changes?

Use a map to observe the distribution and shape of islands across the Wadden Sea – and explain these based on the differences in tidal range.

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Outstanding geological processes

The Wadden landscape around us

The whole is more than the sum of its parts – it is the interplay of mudflats, sandbanks, beaches and more that makes the Wadden Sea a dynamic natural wonder of global importance.

The Wadden Sea stretches for around 500 km along the coasts of Denmark, Germany and the Netherlands.

It is the world's largest continuous tidal flat and barrier island system.

Its different habitats – mudflats, tidal creeks and other permanently flooded areas, beaches, dunes, islands, salt marshes – are closely connected and mutually dependent:

- Around 11,500 km² of mudflats are regularly uncovered and flooded by the tides.
- Islands and sandbanks protect the coastline – and slowly migrate over decades.
- Salt marshes develop when sediment builds up over time – often protected by islands and barriers.
- Beaches and dunes are shaped by wind and water – and then stabilised by vegetation.

All this works only through interaction – and makes the Wadden Sea a globally unique example of dynamic coastal processes.

We're standing in a place that might look like just a single stretch of coast.

But what if we could look at it from space?

A satellite image shows that the Wadden Sea is a vast, interlinked natural mosaic – like a puzzle that only makes sense when all its pieces come together.
The whole is greater than the sum of its parts.

Using a satellite image (e.g. IWSS poster or banner), show the entire Wadden Sea and draw attention to its various components – mudflats, sandbanks, island chains, salt marshes, river mouths.

Discuss how these elements are connected and affect each other. »

Key insight: the Wadden Sea is a single, cohesive natural system, constantly reshaped by wind, water, sediment and vegetation.

The only constant in the Wadden Sea is change.

The Wadden Sea was not nominated as a UNESCO World Heritage Site because of many small protected areas, but because it forms a **coherent tidal flat and barrier system** – a dynamic and unique coastal system with exceptional geological and geomorphological processes that are now rare in the world.

- Estimate together: how many kilometres of coastline does the Wadden Sea cover?
- Where does the Wadden Sea begin and end? (Also in relation to the open North Sea – how far inland would it extend without dykes?)
- How many countries share this natural heritage?
- Which habitats can you identify?
- Which forces are constantly at work in the Wadden Sea – and what effects do they have?
- How long do you think it takes before a visible change happens in the landscape?
- Can you spot any changes already (e.g. the shape of sandbanks or tidal channels)?
- What would happen if one of the habitats – like the island chain – disappeared?
- Why isn't it enough to protect just individual mudflats or islands?

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Ripple marks

**What seems flat at first glance is actually a landscape of hills and valleys.
The mudflats are like a miniature mountain range – shaped by wind, water, and waves.**

The surface of the mudflats is full of life. Depending on the substrate, current, wind direction, and wave energy, a variety of surface patterns form:

- Current ripples: wave-like patterns in the sand, running across or diagonally to the main current.
- Wave ripples: usually finer and more uniform – shaped by wind waves in shallow water.
- Drying cracks: occur when the surface layer dries out as the water recedes.
- Tidal creek edges, mud islands, tidal channels: larger structures formed and constantly reshaped by tidal currents.

We're standing in a mountain landscape! A miniature mountain landscape.

Wind, waves and currents reshape the mudflats daily. This creates a varied and ever-changing terrain – like a mountain range, just on a much smaller scale.

Let's take a closer look!

Let participants feel the ripples with their hands and feet.

Tip: They are especially noticeable along the edges of tidal creeks or in areas where the water is currently receding.

- How big are the ripples?
- Where are they closer together, where further apart?
- What do you think shaped them – current, wave, or wind?

Key insight: These small surface patterns are visible traces of the forces that shape the Wadden Sea every day.

The Wadden Sea is a World Heritage Site because of its **distinctive geomorphological diversity**. Ripple marks are a clear and visible example of this.

Just like tidal creek systems or migrating islands, they reflect the constant dynamism of a largely undisturbed natural environment. No two days look the same here.

Feel the ripples with your bare feet or hands – what do they feel like?

Use your finger to trace the path of a ripple – where does it start and end?

Search for different types of ripples nearby: shallow or steep, narrow or wide apart.

Why do the patterns in the mudflat change so quickly?

What can these surface patterns tell us about tide levels, currents, or wind direction?

Discuss: What's the difference between a naturally changing mudflat and, for example, an artificially fixed harbour area?

If you were to build a mini mountain landscape in the mudflat – where would be the highest peak? Where would the valley lie?

How do you think your "mudflat mountain range" would look after the next high tide?

Optional: Take a photo of the ripples with your phone – your "Mini-Mountain of the Day".

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Sandflats, mixed flats, mudflats

Not all mudflats are the same: firm or soft, dry or moist and shiny – the surface of the Wadden Sea changes depending on local conditions.

