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Ocean Calamities: Delineating the Boundaries between Scientific Evidence and Belief

We welcome the contributions of Jacquet and colleagues (2015) to the debate we opened (Duarte et al. 2015). They begin by pointing out that marine extinctions go unnoticed and that, by waiting to collect data before taking action, we are losing precious time. They therefore imply that, by calling for a more rigorous analysis of ocean calamities, we are slowing progress for ocean protection. This is a false dichotomy. We called for a more critical examination of data so that we may better assess the generality, severity, and immediacy of ocean calamities in order to better focus—not slow down—conservation efforts. This debate is about neither distributing shame (cf. Jacquet 2015) nor assessing who holds superior scholarship practices. Indeed, we deliberately stressed the limitations of evidence in our own work (e.g., Vaquer-Sunyer and Duarte 2008).

The core of the debate we proposed is about the collective responsibility of scientists to clearly delineate the boundaries between scientific evidence and belief, thereby separating our views as marine scientists from our beliefs and values as conservationists.

We agree with Jacquet and colleagues (2015) that there is a long list of human impacts on the ocean, which we acknowledged in our article and have discussed in detail elsewhere (Duarte 2014). However, we argued that some of the calamities composing the syndrome of collapse of marine ecosystems may not be as severe as is portrayed in some narratives and provided examples to support our point.

Jacquet and colleagues (2015) argue that our manuscript misrepresented what is known about human impacts on the ocean. A more careful reading of our article reveals that we provided an approach for assessment of whether perceived ocean problems represent ocean calamities, illustrated with a few examples. However, we did not claim to have conducted a thorough auditing exercise but rather suggested that "a robust audit of ocean calamities, probing into each of them much deeper than the few examples provided here, is imperative to weeding out the equivocal or unsupported calamities" (Duarte et al. 2015).

Jacquet and colleagues (2015) claim that we ignored important scholarship showing strong evidence for calamities that we suggested were insufficiently supported. Their charge is based, however, on a single case—that of eutrophication and hypoxia, which they support with two references. Contrary to their assertion, neither one of them provides long-term evidence that hypoxia has increased globally. Their long-term evidence refers to a single case in the Gulf of Mexico, which cannot be extrapolated globally. In addition, contrary to their statements, we acknowledged losses of habitats and marine biota as important problems, and nowhere in our manuscript did we dispute that eutrophication has increased in coastal ecosystems around the world.

Jacquet and colleagues (2009) argue that "there is far greater risk in failing to detect existent impacts than in having detected nonexistent impacts." We concur with this statement but argue that detection and attribution must conform to robust practices, as O'Connor and colleagues (2014) delineated for impacts of climate change. Whereas we believe—to continue with the example they choose—that hypoxia is likely to have increased in coastal systems globally, we acknowledge that our belief is no substitute for robust evidence. We argued that in this and in other cases, we should not be content with current evidence and that we must extend our efforts to separate a possible global spread of hypoxia from a global increase in the likelihood of detection (Duarte et al. 2015).

Jacquet and colleagues (2009) object to our belief that "things are better off

than most people perceive." However, a survey on the understanding of impacts on the ocean of over 10,000 European citizens indicated that nearly 50 percent of the respondents overstated the severity and immediacy of climate-change impacts on the ocean (Gelcich et al. 2014). If a large fraction of the public believes that the impacts forecasted under various scenarios for 2100 or beyond have already occurred, what would be their incentive to engage in actions to avoid such impacts? We call for an evidence-based narrative that reflects sound empirical approaches to underpin a realistic accounting of the state of the oceans, both positive and negative, accompanied by a focus on solutions and communication of outcomes.

Like Jacquet and colleagues (2009), we believe that a focus on solutions would lead to better outcomes and stewardship of ocean health. Indeed, we join Jacquet and colleagues (2009) in celebrating the positive contributions scientists make to improving ocean health, and we are encouraged to hear of the positive experiences they report on their interactions with the media. We hope that such positive experiences and outcomes spread further. In the interim, we emphasize our advice to continue to make efforts to improve the evidence underpinning our assessment of ocean calamities. Scientific rigor should never be compromised when evidence is insufficient to support our beliefs.

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