Dear Editorial board,

Please find attached our manuscript entitled “Drivers and vulnerability of global coral reef fish functions” for consideration as a research article in Nature.

Biological processes of consumer species, such as ingestion, growth, respiration, and excretion are important drivers of ecosystem-scale biogeochemical cycles. Fishes are key players in biogeochemical cycles across aquatic ecosystems, in particular in coral reefs. Due to methodological challenges, existing studies assess their important functional role by using proxies of function rather than quantifying actual processes. A lack of quantification of functions by fish impedes our understanding of community drivers of ecosystem functions as well as their vulnerability to change. Anthropogenic stressors such as extensive exploitation and climate-change induced coral loss are drastically affecting fish communities in coral reefs worlwide. It is therefore urgent to understand how multiple ecosystem functions interact, assess what drives them, and gauge their vulnerability to ongoing stressors.

In our manuscript, we overcome methodological challenges of quantifying functions by combining novel data and innovative bioenergetic models to quantify five key ecosystem functions by fishes on a global scale. We demonstrate that beyond the obvious relationship with biomass, functions are highly variable. Moreover, we reveal a trade-off between functions for communities with similar biomass. As a consequence, at a certain biomass it is not possible to maximize all functions. We then show that this variability whitin and among functions is driven by varying elements of community structure and species dominance. Furthermore, we show that certain species vary often dominate functioning on a local scale, while the identity of the dominant species varies a lot. This means that most species are important for functioning at a certain location, yet no species is important across its range. Finally, we illustrate the variable vulnerability of functions to two major stressors; exploitation and coral loss.

We believe our manuscript is ideally suited for the broad readership of Nature because it introduces several concepts that are completely novel and improve our understanding of coral reef ecosystem functioning. In light of the fundamental importance of fishes for humanity and the intensifying anthropogenic threats to aquatic ecosystems, our work represents a timely advance in ecology and provides a new avenue for conservation biologists to gauge ecosystem functioning.

Thank you for your consideration. We look forward to your response. Kind regards,

Nina M. D. Schiettekatte, on behalf of all co-authors