

Interactive comment on “Reviews and syntheses: Bacterial bioluminescence – ecology and impact in the biological carbon pump” by Lisa Tanet et al.

Anonymous Referee #2

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General comments:

This is a fascinating subject for a review and I read it with much interest. It is extremely thorough, and in some places even a bit too detailed and requires a step back for the non-expert (see specific comments below). It is well organized and generally well written, although requires a thorough editing for grammar (some examples below).

The one figure and Table are well done, but in a review of this detail and length a few more figures to help illustrate some of the concepts would be helpful. One example that comes to mind is a diagram showing the mechanisms of expulsion.

The discussion on impacts on the biological C pump need to be qualified more. Luminescent bacteria are not always a catalyst for sequestration. If bioluminescence leads

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to disaggregation and “slowing down the sinking rate of particles and consequently increasing their degradation and the remineralization rate” and this happens in the mixed layer, that will decrease carbon export and sequestration.

Specific comments:

Paper uses ‘bacteria’ throughout. Are Archaea bioluminescent too? (This should be mentioned somewhere).

p. 2, L 34 beneficiaries (should this be benefits?) p. 3, L 68 spelling- evidence p. 3, L 77 pyrosomes are not fishes (they are pelagic tunicates) p. 3, L 87 Anglerfishes- would be more clear if you give the rule first then the exception (isn’t it that nearly all the esca in Angler fishes are symbiotic luminous bacteria and not intrinsic light organs? p. 4, L 91 spelling- internal

Section 2.2; p. 4, L 101-118 This section gives examples, but does not actually explain how symbiont selection or colonization occurs. What is ‘microbial recognition and molecular dialog’ and how does it work? How colonization occurs is not described at all.

p. 6, L 174- spelling- reduces p. 6, L 176- The bacterial . . . p. 7, L 193- More detail needed here. How does the expulsion actually take place? How do the bacteria get from the tubules into the digestive tract (are all light organs directly connected to the digestive tract, and through what)? Or from tubules into the surrounding water, for that matter- do all tubules have an opening on the animal surface- seawater interface, or only some ? For example, I have always wondered in an Anger fish esca, how are the bacteria expulsed? A figure would be helpful to illustrate.

p. 7, L 193- “Most hosts with internal light organs. . .”

p.8, L237- “in an herbivorous fish compared to a carnivore.” p.8, L240- prey

p. 9, L273- what is meant by ‘A rare item’? Do you mean that one rare piece of information we do have is that luminescent bacteria are known to help in chitin digestion,

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or that in rare cases luminescent bacteria are known to help in chitin digestion.

p.11 , L329-330 'prior eaten' is awkward

p.12 , L353 'and is always associated with luminous bacteria'

p.13, L387- replace the word 'unbelievable' p.13, L394- 'amphipods were attracted'
p.13, L398- do you mean 'the attraction of luminous bacteria to zooplankton?'

p.13, L404- replace 'excreted' with 'egested' p.13, L414- replace 'excreted' with 'egested'

p. 14, L424-429. As mentioned in general comments, need to be careful here- it is not always a catalyst for sequestration: if bioluminescence leads to disaggregation and slowing down the sinking rate of particles and consequently increasing their degradation and the remineralization rate , and this happens in the mixed layer, that will decrease carbon flux and sequestration.

p. 14, L438- relies p. 14, L448- replace 'pilled' with 'combines'

p. 15, L467- 'role of bioluminescence bacteria...' p. 15, L473- 'pursuit' of investigations p. 15, L475-476- be specific- vertical migration of what ? (diel vertical migration zooplankton and fish?)

p.16, L486-487; suggest make this more broad/ global statement than just European initiatives (mention of ARGO is good, and Bioargo should be mentioned too).

p. 17, L518- The 'pursuit' of investigations p. 17, L528- what about use of acrylamide gels in sediment traps, which preserve the integrity of the particle, and presumably the attached bacteria?

p. 17, section 5.2.3- I found this section unfocused (too much of 'catch all'), and it also does not discuss vertical migration, which is mentioned in the section heading.

p. 18, section 5.2.4 L554- the word 'lock' needs to be replaced

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whole section- I thought bioluminescence in zooplankton was used mainly to startle or confuse a predator. Also, bacteria in fecal pellets should be mentioned in this section

Figure 1- not clear to me why the arrow in 4 denotes slow sinking (why are particles released from vertical migrators slower than those repackaged or from sloppy feeding?)

Table 1.- Caption should specify 'in fishes and squids' (as there are also luminescent bacteria in zooplankton, which are not shown here). "List of luminous bacterial species found in light organ symbiosis in fishes and squids"

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