A Subtidal Algal Turf Community

The Subtidal Community

Subtidal algal turf communities vary greatly from their intertidal and reef flat counterparts. The benign waters, generally low nutrient levels and high herbivory of the subtidal region are influential factors in the community structure. Due to the less rigorous physical environment, subtidal turf communities are comprised of more small, filamentous species accompanied by the ever present cyanobacteria, diatoms and detritus. Benthic diatoms, which are small epiphytic unicellular algae, are probably the most diverse and important component of turf communities.

The larger forms of turf present in the intertidal and reef flat regions cannot survive the herbivory at these deeper depths. Instead, the faster growing filamentous species with higher surface to volume ratios, such as *Polysiphonia spp., Herposiphonia spp., and Ceramium spp.,* are more successful.

Diverse turf community on *Porites compressa* coral at French Frigate Shoals.

Subtidal *Porites lobata* colonies with turf communities. Puako, Hawai'i.

Subtidal *Porites lobata* colonies with turf communities. Puako, Hawai'i.

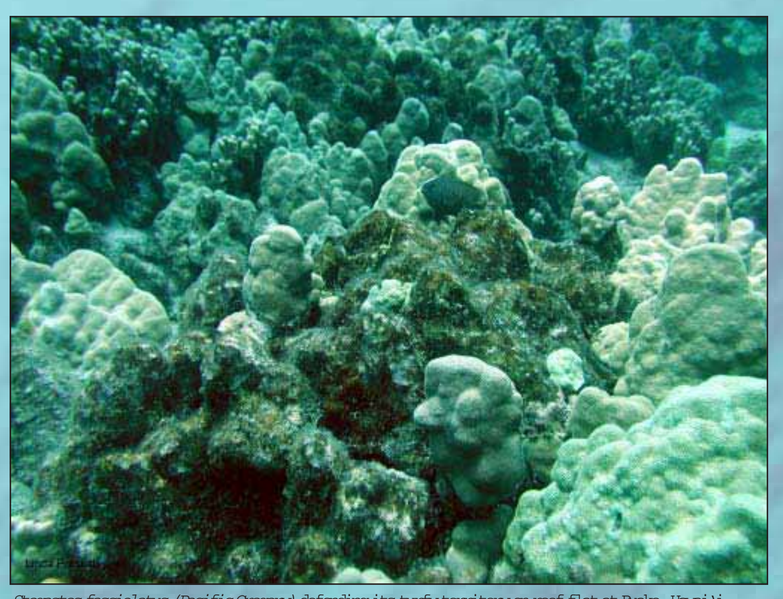
The Subtidal Environment

The subtidal region encompasses the deeper reef areas that slope out from the reef crest. This region is subjected to less hydrodynamic forces than the intertidal zone or reef flat, with the most extreme water motion occurring during storms. Nutrients and sediments are moved along the reef front by currents. High coral cover is characteristic of the deeper subtidal waters when adequate herbivorous fish populations are present. With sufficient herbivory to control macroalgae, the corals will dominate the substrate. The major reef building coral in Hawaiian waters is *Porites lobata,* which dominates in 5 to 15 meter depths. Thick stands of *Porites compressa,* or finger coral, cover the calmer deep reef to approximately 20 meters.

Algal turfs are very common on coral in the subtidal regions. Established *Porites lobata* colonies commonly have turf communities interacting with live tissue and *Porites compressa* fingers have live coral tissue at the top of the "fingers" and algal turfs on the bottom ½ to ¾ of the "fingers". With high grazing pressure, most of the macroalgae present are either cryptic or use chemical defenses. The turfs are the major primary producers in the subtidal environment.

Damselfish Territories

Algal community structure is affected by the behavior of certain territorial damselfish. *Stegastes fasciolatus* (Pacific Gregory) is highly territorial and will chase off any larger herbivores that may come into their area. Damselfish are thought to be selective grazers, cropping their preferred algae and grooming their turf territories. Because of their preferential grazing, algal turfs in damselfish territories are more diverse and have higher biomass.



Stegastes fasciolatus (Pacific Gregory) defending its turfy territory on reef flat at Puako, Hawai'i.

Community Structure

The calmer physical conditions of the subtidal region enable the more delicate filamentous and smaller sized turf algae to thrive in a variety of microhabitats found in deeper subtidal regions. Grazing exerts strong controls over the structure of these benthic turf communities.

Higher grazing pressure tends to reduce biomass leaving small stands of turfs to reside in cryptic regions along long fingers of corals or other areas that are relatively inaccessible (even to scientists). Lowered grazing pressures favors turf species over other morphologies; their large surface areas to small volume favor nutrient uptake, fast growth and other quick responses associated with rapid physiological metabolism.

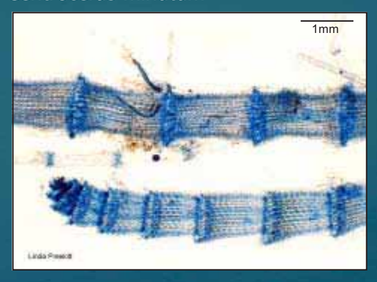
Subtidal turf communities are dominated by red algae, reflecting that this group is about 70% of our algal diversity. Coincidentally, their photosynthetic capabilities in low light environments can be very effective, allowing some turfs to complete a cycle from germling to reproduction in about 2 weeks.

Below is a sampling of the genera and species found on coral heads and rubble:

Red Algae:
Anotrichum secundum
Antithamnion erucaclaclellum
Centroceras minutum
Ceramium spp.
Champia parvula
Chondria polyrhiza
Corallophila huysmansii
Diplothamnion jolyi
Herposiphonia sp.
Heterosiphonia crispella
Hypnea pannosa
Hypoglossum sp.
Jania pumila
Sphacelaria tribuloides
Spirocladia hodgsoniae
Taenioma perspusillum
Tiffaniella saccorhiza
Tolypiocladia glomerulata

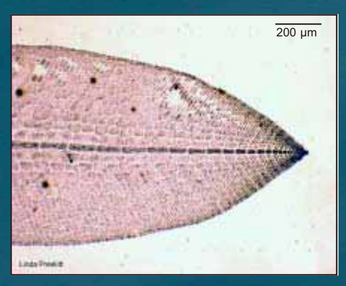
Green Algae:
Enteromorpha paradoxa

Centroceras minutum



Anotrichium secundum

Hypoglossum sp.



Tolypiocladia glomerulata

Poster by Linda Preskitt