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Amino acid stable N isotope estimations reveal uniform diazotrophic contributions across zooplankton size fractions in the subtropical N Atlantic

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Natural abundance of stable N isotopes ($\delta^{15}N$) in both individual amino acids and bulk organic matter of size-fractionated plankton samples were compared to analyze the differential impact of nitrogen fixation through the food web, in a transect across the subtropical North Atlantic. Low $\delta^{15}N$ values in the central and western regions were consistent with the prevalence of nitrogen fixation, while maximum $\delta^{15}N$ values tracked the influence of West African upwelling in the eastern zone. Compound-specific amino acid isotope data (CSI-AA) revealed relatively low variability in the impact of diazotrophic nitrogen within the different plankton size fractions, while $\delta^{15}N$ of bulk organic matter showed higher variability with size. Moreover, CSI-AA results also indicated a greater importance of diazotrophy than suggested by bulk $\delta^{15}N$ values. Trophic position estimates using CSI-AA showed the expected general increase with mean plankton size class and varied in a relatively narrow range (1.8 to 2.5), with the lowest values in the central zone. Using isotopic $\delta^{15}N$ values of individual amino acids (in particular Phe and Thr), as well as reconstructed total protein $\delta^{15}N$ values, a set of new relationships with bulk plankton $\delta^{15}N$ was determined, aimed to improve the use CSI-AA data in tracing direct plankton contributions to organic nitrogen pools in the ocean. These new results represent the most detailed investigation of CSI-AA data in zooplankton size classes to date, and point to a key role of large zooplankton in the transmission of the diazotrophic nitrogen up oceanic food webs.

Keywords: stable isotopes, $\delta^{15}N$, plankton, compound-specific, N fixation, amino acids

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