

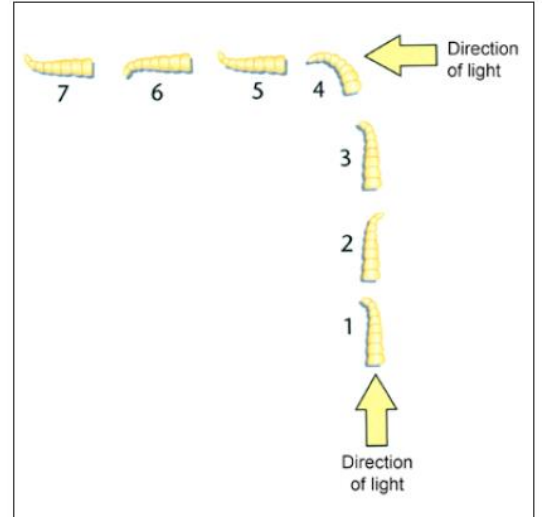
AS91603 Demonstrate understanding of the responses of plants & animals to their external environment

Animal behaviour

(2015, 1)

Some animals display innate behaviours.

As green bottle fly maggots (*Phaenicia sericata*) crawl, they turn their heads, comparing the light intensity from each side. They always turn towards the darker side, taking them away from light.



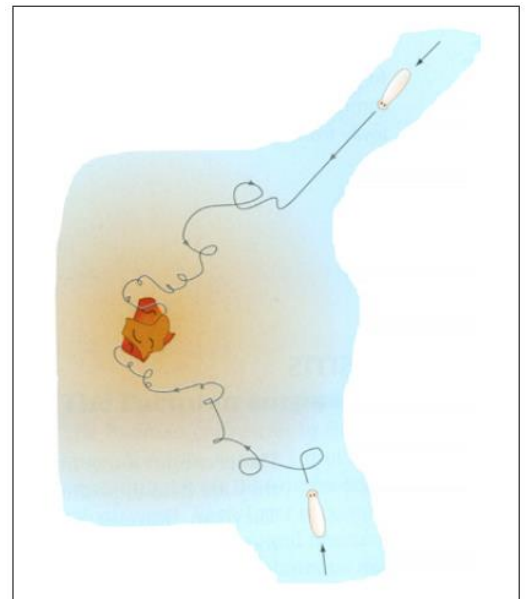
Maggot response to light stimulus.

A piece of meat in water causes a chemical gradient. Flatworms, such as *Planaria torva*, move along a straight path until they detect an increase in chemical concentration. The flatworms increase their rate of turning in the area until they touch the meat and start feeding.

Compare these responses, the adaptive advantages gained for the animals that display them, and how these animals come to have them.

In your answer:

- identify the full term given for both responses, and define these terms
- using the information above, justify the types of orientation you have described, and explain how they operate in both the maggots and the flatworm
- compare the adaptive advantages these animals gain by displaying these behaviours.



Flatworm response to chemical stimulus.

(2015, 2)

Cape Kidnappers on the coast of Hawke's Bay is an exposed headland, which hosts the largest mainland gannet (*Morus serrator*) colony in New Zealand, with around 6500 breeding pairs arriving in early August each year. The birds remain until the young fledglings are mature enough to leave, and then return to Australia in March the following year.

✂ No Brain Too Small ● BIOLOGY ✂

Gannets usually have the same mate over many breeding seasons and re-establish their relationship at the beginning of each breeding season. During the breeding season, the area is densely occupied by the gannets which actively defend their nesting sites.

Females lay a single pale blue egg, the size of a large hen's egg, any time from mid-September till mid-December. It is laid in a nest prepared from dried seaweed, cemented with guano (bird droppings), and incubated by each parent in turn. After 43 days, a blind, naked chick hatches, and is fed and cared for by both parents.



Gannets nesting at Cape Kidnappers NZ

Evaluate the behaviours the gannet displays, using the given information above.

In your answer:

- identify and describe THREE behaviours displayed by the gannets
- explain the costs and benefits of the behaviours you have identified
- discuss how the combination of behaviours provides adaptive value to the gannets.

(2014, 1)

BEHAVIOUR IN AUSTRALASIAN GANNETS

Australasian gannets, *Morus serrator*, are known as colonial breeders. During the summer, large colonies of birds can be found within gannet colonies, where breeding pairs fiercely defend their individual nesting territories. However, recent studies have shown that when foraging at sea, the same birds show no territorial behaviour across their chosen feeding areas, and yet they appear to maintain largely separate foraging areas at sea, specific to the particular colonies they belong to when nesting on land.