In the Wadden Sea, we distinguish three main types of tidal flat substrate – depending on the proportions of sand, mud, and water:

Sandflats

- light-coloured, firm ground, often near the outer coast, close to the open North Sea
- strongly mixed by waves and currents

Muddy mudflats

- dark, soft, shiny ground with a high content of fine sediment and organic matter
- usually found further inland or in sheltered bays
- rich in microorganisms – ideal for feeding birds

Mixed flats

- transitional type, especially diverse as it combines characteristics of both.
- habitat for species like cockles, sand gapers and lugworms.
- important nursery for many animals – from juvenile fish to shrimp.

These different substrate types are shaped by the interaction of currents, sediment supply, tidal range, wind, and waves. They can change over years – or after just one storm surge.

As you walk across the flats, you'll feel it right away: Sometimes the ground is firm and dry, sometimes you sink in or your shoes get stuck.

What we're feeling are different types of tidal flat – and they reflect the geomorphological diversity of this ecosystem.

Let's take a closer look at what that means.

Invite the group to explore the ground beneath their feet – barefoot or with their hands. How firm is it? Does water pool or sink in? Is the sediment coarse or fine?

Use the texture of the ground to explain the different types of flats and their roles as habitats.

The Wadden Sea is a World Heritage Site because it is largely preserved in its natural state – including its **characteristic geomorphological diversity**. The variety of sediment types shows: Here, tides, currents and sediment still shape the landscape freely.

Dig up a small sample and feel the grain size.

Can the group guess: is it sandflat, mixed flat or mudflat?

Think together: Which type offers more food? Which is more stable?

Compare two nearby areas of mudflat: What differences can you find – and what causes them?

What happens when current patterns or sediment supply change – for example through human intervention?

Discuss: Which animals depend on a specific type of substrate?

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Outstanding geological processes

Erosion bank & slip-off slope

A miniature canyon – where water exerts its force, a dynamic mudflat landscape emerges.

A tidal creek is a natural watercourse system within the mudflats. Its shape is no accident – it's the result of constant motion:

- At the erosion bank (the outer bend), the water flows faster – it scours the ground and deepens the channel.
- At the slip-off slope (the inner bend), the flow is slower – sediments carried by the current are deposited here.

As a result, the tidal creek gradually shifts sideways across the mudflat, much like a river meandering through a valley.

Its depth and width also change – a clear example of the Wadden Sea's constant reshaping by natural forces.

Look over there – do you see that small depression with the steep edge?

What appears to be a harmless little channel in the mudflat is actually... a canyon.

Or is it? Let's change perspective for a moment: Imagine you're as small as this Playmobil figure – and standing right here at the edge.

Use a Playmobil figure to set up a small scene – place it on the erosion bank looking down into the "canyon".

Suddenly, it all looks very different: the steep side drops off sharply, while the opposite slope is gently inclined.

What seems flat and featureless from our point of view becomes, at this miniature scale, a landscape of highs and lows– a canyon not carved over millennia by rainfall, but shaped daily by the power of the tides.

Tidal creeks show how ongoing geological processes constantly shape the Wadden Sea – every single day, with every tidal cycle.

It's exactly these dynamic natural processes that make the Wadden Sea unique on a global scale. »

That's why it is designated as a UNESCO World Heritage Site: a natural landscape that shapes and reshapes itself – in rhythm with the tides.

Walk with the group along the curve of the tidal creek and let them feel the texture of the ground:

- Where is the ground firm and scoured?
- Where is it soft and built up with sediment?
- Which animals prefer to live near the erosion bank – and which ones near the slip-off slope?
- What do you think: What might this tidal creek look like in 10 years?
- How do habitats change when a tidal creek shifts?

The wandering nature of tidal creeks is a constant challenge for plants and animals – but also a powerful driver of biodiversity.

Imagine you're a landscape architect – using water as your tool:

- What would you design?
- Where would you guide the flow?

Anyone who likes can look over the shoulder of the Playmobil figure with their smartphone and take a photo of the "mini canyon" – a snapshot of nature's dynamic design.

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Ongoing ecological and biological processes

Lugworm cast

Small worm, big impact: a bioengineer at work.
The creatures of the mudflats help shape their own habitat.

The lugworm lives in a J-shaped burrow in the seabed. On average, around 25 lugworms live per square metre – in the nutrient-rich mixed mudflats, often many more, especially juveniles. Across the entire Wadden Sea, that adds up to an estimated 100 million lugworms.

The lugworm ingests sand, digests the organic matter, and excretes the cleaned sand in the form of characteristic casts. In doing so, the lugworm acts as a bioengineer in several ways:

- All the lugworms together ingest and clean the top 25 centimetres of the mudflat soil every year in the areas where they occur.
- The lugworm aerates the sediment by pumping water through its burrow for respiration.
- It creates habitat along its burrow for bacteria and microorganisms that use 60% of the oxygen.
- It structures and stabilises the sediment through bacterial and geochemical processes along its burrow system.

