Candidate 1 evidence

Investigating the Colour Preference of Garden Birds

Word count: 3,959

Contents:

Abstract:

The aim of this investigation is to investigate the effect of colour preference on the feeding habits of garden birds.

Results of the investigation concluded that the garden birds did not have a preference for colour however, they did have a preference for the feeder in position four regardless of its colour.

Introduction:

Aim and Hypothesis:

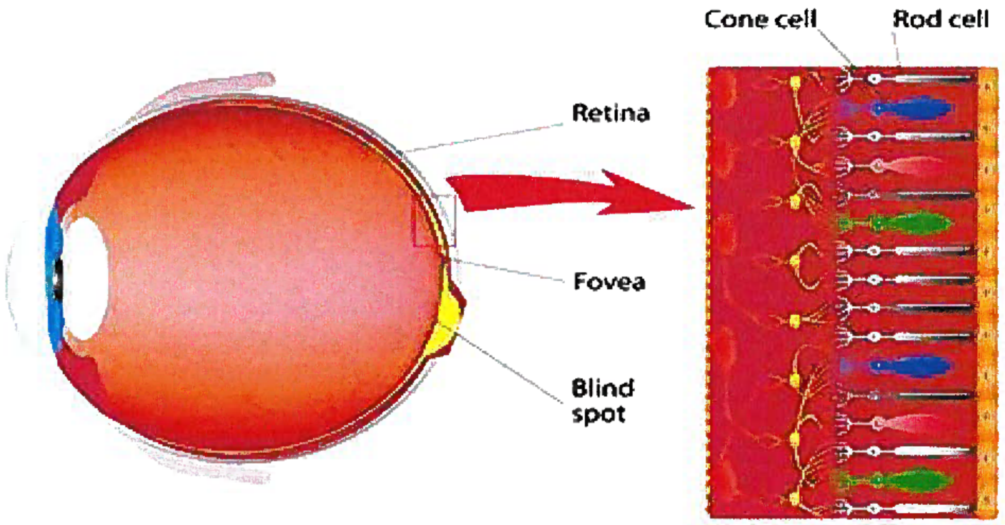
The aim of this investigation is to investigate the colour preference of the UK's Garden birds by conducting point counts of birds while they visit different colours of supplementary feeders.

The most preferred of the colours of feeders available, silver, white, yellow, and blue, will be the silver feeder.

Underlying Biology:

As humans, with our own vision as our only frame of reference and limited imaginative power it's challenging to visualise what the world looks like with an optical system which is in many ways more efficient than our own without first understanding it.

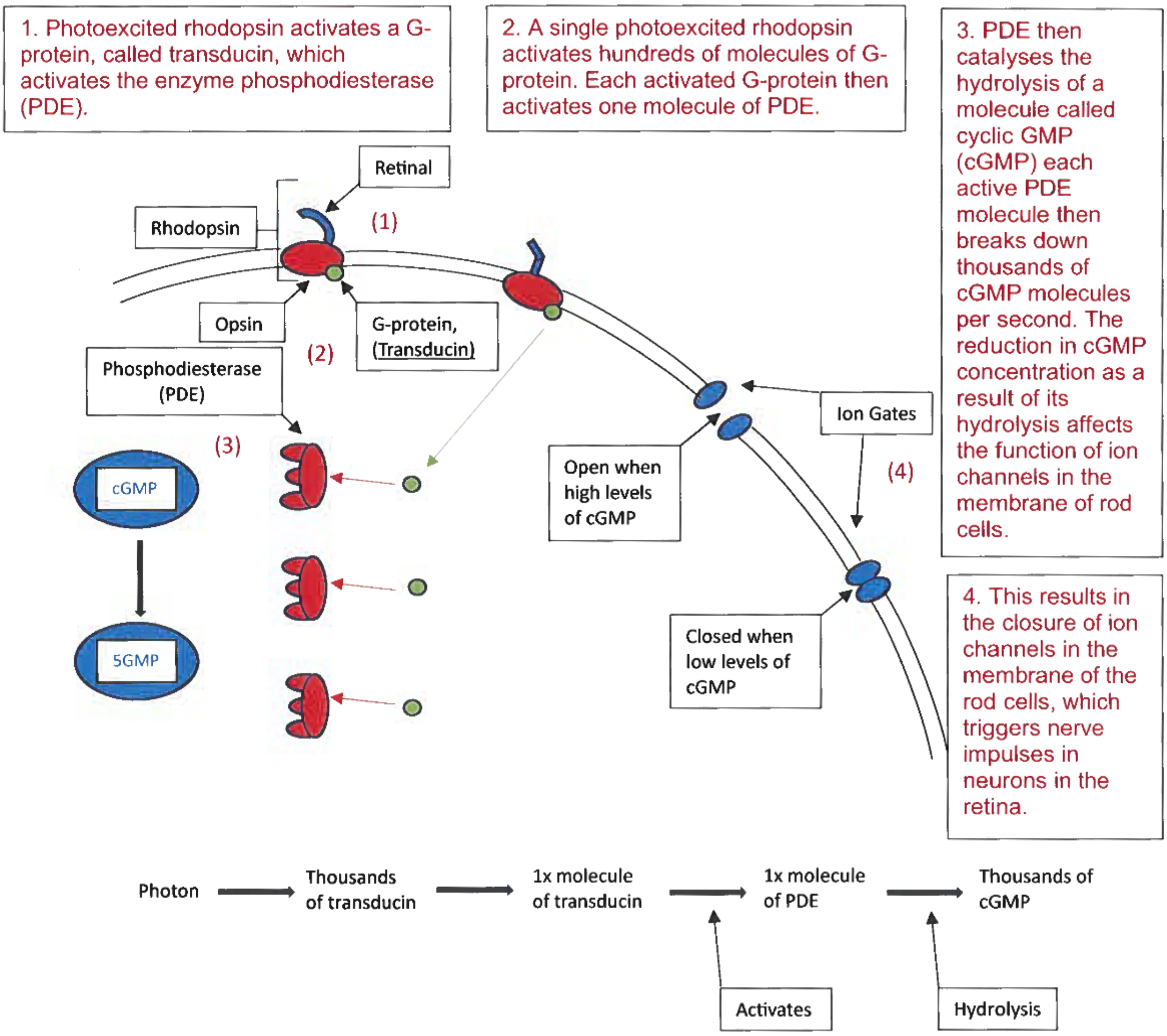
Cone cells are a layer of photoreceptor cells on the retina that transmit signals to the brain, each cone cell contains a pigment, made up of a protein called opsin, which is sensitive to particular wavelengths meaning that when it absorbs photons (small packets of energy/light with energy proportional to their frequency), this causes the retina to change conformation leading to the cone cells being excited, activating retinal neurons, sending signals to the brain via the optic nerve with information about the stimulus (light). We (humans) have opsin sensitive to red, blue, and green wavelengths. However, birds have another form of opsin which is sensitive to UV.



[1]

Rods, another type of photoreceptor, are an important structure within the retina which function in low levels of light as they're more sensitive to light due to a higher degree of amplification of a proton and the presence of a visual pigment called rhodopsin. Rods don't allow colour perception like cones. We have far fewer cones than rods unlike diurnal birds (the type in this study, active during the day) which possess an 8:2 ratio of cones to rods, prioritising a more significant range of colour vision over the ability to see in lower light.

Nocturnal birds, prioritising the ability to see in low light/darkness, have almost all rods to aid with night vision [2]. Retinal is a light sensitive molecule which vertebrate animals can digest directly from meat or produce from carotenoids found in their diet e.g., some birds obtain carotenoids from plants. Retinal acts as a prosthetic group, binding to a membrane protein called opsin forming the photoreceptors of the eye. This complex is known as rhodopsin which changes conformation to photoexcited rhodopsin when the retinal absorbs photons of light. The reason that rods allow us to see in low levels of light is due to a high degree of amplification of a single photon of light which is caused by a cascade of proteins. The amplification of a photon of light in rod cells looks like this:

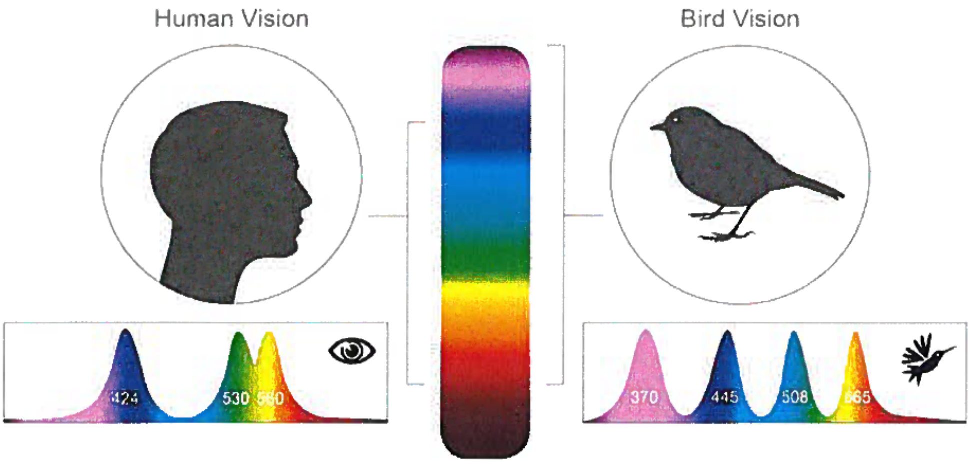


More intense light leads to more photons being absorbed by the cones, meaning the brain receives signals indicating brighter light. Cones cannot distinguish between two wavelengths despite the fact that some wavelengths are absorbed better than others. This means that

5

cones cannot tell the brain what wavelength of light is being absorbed which can lead to two separate light sources, one which has a poorly absorbed wavelength but that's brighter and one that has a more easily absorbed wavelength but that's dim appearing the same. This is because all a cone is capable of is counting the photons it absorbs so when it's equally excited by two different sources, they'll appear the same.