Gannets display territorial behaviour when nesting on land, but not when foraging at sea.

Discuss the reasons why Australasian gannets appear to behave as described above.

In your answer:

- describe territorial behaviour
- use biological ideas to explain why the territorial behaviour provides adaptive advantages for the gannets
- justify possible reasons why the Australasian gannets appear to maintain separate foraging areas when at sea.

(2013, 1)

The brown-headed cowbird, *Molothrus ater*, is found throughout the USA. Cowbirds follow herds of grazing animals, covering large distances daily, and feeding on insects. They are known as brood parasites because they lay their eggs in the nests of other birds.

Female cowbirds lay single eggs in host nests, abandoning them to the care of foster parents. On average up to 40 eggs are laid per breeding season. Cowbird chicks usually hatch sooner and grow faster than their hosts' chicks.

Cowbirds are believed to be a factor in the decline in numbers of songbirds across the US

Courting cowbirds, female (left) and male (right)



Eastern phoebe nest containing one egg from a brown-headed cowbird



Discuss the effectiveness of the brown-headed cowbird's reproductive strategy and why it could be affecting the survival of songbirds across the USA.

In your answer you should:

- describe parasitism and the adaptive advantage it gives the brown-headed cowbird
- explain why the reproductive strategy works well for the brown-headed cowbird in its ecological niche
- justify why brown-headed cowbirds could be contributing to the decline of songbirds across the USA.

(2012, 2)

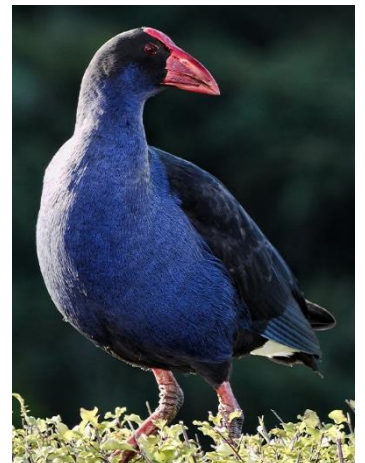
Pūkeko (*Porphyrio porphyrio*) have an interesting social structure. They live in family groups, where they carry out **cooperative interactions** in their breeding behaviour. They form a **hierarchy**, which is maintained by agonistic displays (such as threats and submission). Only the most dominant individuals breed.

The family groups are very **territorial** towards other such groups.

Analyse the breeding behaviours of the pūkeko, and how these result in successful reproductive outcomes.

In your answer you should:

- define the terms **cooperative interaction**, **hierarchy**, **territorial**
- explain why these behaviours are carried out
- discuss how the behaviours benefit both the group and each individual group member.



The questions below are collated from the now expired AS90716 Describe animal behaviour & plant responses in relation to environmental factors.

However they may still be useful for **AS91603** Demonstrate understanding of the responses of plants & animals to their external environment

(2010: 3)

Olive baboons (*Papio anubis*) are widespread throughout equatorial Africa, where they occupy a variety of habitats, from open grassland, to moist evergreen forests. Baboons have a highly developed social structure with a dominance hierarchy. Olive baboon troops each occupy a distinct home range.



(a) Explain what the term **home range** means.

Home ranges and daily ranges have been recorded for some olive baboon troops in Africa. The data for troops in four areas is recorded in the table.

Area	Approximate home range size (km ²)	Approximate daily range (km)	Average troop size	Habitat	Yearly rainfall (mm)
Bole Valley, Ethiopia	0.745–1.12	0.3–2.0	15–24	Mixed forest and grassland	2000
Ishasa, Uganda	3.88–5.18	0.2–2.4	60	Forest and shrub-land	1100–1600
Gilgil, Kenya	19.7	2.2–7.8	49	Open grassland and shrub-land	500–1000
Laikipia Plateau, Kenya	43.8	5.64	100	Dry grassland	400–600

Home range sizes and approximate daily ranging distances of olive baboons from four different areas.

(b) Explain how environmental factors impact on BOTH the **home range** size and the **daily range** of olive baboons.

You **must** include the given information in your explanations.

(c) The social structure of a baboon troop can be described as a **complex dominance hierarchy**.

