Flood plume water quality in the Elizabeth River estuary

During the wet season large amounts of freshwater enter Darwin Harbour from rivers. This study investigated the influence this inflow of freshwater has on marine water quality and how it affects water quality indicators during and after a large storm event.

What was studied

Distribution of water quality indicators was mapped on 19 February 2010 prior to a large rainfall event, during a flood plume on 3-4 March 2010, and after on 19 March 2010. Seven sites were also monitored for physical indicators over the depth of the water column during the flood plume and about three weeks after the rainfall event. Water quality indicators included dissolved and total nutrients, chlorophyll a, dissolved oxygen, salinity and conductivity.

Key findings

The distribution of physical indicators reflected the influence of freshwater in the upper estuary. Rainfall at Elizabeth Valley rainfall station showed that 258 mm rain fell over the nine days prior to 4 March 2010.

Freshwater inflows reduced salinity and conductivity, especially in the top of the water column. The values of salinity and conductivity in the outer estuary were greater pre-plume than during the plume. Values in the upper estuary were much lower during the plume than 2 weeks after, showing the influence of freshwater inflows (see salinity at 20 cm depth in example maps below). Freshwater has a low salinity value. Dissolved oxygen (percent saturation) was lower in the upper estuary than in the outer estuary. During the flood plume chlorophyll a concentrations were considered low and all complied with water quality objectives.

The influence of freshwater during the plume extended to the outer estuary and probably beyond. The study has increased our understanding of several water quality processes associated with wet season freshwater inflows.
Distribution of salinity in Elizabeth River estuary

Pre plume: 19 February 2010. Greatest salinity range at this sampling: freshwater (low) to typical marine (32 ppt)

During plume: 3 March 2010. Salinity range: freshwater (low) to ‘mid’ marine (18 ppt)