For the brain to perceive colour it needs to compare the signals from at least two classes of cone cells (with different pigments). By having more information from more than one type of cone a wider range of colours/shades can be seen. This is why birds can see a much wider range of colours than humans as they have four classes of cones compared to our three classes of cones, allowing them to absorb a wider range of photons and interpret colours with a shorter wavelength/higher frequency and energy. Our cones can absorb wavelengths between 400nm - 700nm, known as the visible spectrum as this is what's visible to us. With the addition of their fourth type of cone, birds can see outside this spectrum into the near UV which has a wavelength of 100nm - 400nm.



[3]

Humans don't have a fourth cone due to an evolutionary loss of two cones during the Mesozoic era by our distant early mammalian ancestors as they had little need to see such a range of colours so lost two types of cones due to becoming heavily reliant on sensitive rods enabling them to function better nocturnally. Rods are between 500 to 1,000 times more sensitive to light than cone cells making them incredibly useful in low light conditions despite not being able to distinguish colour due to the absence of the distinctive pigments found in cone cells. They also improve peripheral vision, providing an advantage to predators and prey alike.

The addition of a third type of cone cells to our eyes came about coincidentally through genetic mutation and duplication. This mutation was selected for through natural selection due to the advantage it provided to primates, enabling them to distinguish flowers and fruits from the surrounding foliage as an increasing number became diurnal, and began to forage, so the ability to see in a wider range became incredibly useful. Despite this we still don't possess the fourth type of cone cell present in birds (as well as many reptiles and fish).

Birds' eyes also contain coloured oil droplets containing carotenoids. The carotenoid's functions are to protect the retina from damage as a result of light exposure as well as

6

affecting refractive index, allowing them to act as micro lenses increasing the bird's optical capacity. The function of the oil droplets themselves is to act as a filter to limit the overlap of pigments, increasing the number of colours that a bird can recognise and distinguish [4]. The fact that we don't possess these oil droplets further explains why we cannot see to the same capacity as birds.

Suitable investigations [5] with birds involving choice and food reward for recognising and distinguishing between colours within and out with our own range of vision provided suitable evidence that birds can see into the near ultraviolet. Further investigations into a wide variety of species have provided evidence that their ability to see into the near ultraviolet is crucial. It aids in the selection of a mate as males with plumage which reflects more UV than others is indicative of his superior health and genetics and such males are generally better mates overall, with considerably larger territories with suitable prey available allowing them to provide their offspring with food more often than competitors, with less significant UV reflection, would have. What leads to birds reflecting UV is due to the preen gland which is found beneath the feathers at the base of the tale which produces an oil which coats the feathers and reflects UV light. This is because it contains vitamin D3 which is activated by exposure to UV light, reflecting it, and allowing it to be seen by other birds. Birds which preen themselves more often also consume excess D3 found in the oil which is then re-released in the oil indicating that that particular bird is healthier and regularly preening [6]. Additionally, birds such as Kestrels (small birds of prey which can be found in the UK) can trace their prey whose faeces and urine reflect UV, which is recognised by the birds hunting them, allowing them to be efficiently tracked. For more commonly seen garden birds in the UK, the ability to see into the near UV is still crucial in the process of obtaining food, allowing them to distinguish what they're foraging for from the surrounding foliage.

It's important that we remember and recognise that birds have a more extensive range of vision as applying this knowledge enables us to provide for local bird populations which is tremendously valuable as there are numerous benefits of supplementary feeding. Everything from providing food in a feeder to scattering seeds in the grass can be beneficial for the local population of birds. For some birds during the winter when their typical food sources are low, supplementary feeding may be the only dependable source of food for them, allowing birds such as those in the tit family to maintain a constant and healthy weight throughout the winter which otherwise may drop by 10% overnight without suitable nutrition. Larger clutches of offspring, better overall health, and the ability to recover quicker following a range of injuries is also seen following supplementary feeding.

Outside of the physical benefits to the birds, supplementary feeding allows an increase to the overall avian population and encourages a wider variety of birds to visit the area. Increasing biodiversity, leading to the evolution of new migration strategies as well as reducing neophobia (the fear of new things) in birds unfamiliar with new environments.

Putting this knowledge into practice is important as it increases the likelihood of the positive effects of supplementary feeding. A 2017 study [7] investigating the colour preferences of UK garden birds as well as the most popular colours of feeders purchased by the public found that the best crossover of the bird's preference and the preference of customers was green. Suggesting that marketing a larger number of green feeders compared to other colours will prevent a drop in the number of sales of bird feeders (with the UK's bird feeding industry bringing in over £210m annually [7]) whilst simultaneously encouraging a larger number of birds to visit the feeders provided, allowing more to benefit from supplementary feeding.

Designing certain products with the colour preference of birds in the area in mind could be valuable when trying to encourage birds to avoid certain things that could be potentially dangerous to them or damage the item. An estimated 10,000 - 100,000 birds are killed by wind turbine strikes in the UK each year [8] which is a prominent issue in my area as I live in extremely close proximity to a wind farm with the closest turbine being less than 1.5 miles away. It may be beneficial to coat the blades of wind turbines in a colour which does not appeal to birds, or which reflects specific wavelengths of UV which have been proven to deter the birds found in the area. Or something like supplementary feeding for livestock. Designing the product to be contained in a colour which does not suit the preference of the birds may help to reduce the number that attempt to eat from the feeder which would be beneficial as it prevents them from eating something not suitable for their digestive systems, with the ability to be harmful. Or, vice versa, to protect livestock from dangerous habits of birds such as painting lambs a colour which does not suit the preference of the birds in the area in order to discourage the all too common incidents involving ravens mutilating and often killing weaker new-born lambs [9].

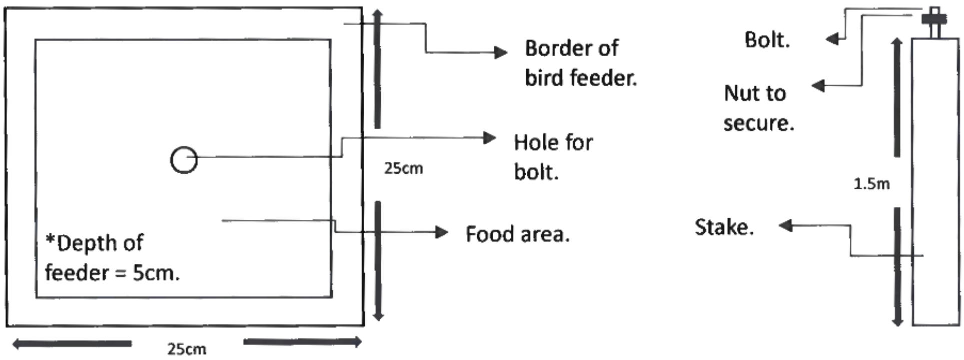
Supplementary feeding is undeniably beneficial for bird populations, and it is also suggested that it can be valuable to us, particularly those of an older age, as it helps to add structure to people's daily routine and encourages them to venture outside more frequently.

