

Supplementary Materials

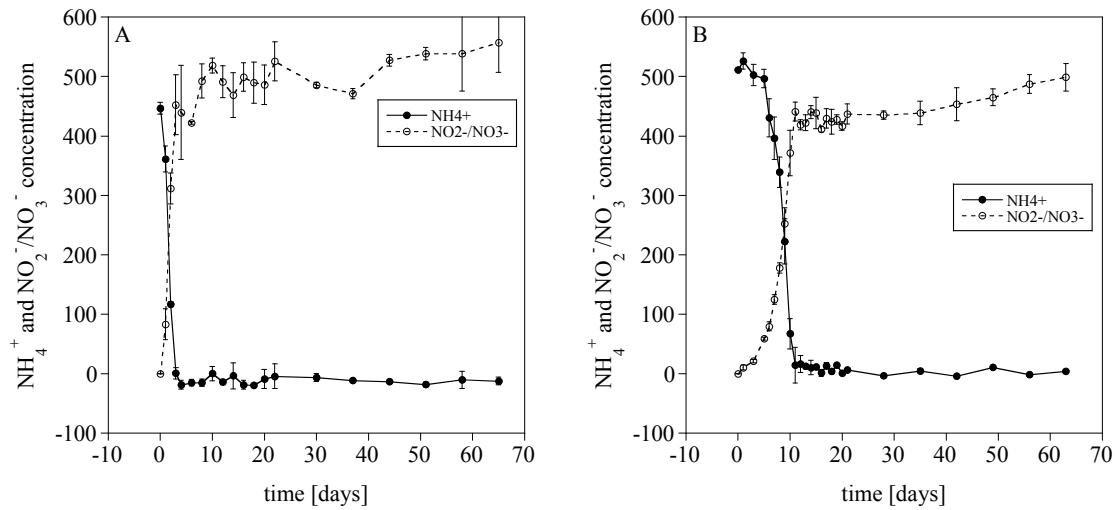


Figure S1. Ammonium consumption and nitrite/nitrate production over time in the starvation cultures of AOA-AC1 and AOB-G5-7 (mean \pm SD, $n = 3$). Starvation started when ammonium was consumed and completely converted to nitrite/nitrate.

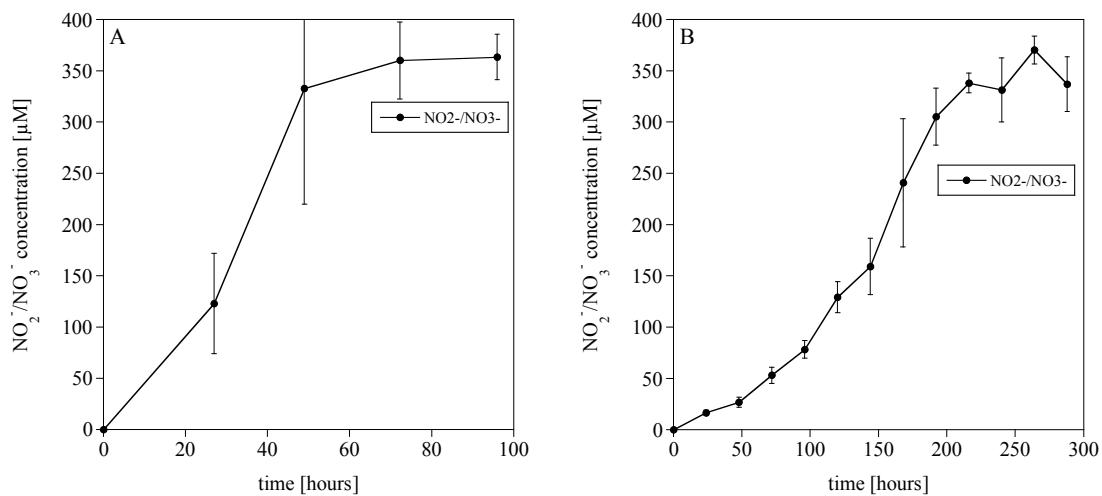


Figure S2. Nitrite/nitrate production over time in the example recovery cultures of AOA-AC1 and AOB-G5-7 (mean \pm SD, $n = 3$).

Table S1. Specific growth rates [h^{-1}] of the recovery cultures after starvation of the AOB enrichment culture AOB-G5-7 and the AOA enrichment culture AOA-AC1 (data are similar to Figures 1 and 2) (mean \pm SD, $n = 3$; different letters behind values indicate significant differences between values determined by one-way ANOVA followed by Tukey test; $p < 0.05$). Starvation started at day 0.

