AMAZING ADAPTATIONS

AGES 11-14

Curriculum resource pack for adaptations, evolution and inheritance

WWT is one of the UK's leading providers of outdoor learning. We welcome over 50,000 learners per year to our Wetland Centres where we provide unique opportunities for learners of all ages and abilities to interact with wetland wildlife from the UK and across the world.

We are open all year round with sessions for every season. Whether you're looking for curriculum-linked learning or simply a fun day out, there really is something for everyone. To find out more about our school visits programme please visit **learningzone.wwt.org.uk.**

Why wetlands?

WWT works across the UK to save, restore and build wetlands for wildlife and people. Wetlands are one of the most important habitats on earth – storing huge amounts of CO_2, providing a natural way of stopping flooding and serving as a home for huge numbers of different creatures. Spending time in wetlands is also proven to improve mental health and wellbeing!

Using this resource pack

This resource pack contains classroom activities designed to cover key curriculum content as well as outdoor activities designed to promote nature connection and a love of the natural world. This is accompanied by supporting resources that can be printed or used on screen with your pupils.

CURRICULUM LINKS

England

KS3: Science

- The variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection
- Heredity as the process by which genetic information is transmitted from one generation to the next

Northern Ireland

KS3: Science and Technology

- Explore the importance of biodiversity, how it impacts on our lives and how it is affected by human activity

Wales

KS3: Science and Technology

- I can explain how reproduction, mutations and the environment can lead to variation and adaptations within organisms which can affect their chances of survival
- I can explain how variation of organisms within a changing environment leads to natural selection which drives evolution

Scotland

Sciences

- Fourth: I understand how animal and plant species depend on each other and how living things are adapted for survival

INDOOR ACTIVITIES

YOU WILL NEED:

Wetland bird adaptations cards

Amazing Adaptations visual (see the end of this pack)

Other relevant resources

School visits:

- We run a wide range of sessions focusing on adaptations at KS3. Visit our Learning Zone to find out more **learningzone.wwt.org.uk**

NOTE: **Where you see a Q this indicates a question to ask your pupils.**

INDOOR ACTIVITIES

Introduction

- What is variation? Look around the class. We are all human, that is our species, but we have different eye colours, hair colours, height and skin colours. These are examples of variation within a species. Differences such as eye colour or hair colour are called inherited variations or they are characteristics that our parents have passed down to us through genetic information.
- Just like humans, other species also have inherited variations. Variation can also be caused by environment. If a variation is beneficial to an animal and helps it survive, that animal will be more likely to reproduce and pass that trait down to its offspring.
- This new feature, or behaviour, is an adaptation. An adaptation is either a feature or a behaviour which helps an animal to become better able to survive in its environment.

- Variation also exists between species. For example, not all species of bird have the same type of beak or feathers or wings.
- Ask learners to contribute as many different bird names as possible to a whole-group list. What features do all of these species of bird have? (They all have wings, a head, feathers, legs etc.).
- In what ways are these species of bird different from each other? (Feather colours, beak shape, size, feather coverage, length of neck, length of legs, feet shape etc.).
- Why are they different? (Each species of bird is uniquely adapted to survive in its environment. e.g. a feature such as a very thin beak for getting worms out of cracks in a rock or a particular behaviour such as a bird call that helps them to find a mate).

Activity 1: Feet

- Give out one set of wetland bird adaptation cards to each group.
- Inform the class that they're first going to think about the birds' feet.
- Ask them to look carefully at the cards. Remind them that for any birds where they can't see their feet clearly in the main image there is a close-up of their feet on the reverse.

Q **Can you think of any ways wetland birds may have developed feet suited to where they live and what they do?**

- Display the main four types of feet.
- The birds' feet on the cards can be sorted into four main groups:

WEBBED FEET **LONG TOES**

TALONS **SHORT TOES**

- See if each group can sort the birds into these four main types. Once they have sorted them into their groups, look at each in turn.

Webbed feet	Long toes	Short toes	Talons
- Mute swan	- Grey heron	- Reed warbler	- Osprey
- Bewick's swan	- Little egret	- Kingfisher	- Marsh harrier
- Canada goose	- Moorhen		
- Greylag goose	- Avocet		
- Mallard	- Black-tailed godwit		
- Shoveler	- Curlew		
- Goosander	- Spoonbill		
- Coot (lobed)	- Dipper		

Q How do you think each type of foot helps these birds to live in a wetland?

- You can talk through each group using the information below:

Webbed feet

- These help the bird swim through the water.
- They are also useful when walking as they stop the bird from sinking in mud.
- These birds spend a lot of their time on the water.

Long toes

- These help to spread the load so that the bird doesn't sink in mud.
- They also help the bird to balance.
- These birds spend a lot of their time standing.

Short toes

- These can easily be curled around things to enable the bird to perch.
- They are also light and flexible, enabling the bird to fly well.
- These birds spend a lot of their time perching and flying.

Talons

- These enable birds of prey to catch and kill their prey.

Lobed feet

- Have another look at the coot's feet. They're not truly webbed. In fact we say they are 'lobed'. This gives them the best of both worlds, meaning they are both strong swimmers and can walk effectively on land. What a fantastic adaptation!
- You might want pupils to carry out some research to see if there are any other birds with 'lobed' feet.

