

Overview of invertebrates in the Goulburn Broken Catchment

**A background paper for the Goulburn Broken
Catchment Regional Catchment review process.**

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Disclaimer

This report was prepared for the general purpose of assisting with the Goulburn Broken Regional Catchment Strategy review and update. An exhaustive investigation was not appropriate for this purpose. The report is based on the best readily available information. The views expressed in the report are those of the author and do not necessarily represent the views of the GBCMA. Neither the author nor the Goulburn Broken Catchment Management Authority assumes any liability resulting from the use or reliance of its contents.

1. Introduction

This report is a background paper for the Goulburn Broken Catchment Management Authority (GBCMA) Regional Catchment Strategy review process. As part of this review process, a number of emerging biodiversity issues have been identified, including the conservation and management of non-threatened flora and fauna, aquatic ecosystems and non-vascular plants (cryptogams). This report focuses on the issue of invertebrate conservation in the catchment. The aim of this background paper is to provide a general overview of invertebrates in the Goulburn Broken Catchment, give some indication of their distribution, diversity and abundance in the catchment and to highlight their importance in ecosystem functioning and the provision of ecosystem services. Finally, potential threats to the invertebrate fauna are identified and actions to reduce these threats are outlined.

2. Overview of the diversity of invertebrates in the Goulburn Broken Catchment

Invertebrates constitute by far the majority of animal species in all habitats. Their patterns of diversity are not as well understood as for vertebrate animals – in part because of their great diversity, and in part because they are insufficiently studied. There is no broad survey information that can be used to describe patterns of invertebrate biodiversity in the GBC – instead we must use two other approaches: (1) the relationship between habitat diversity and species diversity, (2) examination of museum records.

Museums house insect specimens that are collected mostly in an ad hoc manner, which is therefore not an exhaustive collection of all species. For those insect records that have been entered into databases (which again, is a subset of all the records) it is possible to report which species are known from the GBC. We were able to examine the occurrence of Butterflies, Ants, Dragonflies and Termites using such data. We found records for 71 species of butterfly, 38 species of ant, 18 species of dragonfly and 14 species of termite. Although this level of species diversity is great compared to the vertebrate fauna

(ie.reptiles, birds, mammals) it should be kept in mind that the true diversity of these groups is likely to be even greater (because only limited surveys have been done) and that this short list covers only a small fraction of all insect species (for example beetles are one of the most species rich insect orders, but useful survey data is not available).

That part of the catchment that is currently least cleared (i.e. the foothills and mountains in the south east of GBC) is one of the richer areas for this invertebrate diversity. However, there are many species that are prefer the flat land to the north west, (e.g. *Papilio* butterflies).

Like other animals, there is a general correlation between habitat heterogeneity and invertebrate diversity. We expect there to be differences in the composition of the invertebrate fauna between each of the habitats of the GBC. Because so many insects interact closely with plants, there is also an expected correlation between the richness of plant species and the richness of invertebrate species (i.e. sites with many plant species will have a richer invertebrate fauna). Thus, areas with highest invertebrate diversity will be areas of remnant vegetation, particularly native grasslands and woodlands with diverse and high-quality understorey vegetation. In managed lands, highest diversity is likely to be found in well-established, sustainably managed production systems such as low-input orchards with diverse groundcover.

Disturbance does not always reduce the richness of invertebrate species – but it does tend to lead to homogenization, and threatens some “habitat specialist” insects. (i.e. if more and more habitat is disturbed, more and more places will tend to have a similar invertebrate fauna).

3. Role of invertebrates in catchment health and ecosystem functioning

Invertebrates are essential to many ecosystem processes. The ones most relevant in production systems are those we think of as ecosystem services. The components of

biodiversity that deliver these services, if managed sustainably, provide an important ecological and economic resource to farmers and growers.

Soil services

By eating plant matter (dead and alive) and animal matter (inc dead animals and faeces) processing they break down complex organic matter into simple nutrient molecules that can be absorbed by the roots of plants.

By mixing and processing organic matter into fine particulate material and by their creation of pores and channels , they enhance soil structure and its capacity to retain water and nutrients..

These services are important in maintaining soil health, and the health of plants growing in the soil.

All agricultural industries benefit from the activities of soil invertebrates – but particularly important in the GB are orchards, pastures and forestry.

Control of pests

The main predators of insects are other insects. The activity of predatory (or parasitoid) insects helps to control the populations of pests and potential pests. This fact is well understood by horticulturalists in GBC who sometimes pay to supplement the number of “natural enemies” in their crops (i.e. biocontrol). This ecosystem service is also provided for free (conservation biocontrol) but sometimes is limited by the loss of wild populations of natural enemies.

Pest control is most important to the fruit and vegetable industries in the GBC. It can also be important to pastoral industries (e.g. red legged earth mite might be susceptible to conservation biocontrol).