When we look at the mudflat here, we're encountering a very special resident: the lugworm – or rather its traces, the casts. And these tell us that a bioengineer is at work underground.

But why?

While digging up a lugworm, point out the visible burrow structures and explain the worm's role as a bioengineer using the structure and brown colour of the sediment (iron oxides!).

The lugworm symbolises the **interplay of biological, geomorphological, and biophysical processes in the Wadden Sea**.

It shows how a seemingly insignificant animal connects core processes like nutrient cycling, sediment structure, and food chains – keeping the Wadden Sea system running.

This is why the Wadden Sea is a World Heritage Site: not because of spectacular individual species, but because of its unique dynamics and interconnections.

How many lugworm casts do you see in one square metre? Take a guess!

Explain: each of these casts shows that a bioengineer is working underground. What we see here happens millions of times – every single day. It's a vital foundation for life in the Wadden Sea.

Who would like to dig up a bit of mud and see if they can find a burrow?

Touch and smell the different layers: do you notice anything about the colour or smell?

Can you detect a difference between sand with lugworm casts and sand without?

If the lugworm had a human job, how would you describe it?

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Ongoing ecological and biological processes

Mass occurence of mudsnails

Small but countless: millions strong in the World Heritage Site!
High individual numbers of single species provide reliable food sources in the food web.

The mudsnail is only a few millimetres in size, lives in high densities on the mudflat surface, and feeds by consuming microalgae and organic particles from the mud. In doing so, it becomes part of a massive production system:

- Up to 100,000 mudsnails live on a single square metre of mudflat – more than ants in some anthills.
- This density leads to enormous biomass production, making the Wadden Sea one of the most productive ecosystems on Earth.
- For birds like shelducks and dunlins, the mudsnail is an essential food source.
- During high tide, it is a key food item for many fish and crabs.

If we look closely, we can spot tiny dots on the mudflat surface – about the size of a pinhead. These are mudsnails. They may seem insignificant, but collectively they form a true heavyweight.

Have participants search for mudsnails with the naked eye on the mud surface.

Rub sand or mud between fingers until small lumps can be felt: these are not coarse grains of sand, but mudsnails (use a magnifying glass if needed).

Drag a fine tea strainer about 0.5–1 cm deep through the top layer of mud. Rinse the mud in the strainer with a bit of water until only the tiny snails remain visible.

Make it clear: what we see here is just a tiny glimpse – under each step lie tens of thousands of them!

Tip: carry a small jar containing, for example, 4,000 counted mudsnail shells to demonstrate the incredible density in a very small area.

The mudsnail symbolises the **high biomass production** by tiny organisms in vast numbers – a key characteristic of the Wadden Sea.

The biomass produced here is of global importance for millions of migratory birds and is one of the reasons why the Wadden Sea is a World Heritage Site.

How many mudsnails do you think live under one square metre of mudflat?

Why do you think there are so many?

And what does that tell you about the importance of the Wadden Sea?

Note: Reflect together on the role of the mud snail as food for hundreds of thousands of migratory birds – and how this tiny link in a global food chain connects entire continents.

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Ongoing ecological and biological processes

Blue mussel bed

Mussels that connect – a reef for life is forming here.

Blue mussels are one of the so-called biogenic reef builders. That means: they actively shape their habitat – and create new ecological niches in the process.

- With a biomass of up to 12 kg of mussels per square metre, mussel beds can host up to ten times more animals than other mudflat areas.
- Mussel beds aren't just made up of mussels – they provide habitat for 35–50 associated species: barnacles, crabs, amphipods, sea anemones, juvenile fish, algae and worms live among the mussels and in their shells.
- Mussel reefs act like wave breakers and influence water currents – this helps protect the seafloor from erosion.
- At the same time, they promote sedimentation: fine silt filtered from the water gets trapped within the mussel bed – this changes the soil structure.
- Blue mussels filter large volumes of water – each one several litres per hour – and thus contribute to water purification and nutrient cycles.

At first glance, it may look like a chaotic tangle of black shells, firmly anchored in the mud. But on closer inspection, you'll see that this mussel bed is more than just a collection of mussels – it's a reef full of life.

Unlike free-living animals, blue mussels are true team players: they cluster tightly together, stick to each other with byssus threads, and together they withstand currents and waves – all while creating structure and shelter for many other species.

At a mussel bed or mussel clump, point out the compact build and uneven surface structure.

Look for other living organisms on the mussels (especially barnacles), in the gaps between them and underneath loose shells. »

Carefully lift a small clump of mussels and show the byssus threads ("glue threads").

Explain their function: the mussel bed slows down waves, stabilises the seabed – and offers many creatures a safe home they wouldn't otherwise have in the open mud.

The blue mussel bed is a prime example of what makes the Wadden Sea globally unique: the tight **interlinking of biological, geomorphological, and physical processes**.