Activity 2: Legs

- Inform pupils that they're now going to think about the birds' legs.
- As before, ask them to group the birds according to the types of legs they have. Are they long or short? Are they narrow or wide? Again, there is no right answer the first time they sort them.
- This time, the legs can be categorised into four main groups:

SHORT, POWERFUL LEGS

SHORT, MEDIUM WIDTH LEGS

SHORT, NARROW LEGS

LONG, NARROW LEGS

- See if they can sort the birds into these four main groups.

Short, powerful legs...	Short, medium width legs	Short, narrow legs	Long, narrow legs
...for swimming: - Mute swan - Bewick's swan - Canada goose - Greylag goose - Mallard - Shoveler - Goosander **...for catching prey:** - Osprey - Marsh harrier	- Coot - Moorhen	- Reed warbler - Dipper - Kingfisher	- Grey heron - Little egret - Avocet - Black-tailed godwit - Curlew - Spoonbill

- Once they have sorted them into their groups look at each in turn.

Q **How do you think each type of foot helps these birds to live in a wetland?**

- You can talk through each group using the information below:

Short, medium width legs

- These are good for walking.

Short, narrow legs

- These are good for flying and perching.

Long legs

- These keep the bird's body above the water.

Short, powerful legs

- Some birds use these for swimming whilst others use them for catching and killing their prey. This shows that the same adaptation may arise for different reasons.

Q **For each group, can you think of our birds that have the same types of legs for the same reasons?**

Activity 3: Neck

- Inform pupils that they're now going to think about the birds' necks.
- Ask them to make a group of birds with particularly long necks.

Q **Why do you think these birds have long necks?**

A long neck enables these birds to reach down and get food from below the surface. This might be to reach plants below the surface, as is the case with swans, or to reach fish and other animals, as is the case with herons. Other birds such as spoonbills and avocets have a long neck so that they can sweep their head from side to side searching for food. In this case their bills usually have specialised shapes.

- Ask your pupils to identify all of the birds with long necks. For each one, ask whether they think that bird uses its long neck to reach below the surface or to sweep its head from side to side.

Long neck to reach animals or plants below the surface	Long neck to sweep head from side to side
- Mute swan - Bewick's swan - Canada goose - Greylag goose - Grey heron - Little egret - Black-tailed godwit - Curlew	- Spoonbill - Avocet

Q **Many of the other birds on the list also get food from below the surface but they don't have long necks. How do you think they might get their food?**

- Most of these birds either dive below the water for their food or they upend (imagine the classic sight of a duck with its bum in the air!)

Upends	Dives below the surface
- Mallard	- Coot - Goosander - Moorhen - Dipper (actually walks under water) - Kingfisher

NOTE: **Some of the birds with long necks also upend to reach further below the surface.**

Activity 4: Beak/bill

- Inform pupils that they will now look at the birds' beaks or bills (either term can actually be used).
- This is where we get the greatest variety, with each bird having evolved a bill for its particular diet. In fact the differences between birds' bills even helped Charles Darwin to develop his theory of evolution. You might want to ask pupils to research 'Darwin's finches' to find out more.
- Ask pupils to look at the birds' bills and try to sort them into different bill shapes. They should think about how each might be related to those birds' diets.
- Although there can be huge variety, even within groups, the main bill shapes shown on the cards are:

WIDE BILL

SHORT, STRONG ROUNDED BILL

SHORT, POINTED BILL

SPEAR-LIKE BILL

LONG BILL

SHORT, SHARP HOOKED BILL

- Display the main bill shapes.
- Challenge pupils to sort the birds according to the above criteria.

Wide bill	Short, strong, rounded bill	Short, pointed bill	Spear-like bill
- Mute swan - Bewick's swan - Mallard - Shoveler	- Canada goose - Greylag goose	- Coot - Moorhen - Reed warbler - Dipper	- Goosander - Grey heron - Little egret - Kingfisher

Wide bill	Short, strong, rounded bill
- Avocet - Spoonbill - Black-tailed godwit - Curlew	- Osprey - Marsh harrier

- Go through each group in turn together as a class.

Q **Can you think of any other examples of birds that might fit into each of these groups?**

- Look closely at the goosander bill. The goosander actually has a serrated bill which helps it to hold onto fish. Isn't nature amazing?

Q **How do you think each adaptation helps these birds to live successfully in a wetland?**

Wide bills

- Wide bills are great for skimming the water and filtering food out of the water a bit like a sieve.

Short, rounded bills

- Short, rounded bills are great for grazing on grass and other plants.

Short, pointed bills

- Short pointed bills are great for catching insects and eating seeds.

Spear-like bills

- Spear-like bills are great for catching fish.

Long bills

- Some birds use their long bills for probing for creatures in mud. Others sweep them through the water feeling for hidden prey.

Short, sharp hooked bills

- Hooked bills are great for tearing meat.

Activity 5: Create your own bird

- Give out the Amazing Adaptations visual.
- Ask learners to imagine they've just arrived on a previously unexplored island to see what bird species live there.
- Get them to imagine and describe the island. What is the weather like? What types of habitats are there? Where might the birds here live? What might the birds here eat?
- Challenge learners to create a bird that might live here. What makes it suitable for its habitat?
- Get them to draw their bird and label the features that help it to survive on the island.

OUTDOOR ACTIVITIES

Activity 6: Observing local birds

- Go outside. Find a quiet place where the pupils can sit still in their groups.
- Get them to look at any birds they can see and discuss in their groups what adaptations they think each bird might have developed to enable it to live in a particular habitat or obtain and eat a certain type of food.
- Ask groups to report back to the whole class.

