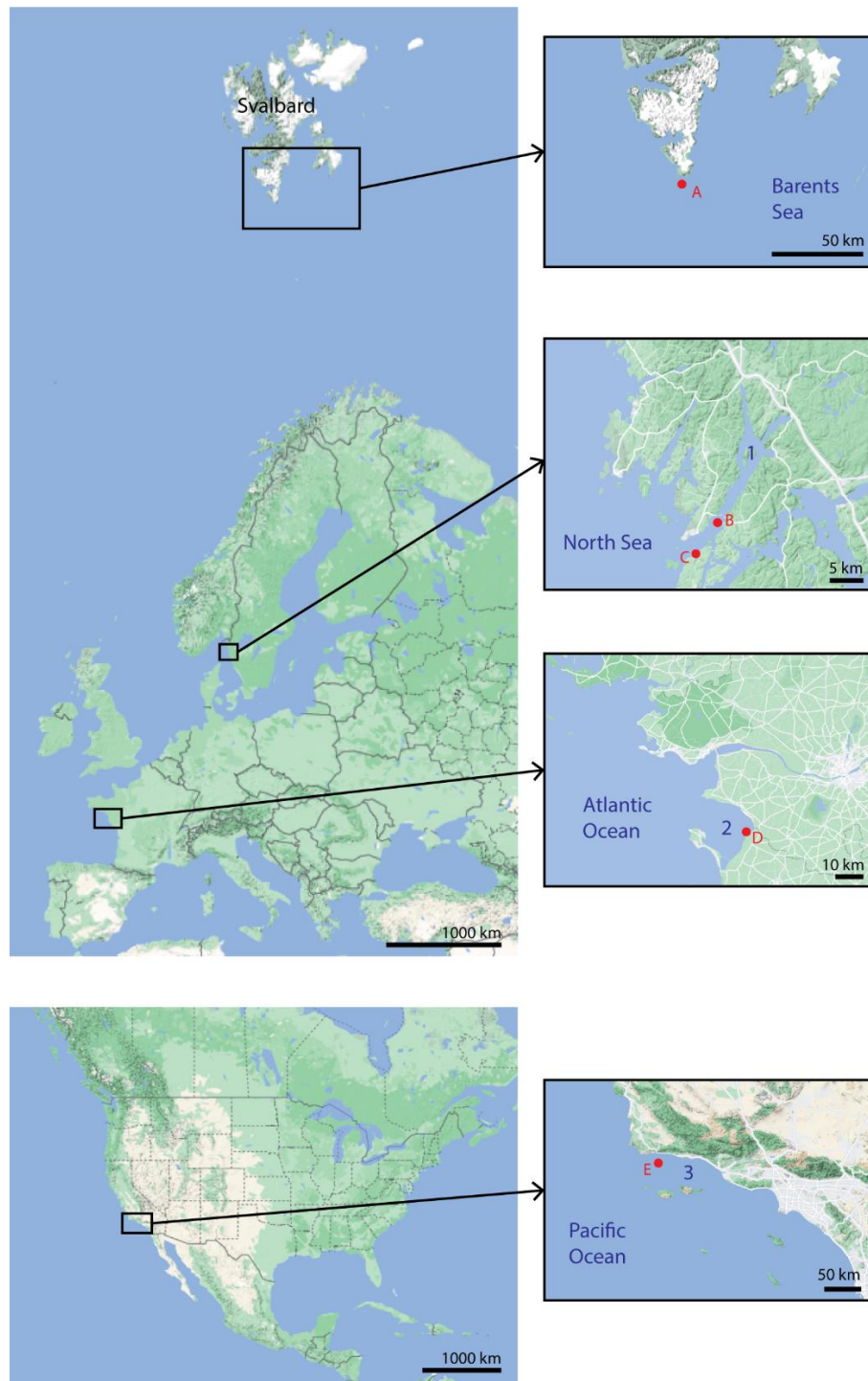


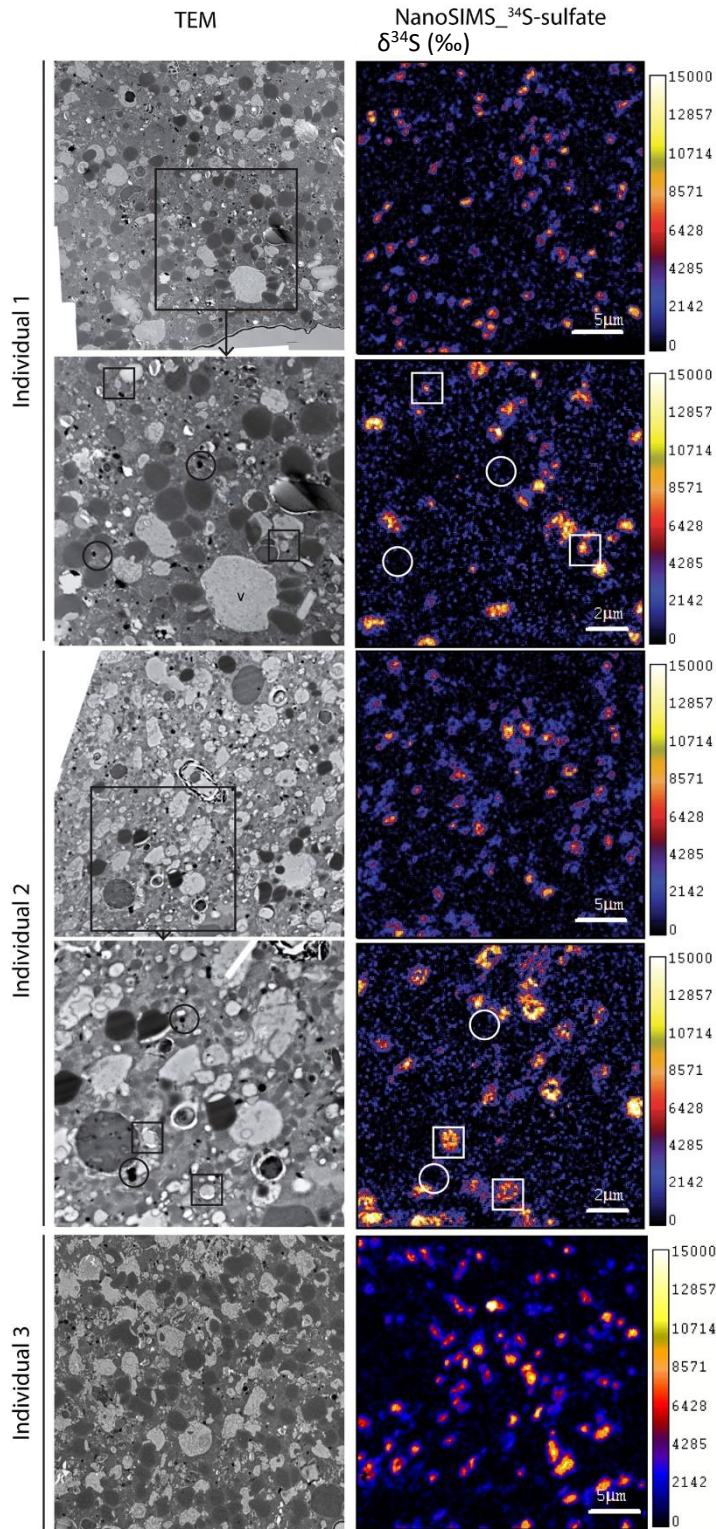
Supplementary Material



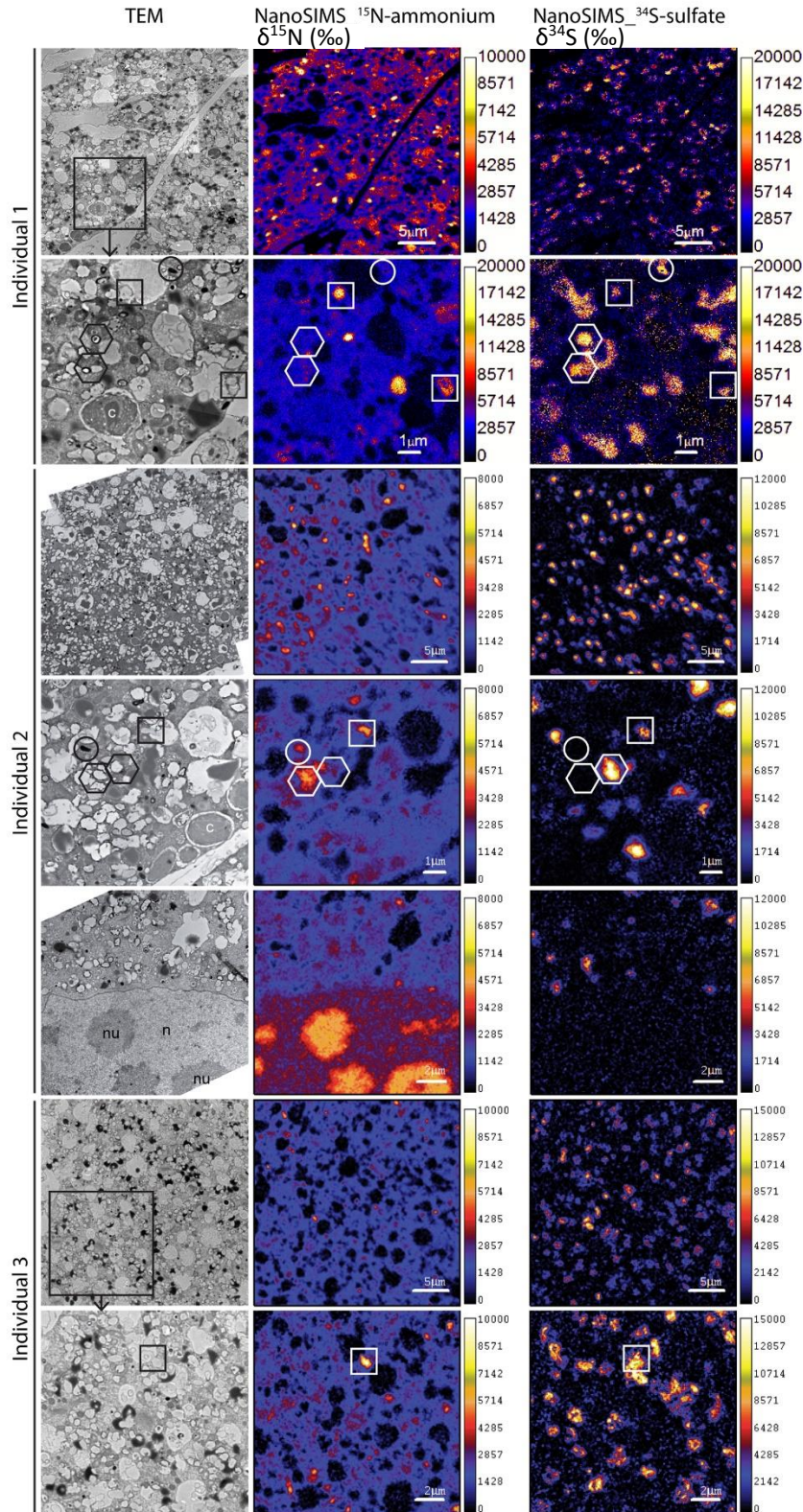
Supplementary Figure 1. Map of the different sampling locations. 1: Gullmar fjord, 2: Bay of Bourgneuf, 3: Santa Barbara Channel. All sampling points are indicated by red circles. A: Methane emission site (Svalbard); B: Station GF51-1 (Gullmar fjord); C: Intertidal mudflat (Gullmar fjord); D: Intertidal mudflat (Bay of Bourgneuf); E: Silled basin (Santa Barbara basin). Google maps, 2022. For more details, see Supplementary Table I.

Supplementary Material

