The beach task:

1. Documentation of algae and animals:

a. Fucus serratus:

It has an olive to brown colour and can found on be the Atlantic coast of Europe¹.



Figure 1: Borrestranda - 01.05.2020

b. Fucus spiralis:

It has an olive to brownish colour and lives in the intertidal zones of the Atlantic coast of Europe and North America².

c. Ulva intestinalis:

It is a green algae, which grows world wide³.



Figure 2: Borrestranda - 01.05.2020



Figure 3: Borrestranda - 01.05.2020

 <u>https://en.wikipedia.org/wiki/Fucus_serratus</u> (12.05.2020)
<u>https://en.wikipedia.org/wiki/Fucus_spiralis</u> (12.05.2020)
<u>https://en.wikipedia.org/wiki/Ulva_intestinalis</u> (12.05.2020)

d. Chondrus crispus:

It is a red algae, which lives in the intertidal and subtidal zone, as well as the bottom of the ocean. It is mostly found on rocky shores of the Atlantic coast of North America and Europe⁴.



Figure 4: Borrestranda 01.05.2020

e. Furcellaria lumbricalis: Is a red algae, which mostly grows on rocks underwater. It has two different ecotypes; one is attached and the other one is mostly drifting⁵.



Figure 5: Borrestranda 01.05.2020

f. Crassostrea gigas:

The pacific oyster has a whitish colour and lives in estuaries, intertidal and subtidal areas. It tolerates various temperatures and salinity and can be found on different hard surfaces, like rocks or shells of other animals⁶.



Figure 6: Borrestranda - 01.05.2020

⁴ <u>https://en.wikipedia.org/wiki/Chondrus_crispus</u> (12.05.2020)

⁵ https://en.wikipedia.org/wiki/Furcellaria (12.05.2020)

⁶ https://en.wikipedia.org/wiki/Pacific_oyster (12.05.2020)

g. Mya Arenaria:

The soft-shell clams are saltwater clams, which are edible. It lives in the mud of tidal flats. The food is consumed through filtering it⁷.



Figure 7: Borrestranda - 01.05.2020

h. Mytilus edulis:

The shells of the common or the blue mussel can be found across the world. They mussel lives in intertidal areas, mostly attached to rocks. It is edible and is itself a filter feeder, so it gets their food Figure 8: Borrestranda 01.05.2020 through filtering water⁸.



Littorina obtusata: i.

> A sea snail that lives in the littoral and sublittoral zone, mostly in the Baltic Sea and European waters. It has mostly a yellow shell, but it vary due can to its environment⁹.



Figure 9: Borrestranda - 01.05.2020

⁷ <u>https://en.wikipedia.org/wiki/Soft-shell_clam</u> (12.05.2020)

⁸ https://en.wikipedia.org/wiki/Blue_mussel (12.05.2020)

⁹ https://en.wikipedia.org/wiki/Littorina_obtusata (12.05.2020)

j. Littorina littorea:

The common periwinkle is a snail with a dark and bended shell, which might have spiral bands on it. It lives on rocky shores in the intertidal area. Its diet consists mostly of small invertebrates or algea¹⁰.



Figure 10: Borrestranda - 01.05.2020

k. Theridiiadae:

It is a very common spider, which mostly feeds on ants or other insects on the ground¹¹.



Figure 11: Borrestranda 01.05.2020

l. Coelopidae:

> There are around forty species of this family world-wide, and around three of them live in Norway. They have a flat and dark body and mostly live in the wrack line of the seashore ¹².



Figure 12: Borrestranda - 01.05.2020

 ¹⁰ <u>https://en.wikipedia.org/wiki/Common_periwinkle</u> (12.05.2020)
¹¹ <u>https://en.wikipedia.org/wiki/Theridiidae</u> (12.05.2020)
¹² <u>https://en.wikipedia.org/wiki/Coelopidae</u> (12.05.2020)

m. Carcinus maenas:

A common crab in the littoral zone. It can live in various environments, since it can tolerate a wide range of temperature and salinity. The colour of the body can be red, green, brown or grey, depending on the surroundings. Its' diet consists mostly of worms, small curtaceans and mollusks¹³.