Q **What do you think is the most impressive adaptation you have seen during your time outside?**

Q **Can you think of any other amazing adaptations animals have developed (not just birds)? Which are your favourites?**

- Did you know that all animals have evolved from a common ancestor? This means that you are related to every single living thing you can see around you.

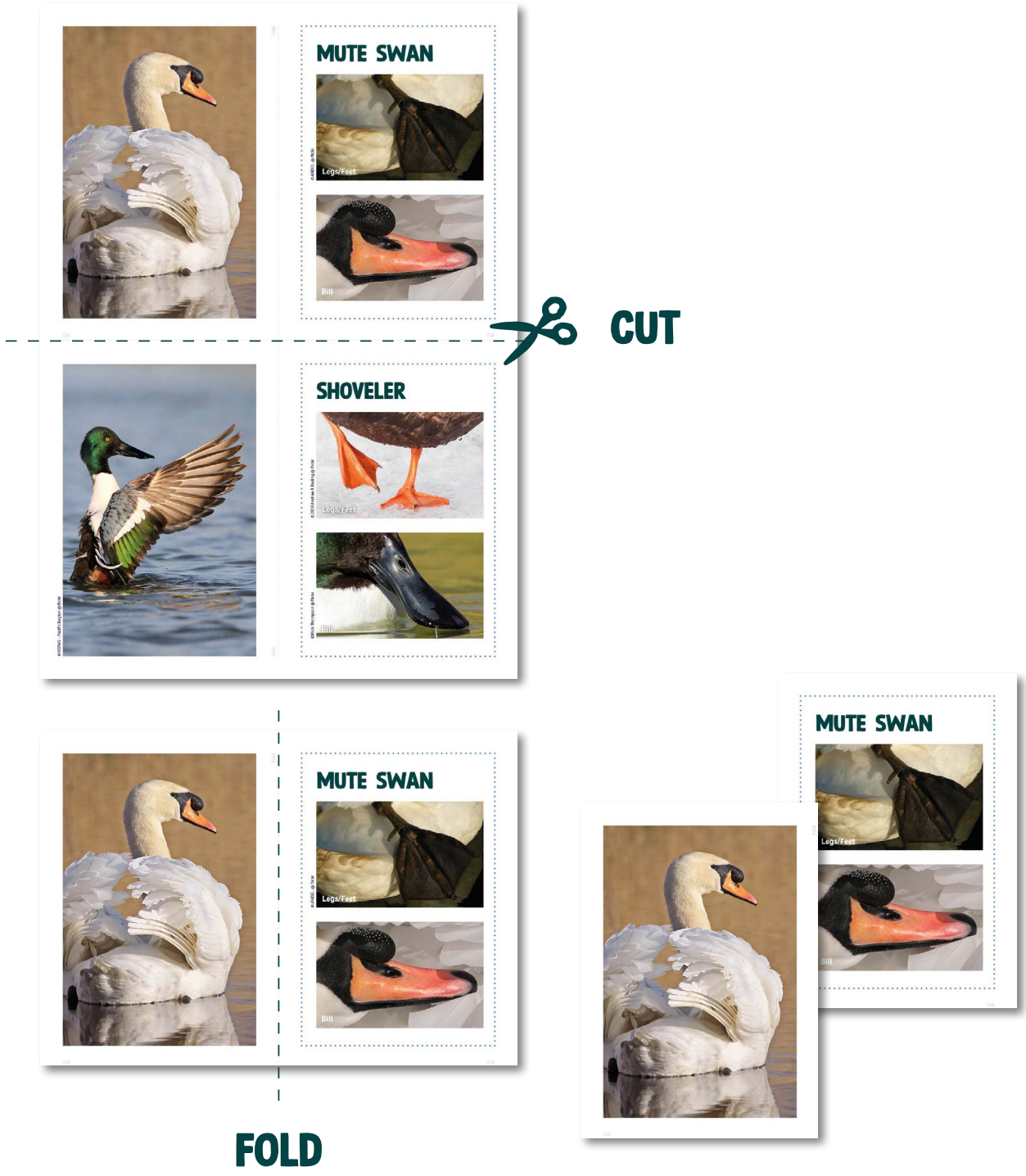
Q **How does this make you feel? Why?**

Activity 7: Evolution

- Take learners to a grassy area and explain that they are grass-eating birds. Also explain that there is not enough grass for them all: only those who eat the most grass will survive long enough to have babies and continue the lifecycle.
- Using thumb and forefinger, demonstrate a pinching action. Get learners to copy you and explain that this will be their beak.
- When you blow your whistle, learners start picking grass with their thumb and forefinger only (they must hold their collected grass in their other hand). When you blow your whistle again, they have to line up according to how much grass they have collected.
- Point out that the majority of 'birds' have not found enough food and so have died (ask them to sit down). The 'birds' with the most food (three learners) have survived and so now have baby birds (all the birds that have just 'died', now come back to life as baby birds and stand up ready to take part). Most of the babies will inherit the same beak shape as their parents (ask all learners to get their thumb and forefinger ready to collect grass again).
- BUT now and again a bird is born with a beak that is different. This could be called a mutation, or a 'change'. Choose one learner and explain that they have a bigger beak than all the others and can use all five fingers to collect grass. Repeat the grass collection exercise. The bigger beaked bird should have lots more grass than everyone else, so will be one of the three who survive this time. Again, ask all but those three, to sit down.
- Now these three birds have babies. What size beak will offspring of the big beaked bird have? (Most often, a big beak). Ask a third of the learners sitting down to stand back up but this time they may all use five fingers to collect grass. What size beak will offspring of the two small beaked birds have? (Most often, small beaks). Ask the remaining two thirds of the learners sitting down to stand back up and continue to use the pinching action to collect grass.
- The process by which this beneficial trait (the big beak) spreads through a population, is called natural selection and over time this leads to evolution. The birds will evolve big beaks over time, because a bigger beak is an adaptation which helped them to survive.