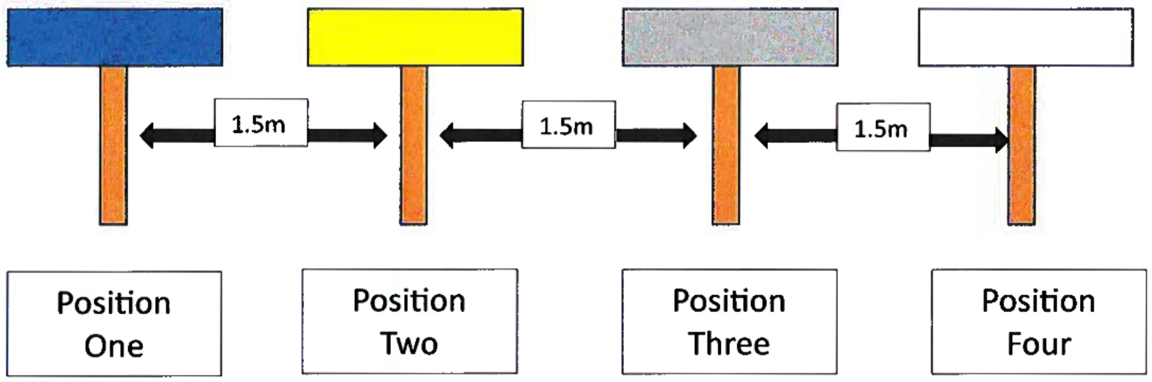
Procedure:

To investigate the effect of colour preference on the feeding habits of garden birds four different coloured feeders (silver, blue, yellow, white) were established and point counts of the number of visits received by each colour of feeder were recorded.

Using a tape measure, feeders were built to the same dimensions (25x25x5cm) and mounted on a stake of the same height (1.5m) equidistantly from one another (1.5m between each feeder).

Feeders had a small hole in the centre of the base allowing them to be relocated to different stakes easily via a nut and bolt on the stake. Stakes were numbered (1-4) to represent their position.





To ensure that birds recognised the feeders as a reliable source of food the feeders were established for one month before the pilot study.

Process:

Feeders were arranged following positions generated online by a random number generator, e.g., replicate one looked like this:

Replicate	Position 1	Position 2	Position 3	Position 4
1	Silver	Blue	Yellow	White
2	Blue	White	Silver	Yellow
3	Blue	Silver	White	Yellow
4	Silver	Yellow	White	Blue
5	Yellow	White	Blue	Silver
6	White	Blue	Yellow	Silver
7	Yellow	Silver	Blue	White

Replicate two looked like this:

Replicate	Position 1	Position 2	Position 3	Position 4
1	White	Yellow	Blue	Silver
2	Yellow	White	Silver	Blue
3	Blue	Silver	Yellow	White
4	Blue	Yellow	Silver	White
5	Silver	Yellow	White	Blue
6	Blue	Yellow	White	Silver
7	Yellow	Silver	Blue	White

Feeders were filled and repositioned the evening before recording the following morning.

Each feeder contained 70g of the same brand of food (Sainsbury's Wild Bird Seed Mix) and a video camera took a 15min recording of the feeders which was watched three times (once by an independent person (classmate)), preventing errors in the point count, and the number of visits received by each colour was recorded in a table.

This was repeated 30mins after sunrise every day for one week producing a mean number of visits received by each feeder.

This was replicated using different randomised positions but controlling the same confounding variables, improving the investigation's validity.

10

Control:

This investigation didn't include a negative control because it wasn't possible to remove colour from the feeders.

Control of confounding variables:

The mass and brand of food available was consistent for all feeders in all repeats and replicates.

Recordings were taken 30mins after sunrise instead of at the same time every day to accommodate for shortening days in winter when the investigation took place.

The feeders' position changed daily improving the investigation's validity as results indicating a preference for colour would be due to colour, not position.

Repeats and replicates:

Each day was one repeat with one 15min recording taken 30mins after sunrise every day. This was repeated every day for one week (one replicate contained seven repeats) which increased sample size.

This was replicated twice providing two replicates and two sets of results/means to be compared.

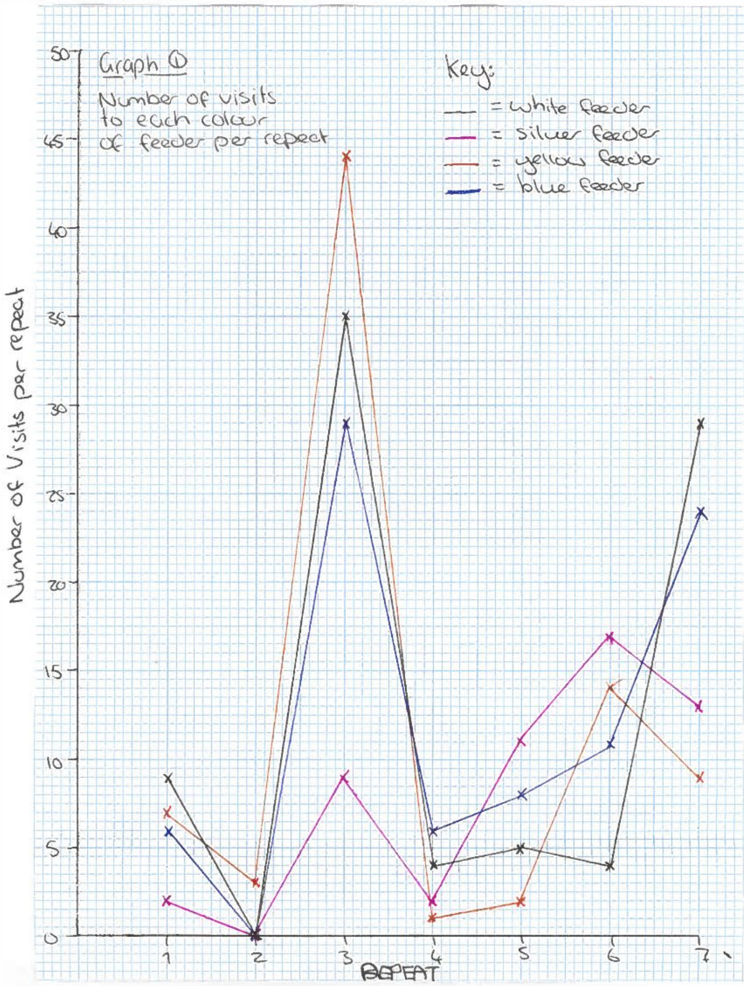
Influence of the pilot study:

The pilot study's results were considered to refine the investigation's process. For the final investigation the length of recordings was increased from 10-15mins, time of recordings was moved from evening to 30mins post sunrise, a video camera was used and point counts taken from there instead of direct observation and point counts, and what was being measured was changed from number of birds visiting the feeders to number of visits received by the feeders.

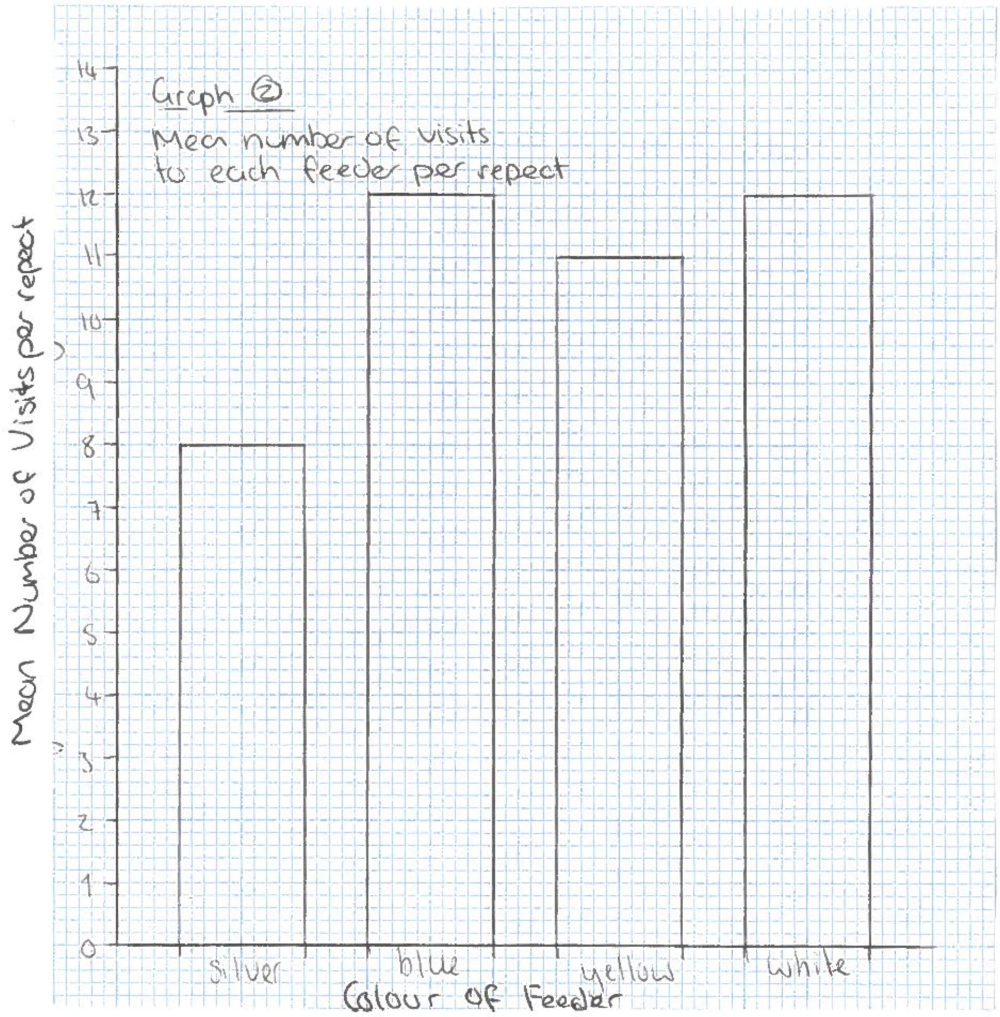
Results:

Results from replicate one:

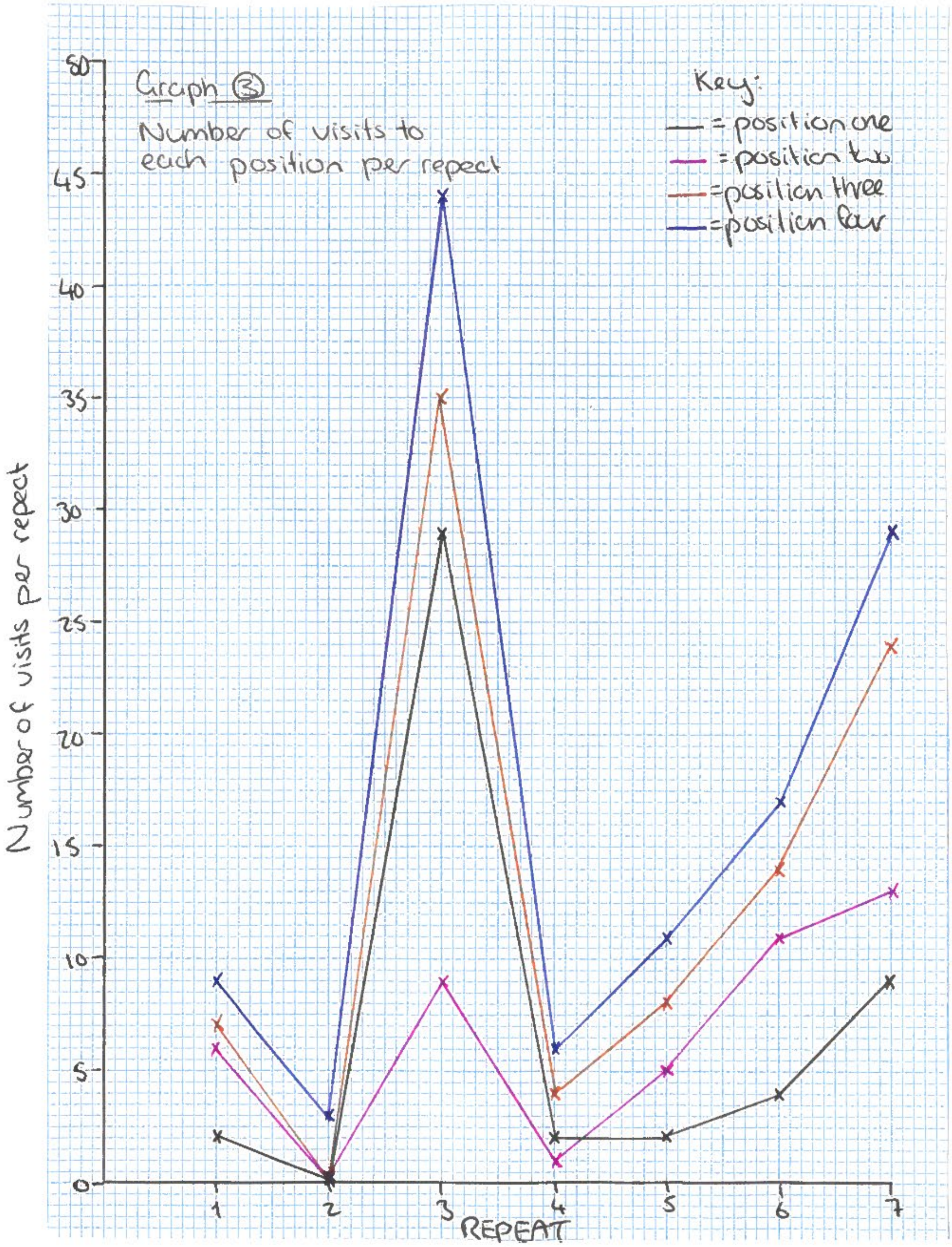
Colour	Visits per 15 minute repeat							Mean number of visits per repeat
	1	2	3	4	5	6	7	
Silver	2	0	9	2	11	17	13	8
Blue	6	0	29	6	8	11	24	12
Yellow	7	3	44	1	2	14	9	11
White	9	0	35	4	5	4	29	12



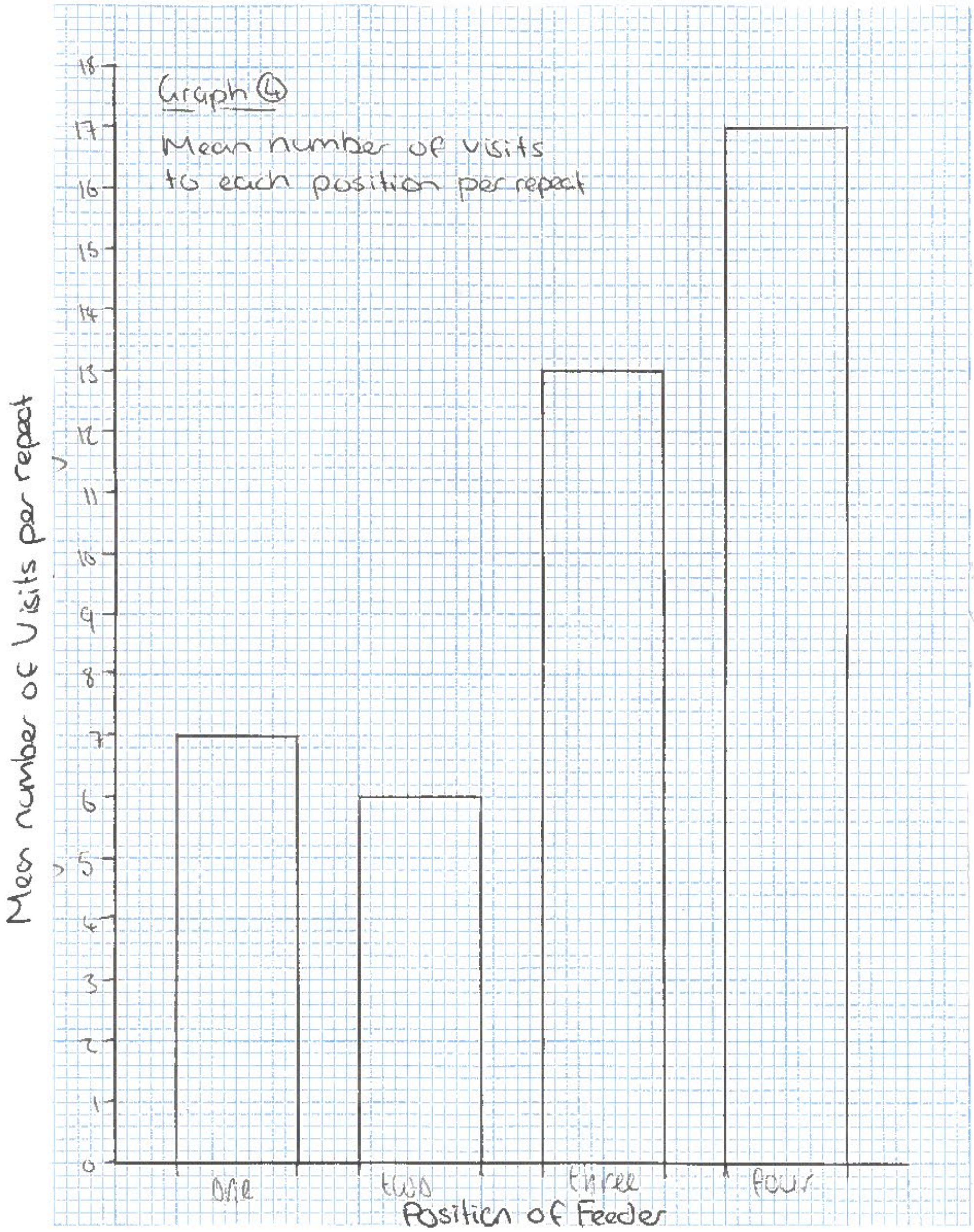
12


Graph ②
Mean number of visits to each feeder per repeat
Mean Number of Visits per repeat
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
silver
blue
yellow
white
Colour of Feeder

