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Acute toxicity largely reflects the salinity sensitivity of stream macroinvertebrates derived using field distributions

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Abstract. Two types of salinity tolerance information are commonly used for assessing salinity risk to freshwater organisms. These are data from laboratory experiments, usually acute ($\leq$96-h LC_{50}) values, and field distributions. Both approaches have advantages and limitations, and their applicability to the formation of guidelines and assessment of risks is not clear. In the present study, the acute lethal tolerances (72-h LC_{50}) and acute tolerance scores (ATS) of 37 macroinvertebrate families from Queensland, Australia, were compared with maximum field conductivities and previously derived salinity sensitivity scores (SSS). LC_{50} values were significantly correlated with maximal field conductivities and SSS. To investigate this relationship further, the changes in community structure related to an increase in salinity were assessed. A salinity index (SI) (based on cumulative SSS) and acute salinity index (ASI) (based on cumulative ATS) were calculated using an independent data set from south-east Queensland (429 samples) and compared with each other and actual conductivity levels. Both indices were significantly correlated with each other and followed a similar trend when plotted against actual conductivity. These results support the notion that salinity sensitivity of macroinvertebrates derived from acute toxicity experiments reflects sensitivities derived using field distributions. Definition of this relationship will allow the two sources of salinity sensitivity to be combined in a weight-of-evidence approach, resulting in a more robust data set with which to estimate safe salinity concentrations.

Additional keywords: aquatic invertebrates, ecological indicators, salt pollution.