WETLAND BIRD ADAPTATION CARDS

- To make the cards, cut the line across the width of your paper then fold each half in half again so you end up with the main picture on one side and the close-ups of the bill and legs / feet on the other. Stick the two sides together with glue.



Fold

Cut

MUTE SWAN

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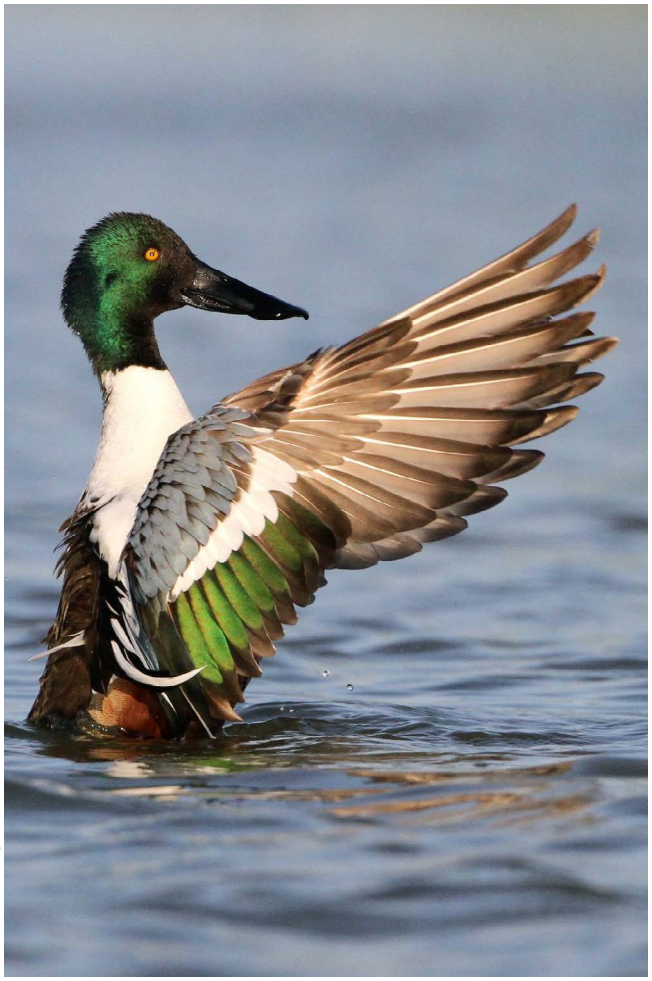
Cut



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SHOVELER

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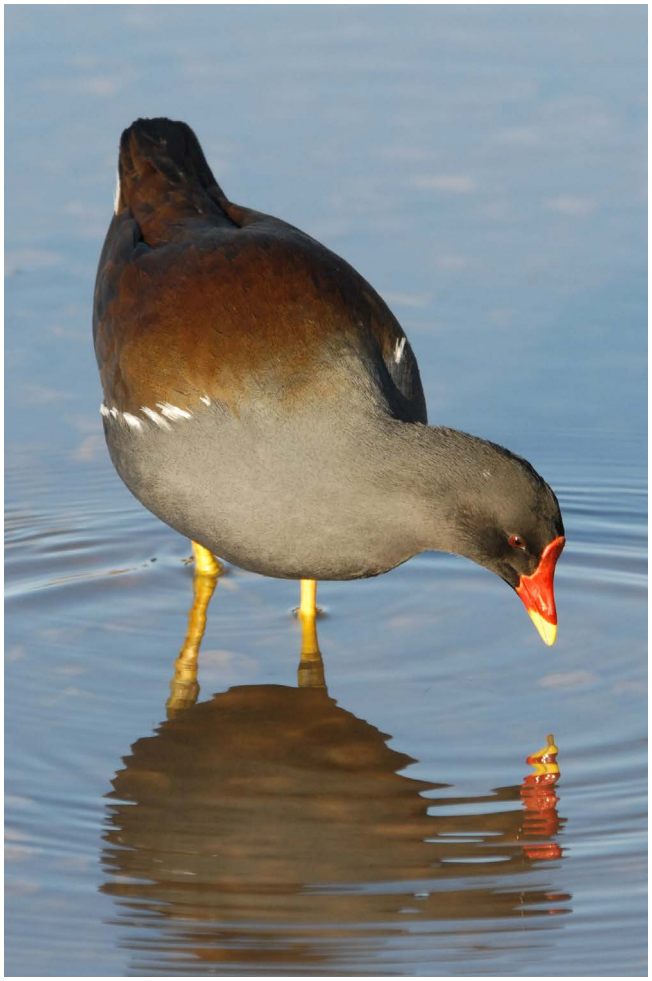

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MOORHEN

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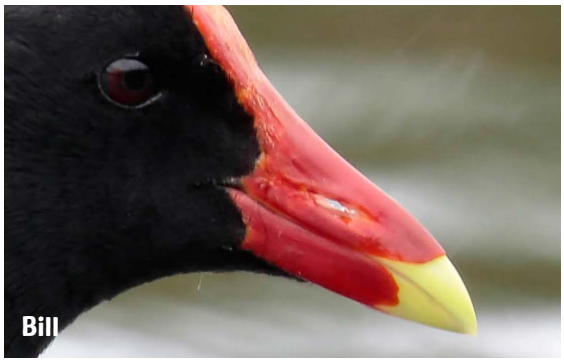

