

TABLE 3. Evidence that uncultured, large, marine sulfur bacteria (*Beggiatoa* spp., *Thioploca* spp., *Thiomargarita namibiensis*, and attached filaments from White Point hydrothermal vents) are vacuolate and tabulation of internal nitrate concentrations

Site and bacterium ^b	Filament width (μm)	Vacuole present?	Presence/absence of central vacuole supported by:		Intracellular nitrate concn	Reference(s) or source
			EM ^c	Protein/biovolume (mg of protein/cm ³)		
Narrow-filament control ^a <i>Beggiatoa</i> sp. strains						
MS-81-6	4	No	Yes	121 ± 17 ⁱ	<0.3 μM	20
MS-81-1c	2	No	Yes	ND	ND	20
White Point, Calif., HTV; attached filaments	4–112 ^d	Yes	ND ^e	7.6 ± 0.8	Not detected ^f (n = 2)	This study
Carmel Canyon; <i>Beggiatoa</i> sp.	20–76	Yes	ND	8.9 ± 1.1	16.6 ± 4 mM (n = 2)	This study
Monterey Canyon; <i>Beggiatoa</i> sp.	65–85	Yes	ND	24	160 ± 20 mM (n = 5)	20
Guaymas Basin HTV; <i>Beggiatoa</i> sp.	88–140	Yes	Yes	9.5	130 ± 10 mM (n = 3)	27
Namibia; <i>Thiomargarita namibiensis</i>	100–300	Yes	ND	4.5	100–800 mM	33
OMZ, Peru and Chile						
<i>Thioploca araucae</i>	28–42	Yes	Yes	ND	150–500 mM ^g	3, 34
<i>Thioploca chileae</i>	12–22	Yes	Yes	ND		
Bay of Concepcion, Chile; <i>Beggiatoa</i> sp.	35–40	Yes	ND	ND	15–116 mM	38
Wadden Sea (Dangast/Jadebay); <i>Beggiatoa</i> sp.	9–11	Yes	ND	ND	288 ± 80 mM	21
Limfjorden, Denmark; <i>Beggiatoa</i> spp.	5–40	Yes	ND	ND	156 ± 71 ^h	21
Tokyo Bay, Japan; <i>Beggiatoa</i> spp.	9	Yes	ND	ND	105 ± 36	32

^a Narrow, nonvacuolate, pure-culture marine *Beggiatoa* strains are included for comparison.

^b HTV, hydrothermal vents; OMZ, oxygen-minimum zone.

^c EM, electron microscopy.

^d White Point filament-specific fluorescent probe WPF445 hybridizes with filaments of ≥10 μm in diameter.

^e ND, not determined.

^f Not detected, below the detection limit of 5 μM for column and conductivity detector. Necessary dilution of original pellet for (i) disruption of cells and (ii) column removal of interfering Cl⁻ implies true detection threshold of approximately 800 μM internal NO₃.

^g Data reported collectively for both *Thioploca* species.

^h Intracellular nitrate concentration of filaments 9 to 12 μm in diameter.

ⁱ n = 12.