Reviewer #1

Major concern:

You validated the particle-tracking simulations by comparing the simulated dispersal areas with satellite observations. However, your model also incorporates larval growth and biomass change. How were these components validated?

Our model indeed includes biomass change (as biological growth, see section 2.3 of the revised manuscript – and we now validate that using the True Skill Statistics of Allouche et al (2006). We don't include larval growth in the sense that our model does not (yet) have reproduction. In the discussion of the revised manuscript, we now discuss that reproduction and fragmentation could be lines of further enhancement of the framework (lines 381-387 in the track-changed pdf).

It is unclear how your model improves upon existing approaches. I would suggest comparing simulations using transport alone versus transport coupled with the growth model. Or some other comparisons.

This is a good point; one that was also raised by reviewer 2. We have now added much more sensitivity analyses (e.g. on phosphate growth limitation, on windage factor, and on the incorporation of Stokes drift), which have made our manuscript much richer.

This manuscript does not appear to have been generated by AI, yet the writing still reads as somewhat informal in places. For example, there are too many paragraphs in this paper have only one or two sentences.

While we feel that long paragraphs are not necessarily easier to read (a paragraph should make one single and coherent point – and sometimes that can be done in one sentence), we have gone through our manuscript and combined some short paragraphs where we found that indeed improved readability.

I would suggest separating the Conclusions and Discussion into two distinct sections. The Discussion should provide mechanistic interpretations of the results and place them in the context of previous studies, followed by a clear acknowledgment of the study's limitations and its implications for fisheries management. A thorough discussion in the context of previous studies is essential; otherwise, your work risks being disconnected from the broader field. The Conclusions, by contrast, should be concise and self-contained, presenting only the key findings of the paper without citing references or introducing new interpretation.

We politely do not agree with this suggestion. We find that a conclusion section at the end of a manuscript often very closely resembles an abstract – and thus provides little new information. We strongly prefer to finish our manuscript with a thorough discussion (which we have indeed strengthened in our revised manuscript) and outlook.

Minor revision

L4: what do you mean "customizable"?

We have now clarified that "*users can easily customize the settings of the transport and growth model*" (lines 8-9 in the track-changed pdf).

Abstract: You need to rewrite this section.

We have updated the abstract based on the advice of the three reviewers.

L30: The significance of this study is mentioned in only one sentence throughout the Introduction, and also the last sentence of this Section, which I feel is inadequate and should be expanded.

Also following suggestions from reviewer 2, we now more clearly state the innovation of our work in the introduction (lines 64-67 of the track-changed pdf).

L31-35, I would suggest rewriting these three sentences, as the third does not follow logically from the previous two.

We have now moved the third sentence to the next paragraph, to make the flow of the introduction more logical (lines 39-41 of the track-changed pdf).

L55: I suggest you list the two challenges clearly, which would improve readability.

This is a good suggestion. We have now expanded this sentence to "In the context of these challenges of high variability in both environmental conditions and growth rates, our primary aim …" (lines 62 of the track-changed pdf).

Section 2.1: Is this a two-dimensional model? If so, please state this explicitly rather than leaving readers to infer it.

We have now added “two-dimensional” to the revised manuscript (line 84 of the track-changed pdf).

L77: delete “for example”

We have removed “for example” in the revised manuscript (line 96 of the track-changed pdf).

Equation 2: $\boldsymbol{v}Stokes(\boldsymbol{x}z=0,t)$ is the wave-induced Stokes drift velocity at the ocean surface, then what is $\boldsymbol{v}Stokes(\boldsymbol{x},t)$? At what depth is it evaluated?

This is the depth-integrated Stokes drift, as also mentioned in manuscript (line 105 of the track-changed pdf).

Equation 4, what’s the value of $\boldsymbol{v}wind10$? I guess it is not a fixed value, right?

No, we have now added that it is temporally and spatially varying (lines 124 of the track-changed pdf).

Equation 1: what’s the value of vocean, how do you get it?

This was described in section 2.3 (Hydrodynamic and biogeochemical datasets), but we now realise that it would be better to move that section to before Equation 1. Hence, we have now moved this section to lines 73-80 of the track-changed pdf.

L131: You have lost the other half of the parentheses.

A single large opening bracket is the common way to write a set of two equations where the choice is based on a condition.

L194: “The simulation captures the areas of *Sargassum* convergence in the Central Atlantic (55°W-15°W in Figure 2) especially well.” Can you give a quantitative value of this?

As also suggested by the other two reviewers, we have now added a quantitative assessment of the skill of these results, using the True Skill Statistics metric of Allouche et al (2006), which was also used in Berline et al (2020) and Podlejski et al (2024). We discuss this in lines 215-228, 240-244 and Figure 3 of the track-change pdf.

L202: k_N should be italic type.

This is now fixed in the revised manuscript (lines 265-266 of the track-change pdf).

L240: There are too many paragraphs in this paper have only one or two sentences.

See also our response to the third major point above; we have now combined some short paragraphs.

L242: "temperature growth factor (left column in Figure 7) is much lower…". How much lower is it?

We have now added that the temperature growth factor in the eastern Caribbean is approximately 0.2 in October 2024 and 0.6 in July 2024 (line 314 of the track-changed pdf).

L244: Wthat's the value of optimal temperature?

We have now clarified that we use T_{opt} = 27.5 °C in the model results (lines 315 of the track-change pdf).

Section Results: Please label all the geographic locations mentioned in the text on the figure. Readers should not have to refer back to the map to identify these locations.

To further strengthen the link to the SaWS dataset, we have now added the names of the SaWS products on each of the regions in Figure 1.

Conclusion and Discussion

L264: "For example…", the context after for example did not explain the sentence before "Our results indicate that the combination of physical transport and biological growth significantly affects *Sargassum* distribution." There is no apparent logical relationship between these two sentences.

This is a good point by the reviewer. We have now removed the first sentence of this paragraph, as indeed it did not connect to the rest of the paragraph (line 337 of the track-change pdf).

L269-275: What does this paragraph want to say? The main point of this paragraph is unclear

The reviewer is correct that the point of this paragraph was not very clear. In the revised manuscript, we have now more clearly phrased it as a summary of the three main reasons why the model and observations might not agree (lines 337-344 of the track-change pdf).