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REED WARBLER

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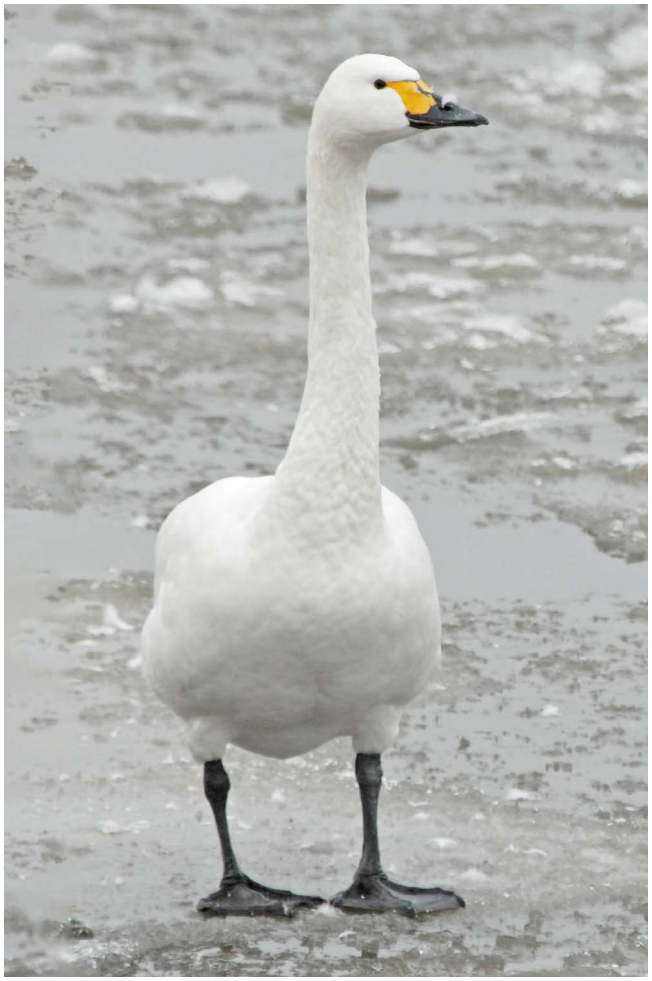

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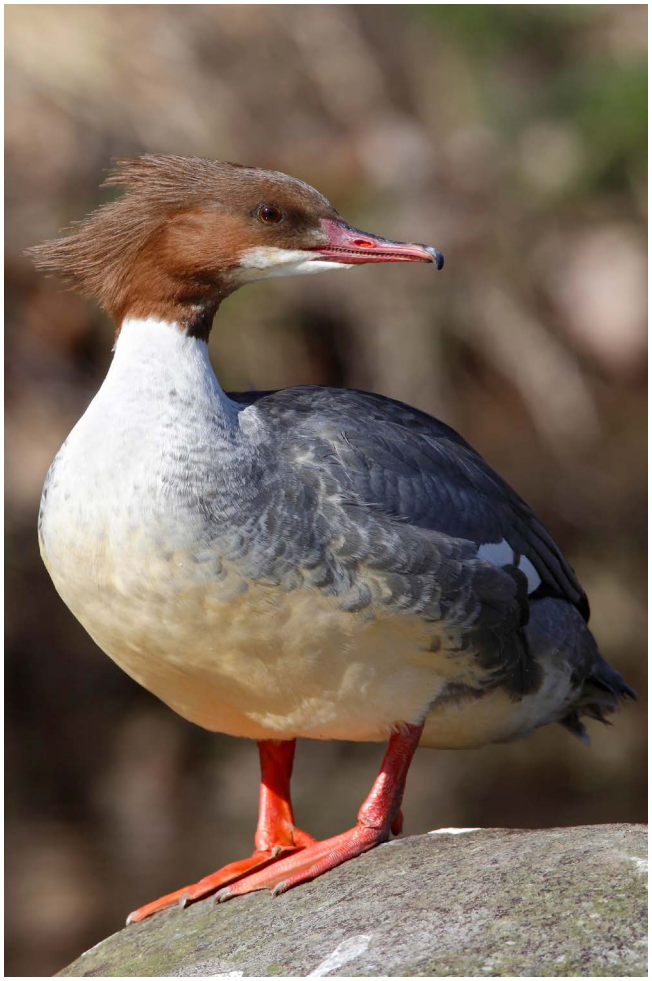
BEWICK'S SWAN