13


Graph ③
Number of visits to each position per repeat
Key:
= position one
= position two
= position three
= position four
Number of visits per repeat
REPEAT
0
5
10
15
20
25
30
35
40
45
50
1
2
3
4
5
6
7

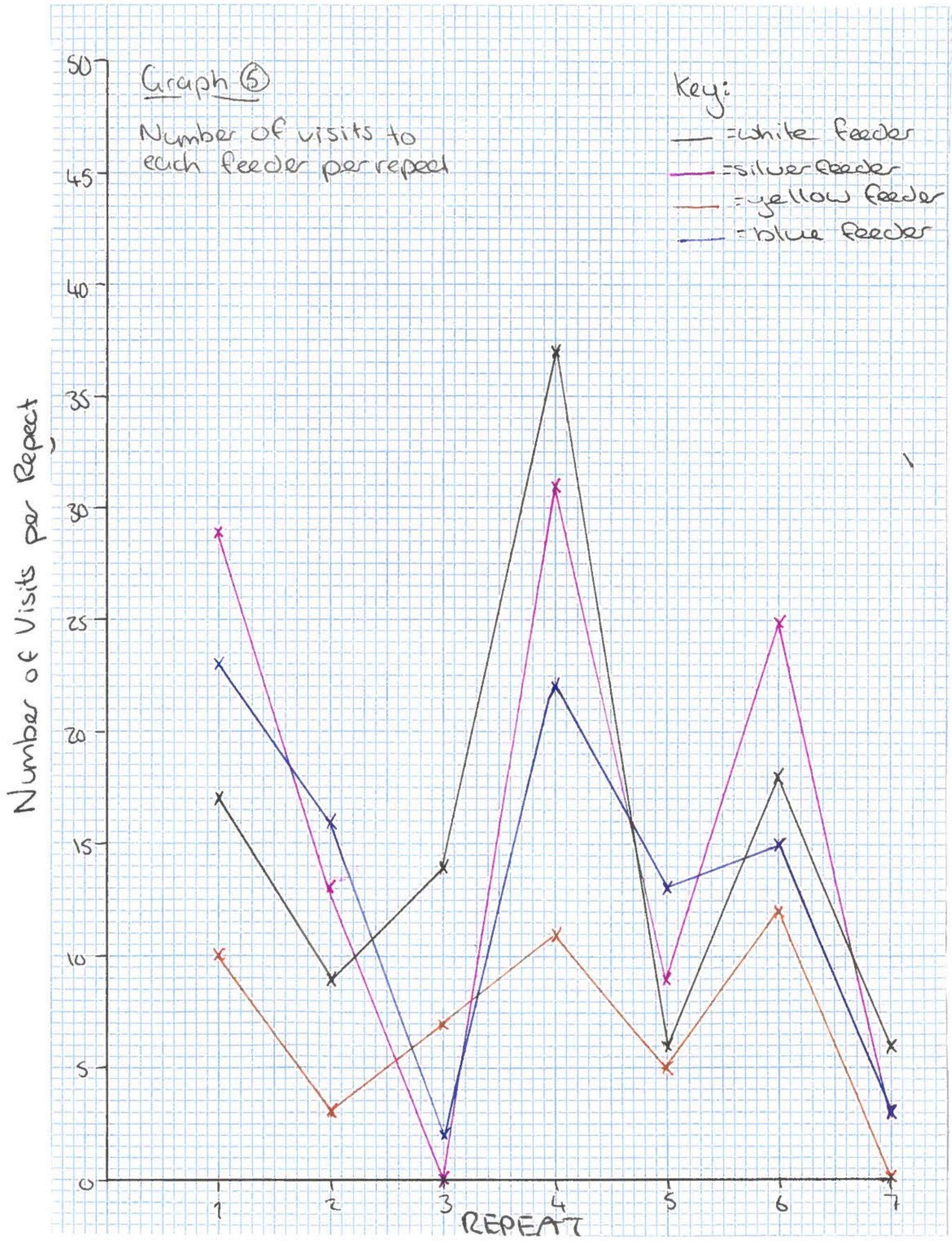
14


Graph 4
Mean number of visits to each position per repeat
Mean number of visits per repeat
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
one
two
three
four
Position of Feeder

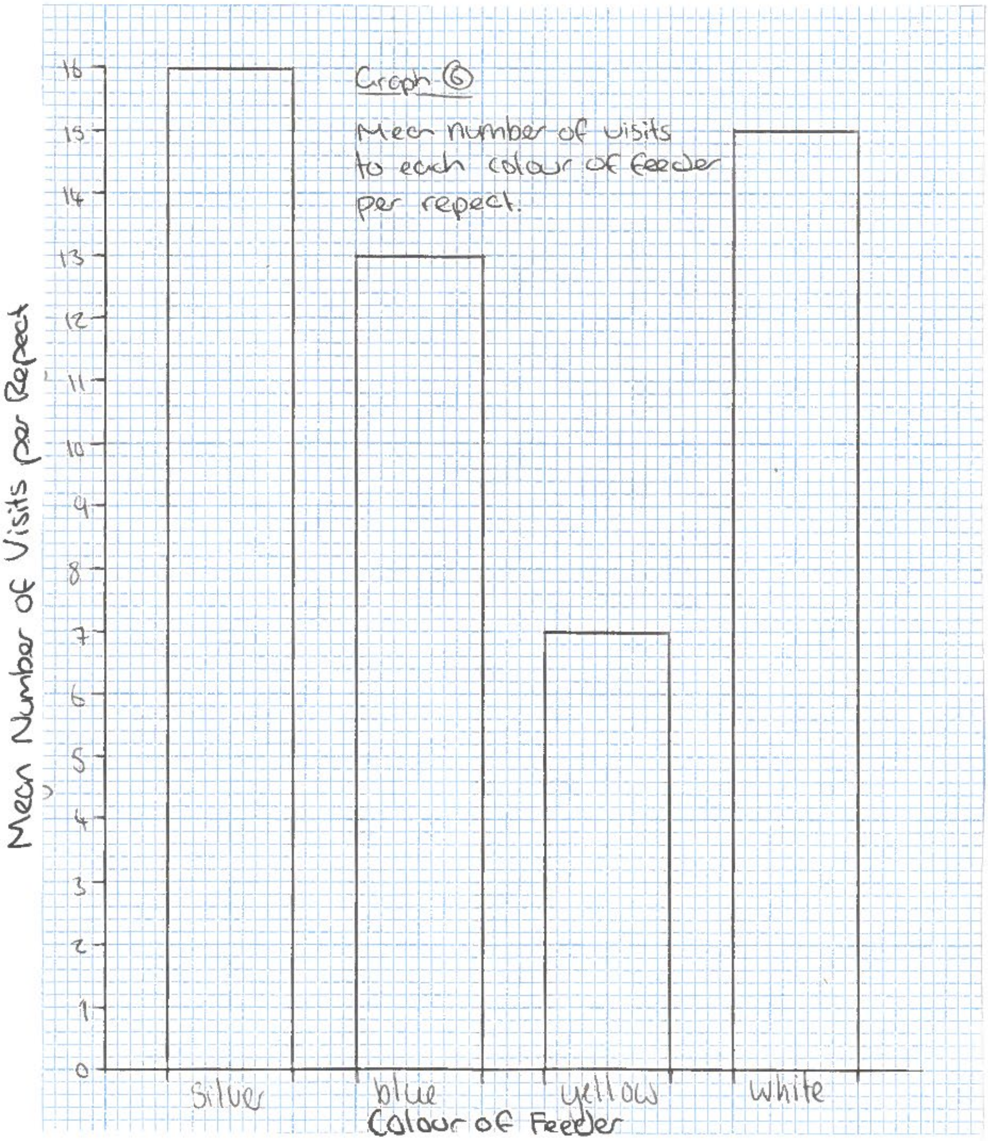
15

Results from replicate two:

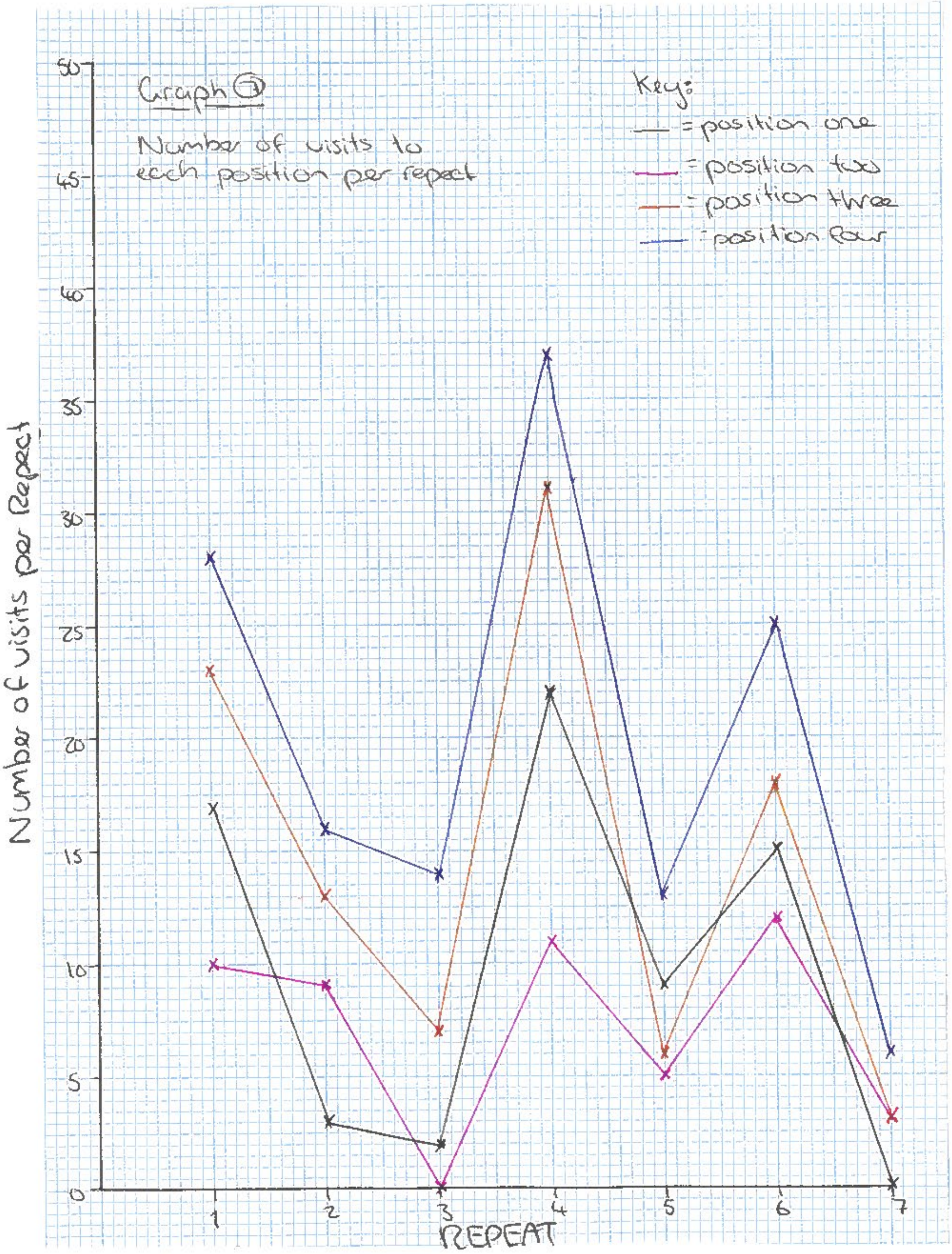
Colour	Visits per 15 minute repeat							Mean number of visits per repeat
	1	2	3	4	5	6	7	
Silver	28	13	0	31	9	25	3	16
Blue	23	16	2	22	13	15	3	13
Yellow	10	3	7	11	5	12	0	7
White	17	9	14	37	6	18	6	15



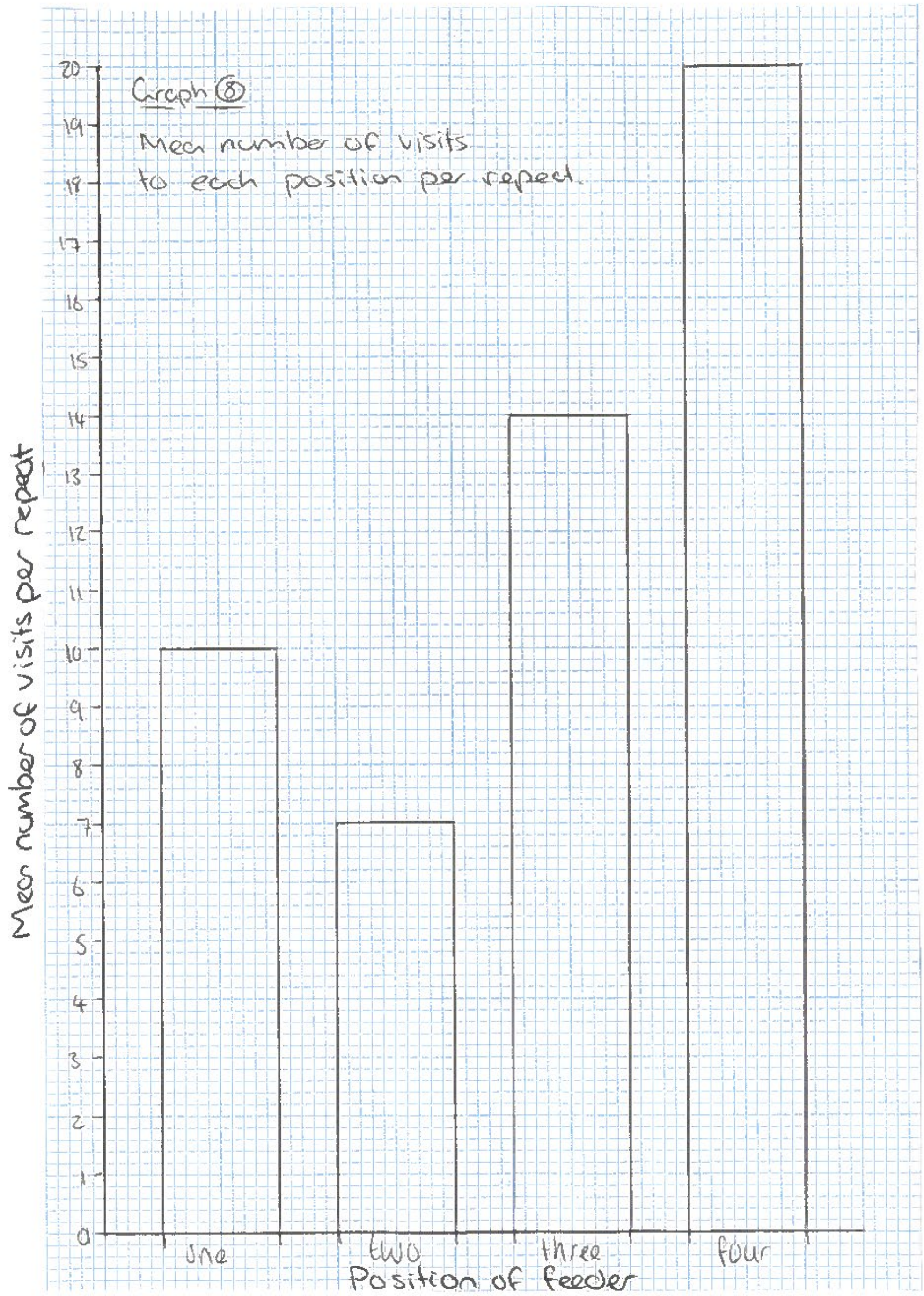
16


Graph 6
Mean number of visits to each colour of feeder per repeat.
Mean Number of Visits per Repeat
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
silver
blue
yellow
white
Colour of Feeder

17


Graph ⑦
Number of visits to each position per repeat
Key:
= position one
= position two
= position three
= position four
Number of visits per Repeat
REPEAT
0
5
10
15
20
25
30
35
40
45
50
1
2
3
4
5
6
7