Figure 13: Borrestranda 01.05.2020



Figure 14: Borrestranda 01.05.2020

n. Nassarius reticulatus:

The shell of this small European snail is pointed at the top with stripes around it. The colour can vary from yellow, to red or blue¹⁴.



Figure 15: Borrestranda 01.05.2020

o. Taliturs saltator:

This is a sand hopper with a brownish to greenish body colour. Its diet consists mostly of rotting seaweed on sandy coasts¹⁵.



Figure 16: Borrestranda 01.05.2020

 ¹³ <u>https://en.wikipedia.org/wiki/Carcinus_maenas</u> (12.05.2020)
¹⁴ <u>https://en.wikipedia.org/wiki/Tritia_reticulata</u> (12.05.2020)
¹⁵ <u>https://en.wikipedia.org/wiki/Talitrus_saltator</u> (12.05.2020)

2. The littoral zone:

The ocean is a very complex environment and can be split up into different horizontal and vertical zones. The zone, which is under the influences of the tides is the littoral (or intertidal) zone. Every zone in the ocean has its own marine animals and plants living in it. The littoral zone is one of the more dynamic environments, because of the tides and therefore the ground being exposed at low tide and covered by water at a high tide (c.f. Molles, M. C. Jr. & Sher, A. A., 2019, p. 50). The littoral zone can be divided into even more segments, which can be seen here:



Figure 17: Littoral zone (Source: Molles, M. C. Jr. & Sher, A. A., 2019, p. 58)

In this figure the structure of the littoral zone comes clear. The top layer, the supratidal fringe, is mostly only wetted by the tides, not covered. Below that, the upper intertidal zone starts, which is covered during the high tides. The middle intertidal zone below is only uncovered in average tides, and the low intertidal zone is uncovered in the lowest tides. The last layer on the bottom is the subtidal zone, which always remains covered by the tides. The physical conditions in the littoral zone change a lot due to the tides. The light intensity, as well as the temperature vary widely, since the tides expose some areas. The chemical conditions change just as much as the physical ones, since the salinity and the oxygen vary with the tide as well. Therefore, organisms that live in the intertidal zone must be very adaptable to the marine and terrestrial environment. It is therefore necessary, that all organism living there can withstand the exposure to air for a limited period. While some can do that better than others, a clear zonation of species results. Furthermore, the given ground of the area also affects which organism you are going to find there. Rocky undergrounds support species like sea stars, mussels, seaweeds and barnacles, and they mostly attach themselves to the rocks. Organisms living on a sandy area mostly burry themselves in it to seek shelter (c.f. Molles, M. C. Jr. & Sher, A. A., 2019, p. 57ff).

3. Activities with children along the shoreline and connected challenges:

Whilst planning any activities with children it is important to clarify what risks are involved while being outdoors and close to the sea. Some examples are the strong currents and waves, which are often underestimated, as well as strong wind and sudden weather changes. To be prepared for all of these challenges as a teacher, be sure to know the area you want to bring the children and inform them of how to act in different (worst case) situations. Always check the weather beforehand and let the children dress appropriately. If the activity might involve the water itself bringing life vests is always good.

The activities themselves can vary widely, since it is an open space where a lot of creativity as well as a lot of science can be enhanced. For once the beach with all the loose objects laying around can afford many different activities for children. But you can always include science if you want to and/ or the children are curious about some animal/ plant/ ... The curiosity of a child can be "used" to dig even deeper into specific knowledge or activities. To sum up, the shoreline is a very open and inviting area for activities with children, but the tides and weather should never be underestimated.

4. Reference list:

 Molles, M. C. Jr. & Sher, A. A. (2019). *Ecology: concepts and applications*. New York, NY: McGraw-Hill Education