Reply to reviewer 1's comments

Original comments appear in straight font, and our answers appear in italic.

EVALUATION
Please list your revision requests for the authors and provide your detailed comments, including highlighting limitations and strengths of the study and evaluating the validity of the results, and data interpretation. If you have additional comments based on Q2 and Q3 you can add them as well.
1. Highlighting limitations and strengths of the study
Authors used a novel mechanistic approach to infer size-based functional response to make explicit consideration of the movement of organisms in aquatic and terrestrial systems.
However, the manuscript format is very casual and does not meet the basic requirements of this Journal. And the lack of some necessary elements of academic papers, and different elements are mixed up and confusing.

We agree that the outline of the manuscript was not clear enough. We thoroughly modified it to make it clearer that it is a perspective paper. Following the editorial instructions, we discussed current advances and future directions by promoting a novel research avenue to investigate the functional response by including factors from the physical medium, and we included personal work (a derivation of the functional response from a published model) as an example of what can be done. We also tried to provide an accurate presentation and citations of other authors' work in a clearer way. We also agree that the presentation of the results was not satisfactory. Thus, we added an evaluation of the goodness of fit of the model.

2. Evaluating the validity of the results
The authors propose new models for some existing problems raised by the research in the field, but the authors do not substantially verify the effectiveness of the model.
The authors did not adopt a classical authoritative approach to verify the effectiveness of the model, for example, using statistical method degrees to validate the degree of compliance between predicted and actual values.

We added several elements to evaluate the goodness of fit. First, we computed the root mean square deviation (RMSD) that account for the mean deviation of the predicted and observed data, as recommended in Pineiro et al 2008 (Ecological Modelling). Second, we added a test on the slope and intercept of the regression of observed versus predicted data (i.e., a slope of 1 and an intercept of 0 mean that the model is unbiased) with body size as a cofactor, and the source of data (i.e., the study where the data was originally collected) as a random factor. It appears that the slope and intercept of the regression for speed, attack rate and capture probability do not significantly differ from 1 and 0 respectively, with no significant effect of size nor the source of data. On the other hand, the model fails to accurately predict handling time, which is the only parameter that does not rely on mechanical factor in Portalier et al.'s original model. Results can be found in the main text (l. 252-260 pp. 12-13, l. 297-315 pp. 14-15) and the full details can be found in the supplementary material.

3. Data interpretation.
The authors did not describe the results.

With the addition of the measures for the goodness of fit, the validation of the results should be clearer. However, due to length constraints, we focused on the implications of the results in terms of theoretical advances or insights. More specifically, we discussed the fact that considering the mechanical factors from the medium leads to a good prediction of speed, attack rate and capture probability without the need for empirical measurements. Only handling time is poorly predicted, but it is also not affected by mechanical factors in the original model. More details on the results per se (i.e., how attack rate and handling time vary according to predator and prey sizes) can be found in the Supplementary material (Fig. S2).

Detailed comments:
Abstract:
What is the aim of this work? What are the main results and conclusions of this work? I suggest that this information should be explicitly provided in the abstract section.
We thoroughly revised the abstract in order to make it clearer. In particular, we emphasized the fact that the aim of the study was to promote a novel approach to derive functional response by considering the physical properties of the surrounding medium. We also mentioned that our derivation from Portlier et al.'s model that we proposed was a first attempt to achieve this goal, and that we used the results from the model to point out possible improvements.

Introduction:
What are the specific scientific problems proposed to solve in this work?
What is the relationship in the following parts? For example, line 33 (Introduction), line 65 (Physical features of the medium and size-related constraints), line 129 (A case study as an example of new mechanistic approaches).

We thoroughly revised the manuscript to make it clearer that the goal is to emphasize the need to include factors from the physical medium. The section "Empirical evidence of the impact of the physical properties of the medium on functional response" gives a general overview of factors from the medium that have been shown empirically to have effects on functional response. The section "Theoretical approaches to the role of physical features of the environment on predation" provides a review of former theoretical studies that took some aspects of the medium into account and their effects on predator-prey relationship. Last, in the section "A first case of an inferring of the functional response from the physical properties of the medium", we present our model as a first step towards the goal presented in the previous section. We hope that this revised structure will make the manuscript clearer.

Line117-124. The "novelty" and the "strength" related to the "approach" proposed by the authors, are the highlights of this work, and the author elaborated it is unpredictable, and it is necessary to elaborate in detail.

We provided more details on our derivation of the functional response from the original study (Portalier et al., 2019) (pp. 10-11). We also gave more information about the implications of the results (i.e., the fact that it is possible to derive attack rate and capture probability from body size and the physical components of the medium, but that it still needs further developments). We also discussed potential way to improve the model and future directions.

A case study as an example of new mechanistic approaches
What does this part do? What's the relationship with “Main framework”? Is the main framework affiliated with the author or the "case study"?

We revised the structure of the manuscript. It should be clearer now that the model presented is a first attempt to achieve our goal. Even though we knew that further developments are needed before we can reach a sound physics-based functional response, we thought that it was important to show in this perspective paper, the potential of the approach with a first derivation from one of the most advanced models so far. We agree that the term “main framework” was misleading, thus we removed it. We also replaced the section title (“A case study as an example of new mechanistic approaches”) by “A first case of an inferring of the functional response from the physical properties of the medium”.

The confusion arises follows:
Are the equations (model) from 1 to 4 proposed by the authors or the "case study"?
What is the foundation for proposing these models?

Following our response to the former comment, it should be clearer now that the equations are the same as used in the Portalier et al.´s (2019) article that considers mechanical factors and body size in a predator-prey interaction. We also provided additional information about this model (pp. 10-11) so that the readers understand the assumptions and algorithms underlying our derivation of the functional response.

Validation of the model
How to verify the effectiveness of the model? Are there some specific statistical methods to test the agreement between predicted and actual observations?

As explained above, we computed the RMSD for each parameter, and we also tested for model bias by doing a test on the slope and intercept of the regression of observed versus predicted data for each parameter with body size as a cofactor (except for capture probability), and the source of data as a random factor (except for speed).

Discussion
Discussions should be an important part of research papers. In terms of this work, it is necessary for the authors to discuss the ecological significance of the established model and its application value deeply.

We developed the validation and conclusion sections to emphasize the insights that one can get from this kind of approach. We also discussed potential improvements to the model and ways to push this approach further.

Animal size is affected by developmental stages as well as contaminants. How will these factors be taken into account in building the models? What are the use scope and limitations of this model? These issues are necessary to be fully discussed.
However, this manuscript does not contain this part.

Portalier et al.'s 2019 model considers size as the main trait characterising organisms. Thus, two individuals taken at two different development stages (for example) would behave differently as long as they differ in size. On the other hand, two individuals at two different stages but of the same size would be considered as similar.

Conclusions
The conclusion part should be a concise summary of the experimental results, rather than to discuss.

We revised the conclusion to emphasize the potential insights that one can get from the novel approach that the model illustrates.