Supplementary Figure 2. TEM micrographs of *Ammonia* sp. T6 specimens sampled from an intertidal mudflat and corresponding NanoSIMS images of ^{34}S -sulfate assimilation (expressed as $\delta^{34}\text{S}$ in ‰). Circles indicate electron-opaque bodies, squares indicate fibrillar vesicles.



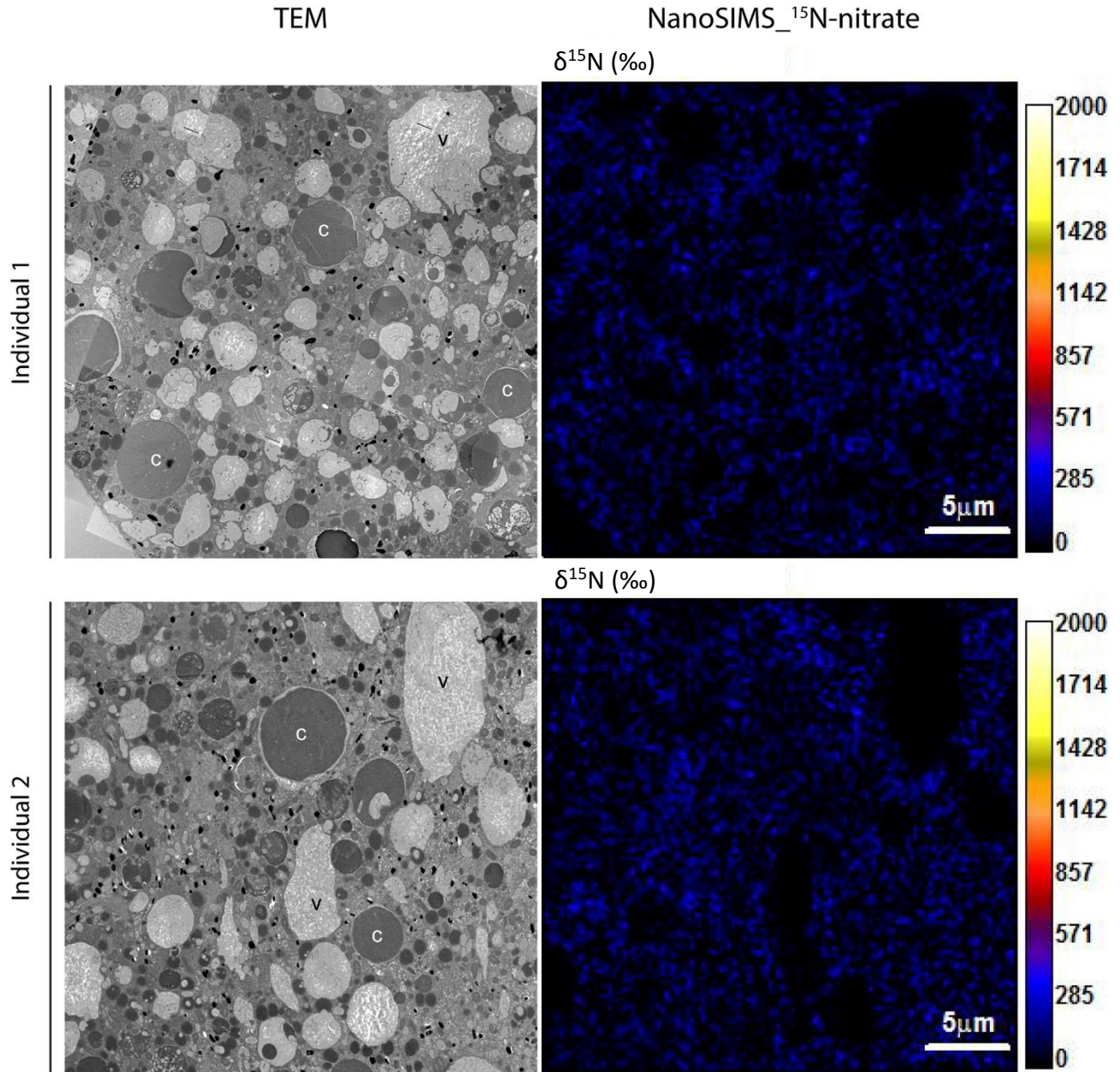
Supplementary Material



Supplementary Figure 3. TEM micrographs of *Elphidium williamsoni* specimens sampled from an intertidal mudflat and corresponding NanoSIMS images of ^{15}N -ammonium and ^{34}S -sulfate assimilation (expressed as $\delta^{15}\text{N}$ and $\delta^{34}\text{S}$ in ‰). Circles indicate electron-opaque bodies, pentagons indicate thick-membrane vesicles, squares indicate fibrillar vesicles, c: kleptoplast, n: nucleus, nu: nucleolus.