It shows that it's not just currents that shape the seabed – living organisms also build landscapes. And in these temporary reef structures, complex communities of life emerge.

Such dynamic, natural interactions are a key reason why the Wadden Sea is a UNESCO World Heritage Site – as one of the last large-scale, largely undisturbed tidal ecosystems in the world.

What do you think – how many species might live in such a mussel bed?

Who wants to gently look under a mussel clump to see what's hiding underneath? What can you spot?

Feel the ground beneath your feet – does the mud here feel different from the surrounding area?

How would you describe the mussel bed – as a house, a protective wall, or a city?

What do you think happens when this structure disappears – for example, in a harsh winter with sea ice or overfishing?

Note: reflect together on the ecological consequences – especially for birds.

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Diatom mats

Green gold of the Wadden Sea – invisible, yet indispensable. Diatoms form the foundation of life in the mudflats.

Diatoms – also called microalgae – are single-celled algae with a glass-like shell made of silica. They are tiny – usually smaller than 0.1 mm – and live right on the surface of the tidal flats.
What makes them so special?

- They perform photosynthesis and are primary producers – turning sunlight into biomass.
- In doing so, they bind carbon and release oxygen, which becomes visible as bubbles. (A visible reminder of the ocean's role as an oxygen producer.)
- Just a few square centimetres of tidal flat surface contain millions of diatoms – per square metre, they produce as much biomass as a tropical rainforest.

This makes them the driving force behind the entire food web in the Wadden Sea and a kind of "solar park" for the North Sea.

The shallow Wadden Sea produces more biomass than many other seas because it is nutrient-rich, warms more than the open North Sea, and is intensely penetrated by light – ideal conditions for the growth of algae like diatoms.

When we look at the tidal flats on a sunny day, we sometimes see a fine greenish-brown film on the surface. In shallow puddles, many small bubbles stick to the algal mat – oxygen bubbles.

These aren't random occurrences, but signs of active life: billions of diatoms, tiny single-celled plants, are at work here. They form the green carpet of the Wadden Sea – a barely visible but highly productive ecosystem.

Spread a small amount of diatom mat onto a white surface (e.g. the back of a laminated sheet) to highlight the greenish-brown colour. jUse a laminated photo to show the typical symmetrical structure of diatoms.

Tip: A small plastic Petri dish with a glued-in image of a diatom species can help illustrate its shape and be used to explain reproduction.

Diatoms symbolise what makes the Wadden Sea globally unique: Its **exceptionally high biomass production**.

Diatoms play a key role in this. They are at the base of every food chain and form the foundation for the lives of billions of organisms – one of the reasons the Wadden Sea is a UNESCO World Heritage Site.

Why do you think this shallow mudflat produces more biomass than many seas?
What role do diatoms play?

Emphasize: even though they are invisible, diatoms are the foundation of the Wadden Sea's food richness. They are essentially the "fuel" for the Wadden Sea – and indirectly for the birds that gather strength here for their flight all the way to Africa.

Who would like to scoop a little of the tidal flat surface with a spoon and examine it?

What do you see? Can you feel a difference compared to the deeper sand layer?

How would you describe this algal carpet to someone who has never seen it?

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Glasswort

Ongoing ecological and biological processes

Border crossers in the tidal zone – this is where life between worlds begins. The fluid transition between land and sea provides habitat for true specialists.

Glasswort (*Salicornia*) is a salt-tolerant plant (halophyte) that can withstand extreme conditions:

- It is regularly flooded by seawater and must endure high salt levels, which are toxic to most organisms.
- To balance the salt, it stores water in its fleshy stems – giving it a succulent, cactus-like appearance.
- It is a pioneer plant, forming the first vegetation belt in the salt marsh – growing where few other species can survive
- Its root system helps stabilize the soil, paving the way for other plant species.
- It creates the first elevated structures in the mudflats and calms the water, acting as a natural sediment trap.
- Over the course of the year, it shows striking colour changes – green in summer, yellow to red in autumn.

At the edge of the mudflats, where the soft ground gradually becomes firmer, grows a plant that's easy to overlook – but it has a lot to offer.

This small, juicy glasswort is a true survival artist. It thrives exactly where other plants give up: between fresh and salt water, between dry and flooded.

Its habitat is neither truly "land" nor fully "sea" – it's the dynamic boundary in between. And that's what makes it so special.

Wherever you find glasswort, break off a small piece and crush it between your fingers – feel how much water it holds.

Let visitors taste a bit: What does it taste like, and why?

Show or describe how the plant changes colour throughout the year – a sign of seasonal dynamics (use laminated photos if available).

Glasswort symbolizes the seamless transition between sea and land – still largely undeveloped and dynamic in the Wadden Sea.
It reminds us that this World Heritage Site is not just made up of water and mudflats, but also of these vital transitional zones where specialized plants and animals live.
Such **intact natural intertidal habitats** are still widespread in the Wadden Sea – and that's exactly what makes this area so precious.

