Stawitz et al. present an analysis of seafood mislabeling and make inferences about its financial and ecological implications. We applaud the authors for tackling this important topic. As presented, however, we have reservations about the research which call into question the main conclusions. First, based on the data and results that are presented, there appear to be errors and some of the conclusions are not supported. Second, there may be a bias in the analyses that favors the conclusions. Third, details are lacking regarding the analyses, challenging their verification. We briefly describe some of the issues.

At least, two main conclusions are not supported by the data and analyses presented. The authors claim that mislabeling results in the consumption of fish with less endangered conservation status, and thus “mislabeling may not mislead people into eating less sustainable seafood.” First, the authors fail to mention that many substitute species come from aquaculture, where IUCN status is less relevant and environmental impacts are commonplace (e.g., Salmo salar and Pangasius spp.). In fact, it is perplexing that S. salar (Atlantic salmon) is included as a mislabeled species in the conservation status analysis, since it is commonly a substitute and rarely a mislabeled species (Cline 2012; Warner et al. 2015). Second, there are apparent errors. From our analysis of the data sources (Table S1 in Stawitz et al. 2016), 11 studies included salmon, and only two samples labeled as Atlantic salmon were mislabeled, substituted by Oncorhynchus mykiss in both cases (Filonzi et al. 2010). The former is listed as least concern and the latter has not been assessed (IUCN 2016). Yet, the authors’ figure 2 (with no sample sizes reported) shows Atlantic salmon having an IUCN status of near threatened being substituted by a species with a status of least concern. It is unclear why Atlantic salmon (i.e., an aquaculture product) was included in the IUCN analysis, but several studies targeting wild Pacific salmon (Oncorhynchus spp.) were omitted, some of which revealed high levels of mislabeling (e.g., Cline 2012; Warner et al. 2015). Third, we suspect that outliers might be driving the authors’ conclusion that true species
are of improved conservation status. In figures 2 and S7, there are more seafood pairs that are in the opposite direction (i.e., true species are of diminished conservation status), and there are a few pairs with large differences in the direction of the author’s conclusion (i.e., grouper and toothfish). This may be influencing the overall conclusion; the authors state that the rest of the data (not included in figure 2) “had no difference in IUCN status between labeled and true items.”

A bias may be present in the analyses favoring the conclusion that “mislabeling results in the sale of items of better conservation status and nearly equivalent price.” In choosing substitutes to compare for cost and IUCN status, the authors exclude data-deficient species from their analysis. Thus, substitutes they consider may be drawn from a subset that is likely more valuable, better managed, and information rich. Similar biases have been documented in other systems, where research output was strongly biased toward well-funded settings and more common species (Roberts et al. 2016). Thus, the author’s substitutes may overrepresent the value and conservation status of substitutes in general, in the direction of the authors’ conclusions. It might be possible to avoid this potential bias by using life history-based indicators of sustainability. Given the data presented, we cannot quantify the bias (e.g., the authors fail to report the mean IUCN status of labeled and true fish species, and their table S3 reports the number of mislabeling cases, while it is the species that is of interest).

The second problematic conclusion is the claim that “distributors had the highest probability of serving mislabeled items (mean = 0.184).” The authors suggest that efforts to reduce mislabeling should be prioritized “at points in the chain-of-custody beyond ports, where the majority of mislabeling occurred.” In figure 5 (with no sample sizes reported), however, the variability across purchase locations is substantial, and no pairwise tests are presented. Further, the statistical model is suspect. The authors first describe the model using a binomial distribution and response variable (i.e., mislabeled or not). They then present the model with mislabeled probability as the response variable (equation #1). The fact that the best performing model (i.e., source) has an AICw of 0.99 and that other models that include the same fixed effect have AICw of 0 suggests that all models in the set could be quite poor. Yet, there is no reporting on the goodness of fit or over dispersion in the final model—both standard practices, nor reporting on the deviance explained and the AIC of the null model which would allow evaluation of the explanatory power of the model.

As important, the above conclusion is based on an unbalanced dataset for five species, including the rarely mislabeled Atlantic salmon. This dataset also appears to contain errors. It includes a single study focused on distributors, which includes only 10 samples covering three of the five focal species, of which none were mislabeled (table 1 in Cawthorn et al. 2012). It is unclear where the 18% probability of mislabeling comes from. Cawthorn et al. report an approximately 9% mislabeling rate for all their 108 samples at the distributor level. Similarly, the port mislabeling rate is based on two studies with contradictory results: one from the United States reporting a mislabeling rate of 15% and one from Taiwan reporting a mislabeling rate of 70% from 34 samples for 17 seafood products (US Food and Drug Administration 2014; Chang et al. 2016). But the former study includes only two of the focal species and the latter study contains none.

While we commend the authors for their efforts to go beyond seafood mislabeling documentation, the above issues are not minor and are even more concerning given additional issues with the data, analyses, and reporting (Table 1). Combined with the potential bias, the
inferences of the manuscript are not supported, as currently presented. Seafood fraud is a nascent topic, one in which natural and human systems are interacting in complex ways that are likely resulting in place-based consequences. To characterize the system dynamics and provide insights into the financial and ecological implications of seafood fraud, a more careful and cautious approach is required. We urge the authors to formally address these issues and revisit the conclusions of their research.

References


