



# Corrigendum: Influence of Light Availability and Prey Type on the Growth and Photo-Physiological Rates of the Mixotroph *Noctiluca scintillans*

Helga do Rosario Gomes<sup>1\*</sup>, Kali McKee<sup>1</sup>, Anxhela Mile<sup>2</sup>, Sharanya Thandapu<sup>3</sup>, Khalid Al-Hashmi<sup>4</sup>, Xiaojian Jiang<sup>1,5</sup> and Joaquim I. Goes<sup>1</sup>

<sup>1</sup> Lamont-Doherty Earth Observatory at Columbia, Palisades, NY, United States, <sup>2</sup> Elisabeth Haub School of Law at Pace University, White Plains, NY, United States, <sup>3</sup> Washington University in St. Louis, St. Louis, MO, United States, <sup>4</sup> Department of Marine Science and Fisheries Sultanate of Oman, Sultan Qaboos University, Muscat, Oman, <sup>5</sup> School of Life Sciences, Huaiyin Normal University, Huai'an, China

**Keywords:** mixotroph, blooms, Arabian Sea, feeding, green *Noctiluca scintillans*, photosynthesis

## OPEN ACCESS

**Approved by:**  
Matthew D. Johnson,  
Woods Hole Oceanographic  
Institution, United States  
Frontiers Editorial Office,  
Frontiers Media SA, Switzerland

**\*Correspondence:**  
Helga do Rosario Gomes  
helga@ldeo.columbia.edu

**Specialty section:**  
This article was submitted to  
Marine Ecosystem Ecology,  
a section of the journal  
Frontiers in Marine Science

**Received:** 08 May 2019

**Accepted:** 04 June 2019

**Published:** 26 June 2019

**Citation:**  
Gomes HdR, McKee K, Mile A,  
Thandapu S, Al-Hashmi K, Jiang X  
and Goes JI (2019) Corrigendum:  
Influence of Light Availability and Prey  
Type on the Growth and  
Photo-Physiological Rates of the  
Mixotroph *Noctiluca scintillans*.  
*Front. Mar. Sci.* 6:342.  
doi: 10.3389/fmars.2019.00342

## A Corrigendum on

### Influence of Light Availability and Prey Type on the Growth and Photo-Physiological Rates of the Mixotroph *Noctiluca scintillans*

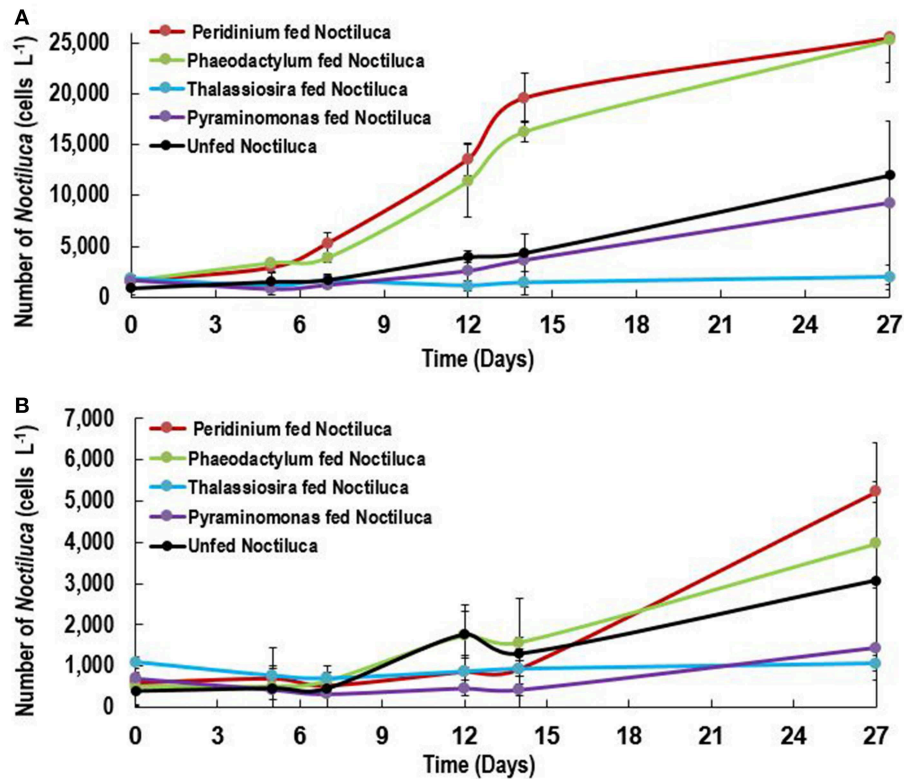
by Gomes, H. d. R., McKee, K., Mile, A., Thandapu, S., Al-Hashmi, K., Jiang, X., et al. (2018). *Front. Mar. Sci.* 5:374. doi: 10.3389/fmars.2018.00374