Why do you think this plant grows exactly here – in a place that seems wet, salty, and hostile to life?

What would need to happen for other plants to grow here – or for none to grow at all?

What colour do you think the glasswort turns in autumn? Why does it change? (*Optional:* refer to edible glasswort species – "sea asparagus" – and connect to sustainable use.)

Who wants to touch the glasswort or taste a small piece? How does it feel? How does it taste?

Do you think this is a plant that needs lots of water – or does it prefer dry conditions?

If you had to assign a role to glasswort in the Wadden Sea, what would it be? (Border guard, door-opener, city planner ...?)

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Ongoing ecological and biological processes

Tidal pool with crustaceans, etc.

The sea retreats – but life remains.
Ebb and flood define life on the mudflats, and each species finds its niche to survive.

Tidal pools form in depressions as the water recedes.

For many gill-breathing creatures, they serve as vital refuges to survive the dry period until the next tide.

Typical inhabitants include shore crabs, shrimps, small plaice, and gobies.

Other survival strategies against the ebb and flow include:

- Burrowing into the sediment (worms, bivalves)
- Enduring the low-tide by sealing their shells (blue mussels, oysters, periwinkles)
- Retreating into deeper channels at low tide (larger crabs and fish)

Here lies a pool – barely ankle-deep. But look closely: it is teeming with life.

When the sea pulls away, small remnants of water are left behind. These tidal pools seem unremarkable – yet they are true survival islands.

What appears lifeless is actually a temporary mini-ecosystem shaped by the tides.

Stand quietly around a visible tidal pool and observe movements together.
Point out the "creators":

- Movement on the bottom (e.g. shrimps, shore crabs)
- Small holes or mounds indicate buried creatures (worms, bivalves)
- Show animals in your hand or under a hand lens and explain their different adaptation strategies.
- Note the shape and sediment structure of the pool (such as its hollow) and compare it to channels or other mudflat formations.

Tidal pools offer a glimpse into the vast dynamism of the Wadden Sea. They reveal how different species survive in a shifting environment and embody what makes the Wadden Sea unique: **intact, natural habitats shaped by tides**, where minute changes in terrain have major ecological importance.

That is precisely why it is UNESCO World Heritage – not because of spectacular species, but because of the interconnectedness and adaptability of its habitat.

Let's crouch quietly beside a pool and watch – what moves first?

How long do you think a shrimp can survive in such a pool?

Imagine you're a shore crab – what do you do when the water disappears?

Can you think of places in everyday life where life adapts to extreme conditions?

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Ongoing ecological and biological processes

Juvenile plaice / shrimps in shallow water

Small, but vital on a coastal scale – the Wadden Sea is the North Sea's nursery. Here grow those who will shape the fish population in the open sea.

The Wadden Sea provides sheltered, warm, nutrient-rich shallow waters where young animals thrive.

Juvenile plaice (as larvae) drift in with the current and metamorphose into flatfish resting on the seabed.

Young shrimps pass through several developmental stages in the mudflats before they are strong enough to return to the open sea.

Other species using the Wadden Sea as a nursery include herring, sole, garfish, whiting, and shore crabs.

Larvae and juveniles use channels, tidal pools, and shallow shores as refuges from predators.

Without this nursery function, many North Sea species would struggle to survive.

Look closely into the water – can you see the tiny translucent creatures or little flat fish?

What seems inconspicuous at first glance is hugely significant: the Wadden Sea is the nursery for the North Sea.

Many fish and crustacean species spawn offshore, but their young grow up here in the calm, shallow mudflats. Why is that?

In shallow water (channel, pool, trench), use a small net or the naked eye to spot tiny transparent shrimps or pale brown plaice.

Gently show the creatures in a shallow dish or hand lens with some water. Point out eyes, movement, and body shapes. »

Emphasise: this isn't just a pool – it's a nursery! The big fish out at sea once started here – tiny and vulnerable, just like these.

Return the animals carefully to the water – the nursery must be preserved.

The Wadden Sea matters not only for its local species, but also as a **key site for sustaining abundant wildlife beyond its borders**. This nursery stage is crucial for countless marine creatures.

Without the Wadden Sea's nursery, many North Sea fish and crab populations would not survive.

This wide-scale ecological connection – between mudflats and the North Sea – is a key reason why the Wadden Sea is a UNESCO World Heritage Site.

Who wants to try netting a juvenile plaice or shrimp?

How big do you think this plaice will grow later?

Why do young animals prefer shallow waters?

If you were a juvenile plaice – what would you need to survive and grow?

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Ongoing ecological and biological processes

Bird footprints and pecking traces on the mudflat

Feast laid out – for millions of migratory birds. The mudflats offer a vast buffet along the migratory route from the Arctic to Africa.

The Wadden Sea is one of the world's most important wetlands for birds migrating along the East Atlantic Flyway. Up to 10 million waders and waterbirds rest here each year. They arrive from breeding grounds in Siberia, Scandinavia, and northern Canada – then continue on to overwintering sites as far as West Africa.

