Digitise this! A quick and easy remote sensing method to monitor the daily extent of dredge plumes

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To complement in-situ biological monitoring of coral reef communities and physical monitoring of the Barrow Island dredge plume the visual interpretation of daily MODIS imagery was seen as a quick, relatively accurate and easy method to gain an understanding of not only the daily extent of the plume but also the cumulative impact of the temporal plume. This method has the potential to highlight areas most affected by the dredge plume and to gain a better understanding of the impact this environmental change has on monitored sites of high biological significance. Although the preference is to find a remote sensing method that semi-automates the process of extracting the plume boundaries, in this case it was more important to get a timely and inexpensive understanding of the plume impact. It was identified that consistently separating the dredge plume from shallow bottom features was something that the eye could achieve better than an automatic algorithm. Rather than go through the costly process of atmospheric correction, calibrating and thresholding each daily image. The area of the expected plume impact represented with MODIS imagery was relatively small. Therefore, a digitized visual interpretation of the plume in MODIS imagery was a time efficient option. Only focusing on one region allowed the interpreter to quickly become familiar with natural benthic features in the imagery, under different weather conditions and at times influenced by dredge plume and non dredge plume conditions. Higher resolution imagery such as Landsat ^{7} ETM$^{+,}$ and ALOS AVNIR $^{-2}$ were also used to compare interpretation. Digitised plume boundaries were stored with strict naming and file structure so QA of the interpretation could also be done quickly and the interpretation could be defendable. Plume definition is also an important aspect to consider. Digitizing rules were set up and tested by comparing the resulting plume boundaries of different people.

The direct and indirect effects of stimulated, calcarenite-based dredge material on eggs and larvae of pink snapper *Pagrus auratus*.

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The direct and indirect effects of a simulated, calcarenite-based dredge material on eggs and larvae of pink snapper *Pagrus auratus* were assessed. Direct effects were assessed by measuring hatch rate or survival of eggs and pre-feeding larvae, respectively, over a range of concentrations and exposure durations. Exposure of eggs to suspended solids concentrations up to 10000 mg L-1 for 24 hours did not affect egg buoyancy or hatch rate, despite sediment adherence occurring at the two highest concentrations tested. Newly hatched larvae, whose mouths were still closed, were relatively tolerant of suspended solids, with a 12 h LC50 of 2020 mg L-1 and a first observable effect concentration of 150 mg L-1. Once the larvae's mouths opened, tolerance was significantly reduced, with a 12 hour LC50 of 157 mg L-1 and a first observable effect concentration of 4 mg L-1. Tolerance of larvae to suspended solids was found to be negatively correlated with suspended solids concentration and exposure time, with exposure durations of 6 hours or less being significantly less detrimental than those of 9 hours or more. Indirect effects to larvae were assessed by measuring ingestion of copepod nauplii by 10 and 15 days post hatch (DPH) larvae at sediment concentrations from 0 to 200 mg L-1 in 50 mg L-1 increments over 4 hours. Ingestion was not significantly affected by sediment for 10 DPH larvae, however by 15 DPH, sediment was found to have a far greater impact on ingestion, with larvae in all sediment treatments eating significantly fewer copepods than those in the control.

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