Limnologica 42 (2012) 254–263

Contents lists available at SciVerse ScienceDirect

Limnologica

journal homepage: www.elsevier.de/limno

Tyre track pools and puddles – Anthropogenic contributors to aquatic biodiversity

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ARTICLE INFO

Article history:
Received 21 November 2011
Accepted 20 July 2012

Keywords:
Ponds
Biodiversity
Conservation value
Taxon richness
Agriculture

ABSTRACT

Twelve sites of tyre track pools and puddles situated in woodland, heath and pasture in Dorset UK were examined to determine their macroinvertebrate species richness and community changes over the course of one year.

174 taxa were found with Diptera (59) and Coleoptera (48) contributing 61% of the total. The most frequently occurring and ubiquitous groups were nematoceran dipterans, Oligochaeta, Coleoptera, Crustacea and Lamellibranchiata.

Species richness varied with season and on average was highest in March and November samples. On average only 26% (range 16–40%) of the combined total number of taxa found in spring (March) and autumn (November) samples from a site were also found there in each of these seasons individually, indicating a high species turnover through the year.

The tyre track pools contributed to local aquatic biodiversity by adding 29 taxa to previously published taxa lists from aquatic habitats in the area. The relative richness of the tyre track pools is attributed to their successional variation in a heterogeneous landscape.

Conservation value of 9 of the 12 sites was rated *Very high* to *High* and nine regionally notable or rare taxa were recorded. It is suggested that the important conservation status of the tyre track pools warrants greater recognition and further intensive study.

Introduction

In recent years there has been an increasing interest in the role of ponds and small water bodies in maintaining aquatic biodiversity in the landscape (Oertli et al. 2005; Miracle et al. 2010). These water bodies may be permanent or temporary and their importance in contributing to aquatic biodiversity has been recognised in 2 detailed reviews (Wiggins et al. 1980; Williams 2006). The majority of studies have concerned temporary ponds particularly in relation to biodiversity and permanence (Schwartz and Jenkins 2000; Boix et al. 2001; Nicolet et al. 2004; Sanderson et al. 2005; Porst and Irvine 2009; Vanschoenwinkel et al. 2009; Wissinger et al. 2004; Ruhí et al. 2012), and the need to protect and conserve these environments has been a central research issue for the European Pond Conservation Network (EPCN http://campus.hesge.ch/epcn/publications.asp [18 May 2011]).

In contrast to the amount of research on natural temporary waters, anthropogenic habitats have been less well studied. Although there has been work in larger man-made water bodies (farm ponds (Céréghino et al. 2008; Brainwood and Burgin 2009; Gioria et al. 2010), irrigation pools (Abellan et al. 2006) experimental ponds used to examine ecological processes and conservation issues (Fairchild et al. 1999; Sunahara et al. 2002; Blaustein et al. 2005; Frisch and Green 2007; Mokany et al. 2008; Chase et al. 2010; Schröder et al. 2012)), studies of small 'accidentally' formed habitats are few. An exception is the work of Bilton et al. (2008) who examined the ecology and conservation status of a set of fluctuating and temporary ponds which included some formed on ancient cart tracks, in gateways and along hedgerows. Tank tracks on the military training area on Salisbury Plain (UK) are known to be important as habitats for fairy shrimp, *Chirocephalus diaphanous* and in Poland controlled use of 4WD vehicles and tractors has been suggested as a way of supporting suitable habitat for 2 branchiopod species *Branchipus schaefferi* and *Triops cancriformis* Goldyn et al. (2012) but most of the work specifically on tyre tracks and wheel ruts is concerned with damage to existing habitat and its repercussions (Thompson and Schlacher 2008) and their role in providing habitat for disease vectors in the tropics (Carlson et al. 2004; Malan et al. 2009). There has been no study specifically on the macroinvertebrate faunal communities of water-filled tyre tracks.

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http://dx.doi.org/10.1016/j.limno.2012.07.002

Fig. 1. High Wood (**hw1**) January.

Fig. 2. High Wood (**hw2**) January.

The initial stimulus for this study was the observation of large red clumps of tubificid worms under the ice of a water-filled woodland tyre track in January 2009 and a subsequent net sweep in another tyre track in another wood which revealed about 20 palmate newts and about 6 large aeshnid nymphs. Tyre tracks and puddles are associated with human activities. The increasing size of vehicles used in forestry and agriculture has meant that their impacts can be persistent and the soil and subsoil characteristics will determine whether the scars caused by vehicular traffic will retain water (Raper 2005; Ansorge and Godwin 2008). In the county of Dorset in southern England felling over the last 15 years of conifer woods planted about 50 years ago has resulted in deep tracks (up to 30 cm deep) on the forest floor. Where the soil is underlain with clay, water is retained forming small elongated pools in areas where no freshwater habitats existed previously. Similarly, in open field sites and along gravel tracks large vehicles have created water retaining areas where the soil conditions are suitable. Tyre tracks are common in the area and a systematic survey was initiated. It is the objective of this paper to describe the macroinvertebrate fauna and seasonal changes in a set of these habitats and to examine their role in the enrichment of biodiversity in the area.

Study area and methods

All habitats were located to the south of the River Frome in southern England (Latitude 50°40′22″N, Longitude 2°14′1″W). The area lies on Eocene clays, sands and gravel and the thin soils support a heathland habitat on the higher ground which has been extensively planted with conifers. On lower ground the floodplain is dominated by grassland and arable pastures. Tyre track pools in the area as a whole were most common in woodland and less so in fields and on heathland tracks thus of the 12 sites selected for study 8 were in woods, 2 in fields on the floodplain, and 2 on heathland tracks. Examples of the sites are shown in Figs. 1–8.

The 3 woods (Cole Wood (**cw1**, **cw2**), High Wood (**hw1**, **hw2**, **hw3**) and North Wood (**nw1**, **nw2**, **nw3**)) in which the 8 sites are located are plantations of Douglas Fir and Pine with Beech, Oak, Hazel and Ash also present. These woods have been subject to selective thinning over the last 15 years. The sites are located on main tracks and the degree of shading is variable depending on the width of the track and proximity of trees. Coombe Heath (**ch**) site is a small depression alongside the main track with a substratum of peat, sphagnum and gorse needles. The Winfrith Heath (**wh**) site is a deep puddle on a main track running through open heathland. The remaining sites are situated in pasture – East Stoke (**es**) is an isolated puddle caused by tractor movements and Wool Bridge (**wb**) is a depression caused by both tractor and cattle traffic located close to the River Frome and near to ditches draining the floodplain. All sites are isolated from each other and are not connected to any other body of water.

Fig. 3. North Wood (**nw1**) November.

Fig. 4. North Wood (**nw2**) February.