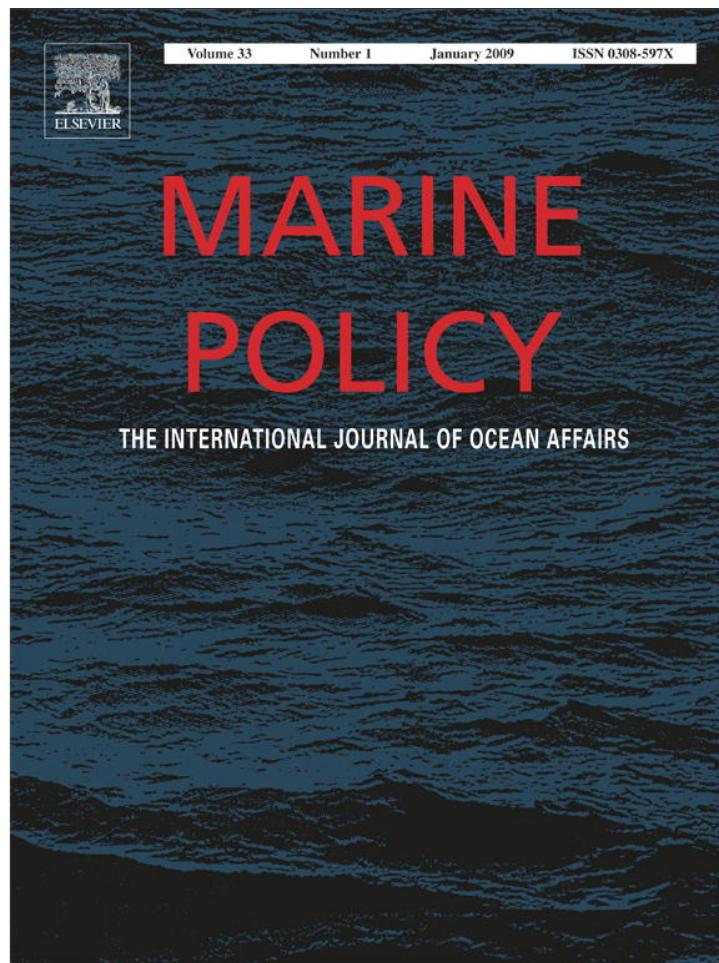


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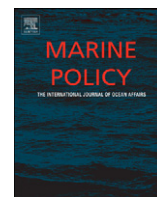
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Letter to the Editor

Out of new stocks in 2020: A comment on “Not all fisheries will be collapsed in 2048”

Branch [1] asserts, probably correctly, that not all fisheries will be collapsed in 2048. He understands this as critique of Worm et al. [2] who predicted—if current trends continue—“the global collapse of all taxa currently fished” by 2048. Branch first criticizes the “problematic assumption that catch is a proxy for abundance [...] noting that catches fluctuate for many reasons, for example, regulations, the environment, cyclic dominance, market forces and errors in global catch databases.” Two of us [3] have published the original method used by Worm et al. [2], and we would like to insist that declining catches are an indication of declining stocks. Assuming otherwise would imply that all fishers or regulatory agencies in large marine ecosystems such as the Mediterranean drastically reduce fishing of a species without the stock being in decline. Except for the World Wars, we are not aware of any such case.

Branch bases his criticism on the observation that, over time, “the total number of fisheries has grown and counterbalances” the effect of collapsed fisheries. Also, some collapsed stocks recover and this would result in 50–55% of the stocks being recovered in any given year. We were not able to reproduce these results.

