

Interactive comment on “The role of wind in hydrochorous mangrove propagule dispersal” by T. Van der Stocken et al.

T. Van der Stocken et al.

dderyck@vub.ac.be

Received and published: 15 April 2013

First of all, we would like to thank anonymous reviewer 2 for the positive and constructive comments, which we used to further adjust our manuscript. More detailed description of the changes we made per comment is given below.

Specific comments

(1) The depth of the flume tank, while standard for these types of experiments (see Chang et al. 2008), is an issue because the actual volume of water determines the momentum with which the main stream flows. When there is higher momentum in stream flow, stronger wind currents are required to make a significant contribution especially if acting in opposition to the water currents. The depth of 0.35 m needs to be

C971

justified in relation to field conditions.

answer:

We varied the flume speed to meet the same current velocity as in the runs without wind. In this way, the current velocity profile (which could have been changed by wind) can be considered identical over all scenarios.

Moreover, by using a smooth flume bottom, the velocity gradient is rather steep (i.e. high currents at the bed because of low roughness). This actually simulates deeper water, where the upper decimeter of the profile has uniform current velocities.

We indicated the above more clearly in the material and methods

(2) When water is considered in isolation of all other factors in dispersal, two hydrologic forces act on the propagule – direct stream flow which acts downstream of the general direction of the river and tides with a simultaneous wave force (Chang et al. 2008) which shifts the propagules progressively towards the edge. Stranding of propagules depends on which of these forces prevails and the situation is dynamic.

answer:

Yes, this is true when you isolate hydrodynamic conditions from all other factors, and thus excluding wind.

However, we saw that wind has a significant impact on a propagule's dispersal route, on top of the hydrodynamic influences, both in the field and in our flume experiments.

(3) In wave-dominated systems, time is another important consideration, which the authors referred to with respect to propagule viability. The field study was for a period of two ebb tides. There is a possibility that the next high tide would have picked up the propagules once again, resulting in a different distribution pattern in the subsequent ebb tide, as there is no evidence that stranding is a once-off event. That is, until propagules germinate and establish, dispersal could still continue. This has been

C972

demonstrated by Merritt and Wohl (2002).

answer:

We went to look for propagules after one week for a second time and found most propagules to be in the same spot as we found the first time. Secondary dispersal may of course have occurred for some propagules, within, as well as beyond the duration of our observations. Nevertheless, the seed distribution pattern should especially be interpreted here in terms of 'the role of wind', which is the subject of the article. Where the dispersal distance distribution gives a good approximation (secondary dispersal may modify its shape to a certain degree) of dispersal distances in our study area, it clearly shows that wind plays an important role in the seed distribution pattern.

(4) Irrespective of morphological differences and differential response to wind, the authors found no significant differences in the dispersal distances of *C. tagal* and *R. mucronata*. This suggests the overall dispersal distances are more hydrological- than wind- or morphology-driven. Thus the question is, if irrespective of the wind the final dispersal shadows are the same, how important then is the wind in hydrochorous dispersal of mangroves?

answer:

One cannot say that wind is not important just because there is no difference in dispersal shadow between *C. tagal* and *R. mucronata*. Wind is important, since it has a differential effect on horizontally and vertically floating propagules, which we showed in the field, and therefore can explain the two dispersal distance groups in fig. 6. Furthermore, we saw a differential effect of wind between the four species we used as depicted in fig. 3, which will impact the dispersal distance and direction.

(5a) In terms of technical aspects the Introduction must clarify that there would be field, lab and fishermen studies. (b) In addition the authors need to say why different numbers of propagules were released in the field experiment for different species?

C973

answer:

(a) We clarified in the introduction that we also worked with fishermen to gather data of LDD. (b) We clarified this in the text: The different numbers of *C. tagal* and *R. mucronata* propagules, 200 and 100 per site, resp., reflect the availability in the field.

(6a) The authors need to clarify the analysis of their data. There are treatments with wind, without wind and with wind in different directions. We cannot just assume that the water effect is constant when the wind component is added – a two- or three way analysis of this data set would have served better for purposes of statistical significance. In a similar experiment which simulated retention of seeds by extant vegetation of a marsh, Chang et al. (2008) used a General Linear Model that allows for simultaneous analyses of multiple factors which is more appropriate as it allows for interactions between factors to be teased out. (b) For *X. granatum*, the calculation of dispersal velocity was adjusted because of its high density. This seems biased since density is a factor under investigation.

answer:

(a) As mentioned in the answer to question (1), we calibrated the water current velocities to be constant between scenarios, so the water effect is equal among the multiple scenarios.

(b) For *X. granatum* the calculation was not adjusted in a way that biased the results. We investigated where stability in the dispersal velocity was reached, in order to let the unequilibrium in the first few meters not to bias the result and its interpretation.

(7) A more comprehensive study would need to take more factors into consideration, as the current experimental design does not sufficiently control for other key determinants of hydrochorous dispersal; the extant plant vegetation along the channel, wave action (Chang et al. 2008), the hydrologic regime, the channel morphology and hydraulics, the phenology of propagule release as it relates to hydrology (Merritt and Wohl 2002).

C974

answer:

Flume studies are usually done to eliminate all the other factors, which might or might not be important. So, the strength of this study is that one can clearly see the effects of currents and wind.

Of course in a modelling study currents and wind can be influenced by local conditions, like waves and channel shape and roughness, but this is beyond the scope of this paper. These suggestions are of course very interesting for future studies.

(8) Technical corrections: Table 1, correct spelling of "length". Use only 2 decimal places.

answer:

We corrected "length" in the table. We did only use 2 decimal places, so we do not understand this comment.

Interactive comment on Biogeosciences Discuss., 10, 895, 2013.