

## ***Interactive comment on “CO<sub>2</sub>-driven compromises to marine life along the Chilean coast” by E. Mayol et al.***

### **Anonymous Referee #1**

Received and published: 9 January 2011

1. General: This paper is very relevant at a time when future impacts of CO<sub>2</sub> rise and enhanced ocean stratification have us concerned over the health of marine biota. The data set appears to be an excellent one and overall its presentation is good. The Chilean coast is one of the areas in the global ocean most stressed by hypoxia, thus a discussion of how elevated pCO<sub>2</sub> and reduced pH may exacerbate effects on ecosystems is welcome.

I'd like to see a little better comparison between RI and hypoxic threshold in a figure (Fig. 4?) to help tie in the much larger number of papers dealing strictly with oxygen effects, and also think the data presented could help others assess pH change brought on by declining hypoxia by providing a regression for O<sub>2</sub> vs pH.

I hope that this work will lead to an analysis of the distribution of biota vs RI, pH and

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O2. This effort should help identify tolerances of various species for these chemical/physiological stressors.

I do not feel this paper requires another review once the points below are addressed.

2. Specific comments line 48 ...in ocean waters has already lead to a decline of 0.1 units in ocean pH, and will decrease by an additional 0.3 pH units by the end of the century...

comments- not the entire ocean has experienced this pH change. Also I'd suggest "...may decrease by an additional 0.3 pH..." since this is a prediction with uncertainty.

60 ...an impact that has only recently been addressed (Brewer and Peltzer, 2009). - see the paper by Powers, 1922. THE PHYSIOLOGY OF THE RESPIRATION OF FISHES IN RELATION TO THE HYDROGEN ION CONCENTRATION OF THE MEDIUM. Journal of General Physiology. Download from jgp.rupress.org

79 This connection had not been elaborated to date... See Powers, 1922 and references therein for examples of the attention paid to this subject many decades ago. Perhaps state that little attention has been paid to this issue in recent years. I agree that not enough attention is being paid to combined impacts.

158 below the 0.7 threshold value across most of the study area Could you add the approximate 0.7 and 0.4 thresholds to Fig 4 a? I'd like some means to understand the typical oxygen levels of the respiration index.

174 corresponds to 1325 m of the studied water column, declining by 50 m from 42° S Perhaps a depth range of 1300 to 1350 m would be better since there is variability from S to N.

186 concentrations  $< 8 \mu\text{mol kg}^{-1}$  at 100 m depth in 30.51° S is this a minimum or just an example?

219 Glibert et al 2010 This reference might be replaced by Keeling et al 2010 (Annu

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Rev Mar Sci 2, 199-229) since I believe Gilbert made the point that oxygen loss from the ocean was being over reported, whereas Keeling focussed on deoxygenation processes.

Fig 4. Please supply regression formulae as well as R2. Could you include O2 vs pH? Both O2 and pH sensors are being used on CTDs with varying degrees of success. Having a regression from good measurements will help those trying to make sense of CTD data. Also, you will be providing a means of converting O2 changes over time into approximate pH change, something that could help re-interpret results based strictly on oxygen data.

Fig. 6 - I don't quite understand the significance of this plot. I cannot conceive of a circumstance in the present ocean where O2 would decline without pCO2 increasing. So a theoretical evaluation of the impact of pCO2 on RI seems unnecessary. Perhaps I am missing the point?

Fig 7 - improve caption. e.g. The relationship between the thickness of the water column (a) with RI <0.7 to a depth of 1,400 m ; (b) with RI > 0.7 in the top 200 m P along the studied transect.

3. Technical corrections 219 - correct date of Gilbert citation (2010)

266-267 plural verb - "...levels  $\Omega$  for aragonite, where calcification may be compromised. RI and the saturation state of aragonite were used in this work as predictive tools to evaluate..."

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Interactive comment on Biogeosciences Discuss., 7, 8895, 2010.

**BGD**

7, C4644–C4646, 2011

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