Starvation Time [Days]	AOB-G5-7	AOA-AC1
-1	0.0461 \pm 0.0038 ^a	0.0201 \pm 0.0016 ^a
0		0.0171 \pm 0.0008 ^{ab}
1	0.0504 \pm 0.0031 ^a	0.0170 \pm 0.0007 ^{ab}
2		0.0182 \pm 0.0023 ^{ab}
3	0.0463 \pm 0.0013 ^a	0.0162 \pm 0.0006 ^{ab}
4		0.0165 \pm 0.0002 ^{ab}
5	0.0509 \pm 0.0032 ^a	0.0163 \pm 0.0017 ^{ab}
9	0.0525 \pm 0.0137 ^a	0.0147 \pm 0.0005 ^{bc}
11	0.0433 \pm 0.0060 ^a	
13	0.0492 \pm 0.0169 ^a	
15	0.0445 \pm 0.0014 ^a	
16		0.0120 \pm 0.0005 ^{cd}
19	0.0436 \pm 0.0012 ^a	
23		0.0112 \pm 0.0027 ^{cd}
24		
26	0.0472 \pm 0.0084 ^a	
30		0.0107 \pm 0.0013 ^d
33	0.0523 \pm 0.0040 ^a	
37		0.0121 \pm 0.0004 ^{cd}
40	0.0523 \pm 0.0035 ^a	
44		0.0105 \pm 0.0009 ^d
47	0.0513 \pm 0.0031 ^a	
52		0.0118 \pm 0.0004 ^{cd}

Table S2. Lag phase [h] of the recovery cultures after starvation of the AOB enrichment culture AOB-G5-7 and the AOA enrichment culture AOA-AC1 (data are similar to Figure 1) (mean \pm SD, $n = 3$; different letters behind values indicate significant differences between values determined by one-way ANOVA followed by Tukey test; $p < 0.05$). Starvation started at day 0.

Starvation Time [Days]	AOB-G5-7	AOA-AC1
-1	24 \pm 0 ^a	24 \pm 0 ^a
0		32 \pm 13.9 ^a
1	24 \pm 0 ^a	40 \pm 13.9 ^a
2		24 \pm 0 ^a
3	24 \pm 0 ^a	32 \pm 13.9 ^a
4		32 \pm 13.9 ^a
5	24 \pm 0 ^a	32 \pm 13.9 ^a
7	24 \pm 0 ^a	40 \pm 13.9 ^a
9	24 \pm 0 ^a	72 \pm 0 ^{ab}
11	24 \pm 0 ^a	
13	24 \pm 0 ^a	
15	24 \pm 0 ^a	
16		128 \pm 13.9 ^{bc}
19	24 \pm 0 ^a	
23		152 \pm 99.9 ^{bc}
26	24 \pm 0 ^a	
30		152 \pm 13.9 ^{bc}
33	24 \pm 0 ^a	
37		160 \pm 13.9 ^c
38		
40	24 \pm 0 ^a	
44		144 \pm 0 ^{bc}
47	24 \pm 0 ^a	
51		144 \pm 0 ^{bc}

Table S3. Influence of starvation time [days] on RNA concentration [ng/ μ l] in the enrichment cultures AOB-G5-7 and AOA-AC1 (mean \pm SD, $n = 3$; different letters behind values indicate significant differences between values determined by one-way ANOVA of the log-transformed copy numbers followed by Tukey test; $p < 0.05$). Starvation started at day 0.

Starvation Time [Days]	AOB-G5-7	AOA-AC1
-1	18.8 \pm 1.7 ^a	91.2 \pm 5.4 ^a
1	22.8 \pm 1.3 ^a	108.3 \pm 13.6 ^a
9		91.7 \pm 29.2 ^a
19	28.4 \pm 4.1 ^{ab}	
23		72.6 \pm 8.5 ^a
34	28.2 \pm 2.5 ^{ab}	
44		82.4 \pm 9.7 ^a
48	36.8 \pm 6.9 ^b	

Table S4. Influence of starvation time [days] on *amoA* copy number [copies/ng RNA] of the enrichment cultures AOB-G5-7 and AOA-AC1 (data are similar to Figures 3 and 4) (mean \pm SD, $n = 3$; different letters behind values indicate significant differences between values determined by one-way ANOVA of the log-transformed copy numbers followed by Tukey test; $p < 0.05$). Starvation started at day 0.

Starvation Time [Days]	AOB-G5-7	AOA-AC1
-1	$2.77 \times 10^5 \pm 0.08 \times 10^5$ ^a	$6.02 \times 10^5 \pm 0.59 \times 10^5$ ^a
1	24119 ± 2119 ^b	13945 ± 8158 ^b
10		5952 ± 2555 ^{bc}
18		4699 ± 2333 ^{bc}
25		2193 ± 588 ^c
46		2441 ± 922 ^c

Table S5. Influence of starvation time [days] on 16S rRNA copy number [copies/ng RNA] of the enrichment cultures AOB-G5-7 and AOA-AC1 (data are similar to Figures 3 and 4) (mean \pm SD, $n = 3$; different letters behind values indicate significant differences between values determined by one-way ANOVA of the log-transformed copy numbers followed by Tukey test; $P < 0.05$). Starvation started at day 0.