We repeated the analysis of Worm et al. [2]. Since we did not have access to catch data by large marine ecosystem (LMEs) as used by Worm et al., we used catch by FAO area instead, with species groups and methods as described in [3]. Plotting, for any given year, the percentage of stocks with catches of less than 10% of maximum catch showed a clear increasing trend, confirming Worm et al. We fitted a linear regression to data from 1970 onward. This accounted for 98% of the variability in the data, showing a steady increase in percentage of collapsed stocks over the past 35 years (Fig. 1). This trend accounted for recovered stocks as well as new and never collapsed stocks, which altogether form the total of fished stocks. The increase in collapsed stocks means that, in every year since 1970, more stocks collapsed than recovered or entered the fishery. If the observed trend were to continue unabated, all fisheries would yield less than 10% of their maximum catches in 2110. This prediction is more conservative than the 2048 collapse predicted by Worm et al. because (a) we fitted a linear instead of a power function and (b) our areas were larger, often including several LMEs, so that a collapse in one LME may be masked by stable yields in another LME. We think the projected year is less important than the fact that collapses of stocks continue to increase.

Note also that the number of new stocks entering the fishery is steadily declining, as shown in Fig. 2. A robust regression analysis, which gives less weight to potential outliers, showed a continuous decline of new stocks, accounting for 48% of the variability in the data. If the trend were to continue, it predicts an exhaustion of new fishable stocks by 2020. Unless recovery rates of stocks

increase, this will further increase the percentage of collapsed stocks.

In summary, our analysis confirms the continuous absolute and relative increase in collapsed stocks shown first by Froese and Kesner-Reyes (2002) and later by Worm et al. (2006). We found that the number of new stocks entering global fisheries is decreasing and that the global reservoir of unexploited fishable stocks is likely to be exhausted in 2020. With clear increase in collapsed stocks and clear decrease in new stocks we cannot

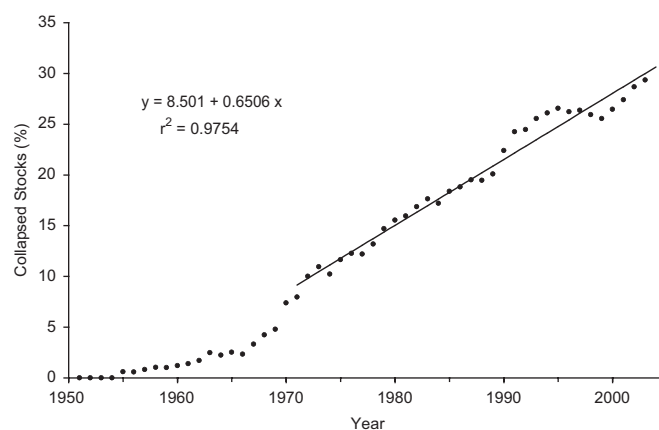


Fig. 1. Percentage of stocks yielding less than 10% of maximum catch from 1951 to 2003, based on catch data for marine fishes and invertebrates by FAO area. A linear regression for data since 1970 accounts for 98% of the variability.

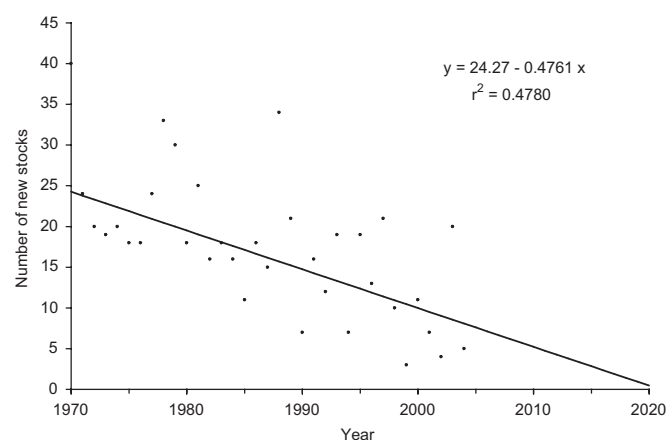


Fig. 2. Number of new stocks entering global fisheries from 1970 to 2004. A robust linear regression accounts for 48% of the variability in the data. If extended, the regression predicts exhaustion of new stocks in 2020.

confirm Branch's [1] assertion that "more than half of the world's fisheries would always be in a recovered state."

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