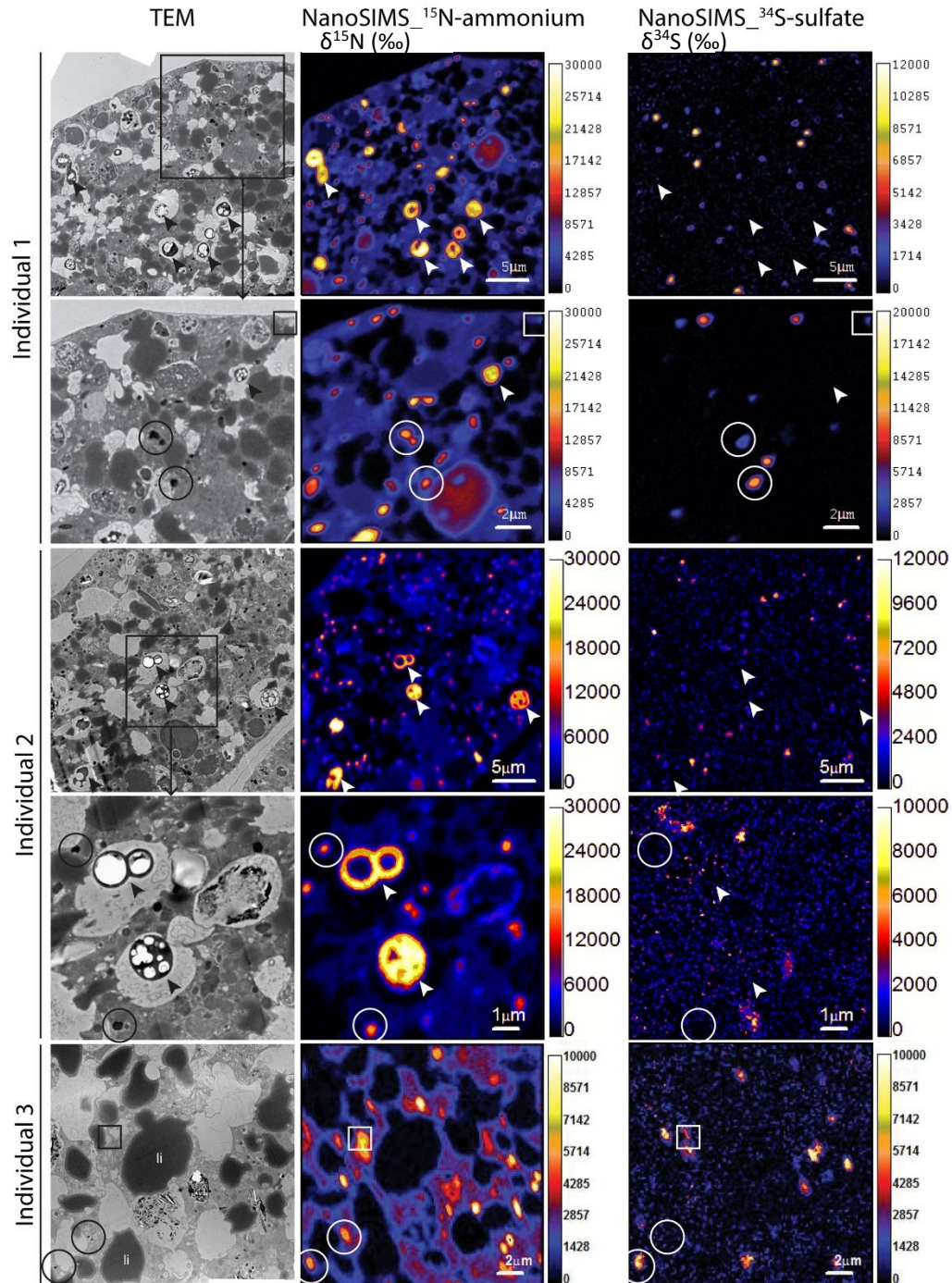
Supplementary Material

Supplementary Figure 4. TEM micrographs of *Haynesina germanica* specimens sampled from an intertidal mudflat and corresponding NanoSIMS images of ^{15}N -nitrate assimilation (expressed as $\delta^{15}\text{N}$ in ‰). c: kleptoplast, v: vacuoles.



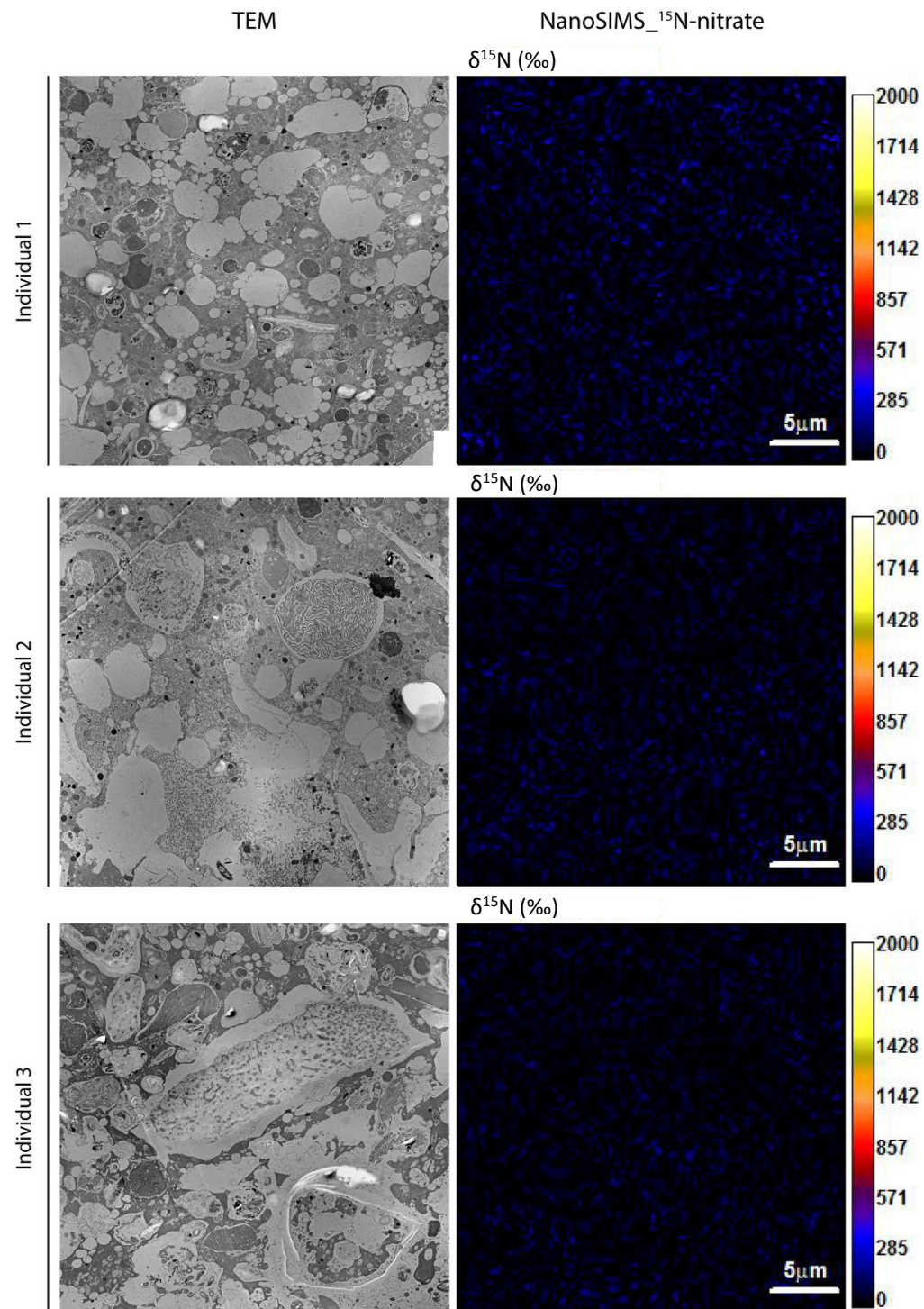
Supplementary Material

Supplementary Figure 5. TEM micrographs of *Bulimina marginata* specimens sampled from a fjord and corresponding NanoSIMS images of ^{15}N -ammonium and ^{34}S -sulfate assimilation (expressed as $\delta^{15}\text{N}$ and $\delta^{34}\text{S}$ in ‰). Arrowheads: prokaryote-like vesicles, circles indicate electron-opaque bodies, squares indicate fibrillar vesicles, li: lipid droplet.



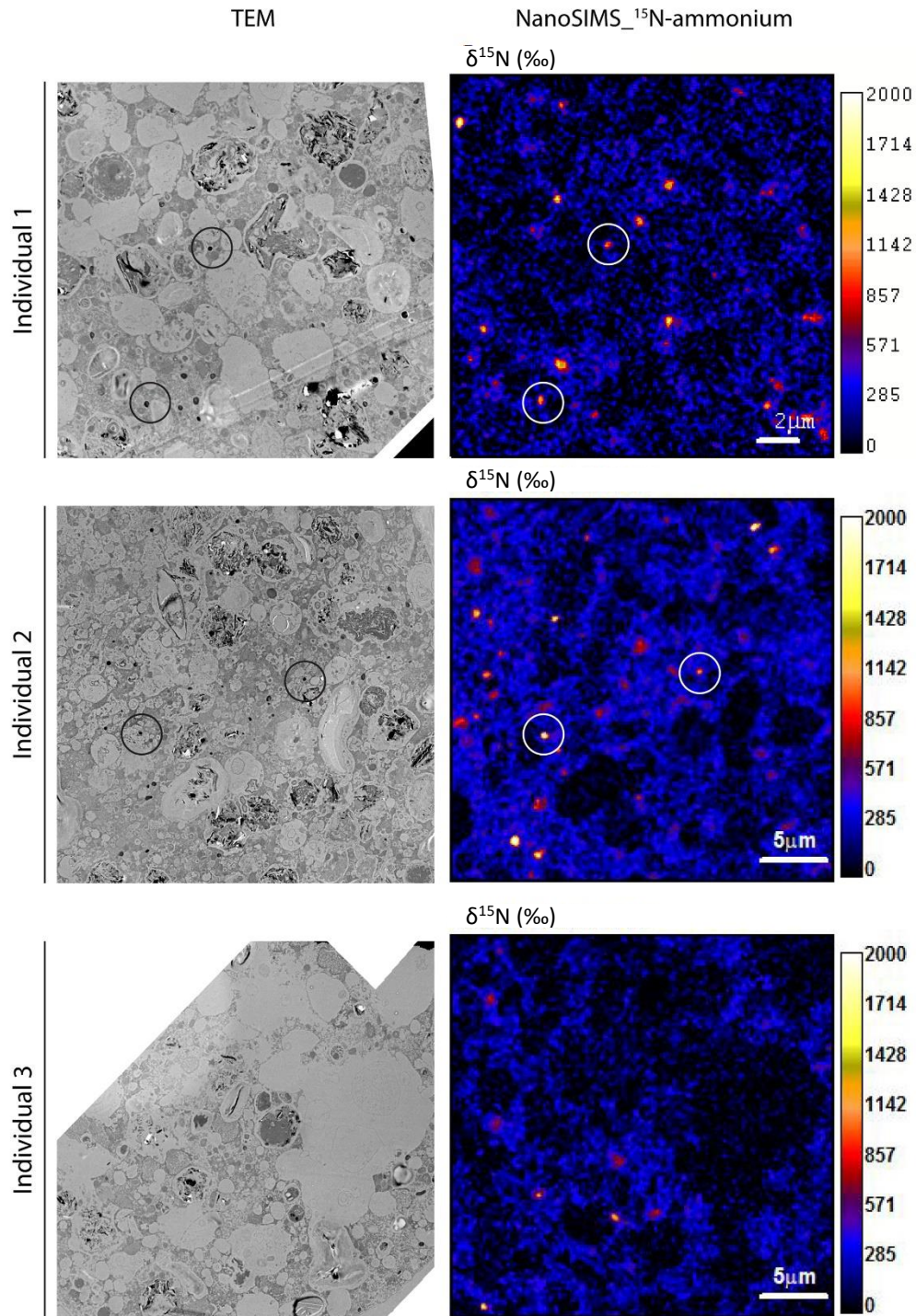
Supplementary Material

Supplementary Figure 6. TEM micrographs of *Bulimina marginata* specimens sampled from a fjord and corresponding NanoSIMS images of ^{15}N -nitrate assimilation (expressed as $\delta^{15}\text{N}$ in ‰).