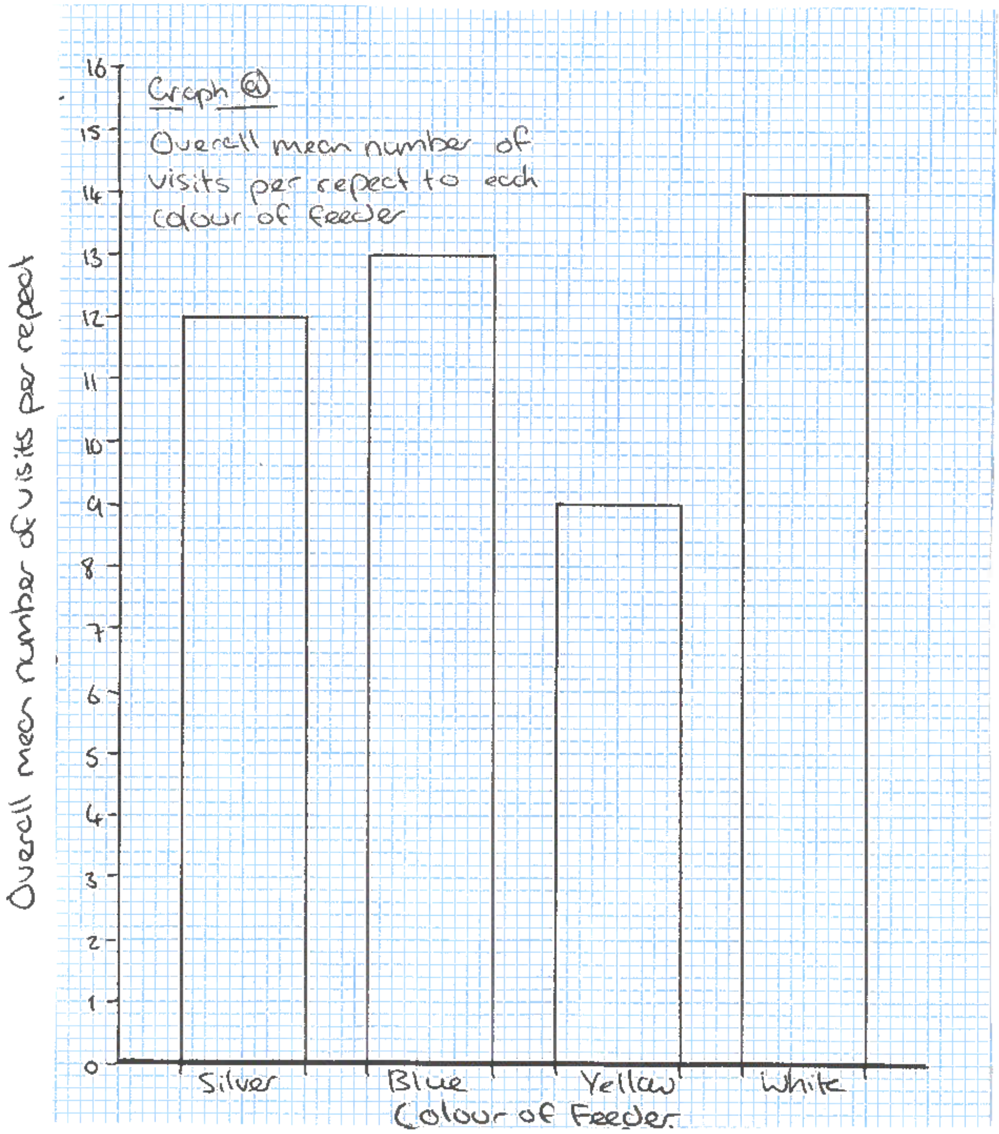
18


Graph 8
Mean number of visits to each position per repeat.
Mean number of visits per repeat
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
one
two
three
four
Position of feeder

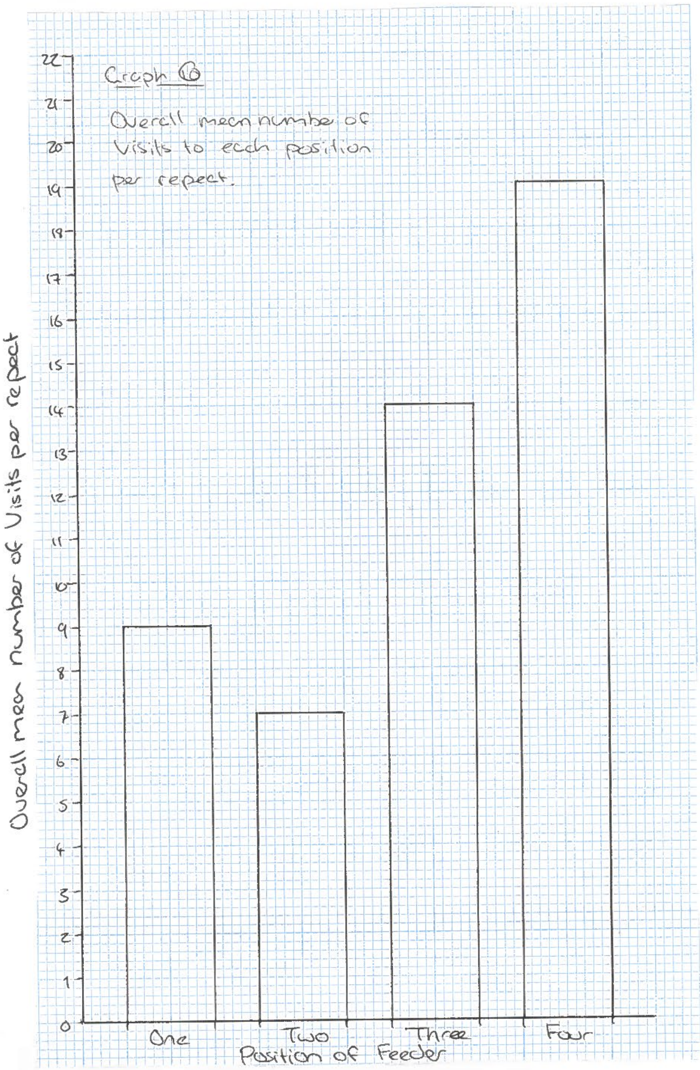
19

Combined results:

Feeder colour	Mean visits per 15 minute repeat		Overall mean number of visits per 15 minute repeat
	Replicate one	Replicate two	
Silver	8	16	12
Blue	12	13	13
Yellow	11	7	9
White	12	15	14



Position	Mean visits per 15 minute repeat		Overall mean number of visits per 15 minute repeat
	Replicate one	Replicate two	
One	7	10	9
Two	6	7	7
Three	13	14	14
Four	17	20	19



21

Discussion:

Conclusion:

In conclusion, the garden birds show no strong preference between white, silver, and blue but least preference for yellow feeders.

However, they did have a preference for position four with this position receiving an average of 9 visits more than any other position overall.

Evaluation of procedures:

Accuracy of measurements:

Dimensions were measured using a measuring tape with 1mm increments, ensuring that sizes of each feeder and distances between feeders/distances of feeders from the ground were precise. This increased the investigation's validity because the locations of the feeders are as similar as possible with none providing more safety from predators e.g., cats, by being higher than others as this may influence the birds' preference.

Scales were used to measure the mass of food available. This improved the accuracy of measurements so the mass available was more consistent than using measuring cups as this leaves room for interpretation/human error. This increased the investigation's validity as birds couldn't form a preference based on the availability of food as it was kept consistent across all four feeders in every repeat.

A video camera recorded feeders making it easier to distinguish the birds' preference as the pilot study showed that the presence of a person resulted in fewer overall visits. Recordings were watched multiple times and by a second person (classmate) with no biased opinions of the investigation. Each feeder was zoomed in on and point counts taken of one at a time preventing activity elsewhere being a distraction, affecting results recorded. This increased the investigation's validity because errors in point counts are reduced as recordings can be checked/rewatched.

Sample size:

Sample size was appropriate as establishment of feeders prior to recording results ensured that birds understood the feeders were reliable sources of food. Repeats were also taken for seven days (one repeat each day), and this was replicated twice. Length of recording was increased from 10 to 15 minutes following the pilot study. This takes into consideration effects of dietary conservatism [10] which may cause birds to avoid new foods for longer because they perhaps struggle to recognise aposematism in unfamiliar foods and might fear potentially dangerous foods mimicking foods recognised as safe by lacking/concealing aposematism features, possibly leading to extended lengths of dietary conservatism even after neophobia has been overcome meaning it's important that the birds identify the feeders as safe in order to get a true idea of preferences they have because birds became familiar with the feeders and overall number of visits increased, increasing the investigation's validity as results are more representative of the population as a whole and recording results over a longer period of time accounts for temperature fluctuations.

Controls:

This investigation didn't involve a control because a control's results are evidence that an investigation's results are due to the independent variable and it's not possible to remove the independent variable, colour, therefore a control wouldn't function correctly.

Independent variable:

A similar study [7] investigated a wide range of colours and found silver and green to be the most preferred by birds. I included silver in my investigation but not green in hopes of seeing a greater preference for another colour in the absence of green.

Confounding variables:

Feeders were modified to be easily switched and a random number generator determined the feeder's positions in repeats ensuring that it was truly randomised to prevent birds forming a preference for a position. This was to improve the validity of results as any preference for colour would be less likely to be due to position. Despite this, birds still formed a preference for position over colour perhaps due to the close proximity of foliage/foraging areas to certain positions more than others.

Length of time after sunrise that recordings were taken, and length of recordings were kept consistent to increase the results' validity as light levels, temperature, and overall levels of bird activity in the area were as similar as possible during each repeat.

The brand and mass of food available in feeders were kept consistent, improving the investigation's validity as birds weren't more/less likely to visit feeders based on inconsistencies within key confounding variables.