In the original article, there was a mistake in the legend for **Figure 3** as published. The legend was stated as “Growth rates (cells day<sup>-1</sup>) over the course of the experiment for unfed *Noctiluca* and for *Noctiluca* fed *P. foliaceum* (Perid), *P. tricornutum* (Phaeod), *T. weissflogii* (Thalas), and *Pyramimonas* sp. (Pyram) and exposed to optimal (250 μE m<sup>-2</sup> s<sup>-1</sup>, HL) and low light (10 μE m<sup>-2</sup> s<sup>-1</sup>, LL). Data points represent means ± SE (*n* = 2)”. In this legend, the unit of Growth Rates was incorrectly stated as (cells day<sup>-1</sup>) instead of day<sup>-1</sup>. The correct legend appears below.

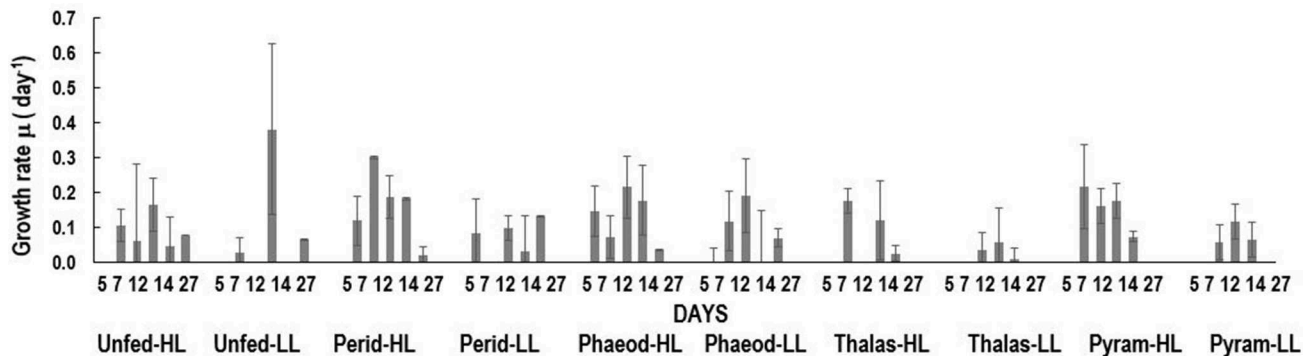
In the original article, there was also a mistake in the legend for **Figures 2A,B** which denotes line colors assigned to the various algal foods provided to *Noctiluca*. It should have read ‘*Pyramimonas* fed *Noctiluca*’ instead of ‘*Prasinomonas* fed *Noctiluca*’. Additionally, cell counts for Day 0 were miscalculated. This Figure has been redrawn with the above mentioned two corrections. The corrected cell counts do not change the statistical results given in Supplementary Table 1.

In the original article, growth rates of *Noctiluca scintillans* (*Noctiluca*), which were calculated incorrectly, have been recalculated and **Figure 3** has been revised to reflect these revised growth rates. The unit of Growth Rates which was erroneously stated as (cells day<sup>-1</sup>) have been corrected to (day<sup>-1</sup>) throughout the manuscript.

A correction has been made to the abstract: The line “However, irrespective of the food provided, adequate light was required for *Noctiluca* to grow as evidenced by its maximum growth rates of 1.44 cells day<sup>-1</sup> when fed the preferred dinoflagellate *Peridinium* and exposed to optimal irradiance of 250 μE m<sup>-2</sup> s<sup>-1</sup> vs. growth rates of 0.18 cells day<sup>-1</sup> with the same food but at a low irradiance of 10 μE m<sup>-2</sup> s<sup>-1</sup>” has been corrected to “However, irrespective of the food provided, adequate light was required for *Noctiluca* to grow as evidenced by its maximum growth rates of 0.3 day<sup>-1</sup> when



**FIGURE 2 | (A,B)** Growth response (Cells L<sup>-1</sup>) of unfed *Noctiluca* and *Noctiluca* fed with prey and exposed to **(A)** optimal light (250  $\mu\text{E m}^{-2} \text{s}^{-1}$ , HL) **(B)** low light (10  $\mu\text{E m}^{-2} \text{s}^{-1}$ , LL). Data points represent means  $\pm$  SE ( $n = 2$ ).



