Comment on the Revised Turbidity Standard

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Abstract: A Sediment Index is proposed that additionally would capture the effects of accumulated sediment loading that are lacking in the current Revised Turbidity Standard.

When the proposed Revised Turbidity Standard was presented to the SEFCRI TAC on October 31, 2019, we realized that no mechanism exists for preventing prolonged, and ultimately lethal, levels of exposure to dredged sediments that are below the permitted cutoff limit for corals in the baseline areas. An effective turbidity standard also would integrate the magnitude and duration of sediment exposure impacting these coral populations[1] (a measure analogous to discharges from a river after storms).

Our proposed Sediment Index (SI) would provide near-continuous information on both instantaneous and cumulative sediment stress. A range of critical lethal thresholds for instantaneous sediment loading (IS), measured in mg/l as beam transmittance, NTU or other methodologies, would be calibrated under realistic field conditions for the potentially affected corals. This range will vary among species or species groups as a function of coral polyp size, shape and thickness, as well as colony morphology. Critical threshold ranges would be calibrated for lethality from cumulative sublethal sediment loading ($\sum$CS), the sum of instantaneous load integrated over time ($\sum IS_{mg/l}t$).

Imagine an array of instruments that estimate mg/l sediment concentrations installed over the baseline coral area that will be impacted by a dredging operation. (An array would be needed to account for variation in the path of the sediment plume from the dredge caused by naturally changing current, wind and tidal directions.) All instruments would generate near real-time data that are sent to a receiving computer for data storage and near-continuous examination of sediment stress. Dredging would be suspended whenever the sediment loading measured by any baseline instrument exceeds either the critical instantaneous IS threshold or the critical cumulative $\sum$CS threshold.

[1] Note that the cumulative SI represents the turbidity equivalent of the widely used Degree Heating Week (DHW) a cumulative measure of the intensity and duration of thermal stress, in °C-week units). Thermal stress thresholds have been established for DHW: levels of 1-4 generate a "warning" status; 4-8 may cause significant bleaching; >8 may result in significant bleaching and death.

If desired, the SDI could be partitioned into natural stress levels and added stress from dredging by comparison with a control in a similar ecosystem to that of the baseline but distant from the influence of the dredging operation:

Instantaneous dredge sediment dose = $IS_{Dredge} - IS_{Control}$

Cumulative dredge sediment dose = $\sum CS_{Dredge} - CS_{Control}$

In areas that corals are chronically exposed to high sediment loads, the additional stress associated with the proposed dredging would be unacceptable, and a different form of remediation would be needed. Conversely, the proposed SI would be less likely to be exceeded when dredging operations are performed during seasons and weather conditions when background sediment stress is expected to be low *(e.g.*, in calm weather during Florida's dry season).