

Sea stack plots: replacing bar charts with histograms

Alice Stuart¹, Maja Ilić², Benno Simmons³, and William Sutherland⁴

¹University of East Anglia

²Queen's University Belfast

³University of Exeter Centre for Ecology and Conservation

⁴University of Cambridge

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Abstract

1. Graphs in research articles can increase the comprehension of statistical data but may mislead readers if poorly designed. Previous literature has found that the two most frequently used plot types - bar charts and dot and whisker plots - are a poor way to represent data because they only show the summary statistics of data, not their distribution, potentially hiding important information. 2. Calls have been made encouraging abandonment of bar charts and the use of more informative plot types, such as boxplots, violin plots, univariate scatter plots, and dot plots. We compare these plot types to assess their relative strengths and weaknesses to represent four different distributions of the data commonly observed in biological studies, finding that all the assessed plot types are either difficult to read at large sample sizes or misrepresent certain distributions of data. 3. We present an analysis of the plot types used in four ecology and conservation journals covering multiple areas of these research fields, finding widespread use of uninformative bar charts and dot and whisker plots (60 % of all plots showing one-dimensional data from multiple groups for the purpose of comparison). Some articles presented more informative figures by combining plot types, generally boxplots and a second layer such as a flat violin plot, to better display the data. This shows an appetite for more effective plot types within conservation and ecology, which may further increase if an accurate and user-friendly plot types were made available. 4. In response to this, we propose sea stack plots, which combine vertical histograms and summary statistics, and allow for an accurate representation of different data distributions, thereby largely overcoming the weaknesses associated with other alternatives to uninformative plots. We provide a tool to create sea stack plots with our R package 'seastackplot', available through GitHub.

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