Electronic Supplementary Information

The calculations used to estimate uptake and release rates were modified from Tyler and McGlathery [48] and Naldi and Wheeler [7]. Briefly, the total amount of nitrogen (mg) in the thallus at time t (N_t) is equal to the initial amount (N_i) plus new N taken up from the environment (N_u) minus N released (N_r):

$$N_t = N_i + N_u - N_r \quad [1]$$

Equation 1 is split into two separate equations for ^{15}N and ^{14}N:

$$^{15}N_t = {}^{15}N_i + {}^{15}N_u - {}^{15}N_r \quad [2]$$

$$^{14}N_t = {}^{14}N_i + {}^{14}N_u - {}^{14}N_r \quad [3]$$

The initial amount of N in the thallus at each time step was calculated as:

$$N_i = M\left(\frac{\%N}{100}\right) \quad [4]$$

where M is the dry weight and $\%N$ is nitrogen content. The final amount of N in the thallus at each time step was calculated as:

$$N_t = N_i + \Delta N \quad [5]$$

where ΔN is the amount of nitrogen taken up from the water based on DIN concentrations and water volume.

The total amount of ^{15}N and ^{14}N in the thallus was calculated for each day as:

$$^{15}N_t = N_t\left(\frac{\%^{15}N}{100}\right) \quad [6]$$

$$^{14}N_t = N_t\left(\frac{100 - \%^{15}N}{100}\right) \quad [7]$$

where $\%^{15}N$ is the ^{15}N content. We assumed that the N released from the thallus at each time step had a ratio of $^{15}N/^{14}N$ equivalent to the ratio found in the thallus in the previous time step (b) [48]:

$$\frac{^{15}N_i}{^{14}N_i} = \frac{^{15}N_r}{^{14}N_r} = b \quad [8]$$

and that newly acquired N has the same ratio of $^{15}N/^{14}N$ as the stock solution used for daily spikes (k):

$$\frac{^{15}N_u}{^{14}N_u} = k \quad [9]$$

The latter assumption reflects the lack of isotopic fractionation reported for macroalgae [59, 72]. Substituting $^{15}N_r$ and $^{15}N_u$ from equations 8 and 9 into equation 2:

$$^{15}N_t - {}^{15}N_i = {}^{14}N_u k - {}^{14}N_r b \quad [10]$$

Rearranging and substituting $^{14}N_u$ from equation 3 into equation 10:

$$^{14}N_r = \frac{k\,(^{14}N_t - {}^{14}N_i) - {}^{15}N_t + {}^{15}N_i}{b - k} \quad [11]$$

$^{14}N_r$ is then used to solve for $^{15}N_r$ in equation 8, the sum of which equals N_r used to calculate release rates. $^{15}N_r$ is used in equation 2 to solve for $^{15}N_u$, which is inserted into equation 9 to solve for $^{14}N_u$, the sum of which is N_u, used to calculate gross uptake.