The rich food supply is crucial, and each bird species has its own "place at the table": mudflat, channel bank, salt marsh, drift line – each habitat is used according to feeding style (bill shape and length, leg length), with or without water.

Examples include:

- Sanderlings probing the mud for worms.
- Oystercatchers picking small shellfish off the surface.
- Dunlins probing deeply with long bills.
- Oystercatchers cracking open mussels with powerful bills.

Look closely at the ground: three-toed footprints here, a small droppings spot there, a series of tiny round depressions – who do you think has been here? Correct: birds foraging for food.

The birds "read" the mud like a supermarket – where we see mud, they see a buffet full of lugworms, snails, mussels, crabs.

And every species knows exactly where and how to feed.
This well-stocked table feeds the birdlife along the East Atlantic Flyway.

Explore footprints together using the IWSS guide to signs and tracks and explain:

Three toed prints with webbing: gulls, ducks, and geese; prints without webbing: waders like sanderlings, oystercatcher, knot.

Explore beak pokes: shallow poke rows: sandpipers; deep burrows: oystercatcher or curlew.

Show different bill shapes and link them to feeding specialisations.

Draw attention to the salt marsh and beach – birds also feed there, using different strategies.

The Wadden Sea is vital for millions of migratory birds – not just locally, but also along their journeys of up to 10,000 km.

As a food rich stop over site, it helps sustains many bird populations – making the Wadden Sea a **crucial site for sustaining abundant wildlife beyond its borders**. This international ecological significance is a key reason for its UNESCO World Heritage status.

Go bird track hunting: which birds passed by here?

"Beak challenge": who can spot the most peck marks in one minute?

How deep did the bill probe? What might the bird be seeking?

Why do the birds come here – and not elsewhere?

Imagine a migration without the mudflats – what would that look like?

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Moulted feathers in the drift line

Someone has had a good meal!
Plentiful food and no disturbance make perfect condition for moulting.

Feathers found in particular in the summer and autumn drift line are a sign of how important the Wadden Sea is as a moulting site for migratory birds.

During the regular replacement of feathers – the moult – birds systematically shed old feathers and grow new ones, often over a period of many weeks.

This can leave them unable or limited in flight, so they need special protection and undisturbed conditions during this time.

Feathers make up around a third of a bird's body mass (though not its weight), so moulting demands enormous nutrient intake.

The Wadden Sea offers both: vast, quiet, undisturbed refuges areas, and abundant food to support the growth of new feathers.

The feathers we find here in the drift tell us that someone has had a good feed here!

But who was it? And why do we find these feathers right here?

Collect feathers together along the drift line and use them to explain the moulting process and the Wadden Sea's importance as a moulting site.

Note: These are not chewed-off remains – the bird voluntarily shed its old plumage, having found plenty of food and safety in the Wadden Sea.

These feathers show us: migratory birds don't just find food here, but also rest and protection. The Wadden Sea supports life-critical phases as a **resting, moulting, and wintering area**.

It is a key piece in the global puzzle of biodiversity – and that is what makes it a UNESCO World Heritage Site.

Mini feather workshop: collect feathers and compare different types (e.g. down feathers, flight feathers, covert feathers).

What does this feather tell you? Who might have been here? (Use feather ID guides such as the laminated "Bird Feathers" chart.)

Optional: examine a feather under a magnifying glass or phone lens – observe the structure and function.

Imagine you are a bird going through moult:

- What would you need to grow new feathers?
- How would you manage your "wardrobe change" if you were constantly on the run?
  Tip: the Wadden Sea, with its rich food supply and safe resting areas, is the ideal place for a wardrobe change.

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Flock of birds

Vital habitats for in-situ biodiversity conversations

No mudflats, no migration – the Wadden Sea is the hub of the East Atlantic Flyway. What we protect here safeguards life far beyond its borders.

The East Atlantic Flyway is an invisible network connecting millions of birds across continents.

Up to 10 million wading and water birds travel along this migratory route between their breeding grounds in the Arctic and their wintering areas as far south as West Africa – covering stages of thousands of kilometres along the way.

The Wadden Sea plays a vital role in this journey, acting as a central "refuelling station" where many species replenish their energy stores.
Without this stopover, the entire flyway would collapse – it simply wouldn't work.

Can you see that huge flock of birds in the air / on the sandbank? Thousands of figures gathering here, dancing like a dark ribbon along the horizon – a powerful, visible sign of how important this place is.

Who are these birds? And why are so many of them right here?

Using a graphic of the East Atlantic Flyway (such as the IWSS poster), show the breeding, resting, and wintering grounds along the route.

Emphasise: without the Wadden Sea as a central resting area, the whole chain breaks down.

Optional comparison: it is like major international airport– if it's closed, the connections across the network fail.