Cut

Cut



Fold

GOOSANDER

© Tony Sutton @ flickr

Fold

Cut

AVOCET

© Nigel @ flickr

Legs/Feet

© Nigel @ flickr

Bill

Cut

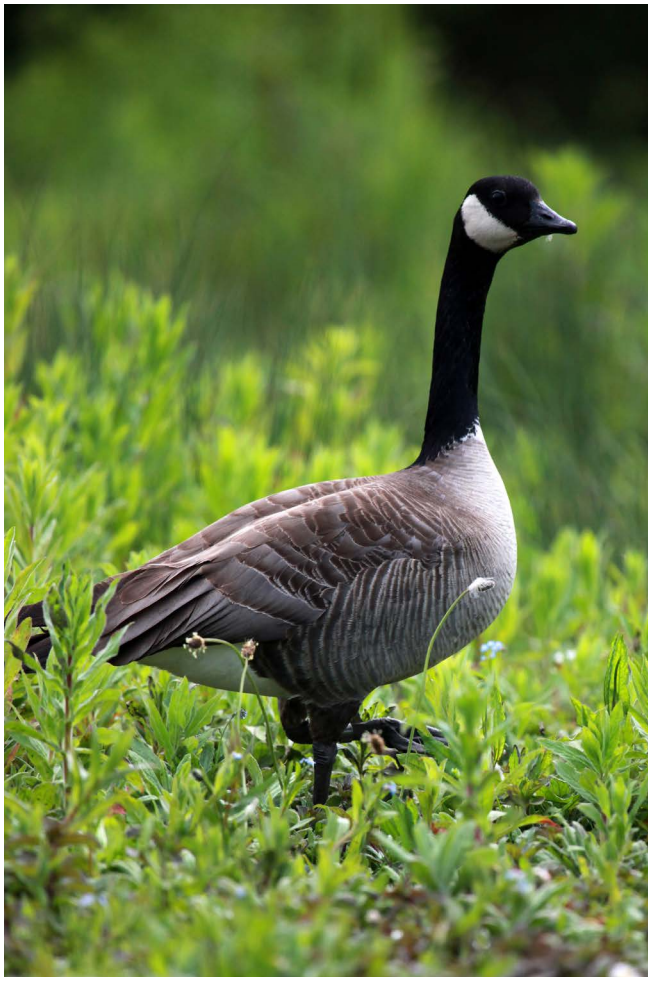
© ianpreston @ flickr

Fold

DIPPER

© ianpreston @ flickr

Legs/Feet



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CANADA GOOSE

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GREY HERON

© Janie Easterman @ flickr

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BLACK-TAILED GODWIT

© Frans Vandewalle @ flickr

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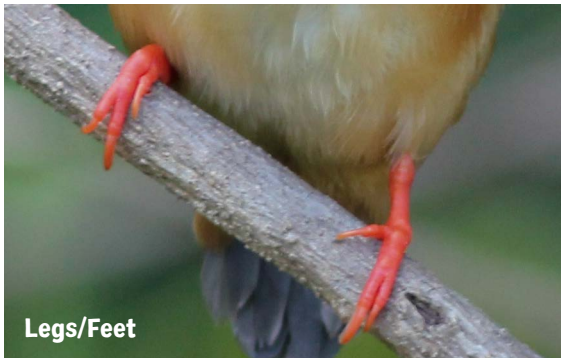
KINGFISHER



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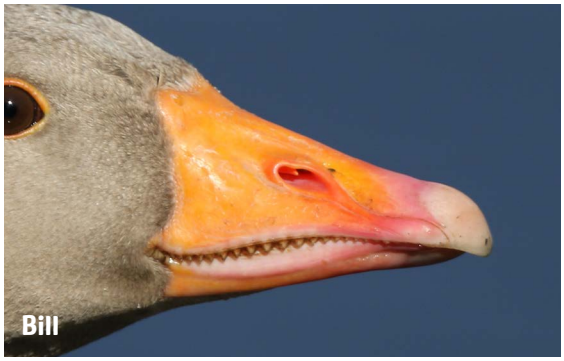
GREYLAG GOOSE



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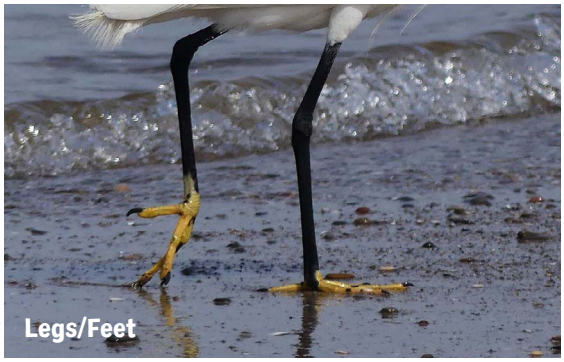
LITTLE EGRET



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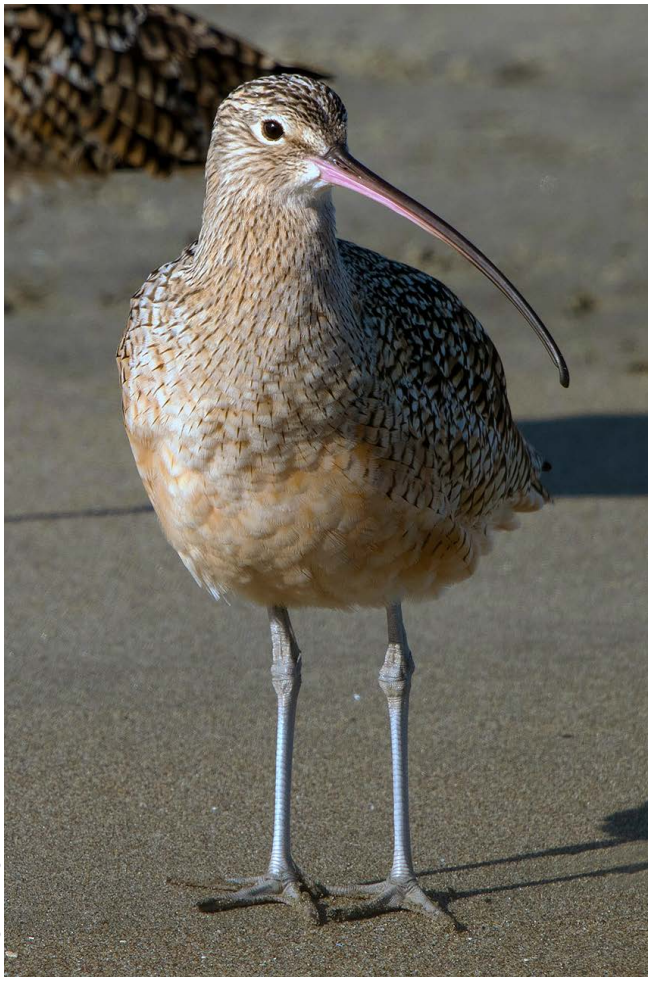

