



This experiment about countershaded prey was performed by scientists in 1994 in the United Kingdom (see More information no. 4 for the original scientific article). It is designed to test whether:

1. countershaded prey are taken less often by birds than reverse shaded prey and
2. whether countershaded prey are less often taken than uniformly dark green prey.

NB Experiments involving animals must be approved by an Animal Welfare committee (depending on your state or territory's education department). Please obtain approval from your education department before carrying out these experiments.

## What you need

Each group of students (4–5 per group) should have:

- PLAIN white flour.
- Lard such as copha or butter.
- Bowls and spoons to make pastry.
- Aprons, gloves, etc to protect clothing and skin from pastry and food colouring.
- 40 ml each tasteless food dye colours—green, orange/red, black, brown.
- Paint brushes.
- One tape measure that reaches 4 metres or more.
- Tent pegs that can be placed in the ground.
- One roll of string.

## What to do

1. The amounts of pastry can be increased to produce more pastry prey and achieve more reliable results. In the original scientific study, they produced 900 pastry prey for 9 different experiments, so you may be interested in using more flour and copha if larger numbers are achievable by your class.
2. For each activity, mix up 400 grams of pastry from a mixture of 300 grams plain white flour and 100 grams lard (3:1). Pastry prey can also be kept in the freezer until required.
3. Also check whether the area where pastry prey will be left is protected from dogs, cats, young children, native mammals, etc.
4. Birds most likely to be present in a school yard are:
  - sparrows (*Passer domesticus*)
  - starlings (*Sturnus vulgaris*)
  - Indian mynas (*Acridotheres tristis*) and
  - magpies (*Gymnorhina tibicen*).
- As an extension activity, students can research the birds most commonly observed attacking the pastry prey.
5. Ideally, these experiments should be set up in the morning and observed from the classroom window throughout the day. Then the number of pastry prey left at the end of the day can be counted.
6. Check the ground colour of the area where tests will be carried out. Lush green grass will require the use of green food dye, while more yellow or brown coloured grass and dirt may require different coloured pastry prey.
7. Add 10 ml green food dye to one 200 g batch of pastry (light green prey) and 30 ml green food dye to the second 200 g batch of pastry (dark green prey).
8. Roll half of the light green pastry by hand into cylinders approximately 3 mm in diameter and cut into 10 mm lengths. This should create about 8 light green pastry prey.



9. Roll half of the dark green pastry by hand into cylinders approximately 3 mm in diameter and cut into 10 mm lengths. This should create about 8 dark green pastry prey.
10. Combine the remaining halves of light and dark green pastry and gently roll together so when they are cut into 3 mm diameter, 10 mm long cylinders, they form about 8 two-tone prey with one half dark green and the other half light green.
11. When these two-tone prey are laid with their dark side up, they represent COUNTERSHADED prey. When they are placed light side facing up, they are REVERSE SHADED prey.
12. To mark out a 4x4 metre square on the ground, measure 4 metres with the tape measure, place a peg in the ground at each corner and tie the string between each peg, to form a square.
13. Once the pastry prey pieces have set and dried, place the pieces in a random order, equally spaced within the square on the ground. This can be done by randomly drawing one pastry prey from the container and gently placing it on the ground within the square. Step away from this spot, draw another pastry piece from the container and gently place on the ground within the square.
14. At the end of the day (or chosen period of time), check how many pastry prey have been left untouched and record this in the table. Do not record pastry prey that has been pecked and left behind (these have been attacked by birds but not eaten).
15. This experiment can be repeated over different days with different light levels and weather conditions to see if the results change drastically.

### What's happening

Countershading occurs in some fish, birds and insects.

They are dark coloured along their back and have a white, reflective layer along their belly.

When predators positioned above the countershaded animal look down, the dark colouring of the countershaded animal blends in with the dark ground or water, making the countershaded animal difficult to see.

### More information

1. The Eaten Alive exhibit Aquatic Ambush shows how some sea creatures use camouflage to capture prey by surprise. The Aquatic Ambush online activity can be found at <http://virtual.questacon.edu.au/EA/Ambush.htm>  
The Aquatic Ambush background notes at <http://www.questacon.edu.au/html/assets/pdf/Aquatic%20Ambush.pdf>
2. Protective colouration <http://www.encyclopedia.com/html/p1/protctvcl.asp> and <http://www.infoplease.com/ce6/sci/0840/3/0/A0840300.html>
3. Countershading used by cookie cutter sharks <http://www.questacon.edu.au/html/assets/pdf/Cookiecutter&sawshark.pdf>
4. The survival value of countershading with wild birds as predators. *Biological Journal of the Linnaean Society*. (1994), 51:447-452. Malcolm Edmunds, FLS and Robert A Dewhirst.

### What to notice

Students can record and pool their results in a table similar to this one.

Experiment	Number of prey left				Total
	Dark	Light	Counter shaded	Reverse shaded	