Pollination

Insects are the most important group of pollinators. The majority of native plant species require insect pollination. Many important crops in the GBC are either very dependent on

insect pollination (e.g. Pears and Apples) or slightly dependent on insect pollination (e.g. Canola). Given the value of insect pollinated crops to the CBC, the economic contribution of pollinators is great. We know that this ecosystem service is no longer provided sufficiently by wild insects because many growers in the GBC pay beekeepers to provide them with honeybees to supplement pollination by wild insects.

Pollination is important to many horticultural industries. It can also be important to pastoralists because some legume species (e.g. lucerne) rely on insect pollination for seed production.

4. Current status of invertebrates in the catchment

Most of the world's endangered species are invertebrates. However, they tend to be under-represented on governmental endangered species lists because of our limited knowledge, and because the public are more familiar with vertebrates. There are nevertheless 16 terrestrial invertebrates listed on the Flora and Fauna Guarantee schedule of endangered species. It is difficult to know the true distribution of rare and endangered species, but at least some of these species are known from the GBC (e.g. *Hemiphysalis mirabilis* [a Damselfly], *Acrodipsas brisbanensis* and *Acrodipsas myrmecophila* [Ant-Blue butterflies]). These species have attracted attention because they are relatively prominent, charismatic insects. Like most endangered species, they are likely to be associated with a habitat that is now very restricted, or subject to degrading processes. There are certainly many more endangered invertebrate species in the GBC. For example, the Golden Sun moth (*Synemon plana*) a species under consideration for EPBC Act listing, could well occur in the region in patches of relatively undisturbed grassland .

A major threat to invertebrate biodiversity is the clearing of native habitat, or the disturbance of native habitat such as through grazing, weed invasion or too frequent burning. These threats may place multiple pressures on invertebrate populations. For example grazing of native vegetation may impact directly on invertebrates species that depend on specific host plants for various stages of their life cycle by reducing biomass,

destroying flowering or fruiting bodies and disturbing the litter and soil layers of native vegetation. More subtle impacts however may occur through the continual grazing over long period of time, by changing the composition of native plant communities, increasing the sites susceptibility to weed invasion and the reduction of key elements such as litter and soil surface crust development. Roadside burning has an adverse impact on invertebrates and is one of the last areas of remnant habitat in many areas.

The use of insecticidal chemicals in agricultural may have impacts on non-target and useful native species. These chemicals have a direct effect on the immediate area of application, but can also have off site effects through spray drift or movement of chemicals in the water table. Insects can also be threatened by other agricultural chemicals, such as livestock drenches that end up in soils, or fertilisers that dramatically change the soil environment.

Increasing soil salinity and acidity will directly affect soil-dwelling invertebrates. It will also degrade some important habitats by causing a decline in some plant species – which will in turn effect insect populations.

5. Actions required

Recommendations

1. Prevent further loss of native vegetation. Use native vegetation retention controls to ensure that endangered EVCs are protected, e.g. in the irrigation area, protect remnant areas of Grey-Box – Buloke Grassy Woodland, through covenants and use of overlays to assist councils with planning applications.
2. Protect existing native vegetation from disturbance (e.g. grazing, weeds)
3. Utilise the current Bioregional planning processes to identify and protective significant habitats.

4. Increase public awareness about the role of invertebrates in catchment health and production. Educated the public about threats of removing firewood, burning stubble, leaving fallen timber, role of invertebrates in providing food for vertebrates, pollination of crops and native species and the formation of healthy soil. Biodiversity month can have an important role to play in this, as well as incorporating training for extension and agriculture officers as part of Whole Farm Planning.
5. Enhance remnant vegetation by appropriate revegetation where possible.
6. Highlight importance of biodiversity planting to encourage as wide a range of flora and fauna as possible, by appropriate planting in correct areas. Important to stress that it is not just about tree planting but also restoring native grass paddocks (see Action Statement for butterflies).
7. Provide or protect habitat refugia for insects in landscapes that are currently dominated by agriculture. This can protect populations of useful insects, such as those that provide pest control or pollination.
8. Recommend planting of native herbs and grasses within orchards to assist both in pollination and biocontrol of harmful insects. Research has been undertaken in this area.
9. Minimise inputs of insecticidal chemicals
10. Ensure chemicals are applied in a manner to reduce offsite effects.
11. Recommend planting of natural barriers to absorb insecticides. This has added advantage of encouraging invertebrates to assist pollination

12. Enhance natural pest control through conservation biocontrol – achieved by special plantings around agricultural areas to promote communities of insect predators and parasitoids.

13. Develop community-based economic incentives for the adoption of comprehensive sustainable production systems which use invertebrate biodiversity as a resource.