

Interactive comment on “Questions of importance to the conservation of global biological diversity: answers from the past” by K. J. Willis and S. A. Bhagwat

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Received and published: 28 September 2010

Referee 1

Major comments

The word "global" in the title: This is based on Sutherland et al.'s original paper by the same title. Our discussion paper is a response to Sutherland et al. highlighting the importance of palaeoecological studies in answering questions of global biological diversity. However, we have now removed the word 'global' on the referee's suggestion.

The concern of conservation biologists that paleo data are descriptive and not of rel-

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evance to managers: This has been addressed through a number of examples in the manuscript, although not explicitly stated apart from a mention in the abstract. We have now added a sentence to this effect in the closing discussion: "Throughout this paper, we demonstrate that palaeoecological data are not just descriptive, but are highly relevant to management of present-day ecosystems."

Minor comments

Page 1144 Line 1 – Are you referring to 20th century human activity or indigenous activity? Please clarify.

* We are referring to prehistoric thus indigenous human activity and have clarified this point in the text

Page 1144 Line 4 – What forest type? Pinus-dominated?

* Yes, Pinus-dominated forest type

Page 1144 Line 13-14 – Exclusion of people or little to no anthropogenic maintenance of the forest type? The way it is stated suggests a completely untouched landscape.

* We have changed this to 'excluding any anthropogenic management of this reserve'

Page 1144 Line 27 – What is the definition of natural in this context?

* Without any anthropogenic management

Page 1146 Line 8 – What kind of forest?

* Littoral

Page 1146 Line 12 – What triggering mechanisms are you referring to?

* Sea-level rise and storm surges

Page 1152 Line 19 – The word "of" should be change to "as".

* Done

C811

Referee 2

Major comments

Information on palaeorecords: Although there is no room for this in the present paper, we have cited another paper that does exactly what the referee asks for.

Ecological processes: We have now consistently used the term 'ecological processes' (in plural) and define in the introduction what we mean by those.

Minor comments

Page 1143, line 26: What kind of "paleoecological sequence"? Please be more specific.

* Sedimentary

Page 1144, line 22: You need a citation after "grassland ecosystems".

* Same as those for burning regimes - this has therefore been rephrased

Page 1144, line 25: You need a citation after "anthropogenic activity".

* Bond et al. 2008 - added

Page 1145, line 24: It's not clear what is meant by "to try to build the factors responsible for the resilience into regions". I think it may be the word "factors". Please clarify.

* This has been changed to 'to try to build resilience into ecosystems'

Page 1146, line 2: What kind of paleoecological techniques? Please be more specific.

* Including pollen analysis and sediment geochemistry

Page 1146, line 5: This sentence says that the time period is the past 4000 years, but line 1 says the study covers the last 6000 years. Please clarify.

* Line 1 changed to 4000

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Page 1146, lines 11-13: In the sentence that starts out "Specifically, the diverse littoral forest: : .:", is this the first time you say "littoral forest"? I'm not sure it's clear what kind of forest that is. Coastal, but not mangrove forest, correct? It would be helpful if a quick definition was included. Also in that same sentence, it would be helpful if there was a comma after "triggering mechanisms". Otherwise it sounds like the triggering mechanisms show greater resistance, not the littoral forest. I would take out the comma after "environmental perturbation" and change "and also in its ability to return" to "and a quicker return".

* Coastal ecosystems have been defined in advance of the mention of littoral forest; other corrections have also been made

Page 1146, 24-26: This sentence could use a citation.

* Goodman & Benstead 2003 - added

Page 1146, line 26: What kind of "long-term ecological records"? Be more specific. If they are 6000-year long pollen records, then say so. Also, delete word "the" before "long-term ecological records".

* From sedimentary sequences - added

Page 1147, line 10-13: I'm not sure this information is necessary. Possibly delete or better explain why it matters.

* This information refers to different models illustrated in Figure 3 and must be retained

Page 1148, lines 4-5: Some sort of definition of "population abundance" is needed (either in this sentence or earlier in the section).

* This refers to 'higher numbers of individuals' which the second half of this sentence mentions

Page 1148, lines 24-25: I think I get what you mean by "novel ecosystems in anthropogenic landscapes", but maybe you could describe it better.

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* This is explained in the following sentence

Page 1149, line 4: Can you give some examples of what you mean by “ecological processes”? (maybe earlier in the paper).

* This has been added

Page 1149, line 5: Before when?