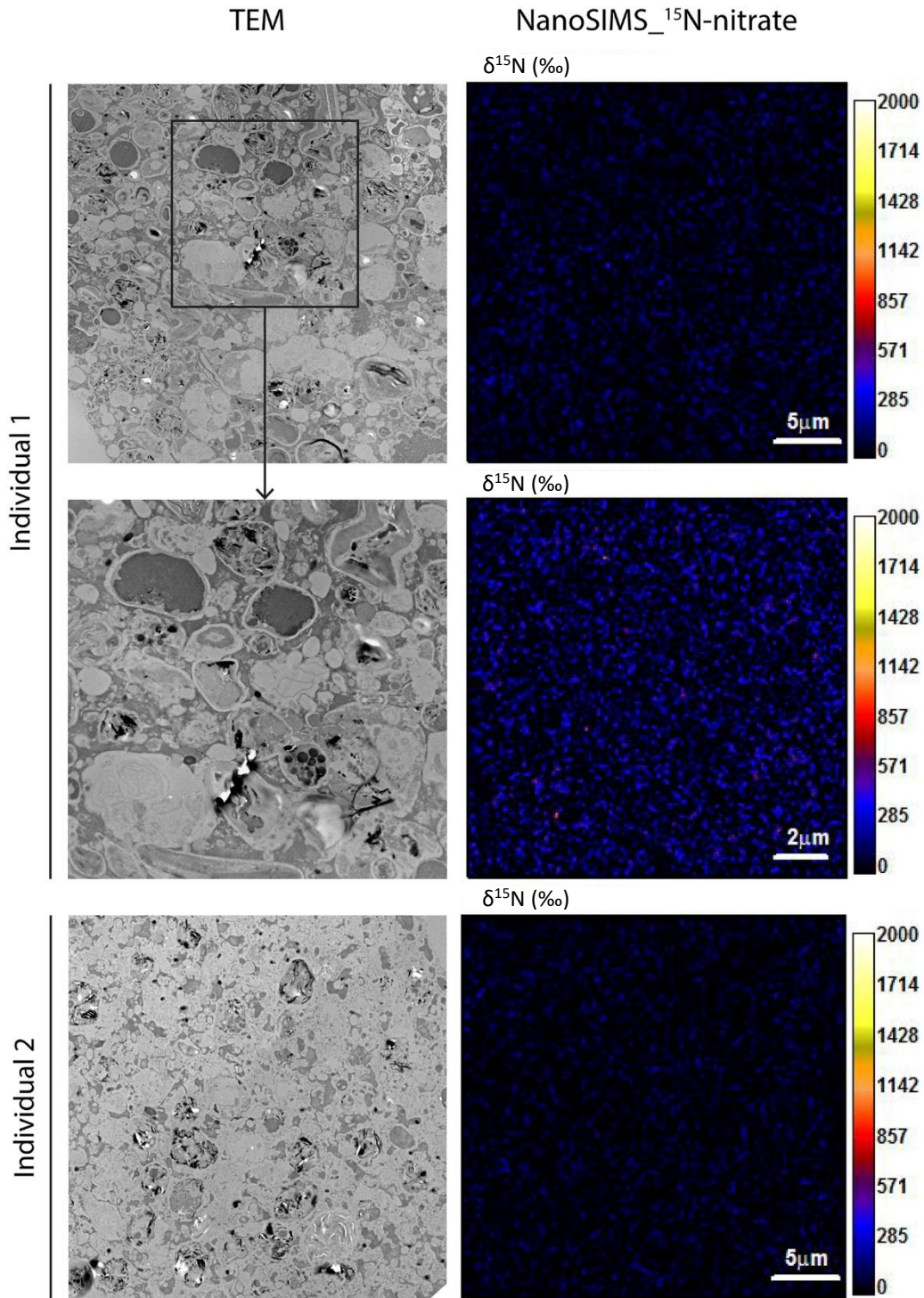
Supplementary Material

Supplementary Figure 7. TEM micrographs of *Cassidulina laevigata* specimens sampled from a fjord and corresponding NanoSIMS images of ^{15}N -ammonium (expressed as $\delta^{15}\text{N}$ in ‰). Circles indicate electron-opaque bodies.



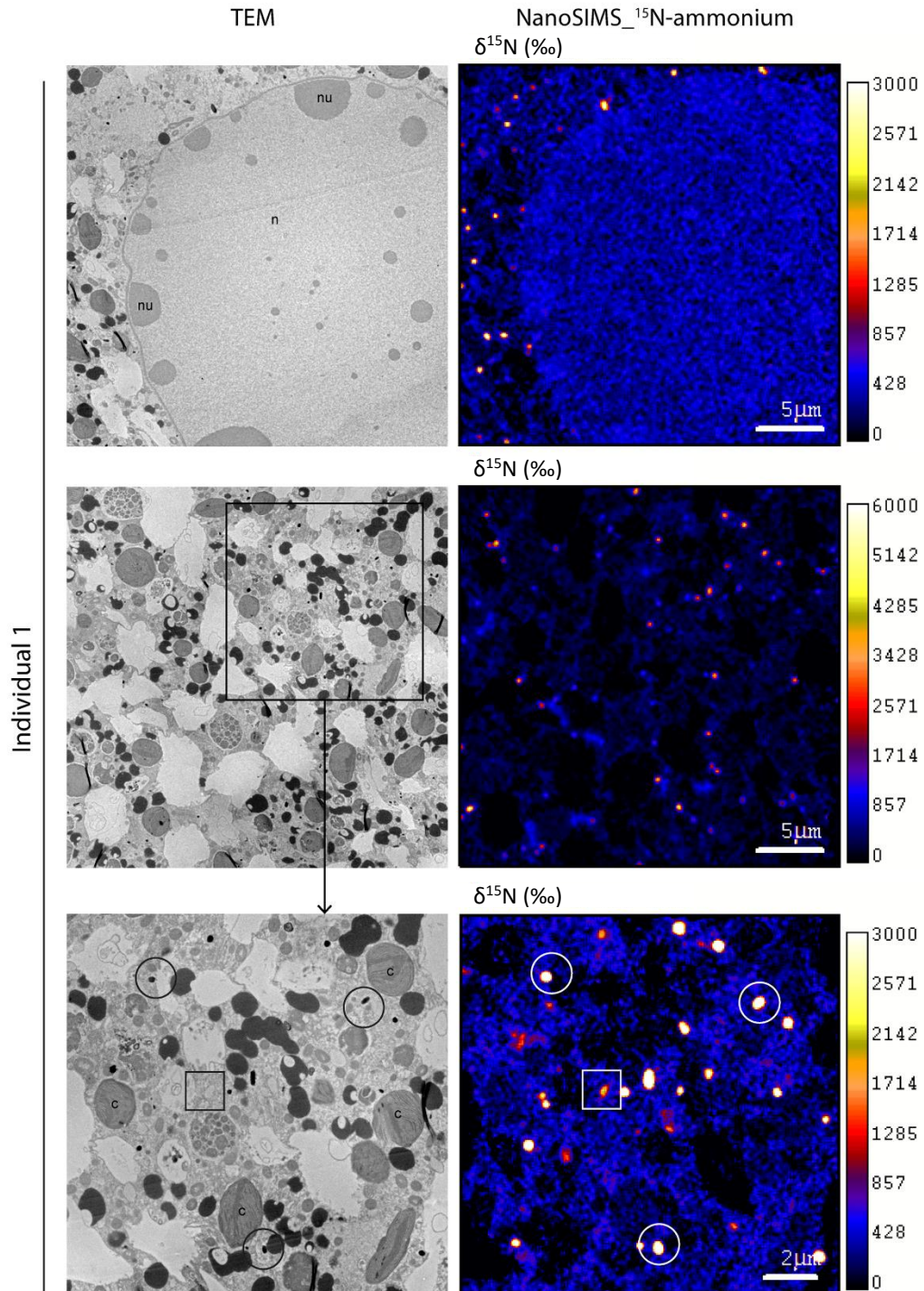
Supplementary Material

Supplementary Figure 8. TEM micrographs of *Cassidulina laevigata* specimens sampled from a fjord and corresponding NanoSIMS images of ^{15}N -nitrate (expressed as $\delta^{15}\text{N}$ in ‰).