The size of feeders and their height and proximity to others was kept consistent, to prevent birds forming a preference for a position that provides more safety from predators than others, improving the investigation's validity as any colour preference seen would in fact be due to colour.

Solutions to problems arising in the pilot study:

Length of recordings were increased from 10 to 15mins and point counts were taken from recordings instead of direct observations as human presence reduced overall number of visits, and recordings could be rewatched, reducing error in point counts. Time of recordings was changed from evening to morning as more birds were more active in the morning and feeders were repositioned and filled with food the night before following a slight peak in activity, ensuring that the birds weren't disturbed, and a sufficient mass of food would remain in the morning. A second pilot study was carried out with recordings being taken at 7am for 10 minutes. However, during the course of the investigation changes in daylight hours and when sunrise started meant that environmental conditions were changing. It was decided that the environmental conditions were more likely to be affecting the number of birds visiting the feeder - particularly the light levels during the morning - and so it was decided to ensure consistency within the results that the number of visits 30 minutes after sunrise (as determined by the BBC weather app) would give a better representation of bird behaviour.This improved the validity of the investigation as more birds visited the feeders overall, so more visits were taken into consideration in the results.

What was being measured was changed from number of birds visiting each feeder to the number of visits received by each feeder as it wasn't possible to confidently distinguish between birds, e.g., two male robins, due to the quality of the recordings.

<u>Evaluation of results:</u>

Replicate one's repeats show only a few consistent trends. A sudden overall increase in the number of visits to all feeders on repeat three could've been due to a sudden drop in temperatures and frosted grounds, forcing birds to utilize supplementary feeding as they're unable to forage for worms etc. On repeat three, yellow received 44 visits, up from 3 on repeat two, with a % increase of:

$$\% \, increase = \frac{difference}{original} \times 100$$

$$= \frac{44 - 3}{3} \times 100$$

$$= 1{,}367 \, \%$$

Also on repeat three, compared to repeat two, blue received 29 visits up from 0, white received 35 visits up from 0, and silver received 9 visits up from 0, all with an $undefined$ % increase.

There's a steady increase in overall visits to every feeder in replicate one, excluding a few outlying values. Visits to white decreased 20% before increasing 625% between repeats 5-7. Between repeats 6-7 visits to silver decreased 24% and visits to yellow decreased 36%. The general increase in overall visits to all feeders could be due to birds becoming more confident using something new to their environment despite establishing the feeders for a month prior to the investigation to prevent this.

Replicate two's results show very little consistent trends bar fluctuations in the overall number of birds visiting all colours of feeders. Between repeats three and four, visits to silver increased from 0 to 31 before decreasing 71% for repeat five, visits to blue increased 1,000% before decreasing 41%, visits to yellow increased 57% before decreasing 55%, and visits to white increased 164% before decreasing 84%. This could've been due to a sudden drop in temperatures similar to repeat three in replicate one. Other overall fluctuations can be attributed to similar sudden changes in temperature or changes to other confounding variables such as precipitation.

In replicate one the blue and white feeders are tied with means of 12 visits per repeat, next is yellow (mean = 11), and last is silver (mean = 8), suggesting a clear preference. However, if compared to replicate two's results; silver (mean = 16), white (mean = 15), blue (mean = 13), and yellow (mean = 7), it's clear that the results do not mirror each other.

These results can be explained if we consider trends in the birds' preference for a position instead of a colour in both replicates. The most preferred positions in both replicates, in order, are four (replicate one mean = 17 in, replicate two mean = 20), three (replicate one mean = 13, replicate two mean = 14), one (replicate one mean = 7, replicate two mean = 10), and then two (replicate one mean = 6, replicate two mean = 7).

This could be due to varying proximities of each feeder to the surrounding foliage, this confounding variable couldn't be controlled. Position four was closest to tall foliage, and three was second closest, meaning that the birds didn't have to venture as far as position one/two to visit those feeders and their safety amongst the trees would always be closer/quicker to reach. After watching recordings, birds noticeably spent a lot of time foraging in the shrubs on the ground closest to one, explaining why one was favoured over two despite being further from the taller foliage as birds would jump up from the ground to the closest feeder.

These findings don't confirm the hypothesis which considered a similar study [7] indicating that the most popular colour should have been silver. Results from this investigation concluded that in non-lab settings the effect of position had a more significant impact on preference than colour.

As results don't confirm the hypothesis due to the impact of position despite controlling the feeders' height and proximity to each other it's possible that if conducted in a more open area with no foliage or shrubs to induce a preference for position, we'd see a distinct trend in the birds' preference for a particular colour.

References:

[1]
(2018) Rods. American Academy of Ophthalmology, access at: https://www.aao.org/eye-health/anatomy/rods#:~:text=Rods%20are%20a%20type%20of,sensitive%20to%20light%20than%20cones. (Date accessed: January 2025)

[2]
(2011) Birds. The Evergreen State College, access at: https://archives.evergreen.edu/webpages/curricular/2011-2012/m2o1112/web/birds.html#:~:text=The%20cone%20cells%20in%20birds,which%20help%20with%20night%20vision (Date accessed: January 2025)

[3]
(2025) UV Vison, Can Birds See At Night? (Everything You Need To Know). Birdwatching, access at: https://www.birdwatchingdaily.com/beginners/birding-faq/can-birds-see-at-night/ (Date accessed: January 2025)

[4]
Stavenga, DG. and Wilts, BD. (2014) Oil droplets of bird eyes: microlenses acting as spectral filters. Phil. Trans. R, Soc. B 369: 20130041 National Library of Medicine, access at: https://pmc.ncbi.nlm.nih.gov/articles/PMC3886329/#:~:text=This%20suggests%20that%20the%20carotenoid,that%20is%2C%20the%20spectral%20dispersion (Date accessed: January 2025)

[5]
Goldsmith, TH. What Birds See. (2006) Scientific American pp 68-75 access at: http://bejerano.stanford.edu/readings/corbo/Goldsmith_what_birds_see.pdf (Date accessed: January 2025)

[6]
(2023) The benefits of UV lighting for birds – Part two. ExoticDirect Part of the Petcover Group, access at: https://exoticdirect.co.uk/news/benefits-uv-lighting-birds-part-two/#:~:text=The%20benefits%20of%20seeing%20in%20the%20UV%20spectrum&text=Perhaps%20more%20remarkably%20the%20tetrachromatic,to%20glow%20under%20UVA%20light (Date accessed: January 2025)

[7]
Rothery, L. Scott, GW. Morrell, LJ. (2017) Colour preferences of UK garden birds at supplementary seed feeders. pp 1-10 PLOS One, access at: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0172422 (Date accessed: January 2025)

[8]
Asher, C. (2022) How many birds are killed by wind turbines in the UK? BBC Science Focus, access at: https://www.sciencefocus.com/science/how-many-birds-are-killed-by-wind-turbines-in-the-uk (Date accessed: January 2025)

[9]
Brocklebank, J. (2024) Heartbroken farmer nearly quit career after ravens massacre 220 lambs. Daily Mail, access at: https://www.dailymail.co.uk/news/article-13456903/Heartbroken-farmer-nearly-quit-career-ravens-massacre-220-lambs.html (Date accessed: January 2025)

[10]
Marples, N. Kelly, D. (1999) Neophobia and Dietary Conservatism: Two Distinct Processes? pp 1-15 ResearchGate, access at: https://www.researchgate.net/profile/Nm-Marples/publication/225967867_Neophobia_and_Dietary_ConservatismTwo_Distinct_Processes/links/54f995590cf210398e98fbf9/Neophobia-and-Dietary-ConservatismTwo-Distinct-Processes.pdf (Date accessed: January 2025)

Appendix:

Replicate one results:

Colour	Visits per 15 minute repeat							Mean number of visits per repeat
	1	2	3	4	5	6	7	
Silver	2	0	9	2	11	17	13	8
Blue	6	0	29	6	8	11	24	12
Yellow	7	3	44	1	2	14	9	11
White	9	0	35	4	5	4	29	12

Replicate two results:

Colour	Visits per 15 minute repeat							Mean number of visits per repeat
	1	2	3	4	5	6	7	
Silver	28	13	0	31	9	25	3	16
Blue	23	16	2	22	13	15	3	13
Yellow	10	3	7	11	5	12	0	7
White	17	9	14	37	6	18	6	15

Sample calculation of means:

Mean number of visits received by silver in replicate one= $\frac{2+0+9+2+11+17+13}{7} = 7.7$

All means were rounded to the nearest whole number as it is not possible to claim a higher degree of accuracy in mean values in comparison to the initial results and it is also not possible to quantify less than one whole visit at a time.

Additional info:

An inquisitive subject having a nosy at the camera!