What's in your coral reef?

Water quality and Coral Reefs: *Why corals need clean water too!*

Basic water quality needs of coral

In order for corals to reproduce and grow in Hawai'i, they require light, mild water temperatures, a slightly basic pH, a narrow range of salinity values, and like other aquatic organisms, relatively high dissolved oxygen content. The presence of chemicals and too much nutrients can negatively affect corals as well. Studies have found that coral reproduction and recruitment are more sensitive to changes in water quality than adult corals and are highly dependant on clean water and low sedimentation.

Optimal conditions for healthy coral reefs include temperatures between 23-25 degrees Celsius (73 – 77 degrees Farenheit). Most coral reefs are found in areas with salinities between 32-35 parts per thousand. The pH of seawater also is important; pH usually varies in the ocean surface waters between 7.5 and 8.5 depending on the relative importance of photosynthesis versus respiration.

Poor water quality threatens our coral reefs!

Global warming

Today our oceans are taking in 48% of the worlds' carbon dioxide from the air. Carbon dioxide reacts with the water to form carbonic acid, lowers the pH and causes changes in alkalinity and calcium levels. This is also known as "ocean acidification" and can affect coral growth.

Coral bleaching, which is when corals lose their zooxanthellae in large amounts in a colony, occurs as a result of unusually high or low water temperatures; unusually high or low salinity; high amounts of visible or ultraviolet light; sedimentation; high levels of nutrients; or high levels of toxins.

To learn more: Hawai'i Institute of Marine Biology: www.hawaii.edu/himb/index.html

State of Hawai'i, DLNR-Division of Aquatic Resources: http://hawaii.gov/dlnr/dar/coral/coral_reefs.html

U.S Geological Survey, Pacific Coral Reefs: http://coralreefs.wr.usgs.gov/

Sediments, nutrients, & sewage, oh no!

Excessive sedimentation is perhaps Hawai'i's primary pollutant affecting coral reefs

Sediments

While large amounts of sediments can smother corals and reduce the amount of light reaching their zooxanthellae, even lower levels can limit a coral's growth by forcing them to spend extra energy on getting rid of the particles, energy that would have been used for other activities. Sedimentation prevents coral larvae from being able to settle down in their preferred habitat and grow, and also increases the potential for death after they settle. Particles that are suspended in the water column can also reduce the survival of larvae attempting to find a place to come to rest and grow.

Nutrients

Long term or persistently increased levels of dissolved inorganic nutrients (DIN-ammonium, nitrates, phosphorus) may change reef metabolism and reef calcification which can cause noticeable changes in coral communities. Specifically, DIN hinders the fecundity, fertilization, embryo and larval development and possibly larval settlement of corals. Too many nutrients can cause excessive growth of the zoox, to the point that they no longer need to stay attached to the coral polyps, since they now can get enough nutrients without the coral's help.

Sewage

As we all know, sewage contains all sorts of nasty pollutants that is harmful to humans, and corals are no exception. Black band disease is caused by a collection of bacteria, including blue-green cyanobacteria. By themselves, blue-green cyanobacteria are not thought to be harmful to coral, but in combination with other bacteria, they can be deadly. Cyanobacteria grow much faster in sewage contaminated waters, so it is likely that sewage may be a culprit in Black band disease. Various forms of Vibrio bacteria, also found in dog feces, have been shown to cause coral bleaching. It is not known whether Vibrio is found in sewage, or naturally occurs in the reefs. Even the excessive turbidity from sewage can cause the loss of photosynthesis; thereby, the zoox no longer produce enough energy to benefit the coral polyps. A study in Kaneohe Bay found that the reduced visibility around the sewage outfall site was linked to phytoplankton blooms.

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