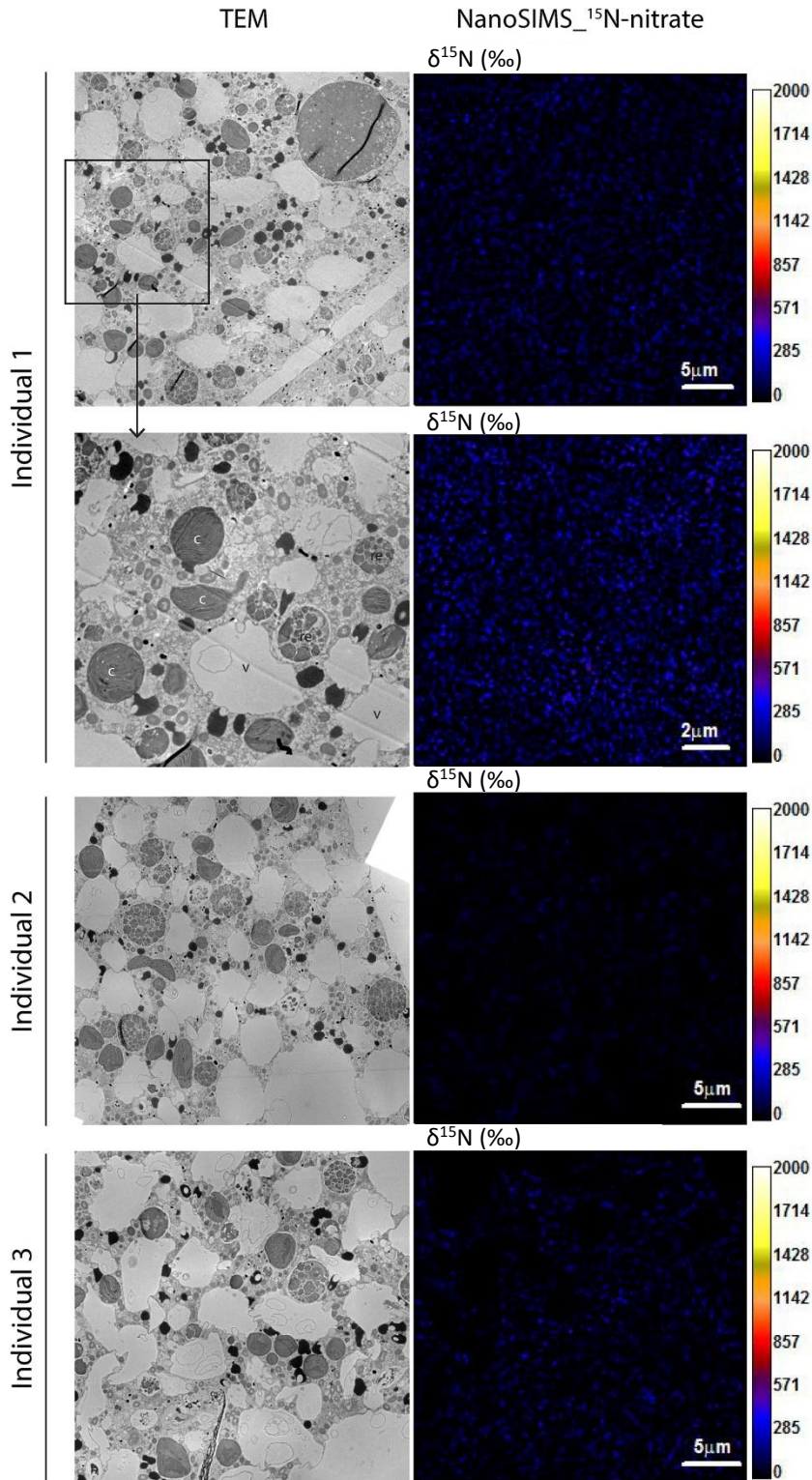


Supplementary Material

Supplementary Figure 9. TEM micrographs of *Nonionella* sp. T1 specimens sampled from a fjord and corresponding NanoSIMS images of ^{15}N -ammonium (expressed as $\delta^{15}\text{N}$ in ‰). Circles indicate electron-opaque bodies, squares indicate fibrillar vesicles, c: kleptoplast, n: nucleus, nu: nucleolus.

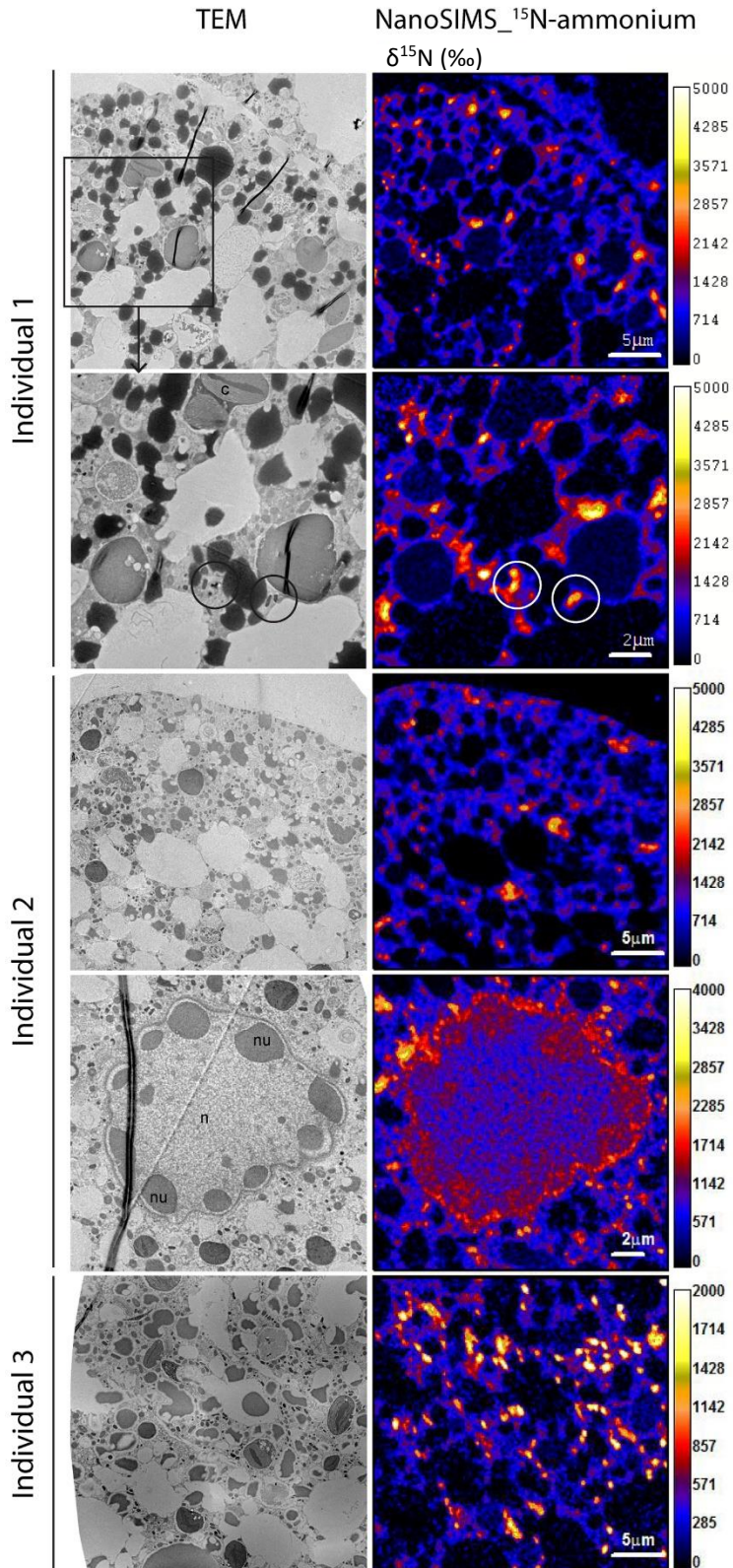


Supplementary Material



Supplementary Figure 10. TEM micrographs of *Nonionella* sp. T1 specimens sampled from a fjord and corresponding NanoSIMS images of ^{15}N -nitrate (expressed as $\delta^{15}\text{N}$ in ‰). c: kleptoplast, re: residual bodies, v: vacuole.

