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Nitrogen stable isotopes in the shell of Mercenaria mercenaria trace wastewater inputs from watersheds to estuarine ecosystems

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We tested the usefulness of del15N values in the organic matrix of whole shells from Mercenaria mercenaria as tracers of anthropogenic nitrogen inputs to coastal ecosystems. del15N values in shell from transplanted and native clams reflected %-wastewater contribution to estuaries, but were 2.3-2.5 permil lighter than del15N values in soft tissues. Low and high stringency acidification methods were tested to define parameters for reliable del15N determination in shell. Accuracy of del15N values depended on recovering a sufficient quantity of organic N from shell (approx. 70 µg) and was not altered by acidification methods. Reliable del15N values were obtained with as little as 80 mg of shell and100 µl of acid. When analyzed in individual shell growth bands in native adults, del15N values followed changes in N sources to coastal ecosystems across years. Results suggest del15N values in shell recorded spatial and temporal changes in N sources, showing an offset from soft tissues likely due to differences in N assimilation among tissues. This approach may be applied (in living bivalves or ancient middens) to trace N entry to coastal systems by allowing biogeochemical and biological data to be aligned for greater spatial and temporal accuracy.