These large flocks of birds reveal why the Wadden Sea is not just a local natural treasure. As a **crucial stopover on the East Atlantic Flyway**, it holds global significance for preserving biodiversity.
This is why the Wadden Sea is a UNESCO World Heritage Site: it is a key link in an international chain – protecting it means actively conserving species on a global scale.

What do you think: How many countries does a migratory bird cross on its journey?

What would happen if the Wadden Sea were built over or destroyed?

What responsibility do we have for birds that visit us for just a few weeks, but depend entirely on the Wadden Sea?

Game: "A bird's journey" – each participant represents a station (breeding ground, stopover site, wintering ground). What happens if one of these stations disappears?

Creative: Choose a bird species and draw or map out its route – showing the start, destination, and the Wadden Sea as a crucial stopover.

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Sea aster

Diversity at second glance – Check-in at Hotel Sea Aster. The sea aster acts like an “insect hotel”, showing just how much biodiversity can be hidden in an extreme habitat like the Wadden Sea.

The salt-tolerant sea aster (*Tripolium pannonicum*, syn. *Aster tripolium*) grows in the mid-range zones of the saltmarsh, where seawater occasionally reaches.

Not only have the plants of the saltmarsh adapted to this extreme environment, but many of them also host a highly specialised community of insects.

Around 30 insect species have been found living on the sea aster – 23 of them specialised, including:

- several micro-moths whose caterpillars feed on the plant,
- drill and stem flies that develop inside its stems,
- three species of aphid – each specialising in sucking from either the flowers, leaves or roots of the plant.

These insects are only found on the sea aster.

In addition, some non-specialist insect species also make use of the sea aster – using it as a "lifesaving tower" during high tides or bad weather by climbing up or sheltering inside its hollow stems.

As we walk through the saltmarsh here, we spot a plant with lovely lilac flowers – quite pretty, don’t you think?

But what we can’t see at first glance is this: the sea aster is not only salt-tolerant, but also a favourite among tiny residents that live only here. Insects that have specialised in this very plant for both food and shelter. There are many such specialists in the Wadden Sea – and what’s truly remarkable is that, despite the harsh conditions, the biodiversity here is surprisingly high.

Let’s take a closer look at why that is.

In summer or autumn, look closely at the flowers, leaves or seed heads of the Sea Aster and observe the diversity that only reveals itself upon closer inspection.

Use a magnifying glass or smartphone camera to try and spot insects – such as aphids or tiny caterpillars.

Think of it like a small apartment block for specialists!

(*Optional:* bring bug viewers to safely examine the insects up close for a short time.)

The Wadden Sea is an extremely dynamic and demanding habitat. It isn’t home to many “generalists”, but rather to a few, highly specialised species. The fact that there is still a **high and typical diversity** here shows that nature has developed clever solutions for extreme conditions.

It is precisely this richness in ecological specialists that makes the Wadden Sea a UNESCO World Heritage Site.

How many different insect species do you think we might find on a single sea aster?

Choose a sea aster and take a really close look – can you spot anything moving? Who’s living here?

Note: each of these insects depends on the sea aster – without it, this specialised diversity wouldn’t exist.

If you were a tiny insect – what would a saltmarsh plant need to offer to be your ideal home?

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Drift line

**The shop window into North Sea diversity: seeing and being seen.
The drift line reveals what lives in the sea – and at the same time, it is a habitat in its own right for specialised species.**

With every tide, the sea brings not just water, but also traces of its inhabitants and users, which are deposited along the drift line. Here we find items:

- that once lived in the sea – such as dead animals, fish bones, mussel shells, and snail cases washed ashore by waves,
- that tell of the past – like chunks of peat or stones from earlier geological eras,
- and that speak of human presence – such as nets, plastic bottles or containers that ended up in the sea, whether by accident or intent.

Some clues, like washed-up feathers, show that birds have moulted here. Others, such as marine debris encrusted with organisms, reveal how artificial materials can become part of the Wadden Sea's ecosystem – whether intended or not.

In autumn and winter, many seeds – especially from oraches (Atriplex species) – accumulate in the drift line. These are pioneer plants that play a key role in colonising new sandbanks and beaches. Their seeds are also an important food source for winter visitors like the shore lark, snow bunting, and twite, which come to the Wadden Sea specifically for this reason.

When the tide recedes, it leaves behind a band of shells, seaweed and drift – the drift line. Like a shop window through time and space, it reveals the sea's inner workings. At the same time, it is a habitat for specialised coastal species.

Let's take a look and see what this shop window reveals to us today!

On a walk along the drif tline, search for washed-up items and living organisms. Let the group collect and sort their finds into "positive" drift (e.g. shells, crabs, seaweed), living creatures (drift line insects, sandhoppers, beetles), and "negative" drift (rubbish, bits of net).

Explain: The North Sea keeps no secrets – it eventually gives everything back.

