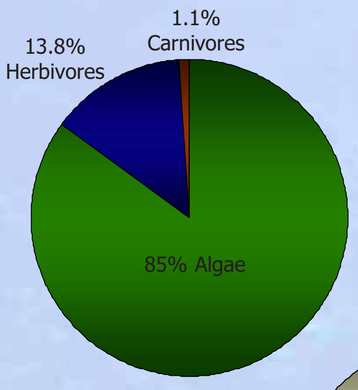
A Reef Flat Algal Turf Community

The Community

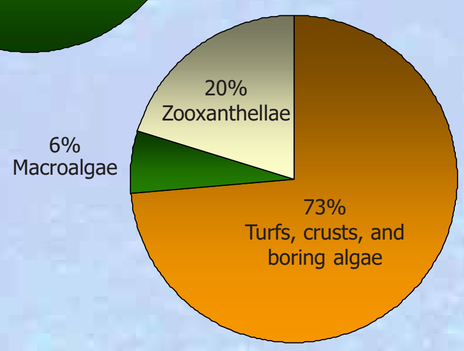
On coral reefs throughout the tropics, shallow, hard substrates are covered by epilithic algae communities (EAC). These algal assemblages are comprised of small compact and filamentous forms that create mats on rock and dead coral. They are complete, miniature environments that can be heavily epiphytized by smaller filamentous algae and form a canopy in which cyanobacteria, microscopic animals, and diatoms live. These turf communities also trap detritus and sediments that are important to the community's success. Detritus raining down from the water column adds to the available nitrogen at the basal portion of the turfs through decomposition. The sediments trapped in the algal turfs may prevent more successful macroalgae from settling on the substrate and out competing small turfs through shading.

Algal turfs are considered one of the most productive habitats on coral reefs, providing the basis for life in otherwise oligotrophic environments.

Turf community at Ka'alawai, O'ahu.



Algae are 85% of the total biomass on a coral reef. Turfs, crusts and boring algae are 73% of that algal biomass, clearly the major primary producers. (Odum & Odum 1955).



Reef flat with algal turfs on hard substrate and dead coral. Kona Coast, Hawai'i.

The Reef Flat Environment

The reef flat starts at the low intertidal zone and extends to the reef crest, a depth of 3 to 4 meters. There is a constant flux of water as wave action moves the water column back and forth across the reef flat. This area may experience high wave energy during winter storms. Terrestrial run off can lower salinity and increase nutrients, both important factors in algal growth. The turf community structure may be governed by the amount of light available (turbidity), and levels of nutrients, salinity and grazing. Species diversity can be expected to vary with gradients in physical factors.

Ecology

Turf algae are important trophic resources on reef flats. Up to 80% of the primary production on the reef can be from the EAC: they are an efficient nutrient "sink" that converts nutrients into biomass. During periods of eutrophication (high nutrient input), algal growth can outstrip consumption by herbivores and reef areas will become overgrown. This can result in permanent changes in the reef community, unless oligotrophic conditions return.

Grazers exert strong influences on these turf communities. Herbivore grazing stimulates productivity by selecting for faster growing forms yet keeps the total algal biomass cropped. When grazing is lessened, the community shifts from highly diverse algal turfs to dominance by macroalgae species. When coupled with eutrophication a phase shift from a coral dominated to an algal dominated reef can occur.

School of *Ctenochaetus strigosus (Kole)*, herbivores on the reef flat at Puako, Hawai'i.

Community Structure

Turf algae in reef flat communities are most often comprised of highly successful, productive species that can recover quickly from constant grazing by herbivores. The scraping by herbivores continuously provides new substrate and thus selects for the more opportunistic algal forms. Early successional communities under heavy grazing pressure have relatively fewer species. With the removal of herbivory, later successional states are mostly algal crusts.

Chondria dangeardii

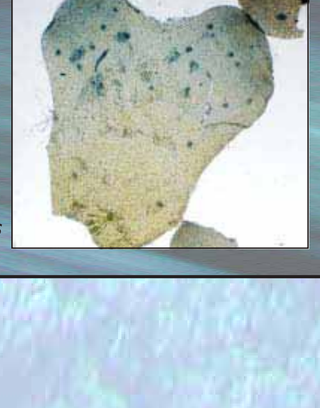
Below is a sampling of the genera and species from the communities above:

Red Algae:
Acanthophora spicifera
Amansia glomerata
Champia parvula
Ceramium flaccidum
Centroceras clavulatum
Chondria dangeardii
Coelothrix irregularis
Gelidium sp.
Gelidiopsis sp.
Herposiphonia sp.
Hypnea spinella
Laurencia spp.
Polysiphonia sp.
Pterocladiella sp.
Spyridia filamentosa

Green Algae:
Cladophora sp.

Brown Algae:
Dictyota friabilis


Spyridia filamentosa



Dictyota friabilis

Champia parvula

Acanthophora spicifera