

When bees exploit plants: Nectar robbery

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The amazing variety and beauty of flowers we see in our gardens is partly due to the relationship between plants and their pollinators. Through millions of years of evolution, insects have adapted to use flowers and plants have adapted to use insects. By producing a sugary reward in the form of nectar, plants attract insects to their flowers and use those insects to carry their pollen. The plants benefit from having their pollen spread over greater distances and with much more accuracy than if transported by wind. The insects benefit by gaining a source of high energy food in the form of nectar. This relationship can then be considered a mutual one, with both groups gaining an advantage from the interaction.

In every mutualism, however, there may be opportunities to take advantage of the situation. Normally there is 'give and take', but sometimes one half of the relationship may just 'take'. For example, there are several orchid species with non-rewarding flowers which do not produce any nectar, but the pollinators still respond to these flowers without gaining any reward. The non-rewarding orchids 'cheat' the insects by not

wasting energy on producing nectar, but still benefit from pollination.

There is another example of a 'cheater' taking advantage of the situation, but with the roles reversed. Some species of bees have learnt to steal nectar from flowers without pollinating them. To do this, the bee will make a hole in the flower near to the source of the nectar. This makes it possible for bees with short tongues to reach nectar in long flowers which would normally be too deep to reach. The bee will then use the hole to extract the sugary reward without going near the stigmas and stamens. This behaviour is described as nectar robbery. You may have seen bumble bees doing this in your garden as it has been observed on several different types of plants, including red campion (*Silene dioica*), bleeding heart (*Dicentra spectabilis*), *Fuchsia*, and common yellow toadflax (*Linaria vulgaris*). Even Charles Darwin observed robbery of broad bean flowers and mentions robbery of azalea and honeysuckle flowers. Examples of species of nectar robber include the bumble bees *Bombus terrestris*, *B. jonellus* (both found in Europe), and *B. occidentalis*, and the carpenter bee, *Xylocopa*

californica (both found in North America). Looking for evidence of robbery is quite simple. If flowers have been robbed, they will usually have a neat circular or semi-circular hole near their base, close to where the nectar is produced. Once holes have been made by the robbers, other insects may also use them. For example, honeybees and ants have been seen using holes made by bumble bees.

Directly damaging the flowering parts of a plant would appear to be detrimental to the plant and in some situations nectar robbery may reduce the numbers of seeds produced. Robbery also reduces the amount of nectar in flowers which can make the flowers less attractive to true pollinators, which in turn may reduce pollination of those flowers. But the holes made by robbery can encourage other insects to feed from flowers which would otherwise be inaccessible, encouraging a greater diversity of insects.

Although there have been many studies on nectar robbery, there have been few in the British Isles. I am currently involved in a study into robbery of red campion (*Silene dioica*) by a short tongued bumblebee, *Bombus terrestris*. At the University of Bristol we are attempting to understand the patterns of robbery in this wildflower and are looking for people across the British Isles to assist us. This summer I am trying to gain a picture of what levels of robbery are like across the country and I would like volunteers to collect and send information. If you feel you would like to take part in active research and help with the collection of data on nectar robbery see the instructions below.

Plants have lived with insects for millions of years, but in some cases the insects have learnt to exploit the plants they visit by robbing nectar. So look out for signs of robbery on wildflowers or in your garden. And if you see a bumble bee making a hole in a flower, you may be witnessing nectar robbery first hand and catching them in the act.

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Instructions

The equipment required is a pen and paper, and it only takes a few minutes to record the data per patch of red campion. Each patch of red campion counts as a single record. You need to be able to recognise red campion and be able to see flowers close up to look for signs of robbery. The main flowering season for red campion is during May and June, but can continue into July.

1. Find a patch of red campion flowers and count the number of open flowers as accurately as you can. Record this as 'number in patch'. For very large or long patches, an estimate to the nearest 50 is sufficient. Ignore small patches of less than 30 flowers.
2. Choose any 30 open flowers, ideally choose flowers that are spread across the patch, and check for signs of robbery. Record the number of robbed and unrobbed flowers. e.g. 25 robbed 5 unrobbed. This gives a measure of the level of robbery and 0 robbed flowers still counts as a record.
3. From the list below, choose a habitat which best describes where the patch is found, selecting from:
 - Woodland
 - Woodland edge
 - Hedgerow or verge
 - Grassland
 - Other, please describe
- 4 Please state the location of where the patch was recorded, e.g. A postcode, grid reference or address, and the date you checked the flowers..
5. (Optional) List any other common flowers close to the red campion. Only open flowers, and only if you know them.

Please email results to Nic.Charlton@bristol.ac.uk Additionally, if you see any bees in the act of robbing, please send details of the species and the location. Photos are also welcome.

NEW RESOURCE

Survey of nectar robbing of red campion

Instructions:

1. Patch of *at least 30 red campion flowers*
2. Record **location**
3. Record the **habitat** where the patch was located
4. Estimate the **number of flowers** in patch
5. **Select 30** open flowers, ideally from across the patch
6. Record **number of robbed flowers** out of 30
7. Record **other flowers** close to the patch



Red campion flower showing distinctive nectar robbing hole

(photo by J Memmott)

Your name/s		
Date		
Location (address, postcode or grid reference)		
Habitat type: (Tick which one)	Woodland	
	Woodland edge	
	Hedgerow/Verge	
	Grassland/Scrub	
	Other (specify):	
Total number of flowers in patch (to the nearest 50)		
Number of robbed flowers (out of 30)		
Other plants in flower within a few metres of red campion patch		

Please e-mail results to:

Nic.Charlton@bristol.ac.uk

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