for novices in the marine aquarium hobby—DANIEL KNOP

Collecting scrap metal?

Heavy metal poisoning in the aquarium, part 2

Hardly any type of aquarium is as sensitive to heavy metals as a coral reef tank. It is important to take the correct steps quickly when an increased heavy metal concentration is present.

Part 1 of this subject in the previous issue described the development of heavy metal poisoning in the reef aquarium. In part 2 we present the measures that should be taken in an emergency.

First, the suspicion must be confirmed, and that is anything but simple. There is no easy way for the hobbyist to test the aquarium water for the presence of heavy metal ions. In principle, a targeted concentration test has to be performed for each metal. Specialized laboratories that perform soil and water testing could test aquarium water for heavy metal contamination to provide clear answers, but such an investigation takes time and money; the cost can quickly reach hundreds of dollars.

A negative reaction of the aquarium system to the scheduled micronutrient dosage is a clear indication that heavy metal poisoning might be present. If a particular metal is already at an elevated concentration, the additional ions from the trace elements can increase the aquarium concentration briefly into the toxic range. In the aquarium in question, laboratory testing confirmed such observations in the case of increased concentrations of nickel and zinc. Although none of the reef animals showed apparent damage before we added the nutrients, all the soft and stony corals stopped growing; they retracted polyps and opened only partially. After feeding a good trace element concentrate from a reputable manufacturer in the prescribed concentration, we found several dead corals the next day. Within hours, the concentration then decreased—due to protein skimming, activated carbon filtration, and precipitation on solid surfaces—below the toxic level, and no further losses of corals were observed. Every additional trace element dosing reproduced the process reliably. Such observations should be taken seriously, as they indicate possible heavy metal poisoning of the source water.

Mollusks like snails and mussels are particularly sensitive to heavy metal pollution. The simultaneous deaths of several snails or giant clams therefore raises suspicion. In particular, one should be concerned about heavy metals when motile invertebrates like mollusks, crustaceans,

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Heavy metal poisoning: suddenly dying snails are an alarm signal.

Sea urchins losing their spines might point to heavy metal contamination of the aquarium.

This *Tridacna squamosa* giant clam presents typical heavy-metal poisoning symptoms: the mantle is not fully extended and is degenerating, most noticeably at the siphon, and instead of a homogeneous field of color, we see the symbiotic algae clustered in small groups.

and echinoderms cannot be successfully established in a reef tank. If herbivorous snails don't survive for long, shrimp die days or a few weeks after introducing them, and sea urchins inexplicably lose their spines, it is time to consider heavy metal toxicity as a cause and take appropriate measures, including:

- add activated carbon filtration and/or a contaminant-scavenging pad such as Poly-Filter.
- optimize the capacity of the skimmer
- add iron oxide–based phosphate binders—they bind other substances such as copper, nickel, cobalt, zinc, and manganese.
- use water conditioners (such as Aqua Safe or similar products) for tap water treatment. They contain chelators that form a bond to a metal ion so that a chelate is formed. By complexing the metal ions they turn them relatively non-toxic, but it may become difficult to test for them. To grossly simplify, the heavy metals are "encapsulated." While they are still physically present in the water, they cannot form chemical bonds with biological material any more, which renders them harmless as long as the chelators are not destroyed. This might happen, for instance, through UV sterilization of the water. Thus, if a chelator is used in a saltwater aquarium to capture heavy metals, UV sterilization should be turned off. The same might apply to ozone, because the possibility that this highly reactive oxygen form has a similar effect on the chelator cannot be ruled out.

Regular water changes are a more thorough approach to tackling the problem; change about a third of the tank volume every two weeks. In principle, this method would be an excessive number of water changes for a coral reef aquarium, but in a case of acute heavy metal toxicity, the damaged animals would otherwise be likely to perish.

Even extensive water changes would only help for a short while, and the combination of water conditioner and large water changes does not solve the problem permanently. Many heavy metals form precipitates on solid surfaces and create a depot effect. To the same extent that we reduce them in the water, they redissolve back into solution, drawing from the deposits on the hard aquascape and in the gravel. In such cases, the partial exchange of the rock or even the entire substrate seems effective, but only to the extent permitted by the bacterial balance of the aquarium. This approach requires the careful monitoring of the nitrification, which should not be disturbed. Therefore, such a measure should be customized for a particular aquarium, taking into consideration its technical equipment, biological water filtration, and bioload. Consult with your reef shop dealer if you have questions!

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REFERENCES

Knop, D. (In press.) *Encyclopedia of Marine Aquarium*. Nature and Animal Verlag, Münster, Germany.

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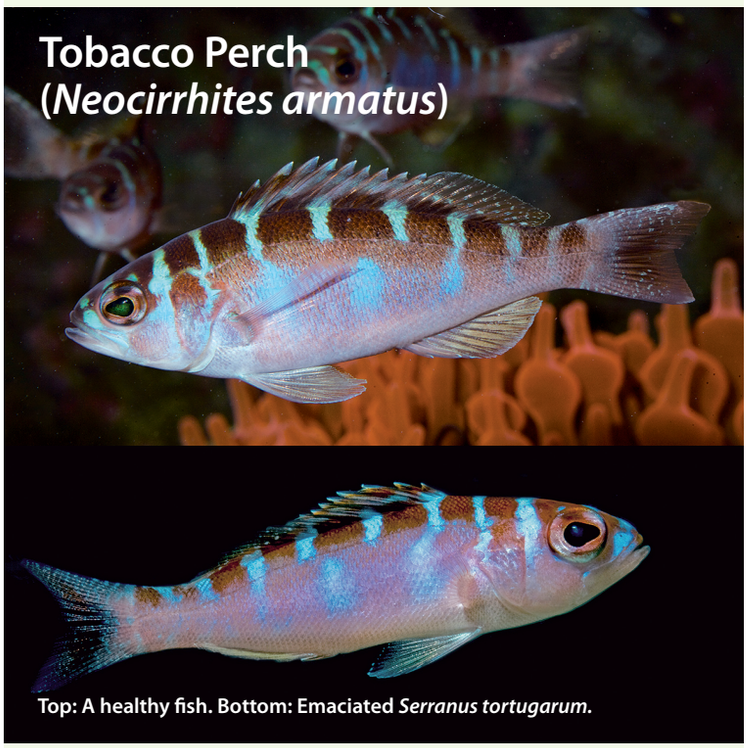

Top: A healthy fish. Bottom: Emaciated *Serranus tortugarum.*

DISTRIBUTION: Caribbean

DESCRIPTION: *Serranus tortugarum* is a small perch of the family Serranidae, which grows to a maximum of 3 inches (8 cm). With its bright blue striped pattern, the species is very attractive.

ECOLOGY: In its natural habitat, the Caribbean reefs, the Tobacco Perch inhabits the open space between corals, hunting free-swimming zooplankton in small, loose groups over sand and gravel.

AQUARIUM MAINTENANCE: Compared to its larger seabass relatives, *S. tortugarum* is a very peaceful aquarium tenant that shows no aggression or predatory tendencies toward other inhabitants. However, dwarf shrimp (for example, *Thor amboinensis*, especially young animals) should not be combined with it as a precaution, because they fit the prey pattern of this *Mysis*-eating fish. For the pairwise care of the Tobacco Perch, a 53-gallon (200-L) reef aquarium is sufficient; for groups of five or more specimens, a water volume of 106 gallons (400 L) is recommended.

FEEDING: *Serranus tortugarum* is not a finicky eater and consumes almost any offered food, such as frozen *Mysis*, but also fine plankton food or even dry food made for carnivores.

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