[AC] We would like to thank both reviewers for their comments on our paper entitled: "Bioerosion by euendoliths decreases in phosphate-enriched skeletons of living corals". We included all the requested modifications in the revised version of our manuscript. We also answered all questions (see below).

Reviewer 1

General comments:

My main general comment is related to the last paragraph of the discussion section. The authors should put the results of their study more into perspective of what they really mean in a coral reef that experiences several simultaneous forms of pollution.

Controlled aquaria experiments have the advantage of testing a single factor while holding the other constant, which reduces the many confounding factors that make understanding causation in non-experimental descriptive studies difficult. Thus experimental studies, such as the present study, are very important in understanding coral reef ecology. However reefs often experience several simultaneous forms of pollution. For example, eutrophic reefs are generally affected by terrestrial run-off rich in nitrates and ammonia in addition to phosphate. Organic matter is also a globally important constituent of pollution of nearshore coral reefs because most of the nutrients are discharged to the sea in particulate form (e.g. dead and decaying plants; human and animal waste). Also, much of the dissolved inorganic nutrients can be taken up and converted into particulate forms within hours to days.

Both nitrogen and organic matter have been demonstrated to influence microbial euendoliths and their bioerosion rates of dead carbonate substrates (Carreiro-Silva et al 2009; 2012). These studies have shown that nutrient effects are specifically different for eukaryotic chlorophytes and prokaryotic cyanobacteria and fungi: nitrogen stimulates mostly green algae, whereas the addition of phosphorus stimulates cyanobacteria, and organic matter stimulates fungi. Although there are differences in community composition in dead and living carbonate substrates, the authors should make use the results of these studies to relate to their observation in live corals. Do the so called "advantages" of the observed decrease in euendoliths abundance with increased coral skeletal growth/decreased skeletal density still hold true on most eutrophic reefs where phosphorus is not the sole pollutant?

[AC] We modified the second and last paragraph of the discussion section, to discuss the general impact of eutrophication on bioerosion in dead skeletons, and how results obtained on dead skeletons may translate to live corals.

Specific comments:

Last sentence of the abstract – the abstract should include a proper conclusion. Summarize the main conclusion of this study and include it here.

[AC] We have modified the last sentence of the abstract, which now reads:

"Results from the present study suggest that coral skeletons of *S. pistillata* will not be further weakened by euendoliths under phosphate enrichment.".

Page 1, line 18 of the introduction section – include Carreiro-Silva et al. (2012)

Carreiro-Silva et al (2012) Phosphorus and nitrogen effects on microbial euendolithic communities and their bioerosion rates. Mar Poll Bull 64: 602–613

[AC] This recent article was unavailable when we submitted our manuscript to BG. We thank the reviewer for letting us know about it. We have now included the reference and discussed results at length in the revised version of our manuscript.

Page 2, line 25 of the introduction section – I read Dunn et al. (2012) and verified that the authors do not refer specifically to microbial euendoliths. They suggest an increase in internal bioerosion under phosphate enrichment, but only cite studies on the relationship between eutrophication, skeletal density and macroborers (worms, mollusks and sponges). None of the papers cited include microborers. Please clarify this.
[AC] We have clarified the text accordingly, and included the fact that this study only cites references on macroborers.

Page 2, line 5 of the Methods section - How many slides per nubbin? If you had 3 nubbins but only looked at a total of 5 slides per treatment, this means that you had more slides of some coral nubbins than others. Did you measure variability in the area colonized by euendoliths within the same coral (i.e. multiple slides of the same coral nubbin)? In dead carbonate substrates, there is quite a lot of variability on the surface area colonized by euendoliths within the same experimental substrate. Please assure the reader that the low replication you have is enough to draw your conclusions.
[AC] We have clarified the text, and included the following sentence in the revised version of our manuscript: "Nine to twelve slides were prepared out of the 3 nubbins studied per treatment. We selected 5 good quality slides out of the 9 or 12 slides for measurements of the different biological variables related to boring microflora, after checking that they were representative of all slides per treatment".
We agree that in dead substrates boring microflora distribution is very patchy and thus, highly variable. There is less variability in live corals. This is due to (a) the growth pattern of microborers inside live coral skeletons and to (b) the low diversity of microboring species which are able to colonize live substrates.

