

OUTLINE: Harmonized macroinvertebrate trait database, Aggregation of traits, Trait definitions, Sources

1 Introduction

Intro: For what are traits used?

Knowledge on macroinvertebrate traits → trait databases

Goal: We harmonized information from different trait databases of four regions in the world, namely: Australia, Europe, North America, and New Zealand.

Studies that use information on aquatic invertebrate traits from different regions and/or aggregate trait information are increasing

In this paper we examine difficulties that ecologists face when using different macroinvertebrate trait databases together. We explore the effect of different decisions researches have to make when working with trait data from several regions/sources, involving harmonization, handling different codings, normalization, and aggregation of traits. Therefore, we harmonized six traits from four trait databases and aggregated the trait information to family level. Our paper also compares the references for the used trait information that were specified in the used trait databases. Finally, we present an overview of differences in trait definitions among databases.

That means:

- How to harmonize different trait databases when the task involves using traits from different regions (e.g. for comparing trait profiles across regions) → Harmonization
- Thereby, we will examine differences in trait definitions
- Look on the sources of various trait databases
- Furthermore, show effect of different ways of aggregating traits (inter alia Problem of different coding styles (fuzzy vs binary))

2 Description of harmonized trait database

The harmonized database consists of the available information on aquatic invertebrate traits for the regions Europe, North America, Australia, and New Zealand and comprises the traits locomotion, feeding mode, respiration, voltinism, size, and body form. The pattern of development (holometabolous or hemimetabolous) was added as an additional trait based on the orders of the taxa included in each database. Traits for Europe were retrieved from the freshwater ecology trait database (<https://www.freshwaterecology.info/>) and complemented by information from Tachet (Usseglio-Polatera et al. 2000). North American macroinvertebrate traits were taken from Laura Twardochleb and complemented by trait information from Viera (Vieira et al. 2006). An overview of the used databases can be found in table 1.

In the following paragraphs, we describe the data processing steps required to establish a harmonized macroinvertebrate trait database.

Table 1: Overview of trait databases.

| Region | Coding of trait states | Reference |
|----------------|------------------------|---------------------------------|
| Europe | Largely fuzzy | Schmidt-Kloiber and Hering 2015 |
| Central Europe | Fuzzy coded | Usseglio-Polatera et al. 2000 |
| North America | Largely binary | Vieira et al. 2006 |
| North America | Largely binary | cite Laura Twardochleb |
| Australia | Binary & fuzzy coding | Kefford et al. 2019 |
| New Zealand | Fuzzy coded | |

3 Harmonization of traits

- Harmonization process: See also Schmera 2015 et al
- Differences in trait definitions
- Sources of traits

4 Aggregation of traits

- Describing & testing different approaches
- Problem of coding of traits

Additional ideas

Section Description of databases:

- Describe different databases briefly?
- State goal of analysis → reference to second paper?