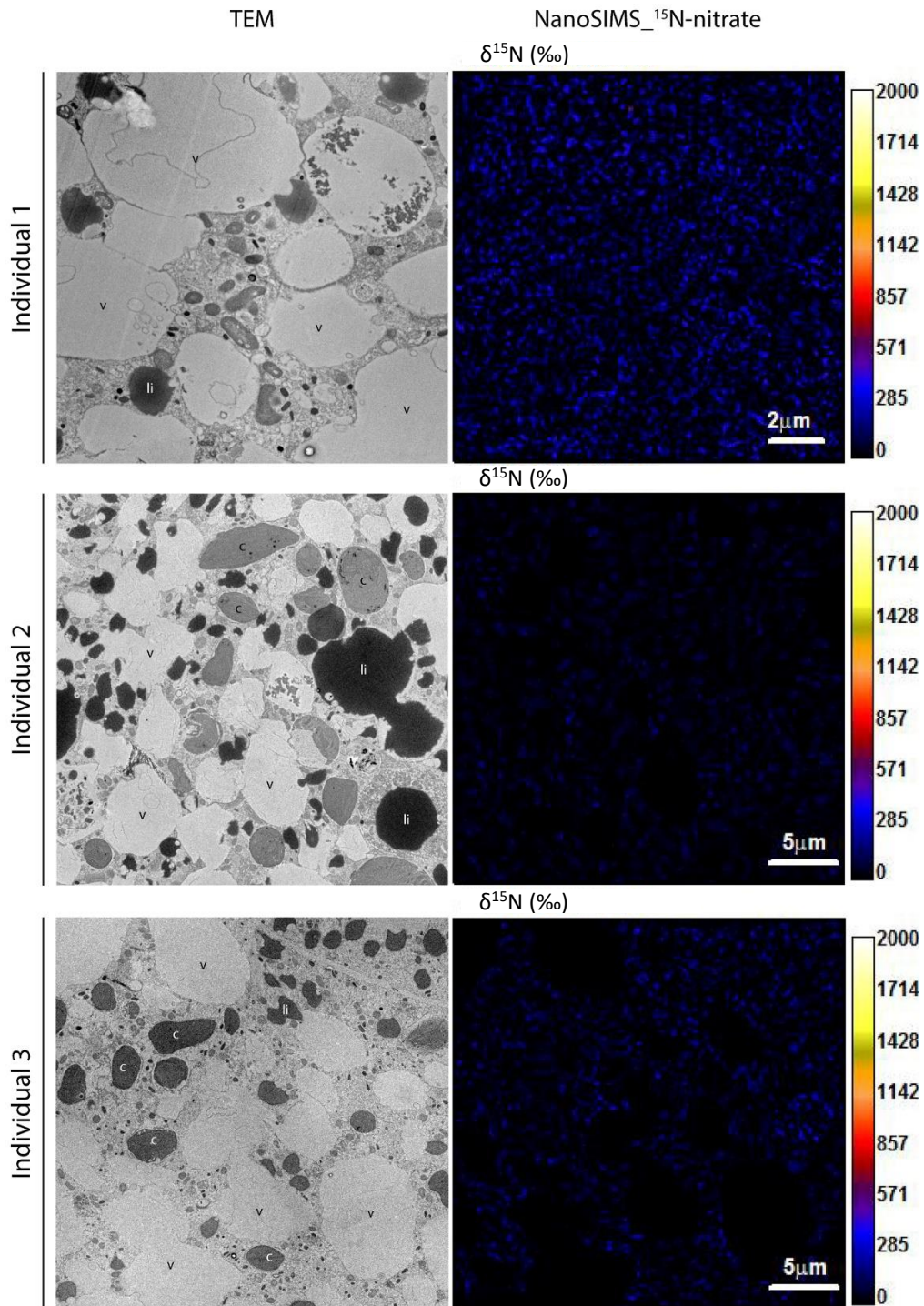
Supplementary Material



Supplementary Figure 11. TEM micrographs of *Nonionella turgida* specimens sampled from a fjord and corresponding NanoSIMS images of ^{15}N -ammonium (expressed as $\delta^{15}\text{N}$ in ‰). Circles indicate electron-opaque bodies, c: kleptoplast, n: nucleus, nu: nucleolus.

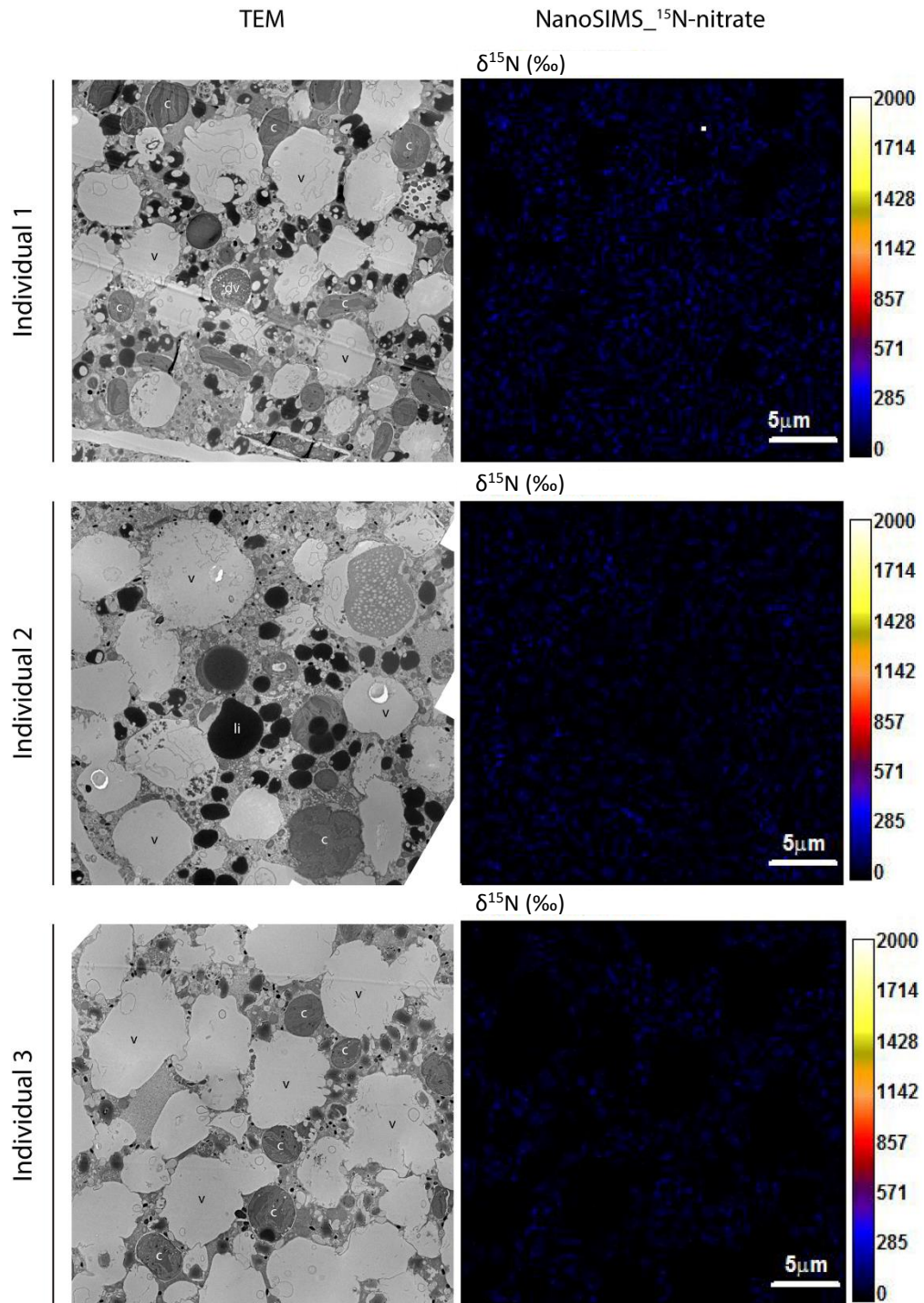
Supplementary Material

Supplementary Figure 12. TEM micrographs of *Nonionella turgida* specimens sampled from a fjord and corresponding NanoSIMS images of ^{15}N -nitrate (expressed as $\delta^{15}\text{N}$ in ‰). c: kleptoplast, li: lipid droplets, v: vacuole.



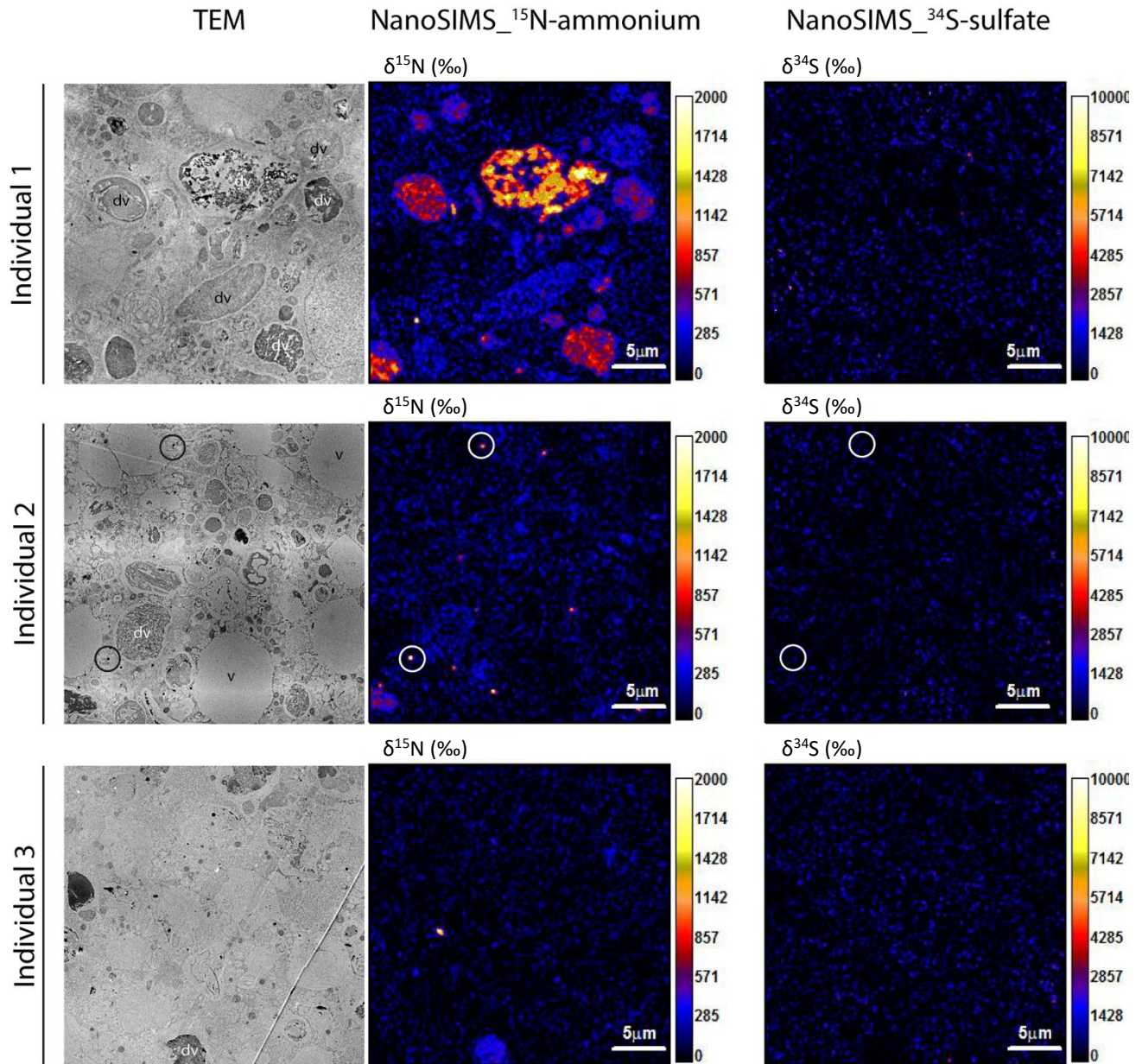
Supplementary Material

Supplementary Figure 13. TEM micrographs of *Nonionellina labradorica* specimens sampled from a fjord and corresponding NanoSIMS images of ^{15}N -nitrate (expressed as $\delta^{15}\text{N}$ in ‰). c: kleptoplast, dv: degradation vacuole, li: lipid droplets, v: vacuole.