Page 1, line 8 of the results section – it would be interesting to see the actual pictures of slides showing the large differences in euendoliths in the apex areas of corals exposed to different treatments.
[AC] We could provide a general view of each slide studied per treatment (size of a slide on average = 1,3 cm in length x 1 cm in width) but this would not highlight the differences in euendolithic colonization in the apex areas. The general picture would indeed be taken at a low resolution under the light microscope which would not allow the observation of euendolithic filaments (microscopic size). That's why we performed a high number of observations at a high resolution (150 ± 25 random measurements per slide, each measurement encompassing an optical field are of 0.14 mm^2) and then, reconstructed the slide and the abundance of euendoliths across it, using Illustrator.

Page 1, line 14 of the discussion section - Green banding has been suggested to be caused by algal blooms within the coral skeleton during periods of coral paling (the partial loss of pigmentation) (Carilli et al. 2010). Coral paling allows more light to penetrate through the translucent coral tissue into the coral skeleton benefiting the euendolithic algae. Could the lack of banding observed in this study be related to the constant culture conditions in the laboratory (i.e. absence of physical stresses that could cause paling – such as increases sea-water temperature, UV light, etc) instead of representing species-specific differences? For how long were the corals cultured in the laboratory after being collected from the Red Sea? Did you make these same observations in skeletons of *S pistillata* in the field?
[AC] There is almost no green banding in live branching corals such as *S. pistillata*, both in laboratory and in the field, whereas green bands are indeed common in massive corals such as *Montastrea faveolata* (Carilli et al. 2010). This is due to the fast growth of branching corals (> 2-3 cm/yr) compared to that of massive corals (< 1 cm/yr). In branching corals, euendoliths have to keep up with the fast colony growth and thus, get "diluted" within the skeleton. In massive corals, euendoliths have more time to ramify and to form green bands while keeping up with the coral

growth. The organization of coral skeletons, which is species-specific, may also greatly influence the distribution and growth pattern of euendoliths (different porosity, density, etc..., influencing the amount of light reaching euendoliths inside skeletons). Finally, some green bands may appear in bleached corals when the bleaching event is slow enough (Fine and Loya 2002 ; Carilli et al. 2010); but this has been shown in solitary and massive corals, not in branching corals.
No bleaching event occurred during our experiment. Environmental conditions were maintained constant except the concentration in phosphorus. Moreover, nubbins used in the experiment had been cut from large colonies, grown in aquaria for more than 10 years under constant conditions as well (the colonies were originally collected in the Red Sea).

Page 2, line 3 of the discussion section – See my comments on Dunn et al (2012) interpretation above.
[AC] As stated above, we have clarified the manuscript regarding the study of Dunn et al.

Page 2, line 12 of the discussion section - Zooxanthellae pigments normally absorbs > 95% of ambient photosynthetically active radiation, so the loss of pigment has been suggested to stimulate growth of the endolithic algae due to increased access to light (Fine et al., 2005). Is it possible that the increased zooxanthellae photosynthetic efficiency and growth rates under increased phosphate might have also contributed to the observed decreased in microbial euendoliths in the coral apex? (i.e. less light available for microbial euendoliths)
[AC] We thank the reviewer for this hypothesis. However, in Godinot et al., 2011, zooxanthellae density did not increase, and areal chlorophyll content even tended to decrease, so we think that the proposed hypothesis cannot hold true, and did not include it in the revised version of the manuscript.

Page 2, line 16 of the discussion section - There was no direct negative effect of phosphate on euendoliths, they merely did not increase proportionally to the increase in coral skeletal growth, and this resulted in reduced filament abundance in relation to the total coral area. Please revise this statement.
[AC] We deleted this sentence.

