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Developing a New Zealand wide coastal bio-indicator of nitrogen loading using patterns of tissue-δ^{15}N and tissue-N in *Ulva* macro algae

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Anthropogenic inputs of nitrogen can lead to eutrophication of coastal and estuarine environments. The use of biological indicators, such as macro algae is becoming a common approach for detecting such contributions; however natural variation of background seawater chemistry as well as other factors in the physical environment can confound the use of these indicators in comparisons over large spatial and temporal scales. We present the results of five independent case studies using *Ulva* spp. as a spatial and temporal bioindicator of nutrient loading around the coastlines of New Zealand. Mean tissue-δ^{15}N values for *Ulva* growing in unimpacted open coastal sites in summer and winter was very similar with (7.8 ‰ and 7.6 ‰ respectively) despite significant seasonal differences in overall tissue-N content. These results suggest a uniformity of seawater nitrogen δ^{15}N values in open coastal sites around New Zealand, and that only minor differences may be attributed to ^{14}N/^{15}N fractionation as seawater nitrogen is assimilated in *Ulva* spp. under varying environmental conditions. We also observed that higher levels of *Ulva* tissue-N ($>$ 3 %) indicate when high levels of biologically available nitrogen occur. Our case studies show that site-specific baseline information recorded in *Ulva* tissues may also provide a cost effective, rapid assessment tool for detecting coastal and estuarine increases in nutrient loading and shifts in N-availability over time.