Primary producers (producers) of the littoral zone.
Seaweeds, lichens and vascular plants.

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The littoral zone comprises the land placed near the sea and that receives the direct influence of the sea. Referring to the primary producers, with the exception of the phytoplankton, they depend on the type of substrate, because of their immobility, besides other factors that affect their distribution such as the high level of salinity, water-stress, wind and light.

In this way, the littoral zone provides one of the most diverse range of habitats for living organisms, and it is characterized by narrow belts of vegetation that present highly adapted plants. In general, 3 zones (subtidal, intertidal and supratidal zone) are distinguished in relation with the effect of the tide.

As has been mentioned in the first module about general conditions, the Basque coast is, predominantly, a cliffed coast where the destructive action of the waves is dominant and a minor portion present sandy beaches and muddy shores, placed, in general, at the mouth of estuaries.

That is why, the flora and vegetation that appear on the Basque coast can be different depending on the substrate and its position. On the basis of all these factors the following three ecologically distinguishable units will be mentioned: cliffed zones, beaches and estuaries.

I. Cliffed Zones (Rocky shores)

The seashore below the zone of the influence of tides, that is the subtidal zone, presents communities of seaweeds such as Gelidium sesquipedale, Laminaria sp., etc.

The intertidal zone, specially the low intertidal zone, is also colonized by seaweeds, where the most important are Cystoseira spp., Bifurcaria bifurcata, Gelidium sesquipedale and Gigartina elongata in habitats with high quality; whereas, Corallina
elongata and Caulacanthus ustulatus dominate polluted sites. In the higher level of the intertidal zone species such as Fucus spiralis and Pelvetia canaliculata can appear, since they can suffer long uncovered periods.

Likewise, in the zone where the tidal influence is occasional, but the sea splashing is still strong, the communities of lichens are dominant, and a "black belt" with Lichina pygmaea, Verrucaria maura and V. marina appears and, in the upper part, extending up into the supratidal zone, an "orange belt" sometimes appear where the most important species are Caloplaca maritima and C. thallincola.

Going up the cliff the influence of the sea decreases and the communities of vascular plants appear. First, an open halocasmophytic vegetation with Crithmum maritimum, Plantago maritima, Armeria euskadiensis among other. The second belt corresponds to a more dense aerohalophilic community of herbaceous plants, with plants such as Festuca rubra subsp. pruinosa, Daucus carota subsp. gummifer, Silene uniflora and Limonium binervosum. And in the last belt a bushy community dominated by Ulex europaeus, Erica vagans, Lithodora spp, or Genista hispanica appears that is more related with the vegetation of the inland zone.

II. Beaches and Dunes.

On the beaches where the tides leaves organic remains and, when the anthropogenic action is not so strong, an halonitrophilous vegetation with Cakile maritima, Salsola kali and Euphorbia peplis as representative plants can be found.

The dunes associated to beaches represent a peculiar substrate that only some plants can colonize. In general, tree types of dunes can be distinguished, each one with a particular community.

1. Primary dune. The sand is not compact, that is to say very movable, where a psammophilic community appears with Elymus farctus, Calystegia soldanella and Euphorbia paralias among others.

2. Secondary dune. Also called white or semifixed dune. This habitat is firmer than the former and has a diverse community, where the grass Ammophila arenaria dominates among the previously mentioned Calystegia, Eryngium,...

3. Tertiary dune. Fixed dune. This zone is the furthest from the sea and presents a vegetation dominated by brushes and grasses such as Helichrysum
III. Estuarine Zones

These areas at the mouth of some rivers, as happens on many beaches, have been used by men throughout the years. Nowadays, these areas have suffered a dramatic reduction in size and also a degradation of their environmental quality.

The ecological characteristics of an estuary are very different from the previous units. Here, the mixture of sea and fresh water, the muddy substrate and the tide are the most important factors. Summing up the vegetation from the sea to the interior, we can distinguish:

1. Grasslands of *Zostera noltii* and few seaweeds (*Fucus* spp.), which remain exposed only in spring tides.

2. In slightly elevated zones a community of grasses grows with *Spartina maritima* and *S. alterniflora*, which are covered by the sea during the spring tides.

3. The upper belt corresponds to the salt-marshes, where more complex communities appear. Here the dominant plants are *Salicornia ramosissima*, *Sarcocornia fruticosa*, *S. perennis*, *Suaeda maritima*, *Aster tripolium* and *Halimione portulacoides* among others.

References