REPORT

Meta-analysis reveals declines in terrestrial but increases in freshwater insect abundances

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Are freshwater species really bucking the trend of global insect decline?

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(29 May 2020)

In their recent meta-analysis, van Klink et al. (1) reported a worldwide increase in the abundance and biomass of freshwater insect communities, based on long-term monitoring surveys (mostly from Europe and North America). Such positive trend contrasts with the negative one found in terrestrial insects, and with the global decline of insect biodiversity reported elsewhere (2, 3). The authors found a positive association between freshwater insect abundance and crop cover, which they attribute to agricultural practices having become less detrimental to water quality, leading to overall improvement of freshwater habitats.

Based on reviews and databases of freshwater insects referring to the past decades (2–4), we argue that the observed increase in total biomass and abundance could be actually associated with negative changes in habitat conditions and community structure. In fact, alteration of chemical and physical ecosystem conditions has been associated with increase in abundance and biomass of widespread, pollution-tolerant, and euryoecious freshwater species (4, 5). These generalist species thrive after severe alteration has occurred in freshwater systems, and they remain favoured even under increased nutrients and decreased concentration of toxic pollutants. Meanwhile there has been a decline of abundance and distribution range of many species sensitive to waterbed and watershed alterations, water pollution and dredging, invasive species, and increasing

global t...

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Competing Interests: None declared.

Context matters for studies of insect abundance and biomass

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(28 May 2020)

Insect declines are of growing importance and concern at the global scale (1). In a recent report (2), van Klink et al. presented the most comprehensive meta-analysis of insect abundance and biomass trends in both terrestrial and freshwater ecosystems to date, finding that terrestrial insects declined ~9% per decade and freshwater insects increased ~11% per decade. Notwithstanding this important and timely effort by the

researchers, we contend there are critical limitations of the work that can lead to problematic interpretations.
A particular concern is that the trends from terrestrial and freshwater ecosystems were compared without necessary context. The majority of terrestrial studies (47/70 data sources, 67%) were single-taxon studies, e.g. “butterflies,” “ground beetles,” and “ants,” many of which are increasingly threatened by anthropogenic factors (1). Meanwhile, 83% (52/63 data sources) of the data for freshwater studies indicated the examination of the whole community (i.e. taxonomic designation of “freshwater invertebrates”). Freshwater invertebrates have diverse responses to anthropogenic impacts (3) and freshwater ecosystems face multifaceted drivers of environmental change (4). In many impaired ecosystems, pollution-tolerant species become more abundant. Tracking the collective abundance of all freshwater invertebrates without further taxonomic context does not provide support for the claim made by van Klink et al. that the observed increases in abundanc...

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Global syntheses of biodiversity require community-driven approaches to reduce bias

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Van Klink et al.’s(1) recent meta-analysis of insect abundance trends adds an urgently needed synthesis to the literature on biodiversity change. As the authors state, their data set of 166 studies has geographic biases and other limitations that illustrate the complexity of understanding humanity’s effects on other species. One solution is new data collection(2), but there also is considerable opportunity to bolster understanding of global insect population trends by improving the way we use existing literature.

We applaud the authors for searching in both English and Russian; however, non-English literature potentially constitutes one-third of conservation research(3) and the systematic exclusion of languages exacerbates geographic biases(4). Exclusion of grey literature adds further biases because small effects often go unpublished(5). Disciplinary fragmentation(6) leads to further problems when large bodies of literature are not identified through a comprehensive, systematic search strategy designed to limit biases(5).

Solving these problems is challenging for pressing global problems such as insect decline, where a vast literature is scattered across countries, languages, and disciplines, ranging from agronomy and public health to ecology and conservation biology. Community-driven approaches to synthesis may provide a solution(7). For instance, EntoGEM is an open, transparent synthesis project that uses emerging evidence synthesis technology and crowdsou...

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