

SYSTEMATIC REVIEW SUMMARY

Background

Throughout Europe, saproxylic insects have been identified as a highly threatened community of invertebrates. Conservation management recommendations for saproxylic invertebrates advocate the continuous provision of dead and decaying wood microhabitats that they require for survival. In addition to protecting veteran trees, this can be achieved by leaving fallen dead and decaying wood *in situ* on sites, providing supplementary coarse woody material (CWM), inducing decay in mature trees and strategic planting in order to maintain a balanced age structure of trees in both space and time. Such site-based management interventions may be of importance when used as a conservation tool to bridge gaps between dead wood generations.

Objectives

The primary objective was to systematically collate and synthesise published and unpublished evidence in order to address the question “Are current management recommendations for conserving saproxylic invertebrates effective?”. The systematic review aimed to examine whether site-based manipulation of biotic and abiotic factors, such as the provision of supplementary CWM, inducing decay in younger trees or altering the degree of sun-exposure within a stand of trees, can benefit the saproxylic fauna. It was anticipated that the review would draw attention to areas where primary research, or long-term monitoring, would be valuable in order to substantiate the current management guidelines and to initiate evidence-based best practice in saproxylic conservation.

Search Strategy

Relevant studies were identified through computerised searches of the following electronic databases: ISI Web of Knowledge (including ISI Web of Science and ISI Proceedings), JSTOR, Science Direct, Directory of Open Access Journals (DOAJ), Copac, Scirus, Scopus, Index to Theses Online, Digital Dissertations Online, Agricola, CAB Abstracts, English Nature’s “WildLink” and the Countryside Council for Wales (CCW) library. Web searches were conducted using the internet meta-search engines Alltheweb and Google Scholar, in addition to inspecting the following statutory organisation websites: UK Department for Environment, Farming and Rural Affairs (Defra), Northern Ireland Department of Agriculture and Rural Development (DARD) and European Union portal (Europa). The specialist publication “Coleopterist” was searched by hand for any appropriate information. No specific non-English language searches were conducted. Bibliographies of traditional literature reviews and articles accepted into the systematic review at the full text stage were examined for studies that had not yet been identified by any other means.

Study Selection Criteria

The criteria, which studies had to meet for inclusion into the final stage of the systematic review, were:

1. *Subject*: any saproxylic invertebrate population or assemblage.
2. *Intervention*: any site-based management action.
3. *Outcome*: desired primary outcomes were change in population density for a target species or change in species richness within assemblages. Nonetheless, studies were not rejected on the basis of outcome.
4. *Type of study*: any.

Data Collection and Data Analysis

Study inclusion assessments were performed and the observed agreement between the two independent reviewers was deemed to be “substantially good”. Due to a lack of high quality data (i.e., long-term fully replicated and controlled field-based experiments or investigations) on changes in the long-term persistence of populations, or in species richness within assemblages, no meta-analysis was undertaken. In addition, the variation in type of investigation and range of outcome measures adopted in the studies precluded the use of formal statistical techniques.

Main Results

The available evidence is insufficient to critically appraise the effectiveness of any site-based conservation interventions for saproxylic species or communities in the long-term. However, there is a range of studies describing changes in the saproxylic fauna in response to a variety of habitat management interventions, observed over relatively short periods of time. The research suggests that incorporating a variety of different management actions, such as the retention of dead and decaying wood or the provision of supplementary CWM, into site management plans will increase microhabitat heterogeneity and therefore the diversity of species present on a site.

Conclusions

In the absence of robust, high quality evidence, recommendations relating to the use of specific site-based management interventions would be speculative. However, it is acknowledged that general proposals for the maintenance of suitable microhabitats, such as the protection of veteran trees within the landscape, are based on sound ecological principles and should not be discouraged even though experimentally rigorous evidence is lacking. Further primary research (including long-term monitoring) is required to fill the gaps in our ecological knowledge that potentially weaken the case for the effectiveness of current saproxylic invertebrate conservation action.

The evidence that is available suggests that management priorities should be to improve the diversity, quantity and continuity of dead and decaying wood on sites. Optimising microhabitat heterogeneity by artificially manipulating the orientation and type of CWM on a site may increase number of saproxylic species present and help to buffer populations against environmental change. Conducting such interventions within an experimental framework, and subsequently monitoring the saproxylic fauna throughout the lifetime of the dead wood, will generate important information on the relative value of different CWM constructions for target species/assemblages at each progressive stage of decay. Detailed information on the distribution and autecology of species, particularly those of conservation concern, must continue to be collated and disseminated in order to allow practitioners to allocate conservation resources effectively.