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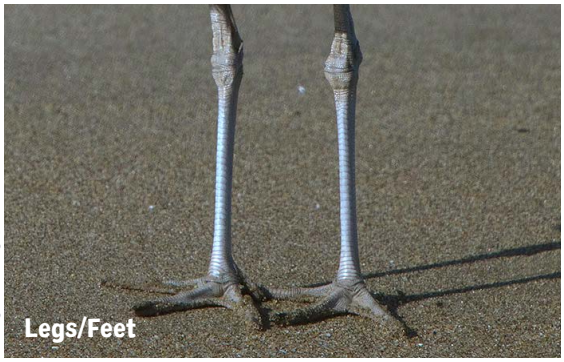
Cut

CURLEW



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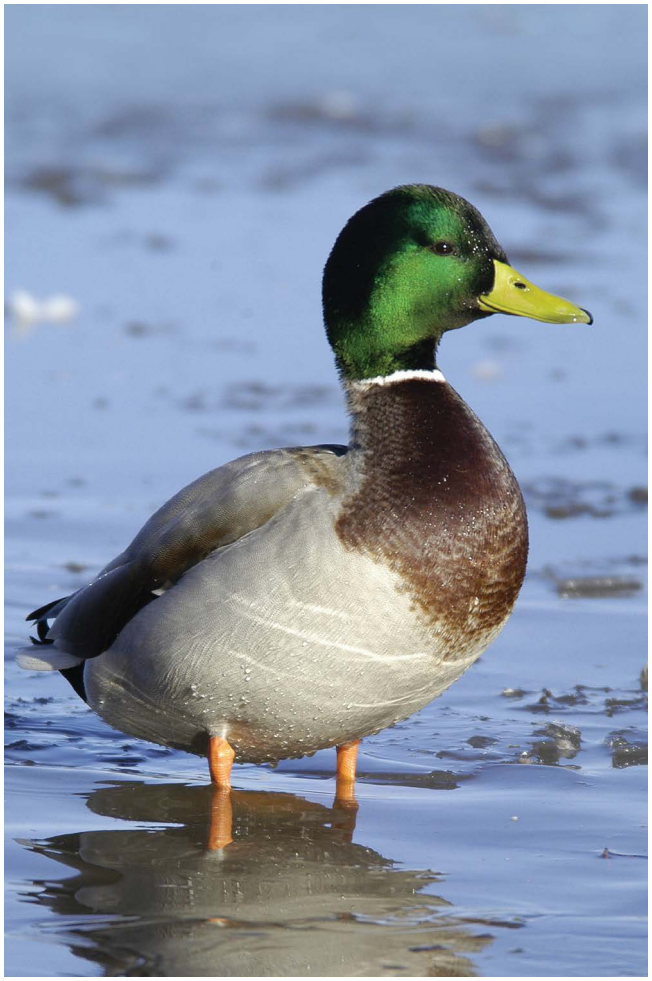
OSPREY



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MALLARD

Cut

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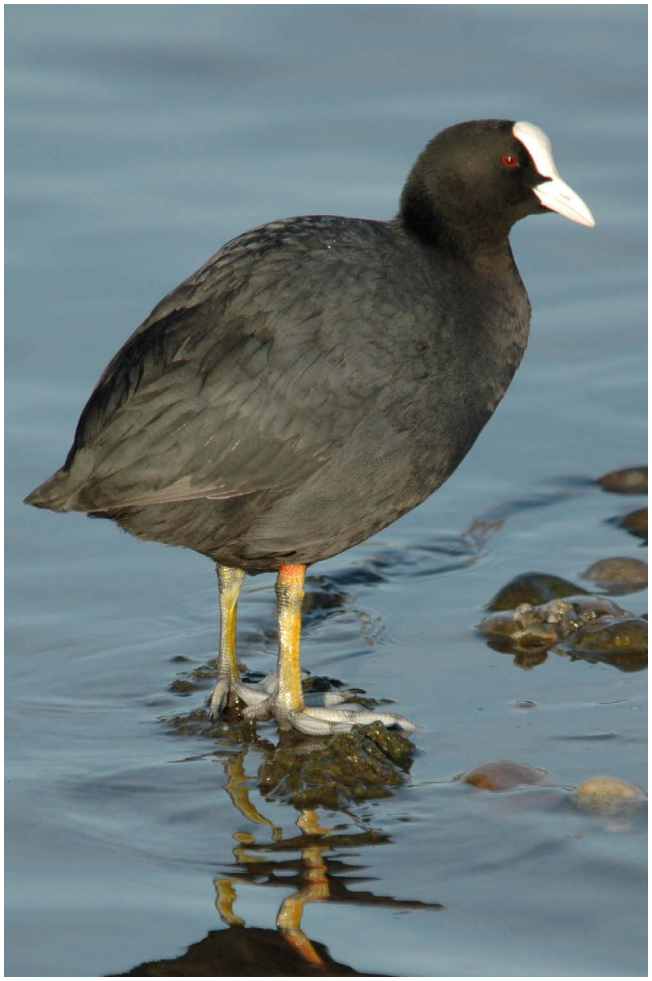