The drif tline symbolises the rich diversity of specialist species in the Wadden Sea and demonstrates how this harsh and ever-changing environment supports a remarkably **high and typical biodiversity**.

This diversity of ecological specialists is one reason why the Wadden Sea is recognised as a UNESCO World Heritage Site.

What can we find here in the drift line? Pick an item and try to identify it (e.g. using the IWSS role-out guide or BeachExplorer.org).

Is it typical for the Wadden Sea – or might it have come from further out in the North Sea?

What did you find that doesn't naturally belong here – for instance, barnacles on a plastic bottle or a fuel canister?

Is a piece of plastic covered in sea life a "natural habitat" (because it supports algae and barnacles) – or a problem (because plastic harms the marine environment)?

What might happen if we succeed in avoiding marine litter – would the drift line lose habitats, or would natural diversity return?

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Integrity

Wadden Sea complete: everything's here, everything works.
The Wadden Sea is whole – with all its habitats, processes and species intact and functioning. And it is large enough to maintain this natural dynamic in the long term.

UNESCO asks:
Is everything present? Is it functioning? Is it still genuine?
Only if a site is complete, undisturbed and naturally functional can it be recognised and maintained as World Heritage.

The Wadden Sea meets these conditions and thus fulfils the criterion of integrity.

The 'integrity criterion' is a central element in the evaluation of UNESCO World Heritage Sites. For the Wadden Sea World Heritage Site, this means:

- All essential habitats are represented – from the open sea to salt marshes and beaches.
- Typical species and processes – like bird migration, tides and sediment dynamics – are fully covered.
- The area is large enough to ensure these processes persist – even as nature changes.
- It is naturally dynamic and in motion – and not disrupted by extensive construction, dykes, or industry.

Opening the walk

Invite the group at the beginning of the walk to open their eyes to a unique and incredibly diverse natural landscape – more than just "mud and sea":

Welcome to the seabed! We're standing in a place that constantly changes – yet is so unspoiled, it's unique in the world. In front of us lies a living natural landscape, as diverse as an entire continent in miniature: mudflats, tidal channels, mussel beds, sandbanks, salt marshes, dunes, bird resting sites, and underwater habitats – all connected by the tides. »

Let's explore this world together – and discover what makes the Wadden Sea so special.

At the end of the tour, take a moment with the group to reflect on what you've seen and experienced: take one last look around – what have we discovered today?

What we saw was more than just sand and water. We read the tracks of worms, felt the currents, watched birds, experienced the mudflats, and sensed the tides – and passed through many different habitats.

You might draw attention to a "typical scene" – like a drying tidal creek, a flock of birds, or a mussel shell – and explain: imagine each of these elements as a puzzle piece. Or like an instrument in an orchestra. Only when everything is present does the whole picture come together – or the music play in full harmony.

That original state, that completeness – that's what makes the Wadden Sea a World Heritage Site. And we were right in the middle of it.

As a symbolic closing gesture, participants can "contribute their puzzle piece": What was your part in the bigger picture today? What will you take home with you?

Nature conservation signs/ nature ranger

Someone is taking care of this place.
Signs, rangers, and fences show: the Wadden Sea is not left to itself. It is protected, managed, and studied – together, across borders, and for decades.

Almost the entire Wadden Sea is protected – nationally and internationally.

Denmark, Germany, and the Netherlands have designated the area as national parks or nature reserves. This protection is visible on site – through signs, nesting and resting zone notices, and local rangers.

On an international level, the three countries have been cooperating for almost 50 years as part of the Trilateral Wadden Sea Cooperation.

This collaboration ensures that:

- Protective measures are coordinated across borders.
- Research and monitoring follow comparable standards.
- The Wadden Sea is preserved as a whole.

Only this combination of national protection and international cooperation secures the Wadden Sea as an ecological entity.

This sign, that fence, or the ranger over there tells us: this area is not left on its own –someone is taking care of it.

But what exactly does that mean?

Use a sign or other local feature to explain national and international protection: This sign isn't standing alone. Whether you're on a Hallig island, in East Frisia, on Rømø, or on Texel – all across the Wadden Sea, similar signs point to protective measures.

The Wadden Sea knows no borders – so its protection can't stop at borders either.

UNESCO World Heritage status is not a permanent award, but a vote of confidence from the global community – with a clear condition:

Only if protection and management remain effective over time, and the site's condition does not deteriorate, can the Wadden Sea retain its World Heritage title.

Reliable protection and coordinated management are key requirements for this recognition – and form one of the core pillars of the Wadden Sea's World Heritage status.

Sign rally: How many different types of conservation signs can you spot along the way?

What do they show? Which symbols or colors do you recognize?

Why do you think such a huge area needs rules in the first place?

Who might take care of all this – and why?

Role-play: Imagine you're a ranger – what would your job be today?

Or imagine you're a bird in a nesting area – how do the rules help you?

What do you think the Wadden Sea would look like without national and international protection?

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