Starvation Time [Days]	AOB-G5-7	AOA-AC1
-1	$1.27 \times 10^8 \pm 0.15 \times 10^8$ ^a	$4.04 \times 10^7 \pm 0.56 \times 10^7$ ^a
1	$1.09 \times 10^8 \pm 0.03 \times 10^8$ ^a	$4.85 \times 10^7 \pm 2.06 \times 10^7$ ^a
10		$4.01 \times 10^7 \pm 1.27 \times 10^7$ ^a
16	$0.71 \times 10^8 \pm 0.20 \times 10^8$ ^a	
18		$5.82 \times 10^7 \pm 1.21 \times 10^7$ ^a
25		$4.28 \times 10^7 \pm 2.31 \times 10^7$ ^a
32	$0.58 \times 10^8 \pm 0.46 \times 10^8$ ^a	
46	$0.66 \times 10^8 \pm 0.14 \times 10^8$ ^a	$2.87 \times 10^7 \pm 0.88 \times 10^7$ ^a

Table S6. Influence of starvation time [days] on eubacterial 16S rRNA copy number of the enrichment cultures AOB-G5-7 and AOA-AC1 (data are similar to Figures 3 and 4) (mean \pm SD, $n = 3$; different letters behind values indicate significant differences between values determined by one-way ANOVA of the log-transformed copy numbers followed by Tukey test; $P < 0.05$). Starvation started at day 0.

Starvation Time [Days]	AOB-G5-7	AOA-AC1
-1	$1.02 \times 10^8 \pm 0.13 \times 10^8$ ^a	$1.10 \times 10^7 \pm 0.15 \times 10^7$ ^a
1	$1.09 \times 10^8 \pm 0.06 \times 10^8$ ^a	$0.99 \times 10^7 \pm 0.43 \times 10^7$ ^a
10		$0.83 \times 10^7 \pm 0.34 \times 10^7$ ^a
16	$0.69 \times 10^8 \pm 0.34 \times 10^8$ ^a	
18		$1.18 \times 10^7 \pm 0.03 \times 10^7$ ^a
25		$0.97 \times 10^7 \pm 0.19 \times 10^7$ ^a
32	$0.77 \times 10^8 \pm 0.04 \times 10^8$ ^a	
46	$0.70 \times 10^8 \pm 0.10 \times 10^8$ ^a	$1.37 \times 10^7 \pm 0.19 \times 10^7$ ^a

Table S7. Primers used quantification of *amoA* and 16S rRNA genes.

	Primer
AOA-AC1 <i>amoA</i>	140F: 5'-GTA GTC GGC GCA TGC TAC T-3' 244R: 5'-CCA TGC ACC TTT TGC TAC CC-3'
AOA-AC1 16S rRNA	398F: 5'-TCC GAG TGT CTT CTG CTA AG-3' 549R: 5'-CCC AAT AAA CCT CCT GAC CA-3'
AOB-G5-7 <i>amoA</i>	415F: 5'-CTG TTG ACG GGT AAC TGG CT-3' 514R: 5'-AGT GGG TCG GGC CAA ATA TC-3'
AOB-G5-7 16S rRNA [25]	189C-F: 5'-GGA GGA AAG TAG GGG ATC G-3' 295R: 5'-GAC CAA CTA CTG ATC GTT GCC-3'
Eubacterial primers [26]	357F: 5'-CCT ACG GGA GGC AGC AG-3' 518R: 5'-ATT ACC GCG GCT GCT GG-3'

Table S8. PCR conditions (temperature [°C]/time [s]) and validation of qPCR.

	AOA <i>amoA</i>	AOA 16S	AOB <i>amoA</i>	AOB 16S	Eubac
Denaturation (initial)	95/600	95/600	95/600	95/600	95/600
Denaturation	95/15	95/15	95/15	95/15	95/15
Annealing	56/30	57/30	56/30	57/30	61/30
Cycles	35	35	35	35	30
Melting curve	95 55	95 55	95 55	95 55	95 55
Efficiency [%]	102	94	104	96	98–99
R ²	0.99	0.99	0.99	0.99	0.99
Concentration for calibration curve	10 ² –10 ⁶	10 ³ –10 ⁷	10 ² –10 ⁶	10 ³ –10 ⁷	10 ³ –10 ⁷