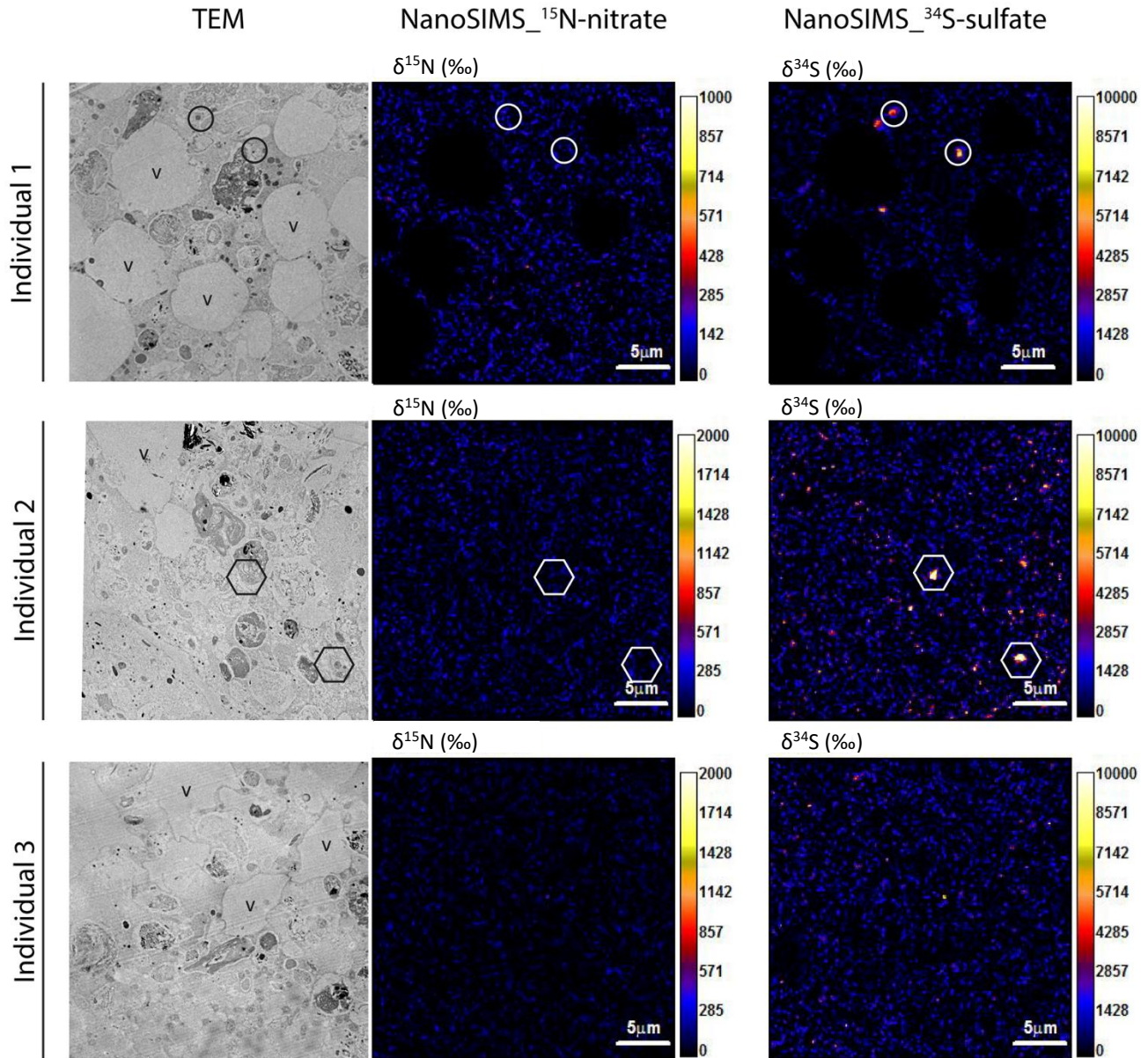
Supplementary Material

Supplementary Figure 14. TEM micrographs of *Globobulimina pacifica* specimens sampled from a silled basin and corresponding NanoSIMS images of ^{15}N -ammonium and ^{34}S -sulfate assimilation (expressed as $\delta^{15}\text{N}$ and $\delta^{34}\text{S}$ in ‰). Circles indicate electron-opaque bodies, dv: degradation vacuole, v: vacuole.



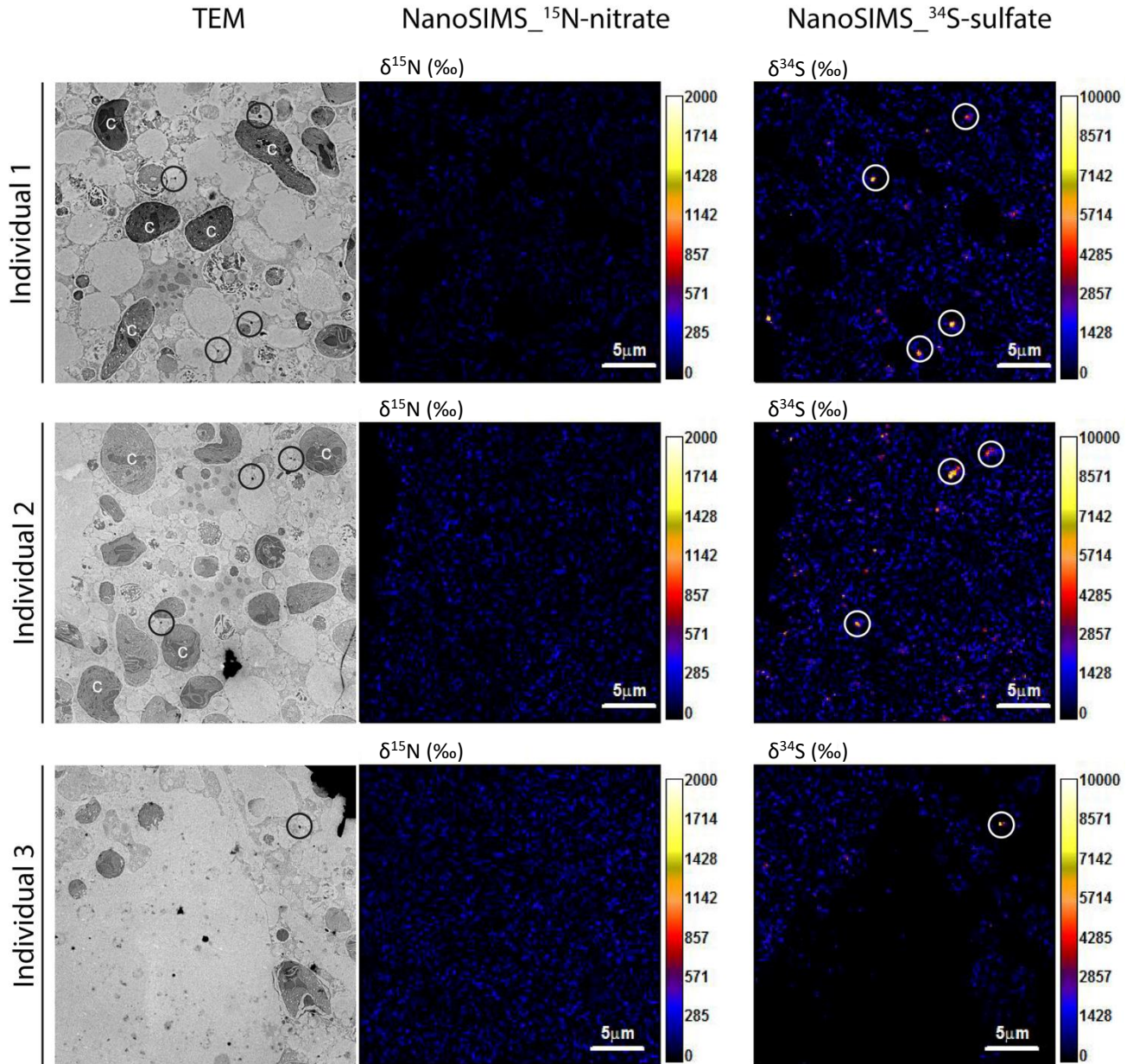
Supplementary Material

Supplementary Figure 15. TEM micrographs of *Globobulimina pacifica* specimens sampled from a silled basin and corresponding NanoSIMS images of ^{15}N -nitrate and ^{34}S -sulfate assimilation (expressed as $\delta^{15}\text{N}$ and $\delta^{34}\text{S}$ in ‰). Circles indicate electron-opaque bodies, pentagons indicate unknown ^{34}S -enriched vesicles, v: vacuole.



