

# GLOBAL CORAL REEF ALLIANCE

A non-profit organization for protection and sustainable management of coral reefs

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Edgar W. Garcia

Antilles Permits Section

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**Subject: Comments on Coral World Dolphinarium Case #SAJ-1976-89037 (SP-EWG) to Army Corp of Engineers**

Dear Mr. Garcia,

This project should be rejected because the inevitable eutrophication that it will cause by nutrient pollution from dolphin excrement and rotting food will damage or kill nearby coral reef ecosystems. **Nutrient pollution is not discussed at all in the EIA, but it is the major environmental impact of the project!** The only water quality problems discussed are fecal coliforms and turbidity, but nutrients, and their effects on coral and fish habitats are completely, and irresponsibly, ignored. Such projects should never be permitted near coral reefs.

I am the only scientist who has studied coral reef eutrophication and algae overgrowth of corals caused by sewage from captive dolphins (references and videos cited below). Their effects are severe and extensive, and had previously been completely ignored only because no one had ever examined them before. I have personally studied the ecology of algae spread in Caribbean reefs and the role of nutrients in causing their rapid growth for nearly 60 years, am very familiar with algae zonation around nutrient sources, and have written half a dozen scientific papers on the role of nutrients in controlling the abundance and distribution of algae species.

The divers in Cozumel and the National Marine Park of Cozumel, with whom I had worked on long term changes in the reefs there since the 1960s, asked for my advice regarding the unprecedented spread of algae killing corals in their shallow reefs. I examined the distribution of algae along the reefs of Cozumel from the remote areas affected right back to find the source of the nutrients driving their prolific growth. The algae zonation led me straight to the captive

dolphin pens, which are of very similar design to those proposed in St. Thomas, double walled fencing to allow water flow through them. The algae species indicating highest nutrients were more abundant as I approached the pens, with the highest abundance of extreme high nutrient-indicating species smothering the walls of the dolphin pens. The down-current side of the pen, where dolphin wastes flowed into the sea, had huge masses of the same Cyanobacteria species that occurs around the South Florida sewage outfalls. The up-current sides of the pen had only very small amounts, and the algae on that side were not indicative of high nutrients. The area of reef smothered with weedy algae extended more than kilometer down-current from the pens. I also swam for miles around another captive dolphin pen on another island, Isla Mujeres, and once again found the same pattern. I also did the same along the coast by the captive turtle farm pens in Grand Cayman, and yet again found the same pattern.

This pattern of massive overgrowth and killing of coral reefs and fisheries by harmful algae blooms caused by nutrient inputs is just as true of sewage from dolphins and turtles as it of humans. While tropical coastal areas suffer far more from human sewage than captive animals, the captive animals are clearly the predominant nutrient source in nearby areas around them, and cause permanent damage to coral reefs and fisheries as far as the nutrients flow. A dolphin can be as large as a cow and excretes about as much as 5-10 humans:



10-20 dolphins in a pen, a typical range, are about equivalent to 50-200 people living in the same space with ALL their excrement going directly into the water. This is sufficient to significantly pollute a large area of coral reefs. The effects are worse in areas that already have high background levels of sewage nutrients from humans, and especially in areas of poor water circulation, such as the proposed Coral World site in St. Thomas. In contrast Cozumel and Isla Mujeres have the strongest wind-driven currents in the Caribbean, and so the nutrients there are diluted faster than in any other part of the West Indies. Therefore the impact in Water Bay will be far worse.

The Clean Water Act requires that activities not degrade water quality, but completely fails to set standards appropriate for the ecosystems whose waters receive nutrient pollution, making them effectively meaningless. EPA water quality standards are based on human health. There is no phosphate drinking water quality standard, and the nitrate standards of 10 mg Nitrogen per liter, which aims to protect infants from methemoglobinemia (“blue baby syndrome” that causes the hemoglobin to be unable to transport oxygen to tissues, asphyxiating them), is more than 714 times higher than the 0.14 ppm that is sufficient to cause massive harmful algae blooms that kill coral reefs, as shown by both field measurements of nutrient levels that separate algae-dominated from coral-dominated ecosystems and by direct measurements of algae growth as a function of nutrient concentrations.

If coral reefs are to be protected from eutrophication, we must have ecosystem-specific standards that are scientifically-sound. Use of human drinking water quality standards are nearly a thousand times too high for the most nutrient-sensitive of all ecosystems, coral reefs. If we are to protect coral reefs from being killed by nutrients they need the strongest water quality standards of all, and there should be ZERO anthropogenically caused nutrient inputs to coral reef waters. To prevent marine pollution all sewage and agricultural and livestock wastes need tertiary treatment to remove the nutrients and recycle them on land.

At the United Nations Environment Programme Global Conference on Land-Ocean Connections in Jamaica in October 2013, focused on implementation of the United Nations Global Plan of Action to prevent land-based sources of marine pollution from nutrients, sewage, and plastics I gave the talk on impacts of nutrients on coral reefs and fisheries, water quality standards needed to protect them, showed how such standards could be met, and gave the specific example of the impacts of captive dolphin pen wastes killing coral reefs as an example of how even seemingly small local sources can have very large impacts.

For much more on the impacts of nutrients on coral reefs, and the importance of scientifically-sound water quality standards to protect coral reefs, please see:

1) The latest review citing the literature:

A. DeGeorges, B. Reilly, & T. Goreau, 2010, Land-sourced pollution with an emphasis on domestic sewage: Lessons from the Caribbean and implications for coastal development on Indian Ocean and Pacific coral reefs, Sustainability, 2: 2919-2949

[http://www.globalcoral.org/sustainability-02-02919\[1\].pdf](http://www.globalcoral.org/sustainability-02-02919[1].pdf)

2) For video showing the direct impacts of dolphin pens on coral reefs please see:

T. Goreau, 2005, Tourism, water quality, and coral reef health

[http://www.youtube.com/watch?v=xDT\\_q1LwGmA](http://www.youtube.com/watch?v=xDT_q1LwGmA)

A full length documentary film that will soon be released that focuses on the impacts of sewage and water quality on coral reef health and features some of my footage from the above.

3) For a report on the impacts of dolphin pens on Cozumel, Mexico reefs:

T. Goreau, 2003, Dolphin Enclosures and Algae Distributions at Chankanaab, Cozumel: Observations and Recommendations

<http://www.globalcoral.org/Dolphin%20enclosures%20and%20algae%20distributions%20at%20Chankanaab,%20Co.htm>

4) For a report on impacts of the Grand Cayman Turtle Farm:

T. Goreau, 2008, [Algae in the Fish Lagoon and Cayman Turtle Farm Effluent Receiving Area: Recommendations for Monitoring Of Water Quality Improvements](#)

<http://www.globalcoral.org/White%20Papers.1.htm>

I cannot personally speak from first hand experience on the impacts of the captive dolphin trade on the dolphins themselves, but I can say very clearly that such projects kill corals around them and should not be permitted anywhere where corals could be affected, as is clearly the case at Water Bay, St. Thomas.

I urge you to reject this proposed project and to greatly strengthen the water quality standards using scientific data and ecosystem-specific limits, so they can be an effective tool for protecting our nearly-vanished coral reefs and fisheries.

Sincerely yours,

Thomas J. Goreau, PhD  
President, Global Coral Reef Alliance