Constructing a simple food web for the Acid Grassland community

The aim of this exercise is that students make a list of the types of animals seen during a field visit and then construct a simple food web as a class exercise.

The food web can be constructed by creating a set of labels for the different types of herbivore, carnivore, insectivore, nectar feeder etc. that are found during the fieldwork. Other species (or taxonomic groups) known to use the site can also be added. These labels can be posted on to a board in class, and feeding relationships shown with lines linking the boxes to create a food web diagram. This is a good way of getting across the complexity of feeding relationships in a grassland community.

The notes below suggest a simplified classification of feeding relationships within a selection of the key groups to be found in acid grassland. Although this is actually a complex area, one can make some generalisations to enable children to construct a simple food web from the contents of their catch. A few mistakes in assigning species to their food type will not affect the overall educational outcomes. For more advanced student groups there can be more thorough checking using reference books and keys. For more depth, one can also consider the role of fungi and other decomposers in the system. Furthermore, acknowledging that different life-history stages may occupy different feeding niches would add even further depth to the work.

Looking as you walk.

This is a great and simple way to spot butterflies, moths, grasshoppers, large spiders, beetles, birds, mammals and other fairly conspicuous species. Butterflies can usually be identified from charts without having to catch them. For smaller, more elusive or harder to identify invertebrates, carrying a hand net and a container with a built-in magnifier, such as a nature viewer will make it much easily to pick up and view smaller creatures – which can be passed around without harming them.

Sweep netting.

A few swipes of a sweep net through grassland in summer is usually enough to net a large number of different types of invertebrate. This is recommended as the quickest and most reliable way to get a large selection of grassland species for a group exercise.

Important: *Always consult with the site owner/manager before carrying out fieldwork and complete a detailed risk assessment. Follow good fieldwork practice so as to minimise any potentially negative impacts of the work you are doing.*

1. Acid Grassland Invertebrates

Many of the invertebrate species to be found in Acid Grassland require some expertise to identify accurately, but it is often possible simply to identify the animal as far as a convenient taxonomic grouping – something that can be done with even very inexperienced groups.

There are many general guides to 'minibeasts' available for schools, aimed at different age groups. The Field Studies Council series of AIDGAP keys are very useful, including "*A Key to the Major Groups of British Terrestrial Invertebrates*" by S. M. Tilling (1987) currently £6.95. For adults, the Collins Field guide "Insects of Britain and Northern Europe" by Michael Chinery provides a good general well-illustrated guide to all the insect groups.

Selected invertebrate groups

a) Snails and slugs
Grassland snails and slugs are easy to distinguish from other kinds of grassland invertebrate. All are **herbivores**; living entirely on grazed plant material.

b) Spiders
Easily distinguished from the insect groups by having eight legs and a two-part rather than three-part body. Youngsters look like miniature adults. A wide range of spiders is found in grassland. All are **carnivorous** predators of other invertebrates (from woodlice to slugs) with bigger spiders able to tackle larger prey

c) Grasshoppers, crickets and ground hoppers
All these insects have enlarged hind legs for jumping away from predators. This means they are often hard to catch or keep in the net as they can jump long distances. Crickets have very long antennae – longer than their bodies, whereas grasshopper and plant hoppers have short antennae. Youngsters look rather like miniature adults but have undeveloped wings. To catch adults, wait until the season is advanced enough for you to hear the adults chirping and calling in the grass. Although some crickets are quite omnivorous and will eat other insects, for a simple class exercise it is fair to consider this entire group to be **herbivorous**

d) Beetles
This is a challenging insect group for beginners, although specimens are relatively easy to recognise as *some* kind of beetle. All beetles have their forewings modified into hard (often shiny) wing cases ('elytra') that conceal a pair of membranous hind wings. The rove beetles (staphylinids) have a small pair of wing cases close to the thorax into which they tuck their hind wings and this means that their long segmented abdomen is always visible. The wing cases never overlap across the middle of the back. There are around 4000 species of beetles in the UK and they take on a very wide range of forms and sizes from around a millimetre to several centimetres. The larvae look completely different from adults and also come in various body forms, depending on the beetle family in question. Many are **carnivorous** e.g. ground beetles (carabids) which feed on other invertebrates, but many others are **herbivorous** and feed on plant material and pollen. Dung beetles include the minotaur beetle. Although not very reliable, you can roughly separate the carnivores

from the herbivores by how they move – strong jaws, strong and long legs for running fast and an elongated body usually mean a predator. Slow movers with short legs and a dumpy body form are usually herbivores (or dung beetles). However, there are quite a few exceptions - the spectacular stag beetle, which looks fearsome, does not feed at all as an adult and the larvae feed on decaying wood.

Although hard to classify in terms of their food preferences, beetles are fun to spot and many common species are in the field guides.

e) Bugs

Although people often use the word 'bugs' for many kinds of creature, there is one very large group of insects properly called the 'true bugs' (order Hemiptera). About 1650 species occur in the UK. The youngsters (nymphs) are rather like miniature adults and you can get large numbers in a net.