Page 3, line 14 of the discussion section - The main source of the inorganic nutrients inside coral skeletal pore-waters is regeneration by microbial euendoliths themselves, as suggested by Muller and Risk (1983) and Ferrer and Szmant (1988), not the overlying water column.
[AC] We think the relative importance of the overlying water column and internal regeneration may depend on the coral species and its skeleton structure (porosity, etc). Corals with an important porosity and pores connected to seawater, would allow circulation of nutrients and other compounds inside coral skeletons where euendoliths live. We agree with the reviewer that, in the case of *S. pistillata*, the very poorly connected pore structure may have indeed prevented circulation of nutrient-enriched skeletal water. Thus, the main source of inorganic nutrients inside skeletons of this coral may come from regeneration by microbial euendoliths as suggested by Risk & Muller and Ferrer & Szmant. We have modified the text to state this:
"However, the main source of inorganic nutrients inside skeletal pore water was suggested to be regeneration by microbial euendoliths themselves rather than the overlying water column (Risk and Müller, 1983; Ferrer and Szmant, 1988). The very poorly connected pore structure of *S. pistillata* may have prevented circulation of nutrient-enriched skeletal water".

Page 3, line 18 of the discussion section – A recent study by Carreiro-Silva et al (2012) has demonstrated that nitrogen not phosphorus is the main limiting nutrient to euendolithic chlorophytes. The addition of phosphorus did not increase colonization by green algae above control levels in that later study. Please add to the discussion the different roles of P and N on

microbial euendoliths in dead substrates described in Carreiro-Silva et al (2012) and how this could relate to your observations on live corals.
[AC] As stated above, we have now included this article in the revised version of our manuscript.

Page 4, line 2 of the discussion section - Polluted reefs generally include different inorganic and organic nutrients not only phosphates. Therefore you cannot make such broader generalizations. Please refer to my general comments above.
[AC] As stated above, we have modified the last paragraph of the discussion section according to the reviewer's comments.

Technical corrections:
Page 1, line 6 of the Methods section - replace “eutrophicated” with “eutrophic reefs”
Page 2, line 22 – replace “details” with “detail”
Page 2, line 24 – replace “thin sections selected” by “selected thin sections”
Page 1, line 5 of the results section – replace “made” by “composed”
Legend of Figure 3 – Replace “Tuckey” with “Tukey”
We included the five requested modifications in the revised version of our manuscript.

Reviewer 2

General comments:

The manuscript introduces new and unexpected consequence of nutrient fluxes affecting the relationship between corals and microbial euendoliths penetrating skeletons of live corals. Whereas most studies pay attention to one or the other of these interacting entities in coral symbiosis, this study appropriately evaluates the dynamic relationship of two interdependent activities. Phototrophic boring microorganisms in growing corals operate under conditions of “moving target” in which a successful coral growth places the light dependent euendolith in a disadvantageous position. If the nutrient requirements for zooxanthellate corals and the skeletal euendoliths are not identical, their equilibrium may depend on nutrient ratios.
The results documented in this paper bear relevance in explaining the rhythmicity of coral growth and of the frequently observed endolithic green zones in coral skeletons. This contribution deserves to be accepted for publication after minor modifications.

Specific comments:

Abstract p. 2426
Line 8 change: /S. pistillata /to: /Stylophora pistillata /(full name when first appears in Ms.)
[AC] We have changed the text accordingly.

Line 12 change: mainly autotrophic to: mainly phototrophic
[AC] We have changed the text accordingly.

Line 24 change: euendolith colonization to: expansion of endolith growth
[AC] We have changed the text accordingly.

p. 2427
Line 2change: autotrophic and heterotrophic to: phototrophic and organotrophic (these terms are technically correct, but differ regarding carbon vs. energy source. In the context of the paper the latter is a better choice as suggested)
[AC] We have changed the text accordingly.

Line 24 change: eutrophicated to: eutrophied
[AC] We have changed the text accordingly.

p. 2434
Line 4 change: negative to: relatively negative (or ..in relation to the stimulus to coral growth)
[AC] We deleted the sentence in the revised manuscript.

Fig. 2 caption (the caption is too long and yet unclear)
Line 2 change: across to: along
[AC] We have changed the caption accordingly.

Lines 3-4 change: petrographic thin section of half nubbins to: longitudinal petrographic thin section of the nubbins
[AC] We have changed the caption accordingly.

Lines 5-6 remove the text: The portions on the left of the dashed lines represent the

length of the skeletons at the beginning of the enrichment, and on the right the portion grown over the course of the 15 weeks-enrichment (estimated from differences in nubbins length between the beginning and the end of the enrichment - And replace the text with: dashed lines mark the nubbin tips at the beginning of the experiment.
[AC] We have changed the caption accordingly.