

CYANIDE

Coral reefs are primary resources that support the livelihood of many coastal communities. It is a must that they be protected from destructive fishing methods like that of cyanide.

What is Cyanide?

Cyanide is a naturally occurring compound that is composed of one hydrogen atom and one carbon atom attached to its nitrogen atom by a triple bond. Cyanide can exist in water as free cyanide or as complex with other chemicals like metals. Free cyanide can either be cyanide ion or hydrocyanic acid, depending on the pH of water. At alkaline pH, the dominant and stable form is the cyanide ion, conversely, hydrocyanic acid predominates at acidic pH.

Sources and Uses

Cyanide is found naturally in plants like cassava and sorghum and can be present as part of natural compounds. It can also be synthesized by certain bacteria and fungi. It has uses in mining, electronics, jewelry, and textile industries.

Cyanide Toxicity

Cyanide is a poison with extremely lethal potency. Cyanide is an inhibitor of the electron transport chain in the biological metabolic pathway. Cyanide inhibits the enzyme cytochrome oxidase, which catalyzes the transfer of electrons from the cytochrome system to molecular oxygen, resulting in cytotoxic anoxia.

The observed toxicity of cyanide to aquatic life is attributed mostly to undissociated molecular hydrogen cyanide derived from ionization or decomposition reactions of cyanide-containing compounds.

Several factors affect the toxicity of cyanide in water. These include the following:

- Concentration: toxicity increases with increasing concentration
- Temperature: toxicity increases three-fold with a 12° rise in temperature
- pH: slight decrease in toxicity due to ionization to the cyanide ion
- Oxygen concentration: toxicity increase with decreased dissolved oxygen levels
- Chloride concentration: survival time decreases with chloride concentration of above 8.8 ppt
- Other factors: like health, age, stress level of the fish.

Cyanide as a Destructive Fishing Method

The export of live ornamental and food fish is a major industry in the Philippines. Increasing demand and the resulting increase in income prompt the use of methods that enable an increase in the volume of catch.

Cyanide, when employed in fishing, is used like an undissociated. At low concentration, it only immobilizes or stuns the fish, thus enabling fishermen to catch them in an aesthetically favorable state.

When cyanide is used in fishing, fishermen/divers crush cyanide tablets and then dissolve it in squirt bottles with sea water. The cyanide solution is then sprayed on coral heads and crevices. In effect, fishes move away, toward cleaner areas. Fishes escaping from the cyanide contaminated water are slightly weakened, enabling the fishermen to catch them in a much easier way.

Signs of Distress on Cyanide Affected Fish

- Increased Ventilation
- Gulping for air at the surface

- Erratic swimming movements
- Muscle incoordination
- Death with extended gill covers

Effect of Cyanide on Corals

- Corals exposed to cyanide die
- Corals remain intact as opposed to dynamite which are fragmented
- Coral heads initially take on a bleached appearance and later become encrusted with algae

Effect of Cyanide Fishing Resources

- Reduced food supply
- Loss of income
- Unemployment
- Reduction in Tourism

The Cyanide Detection Test

To address the growing issue on the destructive cyanide fishing method, the Bureau of Fisheries and Aquatic Resources (BFAR) established a Cyanide Detection Laboratory (CDL). The laboratory focuses on the analysis of cyanide content in fish and in water. The laboratory issues certifications on analysis results in support to regulatory and enforcement laws, as well as export requirements.

Analytical Method

BFAR applies the determination of total cyanide. Fish internal organs and gills are taken from fish samples, homogenized, acidified and distilled. Hydrogen cyanide gas (HCN) is liberated and collected in an alkaline scrubbing solution that converts HCN into cyanide ion. Cyanide in the scrubbing solution is determined potentiometrically by ion selective electrode.

Cyanide concentration is reported as mg cyanide per kg tissue sample or ppm.

Details of the procedure are listed in the "Standard Methods for Water and Wastewater Analysis," published by the American Public Health Association, and in the Association of Official Analytical Chemists (AOAC).