Microturbellarian species richness and community similarity among temporary pools: relationships with habitat properties

AVI EITAM1,3,* CAROLINA NOREÑA2 and LEON BLAUSTEIN1

1Community Ecology Laboratory, Institute of Evolution, University of Haifa, 31905 Haifa, Israel; 2Departamento de Biodiversidad y Biología Evolutiva, Museo Nacional de Ciencias Naturales, c/José Gutierrez Abascal 2, E-28006 Madrid, Spain; 3Current address: Department of Entomology, University of Kentucky, S-225 Ag. Science Center North, Lexington, KY 40546-0091, USA; *Author for correspondence (e-mail: eitam@yahoo.com; fax: +1-859-323-1120)

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Abstract. Temporary water bodies exhibit a high level of biodiversity, much of which is unique to these habitats. Studies of microturbellarian community ecology in temporary pools are scarce, even though turbellarians are potentially important in organizing community structure. Moreover, there has been virtually no documentation of microturbellarians from Israel. We examined the relationships between several pool properties (surface area, water depth, permanence and sediment depth) and microturbellarian species richness among 52 temporary pools at a single site. A total of 17 taxa of microturbellarians were identified, of which 14 were determined to genus or species level. Richness was positively related with surface area and with maximal sediment depth, together explaining 54% of the variance. In more intensive sampling of a subset of 18 pools, surface area was the only significant predictor, explaining 76% of the variance. Community dissimilarity was positively related with differences in both surface area and permanence. We identified three categories of pool size, each characterized by different turbellarian species: large pools were dominated by Castrada viridis and Gieysztoria cuspidata, intermediate pools by Dochmiotrema limicola, and many of the small pools by Gieysztoria ornata and Olisthanella obtusa. Large pools contributed the most to regional diversity, with 11 of the 17 observed taxa. However, some species were unique to small pools. Thus, in order to maintain maximal regional diversity of temporary water turbellarians, it is important to conserve habitats containing pools of various sizes.

Introduction

Temporary water bodies exhibit a high level of biodiversity, much of which is unique to these habitats (Bazzanti et al. 1996; Boix et al. 2001; Vagaggini et al. 2002). Despite the ubiquity of temporary pools, much remains unknown about the invertebrates that inhabit them, with many taxa still undescribed (King et al. 1996).

Data on turbellarians worldwide are particularly scant compared to other taxonomic groups, and there has been virtually no documentation of microturbellarians from Israel. The bulk of the literature on microturbellarian communities is concerned with species assemblages in lakes and running waters
(Kolasa 1991, 2000, and references therein; Noreña-Janssen 1995). In contrast, studies of microturbellarian communities in temporary pools are rare (e.g., Heitkamp 1982; Therriault and Kolasa 1999). Yet large microturbellarians are potentially important in organizing the community structure of other components such as mosquitoes and crustaceans (e.g., Case and Washino 1979; Maly et al. 1980; Kolasa 1984; Blaustein 1990; Blaustein and Dumont 1990), while smaller species are important consumers of protozoans, rotifers and algae (Kolasa 1991).

Various habitat characteristics may influence species richness in temporary pools. Studies on a variety of animal taxa have demonstrated relationships of species richness with either pool size (Ward and Blaustein 1994) or permanence (Holland and Jenkins 1998; Bilton et al. 2001; Eason and Fauth 2001; Therriault and Kolasa 2001) or both (Spencer et al. 1999; Rundle et al. 2002). Surface area, as a major component of pool size, should influence the number of microhabitats per pool (March and Bass 1995). Pools with larger surface areas would also have a greater chance of being colonized (Roth and Jackson 1987; Pearman 1995; Wilcox 2001), and would experience more moderate temperature fluctuations (Brönmark and Hansson 1998). Similarly, water depth could have an influence on habitat heterogeneity, and also on physical water properties such as temperature (Beiswenger 1977). Permanence, or hydroperiod, would influence the probability of life cycle completion prior to drying of the pool (Wellborn et al. 1996), thus affecting the probability of extinction. Finally, sediment is important as a repository for resting eggs (Brönmark and Hansson 1998). At least some turbellarian species may survive as active stages in the interstitial water (Kolasa 1991).

In this study, we examine the relationships between several pool properties (surface area, water depth, permanence and sediment depth) and microturbellarian species richness among 52 temporary freshwater pools at a single site. In a subset of 18 pools, we determine species composition over a full 4-month season. For these pools, we re-examine the relationships between pool properties and species richness, and analyze community similarity along gradients of pool size and permanence.

**Materials and methods**

**Study site and sampling procedure**

The study site was located on the southern slope of Mt. Kabul and the adjacent northern slope of Mt. Shekhanya, Lower Galilee, Israel (32°51’ N, 35°14’ E, elevation 340–390 m). The habitat is a combination of natural oak and planted pine forest, greatly depressed by overgrazing; thus, the majority of the surface area is covered by bushes such as *Pistacia lentiscus* L., with much exposed rock or soil. In Israel, rainfall is restricted mainly to winter, usually from late October to April, with the majority of precipitation occurring between December and February.