**FIGURE 3 |** “Growth rates (day<sup>-1</sup>) over the course of the experiment for unfed *Noctiluca* and for *Noctiluca* fed *P. foliaceum* (Perid), *P. tricorutum* (Phaeod), *T. weissflogii* (Thalas), and *Pyramimonas* sp. (Pyram) and exposed to optimal (250  $\text{mE m}^{-2} \text{s}^{-1}$ , HL) and low light (10  $\text{mE m}^{-2} \text{s}^{-1}$ , LL). Data points represent means  $\pm$  SE ( $n = 2$ ) (day<sup>-1</sup>).”

fed the preferred dinoflagellate *Peridinium* and exposed to optimal irradiance of 250  $\mu\text{E m}^{-2} \text{s}^{-1}$  vs. growth rates of 0.13 day<sup>-1</sup> with the same food but at a low irradiance of 10  $\mu\text{E m}^{-2} \text{s}^{-1}$ .”

A correction has been made to the Results Section, Sub Section Titled ‘Growth of *Noctiluca* With and Without Food’ and paragraph 1, Page 6 to address the recalculated growth

rates: “Growth rates for the preferred food *Peridinium* increased from 0.1 to 0.3 day<sup>-1</sup> after 2 days (Figure 3), the latter being the maximum growth rate achieved during the experiment in HL conditions. When *Noctiluca* was fed *Phaeodactylum*, the other preferred food, growth rates increased gradually with a maximum growth rate of 0.22 day<sup>-1</sup> after 14 days. HL exposed *Thalassiosira* fed *Noctiluca* did not show any growth for 5 days

but a growth rate of 0.17 was observed after 2 days. Although HL *Pyramimonas* sp. fed *Noctiluca*, showed an increased growth rate of 0.2 day<sup>-1</sup> after 7 days, growth rates tapered off and *Noctiluca* cells did not show increases as observed for the preferred cultures (**Figure 2A**). Unfed *Noctiluca* achieved a maximal growth rate achieved of 0.17 day<sup>-1</sup> after 12 days but tapered off to almost negligible by end of the experiment. Growth rates were lower in the LL regime than in the HL regime (Paired *t*-test,  $p < 0.01$ ), except in the case of unfed *Noctiluca* (after 12 days) wherein a highly inflated growth rate of almost 0.4 day<sup>-1</sup> was observed. We think this may have been a counting artifact because our duplicate counts after 7 days were highly disparate (67 vs. 1067). Average growth rate of fed cells (all foods) in HL was 0.12 day<sup>-1</sup> and for LL (all foods) it was 0.05 day<sup>-1</sup>. In the case of HL exposed *Peridinium* and *Phaeodactylum* fed cultures, it should be noted that in spite of a decrease in growth rates between 14 and 27 days (**Figure 3**), the number of *Noctiluca* cells still

increased from about 19,600 to 25,500 cells L<sup>-1</sup> in the case of *Peridinium* fed *Noctiluca* and from 16,270 to 28,600 cells L<sup>-1</sup> in the case of *Phaeodactylum* fed *Noctiluca* (**Figure 2**). From day 14 to 21, in some cases LL adapted cells, also showed a small increase in growth rates (negligible to ~0.10 day<sup>-1</sup>) which led to an increase in the number of cells by the end of the experiment (**Figure 2B**) and which could possibly be from acclimatization by endosymbionts to light levels which initially had been severely limiting.”

A correction has been made to the Discussion section and Paragraph 2: It should read as “Our recalculated growth rates are concurrent with those of Hansen et al. (2004), which were 0.14 day<sup>-1</sup> for HL and 0.058 day<sup>-1</sup> for LL at comparable irradiances.”

The authors apologize for this error and state that this does not change the scientific conclusions of the article in any way. The original article has been updated.

## REFERENCES

- Hansen, P. J., Miranda, L., and Azanza, R. (2004). Green *Noctiluca scintillans*: a dinoflagellate with its own greenhouse. *Mar. Ecol. Prog. Ser.* 275, 79–87. doi: 10.3354/meps275079

Copyright © 2019 Gomes, McKee, Mile, Thandapu, Al-Hashmi, Jiang and Goes. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.