* Before degradation

Page 1149, line 9: It is argued by whom? List researchers and change to active voice.

* For example, Vera 2000 - added

Page 1149, line 13: It is suggested by whom? List researchers and change to active voice.

* As above

Page 1149, 14-16: It isn't clear which time periods go with which locations. Please clarify.

* The sentence has been rephrased to make it clearer

Page 1149, line 17: Argued by whom? If it is Vera (2006), then say that and change the sentence to active voice.

* Changed

Page 1149, lines 18-20: Same as above. State who is making the argument and change to active voice. Also in that sentence, I'm confused by what you mean by “functionality in ecosystems”. Please clarify (maybe with some examples).

* This has been rephrased but it is not necessary to cite all researchers that have been cited in sentences immediately preceding this one

Page 1149, line 23: Delete the word “certainly” and be more specific about how large

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of an increase in biodiversity you are talking about.

* Removed, but the reference cited does not specify the 'magnitude' of the increase in biodiversity

Page 1150, line 1: You repeatedly use the words “long-term ecology”. I think I would just say “paleoecology” since that is what we paleoecologists call it. You could define it the first time you use it to avoid confusion.

* We disagree - the term 'long-term ecology' is now well established in the literature and we believe we are consistent with its use in this paper

Page 1150, line 13: What do you mean by “charred residues”? If you mean charcoal, then it would probably be better to just say charcoal.

* Charcoal would not be appropriate to describe this because 'charred residues' consist of not just charcoal, but also partially burnt substances

Page 1150, 14-16: This sentence probably needs a few citations.

* Willis et al. 2004 includes those - added

Page 1150, line 19: The part of the sentence that says “embedded in a landscape of infertile soils” sounds awkward. Maybe if you put a comma before embedded” it would sound better.

* We have removed the word 'embedded' and rephrased it as 'landscape of otherwise infertile soils'

Page 1150, 23-26: The last sentence of the paragraph doesn't really make sense. Change “that are” to “who” and that might help, but again I think it is the use of the word “processes” (which you use twice in the sentence) that is confusing. I still don't really know what you mean by processes yet.

* Rephrased

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Page 1151, lines 1-11: Overall I think I understand what the paragraph is saying, but the words “conservation”, “processes” and “conserve” are repeated too many times. Try to come up with some different words that are maybe more descriptive and help drive your point home. Also, the last sentence should probably have a comma after “records” and “phylogenies”. In addition, please explain what you mean by “these factors”. What factors are you talking about?

* Changed

Page 1151, line 14: Please explain what you mean by “adverse climatic perturbations”. Adverse for the organisms?

* Such as glaciations - we have removed the word 'adverse'

Page 1151, lines 15-20: This is a really long sentence with a lot of breaks in it, and I'm not sure it makes sense. I guess I don't understand how the “spatial extent of genetic diversity” is known from pollen and macrofossil records. Were genetic studies done, or are you just trying to make a general conclusion? Please clarify.

* Rephrased and shortened

Page 1151, line 22: What are you referring to in terms of “species”? Number of species? Type of species? Please be more specific.

* Species diversity - changed

Page 1151, line 26: “Warm-stage refugia” probably needs some sort of description with it.

* Regions of persistence during interglacial periods - added

Page 1151, line 28: I would change the word “good” to something else like “appropriate” or “important”. In fact, the sentence would be better if it read, “An important time interval to examine: : :”.

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* Changed

Page 1152, line 11: The “spanning 2000-2005” doesn't make sense. What spans that interval? I thought you were talking about Pleistocene refugia? Please clarify.

* Removed

Page 1152, lines 15-17: This sentence doesn't make sense, especially the part that says, “preserving areas important for persistence and ecological processes responsible for this: : :”. I think it would be helpful if you put an adjective with persistence. Persistence of what? Also, the word “the” should come before “ecological processes”. Make sure that the tense of the sentence is appropriate (it should probably be in past tense since the study has already been completed).

* Rephrased

Page 1153, line 18-19: You may want to mention some of the global databases that do exist and how they can be accessed (e.g., the global charcoal database, the North American and European pollen databases, others).

* We provide a recent example of such database - e.g. Binney et al. 2009 describe a new database of Eurasian macrofossil records during the late Quaternary - which cites other related databases

Technical corrections:

* All done

Page 1140, line 2: Add a comma after word “impact”.

Page 1140, line 18: “necessary in order” sounds redundant. I would leave out “inorder”.