All the true bugs have **sucking mouthparts** – instead of typical insect jaws. These sucking mouthparts look like a long tube, which is easily visible – although it is tucked down along the underside of the body when not in use. **Herbivorous** bugs are sap-suckers – like aphids. These insert their mouthparts into plant stems and leaves to drink the juices – rather like using a drinking straw. **Carnivorous** species, like the assassin bugs, use similar mouthparts to pierce the bodies of their prey and suck out their juices. As with the beetles, you can roughly separate the carnivores from the herbivores by how they move – big strong, long legs for running fast and an elongated body usually means a predator. Slow movers with a dumpy body form (like the aphids) are usually herbivores. Some bugs, like the shield bugs, have hardened forewings that can look a bit like those of beetles, but they retain a membranous tip and typically cross-over on the middle of the animal's back.

f) Flies

True flies (order Diptera) have around 5200 species in the UK but are all easily identified by the fact that they only have a single pair of wings. The hind pair is reduced to two tiny drumstick like structures called halteres. There is a very wide range of flies with different diets, but all take food in liquid form. Some suck up juices from things like **dung** or other **decaying matter** (houseflies) or **nectar** (hoverflies). Others have piercing mouthparts and feed on **blood** (horseflies, mosquitoes) or are **predatory** (robber flies). Fly larvae look nothing like the adults, have no legs and usually take various maggot-like forms, although there are various other body plans e.g. mosquito larvae.

g) Bees and wasps.

These belong to the large insect order Hymenoptera. Bees and wasps have **two pairs** of membranous wings and a very narrow 'wasp-waist' between the throax to the abdomen. Although some have distinctive stripes as warning colouration, many do not. Hymenopteran larvae are legless and maggot-like. Bees generally feed on **pollen and nectar**, and wasps are **predatory** or parasitic.

Relatively few species of bees and wasp live in large social groups in hives or nests. The majority live in small groups or are solitary. Bees and wasps are quite easy to recognise as an overall group, but can be confused with other insect types that, as a defensive strategy, mimic their body shape and striped yellow/orange and black body

colouration. Some hoverflies (order Diptera) can be confused bees and wasps – but they lack the wasp waist and only have **one pair** of wings.

Note: Take care to avoid being stung – don't handle bees and wasps. Although most species are very small, they can still be a threat to those with allergies to stings.

h) Ants
These are social insects also belonging to the order Hymenoptera. They only have wings when reproducing males and females swarm. After mating and having dispersed, they break off their wings (2 pairs). Wings are generally an impediment for a creature that lives on or under ground and does not want to risk being blown away from its colony. Ants are easily recognised, although some other groups (e.g. beetles) have effective ant mimics ants very well. Ants like the yellow meadow ant, combine hunting for invertebrate prey (**insectivorous**) and scavenging, with farming aphids underground. The ants protect the aphids, but feed on a sugary liquid that the ants excrete, as well as some of the aphids themselves. This is rather similar to the way that humans farm cattle.

i) Moths and butterflies
Most people are familiar with moths and butterflies (of the insect order Lepidoptera) because of their large, patterned wings. Many day-flying moths and butterflies in grassland are relatively easy to spot and to identify. The Field Studies Council laminated identification charts are enough to identify most of the larger species likely to be seen. Although many tiny moths ('micro' moths) can turn up in sweep net samples and these require specialist knowledge to identify. This group is generally adapted to feeding on liquid food, usually **nectar**, sucked up through a long tubular tongue, which is coiled up under the head when not in use.

Caterpillars can often turn up in sweep net samples. Identifying these can be difficult for the non-specialist. Caterpillars have well developed heads and jaws. They always have 3 pairs of true legs on the thoracic segments and typically 5 pairs of fleshy prolegs on segments 3,4,5,6 and 10, used for gripping on to the plants. Almost all caterpillars are **herbivores**, munching through leaves and other plant material.

2. Vertebrates

While out in the field, there is an opportunity to look for **birds, reptiles, amphibians** and **mammals**. Although some will most likely be recognised by their signs rather than being directly seen. These can be included in the food web analysis.

Common mammals that you may see signs of include rabbits (**herbivores**), foxes (**carnivorous**), badgers (**carnivorous**) or hedgehogs (**insectivorous**). Although foxes and badgers are carnivores, both include a fair amount of invertebrates (such as worms and beetles) in their diet. Voles (**herbivorous**) and shrews (**insectivorous**) are also likely to be present. Grey squirrels (**herbivorous**) may also be seen on the site if there are trees nearby – you could discuss whether or not they are really part of the grassland ecosystem.

Deer or other large **herbivores** (cattle, sheep, goats, horses) may also be present and are often recognisable from footprints or droppings even if they are not seen.

Grass snakes, lizards and slow worms may be present. Grass snakes prey on frogs and newts (**carnivorous**) as well as on invertebrates, whereas lizards and slow worms eat mainly invertebrates (**insectivorous**). Frogs or toads, or newts in their terrestrial phase may also be found amongst the grass. All these amphibians feed mainly on invertebrate prey (**insectivorous**).

Predatory birds such as kestrels (**carnivorous**) may be seen hunting over the site, and also **insectivorous** birds such as skylark, meadow pipit, stonechat, wren and others.

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