Discuss how being a part of a **troop** can **benefit** the survival chances of individual olive baboons.

In your answer include:

- an explanation of **complex dominance hierarchy**
- a justification of why this increases the **survival chances** of the individual.

(2009:3)

The breeding behaviour of African starlings is affected by their environment. Birds living on the open grasslands often breed in large, cooperative groups, while birds in the forests breed in pairs.

In cooperative breeding, although only one pair of individuals may actually produce offspring, all the members of the group help to raise the young.

The African savannah is a highly seasonal habitat, with wide variation in rainfall from year to year, and this would have an impact on the availability of food.

Discuss reasons for the differences in intraspecific relationships within each of the two groups of African starlings. In your discussion you should consider:

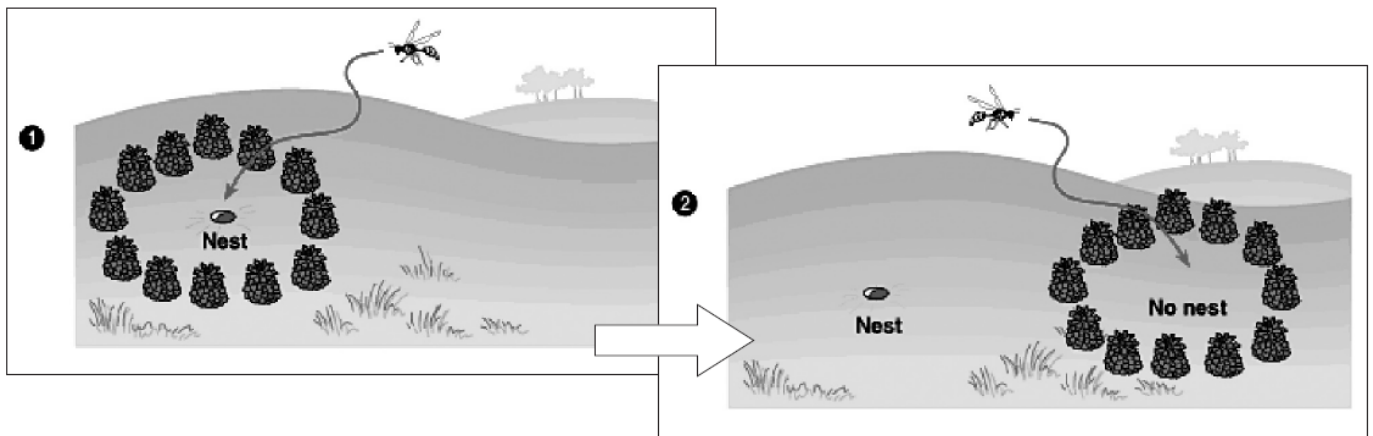
- territoriality
- co-operative interactions
- competition for resources.

(2006:2)

Much of animal behaviour is innate, or inborn. Such behaviour patterns may be quite simple, or are produced in response to simple stimuli. They include kinesis and taxes.

- (a) Describe an example of kinesis in a **named** animal.
- (b) Explain why this behaviour would be an **advantage** to your named animal in its normal environment.

The diagram shows the results of an experiment carried out to study homing behaviour in a hunting wasp. This wasp digs a burrow and then flies off to capture a caterpillar, which it will leave in the burrow as food for its own young.



(1) Pine cones placed round burrow while wasp inside; wasp leaves and returns to nest;

(2) Pine cones moved while wasp away on hunting trip.

- (c) Explain how the wasp finds its way when returning to its burrow from a hunting expedition.

(2006: 4)

Black swans were introduced to New Zealand in the 1800s and have since spread throughout the country. On smaller ponds and lagoons, they occupy territories during the breeding season.

(a) Describe TWO **advantages** of holding a territory.

Newly hatched black swan cygnets have very short necks, and are unable to feed in deeper water

As the adult birds do not actively feed their young, this restricts the areas in which cygnets can feed.

The swans breed in territories on Pukepuke Lagoon, a 15 ha wetland in the Manawatu. The size of their territories varies considerably, from 0.1 ha to 1.5 ha.

(b) Explain why the territories vary so much in size.

Black swans use a range of aggressive displays to defend their territories, to settle disputes with other swans, or to indicate position in a social hierarchy.

(c) Explain why the swans use these displays, rather than fighting over resources.