Page 1140, line 18: Is there a word missing after the word “This”? Study? Review?

Page 1141, line 5: Add comma between “CBD 2010”.

Page 1142, lines 1-6: This seems like a really long sentence. I would split it into two

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separate sentences.

Page 1142, line 20: Add period after "Hobbs et al".

Page 1144, line 7: Delete the word "the" after "reduced the dominance of".

Page 1144, line 17: Delete the word "the" after "processes responsible for".

Page 1144, line 26: Add the word "are" after the word "therefore". Also change the semicolon after "priority" to a period and make the rest of the sentence a new sentence. Probably best to change the word "Whereas" to "However".

Page 1144, line 28: Add a comma after "e.g.". Check these throughout the manuscript.

Page 1146, line 6: Change the word "a" before combined to "the".

Page 1146, line 17-20: Change the semicolon to a comma after "priority" and change "also" to "as well as".

Page 1146, line 21: Delete "long-term".

Page 1146, line 23: The sentence would be better if it read "One example is the Madagascar endemic evergreen forest tree, *Symphonia*."

Page 1147, line 1: "abundances" should be "abundance". Also not sure what you mean by "the populations of *Erica* spp. and *Myrica*". Maybe leave it out.

Page 1147, line 17-18: add commas before "but" and after "abundances" to set off that part of the sentence.

Page 1147, line 19: Change to active voice instead of passive. It should read "*Symphonia* and *Erica* spp. coexisted throughout the sequence."

Page 1147, line 21: "In contrast *St. Luce*" should be the start of a new sentence.

Page 1147, 24-25: The last part of the sentence would be better if it read "driving *Symphonia* populations to local extinction."

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Page 1147, line 25: Delete the words "low/high".

Page 1147, line 26: Change the word "this" to "thus".

Page 1147, lines 28-29: "Under higher *Symphonia* abundances" doesn't make much sense. "With" or "because of" might sound better.

Page 1148, lines 3-4: It would sound better if the sentence read "By examining ecological processes: : through time, this study has important implications for conservation planning."

Page 1148, line 6: Delete the first "that".

Page 1148, lines 11-13: The sentence would be better if it read ": : since during climate perturbations littoral forests located on poorer soils will probably not be able to support many of the region's important endemic taxa."

Page 1148, lines 13-15: This sentence is really awkward. I would change it to read, "By prioritizing conservation of littoral forest situated on nutrient-rich soils it will be possible to preserve the ecological processes necessary for its persistence during climatic perturbations."

Page 1148-9, line 1: I would change the sentence to read, "How then can we create conditions that will protect (?) native species beyond reserves and in novel ecosystems?"

Page 1149, line 2: Should it say "processes" instead of "process"?

Page 1149, line 6: Change "for the functioning of the ecosystem" to "for ecosystem function".

Page 1149, line 6-9: Change sentence to active voice instead of passive voice.

Page 1150, line 2: Change "on" to "in".

Page 1150, lines 4-5: The use of "in fact" in this sentence is awkward.

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Page 1150, lines 9-10: Rephrase sentence to say “: : in Mexico by using algae from wetlands to enrich upland garden plots, and by cultivating trees within their communities.”

Page 1151, line 22: Delete the word “are” and change “indicating” to “indicate”.

Page 1152, line 2: You use “kyr” here but not earlier in the manuscript. In fact, you use cal yr BP (not defined) in some places too. Please be consistent.

Page 1152, lines 4-5: Delete the words “in time”.

Page 1152, lines 8-9: Change “are already starting to be incorporated into” to “are already being incorporated into”.

Page 1152, lines 9-12: This sentence is confusing. Probably best to rephrase it to say, “For example, in a recent attempt to identify important areas for conservation of ecological processes in Australia, refugia locations during previous intervals of : : :”.

Page 1152, line 13: Change sentence to active voice.

Page 1152, line: Change to past tense. “Although this approach predominately focused on: : :”.

Page 1152, line 24: Delete the words “a consideration of”.

Page 1153, line 15: Delete the word “being”.

Page 1153, line 16-18: I think it would be better if the sentence read, “We suggest that there are currently a number of barriers, not in the least is the ability for non-specialists to access and utilize paleoecological data.” The use of the word “presentation” is confusing.

Page 1153, line 21: Change “as to” to “of”.

Interactive comment on Clim. Past Discuss., 6, 1139, 2010.