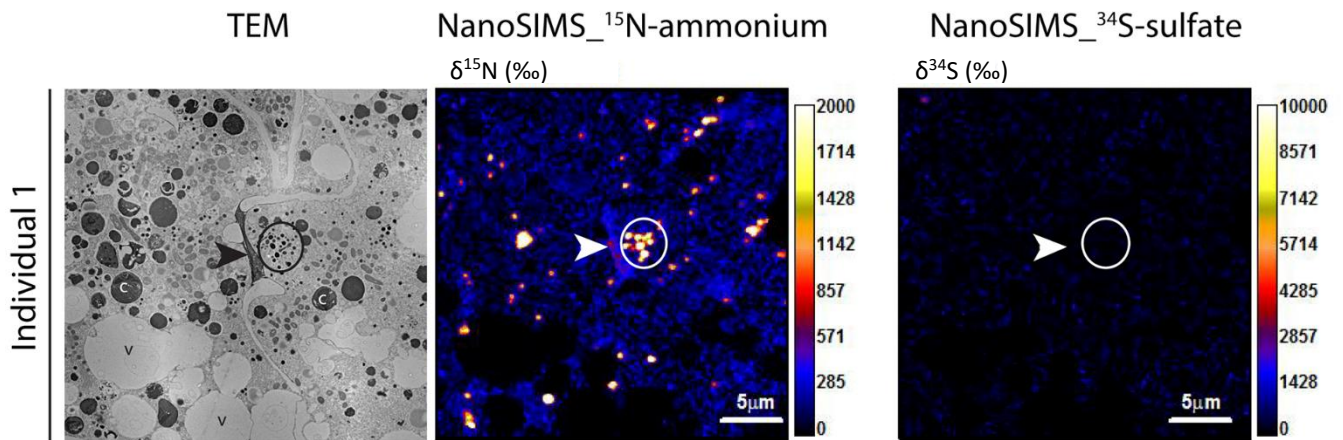
Supplementary Material

Supplementary Figure 16. TEM micrographs of *Nonionella stella* specimens sampled from a silled basin and corresponding NanoSIMS images of ^{15}N -nitrate and ^{34}S -sulfate assimilation (expressed as $\delta^{15}\text{N}$ and $\delta^{34}\text{S}$ in ‰). Circles indicate electron-opaque bodies, c: kleptoplast.



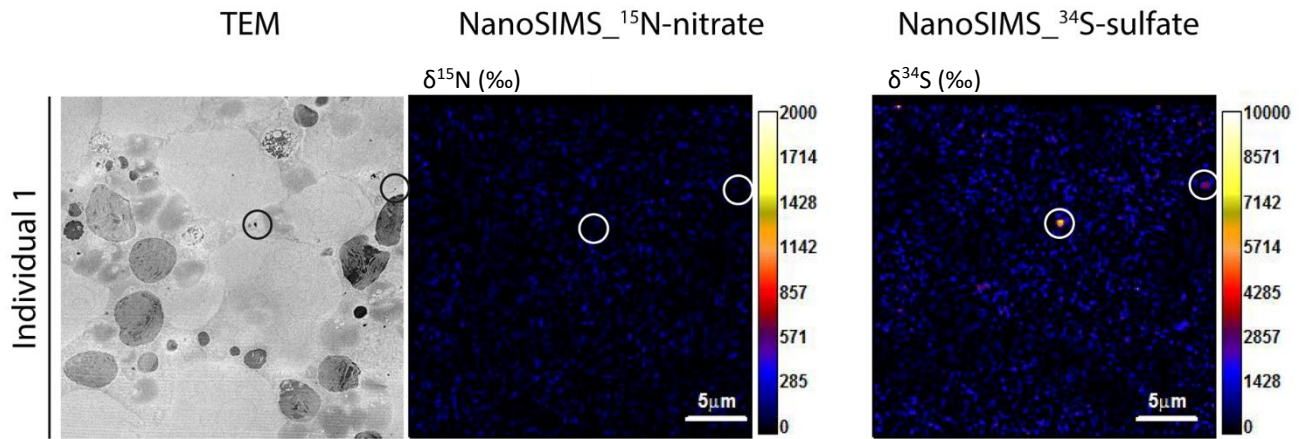
Supplementary Material

Supplementary Figure 17. TEM micrographs of *Stainforthia fusiformis* specimen sampled from a silled basin and corresponding NanoSIMS images of ^{15}N -ammonium and ^{34}S -sulfate assimilation (expressed as $\delta^{15}\text{N}$ and $\delta^{34}\text{S}$ in ‰). Arrowheads indicate apertural collar, circles indicate electron-opaque bodies, c: kleptoplast.



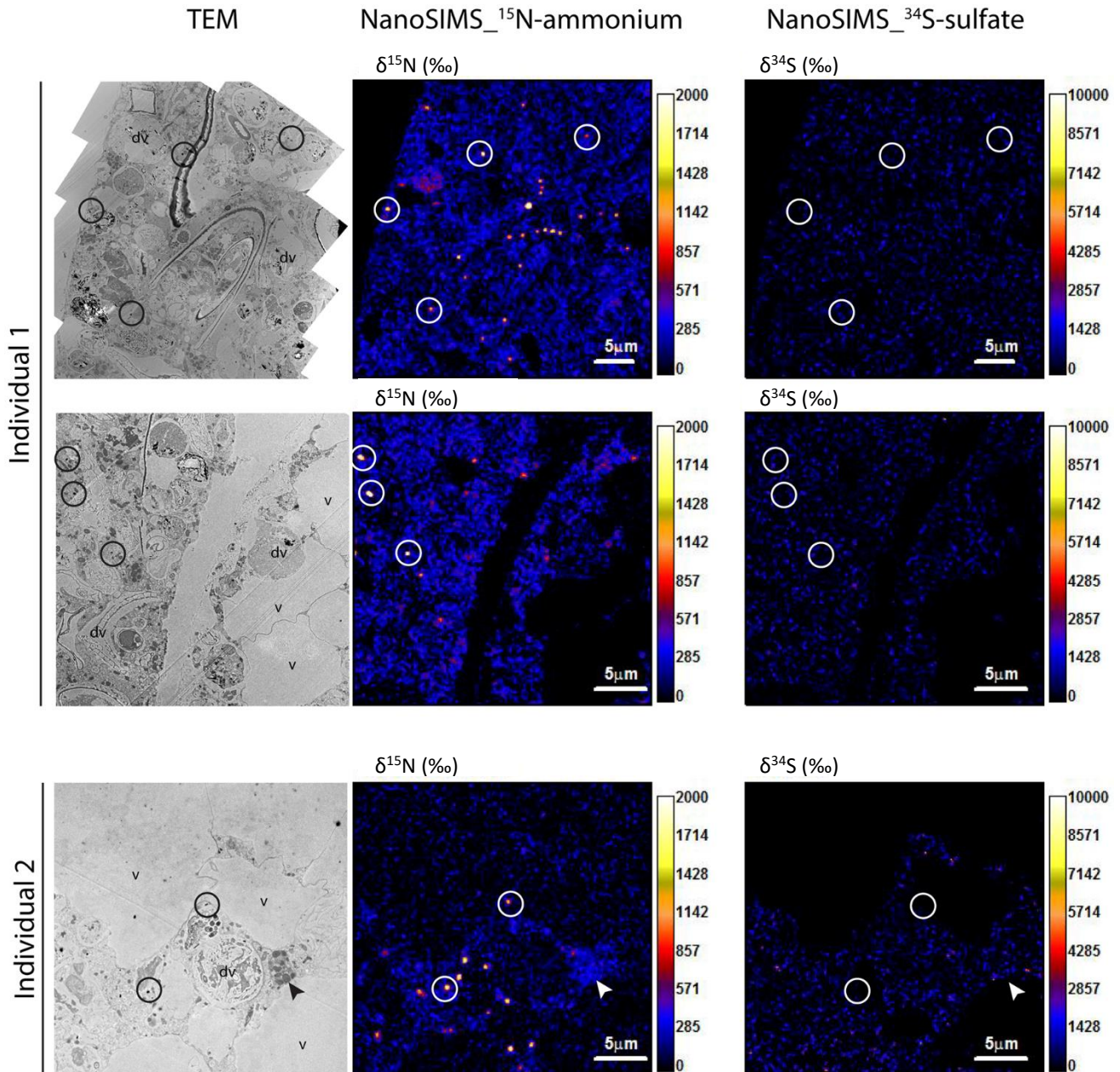
Supplementary Material

Supplementary Figure 18. TEM micrographs of *Stainforthia fusiformis* specimen sampled from a silled basin and corresponding NanoSIMS images of ^{15}N -nitrate and ^{34}S -sulfate assimilation (expressed as $\delta^{15}\text{N}$ and $\delta^{34}\text{S}$ in ‰). Circles indicate electron-opaque bodies.



Supplementary Material

Supplementary Figure 19. TEM micrographs of *Globobulimina* sp. specimens sampled from a methane emission site and corresponding NanoSIMS images of ^{15}N -ammonium and ^{34}S -sulfate assimilation (expressed as $\delta^{15}\text{N}$ and $\delta^{34}\text{S}$ in ‰). Arrowhead indicate P-ER complex, circles indicate electron-opaque bodies, dv: degradation vacuole, v: vacuole.



Supplementary Material

Supplementary Figure 20. TEM micrographs of *Nonionellina labradorica* specimens sampled from a methane emission site and corresponding NanoSIMS images of ^{15}N -ammonium and ^{34}S -sulfate assimilation (expressed as $\delta^{15}\text{N}$ and $\delta^{34}\text{S}$ in ‰). Circles indicate electron-opaque bodies, squares indicate fibrillar vesicles, c: kleptoplast, li: lipid droplet, v: vacuole.

