

Interactive comment on “Physico-chemical and biological factors influencing dinoflagellate cyst production in the Cariaco Basin” by Manuel Bringué et al.

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General comments

Dinoflagellates cysts are ubiquitous in coastal ecosystems worldwide, and have been increasingly used in palaeoenvironmental studies as indicators of past changes in e.g. sea surface temperature, salinity, nutrient status, and primary production.

While the sedimentary record of dinoflagellates is intrinsically fragmentary and integrated in time, the reliability of past reconstructions is dependent on our knowledge of ecological processes occurring at short time-scales that capture seasonal and inter-

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annual variability.

One of the most insightful approaches is the study of high-resolution sediment trap series coupled with hydrographic measurements. Such studies are rare, and often only possible in connection with long-term monitoring programmes and sustained collaborative efforts.

This manuscript reports on a detailed study of dinoflagellate cyst production over 2.5 years in the Cariaco Basin, strongly influenced by seasonal upwelling. The study has been well designed and executed. Comparing cyst production not only to environmental variables but also to biological indicators is novel and provides important insights into the trophic interactions of both individual taxa and groups. Mixotrophy is widespread in dinoflagellates, and the “classical” separation of dinoflagellates in two trophic groups that has been adopted by the paleo-community is clearly an oversimplification. This study clearly highlights this aspect, while also indicating different prey preferences within the heterotrophic group.

I congratulate the authors on providing detailed information for the cyst morphotypes encountered, as this will certainly be of use to future taxonomic work and sets a great example of good practice. Overall, this is a scientific contribution of excellent quality and importance, well within the scope of this journal, and I strongly recommend its publication.

Specific comments

Keywords: I suggest replacing the keyword “Harmful Algal Blooms” with “dinoflagellate cysts”, to be consistent with the main focus of the study.

Page 2, Line 10 and Page 3, line 23 - The authors refer to several studies addressing anoxia in the basin, but it is not clear from the text whether anoxia is episodic or permanent (i.e. how frequent is deep water renewal?). Please clarify.

Page 4, Line 32; Page 5, Line 4 – Four sediment traps have been deployed at the

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CARIACO station, but only Trap A (275m) was studied in terms of dinoflagellate cyst production. Why was this depth chosen? If sediments are also available from all the other traps, it would be extremely useful to study those as well, or at least to compare the shallowest with the deepest trap, in order to understand the dynamics of vertical cyst transport into the sediments. I hope the authors will consider doing this in the future.

Moreover, since this trap clogged during one of the most interesting events of the entire record, it would be important to investigate whether the other traps may provide a continuous record.

Page 5, line 23 – The palynological processing method used is rather standard, and since it is described in detailed, I found it confusing to refer to Pospelova et al. references, because at least in Pospelova et al. 2005, warm HF was used. If there is something specific in the method used by Pospelova et al. that ensures “optimal recovery” that should be mentioned in the text.

Results: I recommend the consistent use of past tense throughout the Results, especially considering that this trap is from the 1990's. E.g.: “The most abundant taxa were XXX”, not are.

Page 12 – It is puzzling that as many as 24 extant taxa previously reported in the basin were not encountered in this study. This is mentioned, but not discussed. What are the possible explanations for this? Transport of cysts from elsewhere? Overwhelming dominance of *Brigantedinium* spp. masking the less dominant taxa (i.e. detection limit too low)? Or could it be that some species have cyst production cycles exceeding 2.5 years? I suggest discussing this intriguing observation further.

Page 13, Line 29 – This seems unlikely to me, because resting spores of *Chaetoceros* are, by definition, heavily silicified.

Page 15, Line 27 – I recommend referring to a more recent study, such as Jeong

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et al. 2010. Jeong, H.J., Yoo, Y.D., Kim, J.S. et al. *Ocean Sci. J.* (2010) 45: 65.
<https://doi.org/10.1007/s12601-010-0007-2>

Conclusions

Again in the conclusions, the use of present tense gives the reader the impression that assemblages as recorded in the 1990's in the trap are similar to present-day assemblages. Is there any information available that supports this? Can we be sure that the dinoflagellate cyst community of the Basin has not changed significantly over the past nearly 20 years (last trap sample dates from 1999)? I recommend carefully addressing this aspect throughout the text.

Technical corrections Terminology: Some terms are used in an inconsistent way. Consider your choice of: - Biogenic/Biogenous - Primary production/ Primary productivity - Planktic/ Planktonic - Biogenic silica: to my best knowledge, the correct abbreviation is BSi, not bioSi

Point-by-point suggestions:

Page 2, Line 13 – delete “at the site”; Line 16 – replace “the site of “ by “under”; Line 21 – add “Here,” before “We present”

Page 3, Line 2 – replace “accuracy” by “reliability”.

I find it excessive to use 13 references here. It would be sufficient to refer to the first study ever, and then one study per main geographical area.

Page 4, Line 22 – The reader has already been introduced to station CARIACO, so this sentence can be simplified. Suggestion: “. . . as part of the Cariaco Ocean Time-Series Program, at station CARIACO, located in the eastern Basin. . .”, followed by “The programme has simultaneously produced oceanographic observations since 1995 (References).” The rest of the sentence is repeated elsewhere.

Page 5, Lines 2,3 – Consider changing to “. . . mounted on a carousel with a rotation

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interval of 2 weeks”.

Page 7, Line 22 – Simply writing “. . . cyst taxa and both physico-chemical and biological parameters” would flow better.

Page 9, Line 4 – “a six month-long” not “an”; Line 8 – “observed during the warmest intervals”; Line 17 - “that caused the trap to clog in April and May. . .” would flow better.; “Fluxes of biogenic material show” instead of share.

Page 10, Line 15 – “Over this time series, . . .” for simplification; Line 19 – “of” missing before “Echinidinium”; Line 30 – “. . .towards the end”.

Page 12, Line 20 – Not all the studies referred to are sediment trap studies. I suggest changing it to “consistently with studies from other upwelling systems”

Page 15, Line 1 – “from site to site” instead

Page 16 – “. . .when diatoms dominate primary. . .”

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