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COOT

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SPOONBILL

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© Don Sutherland @ flickr

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MARSH HARRIER

©Silver Leapers @ flickr

© Arvind Agarwal @ flickr

Feet

WEBBED FEET

Feet

LONG TOES

Feet

SHORT TOES

Feet

TALONS

Legs

SHORT, POWERFUL LEGS

Legs

SHORT, MEDIUM WIDTH LEGS

Legs

SHORT, NARROW LEGS

Legs

LONG, NARROW LEGS

Neck

LONG NECK

Beak/bill

WIDE BILL

Beak/bill

SHORT, STRONG ROUNDED BILL

Beak/bill

SHORT, POINTED BILL

Beak/bill

SPEAR-LIKE BILL

Beak/bill

LONG BILL

Beak/bill

SHORT, SHARP HOOKED BILL

AMAZING ADAPTATIONS

BODY

Long neck

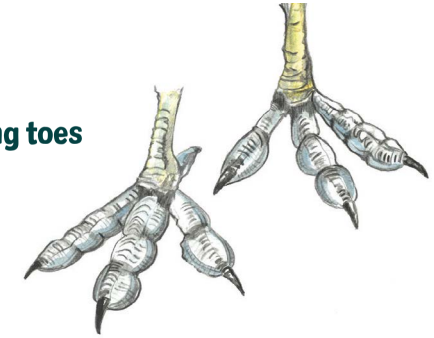
Down feather

Colourful plummage

Long legs

FEET

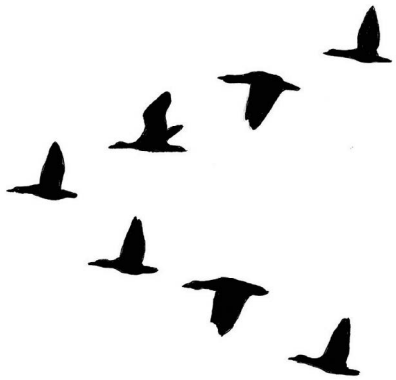
Talons



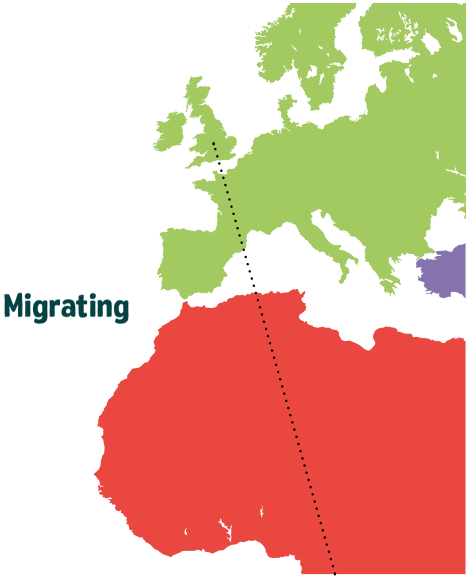
Long toes

Webbed feet

BEHAVIOUR



Flocking geese v-formation



Migrating

BEAK

Pointy

Serated

Long

Hooked

Short

Wide

QUIZ: AMAZING ADAPTATIONS

Round 1: Picture round

The following birds were all featured in the Amazing Adaptation Cards.

Q Can you name them?

1 .....

2 .....

3 .....

4 .....

5 .....

Round 2: Odd one out

In each list below, only one bird has webbed feet. CIRCLE the bird with webbed feet.

6	Reed Warbler	Grey Heron	Mute Swan	Moorhen
7	Kingfisher	Dipper	Black-tailed Godwit	Canada Goose
8	Curlew	Mallard Duck	Kingfisher	Reed Warbler
9	Shoveler	Osprey	Moorhen	Kingfisher
10	Marsh Harrier	Greylag Goose	Reed Warbler	Little Egret

Round 3: How do I get my food?

For each bird below, say whether it **dives below the surface** or **uses its long neck** to get it food.

11 **Grey heron**

. . . . . .

12 **Dipper**

. . . . . .

13 **Moorhen**

. . . . . .

14 **Coot**

. . . . . .

15 **Mute swan**

. . . . . .

Round 4: How do I use my beak?

Q Can you match each **Bird** with **How it uses its beak to feed?**

Draw lines to match them up.

16 **Shoveler**	**Spear-like beak for catching fish**
17 **Black-tailed Godwit**	**Long, curved beak for sweeping through water**
18 **Avocet**	**Long, thin beak for probing mud**
19 **Kingfisher**	**Wide beak for filtering/sieving**
20 **Osprey**	**Short, sharp curved beak for tearing fish**

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For wetlands. For life.

@WWTWorldwide
Have fun and do share your score to our social media accounts
We'd love to find out how you got on!

ANSWERS: AMAZING ADAPTATIONS

Round 1: Picture round

The following birds were all featured in the Amazing Adaptation Cards.

Q Can you name them?

1 Dipper

2 Little egret

3 Mallard duck

4 Avocet

5 Reed warbler

Round 2: Odd one out

In each list below, only one bird has webbed feet. CIRCLE the bird with webbed feet.

6	Reed Warbler	Grey Heron	**Mute Swan**	Moorhen
7	Kingfisher	Dipper	Black-tailed Godwit	**Canada Goose**
8	Curlew	**Mallard Duck**	Kingfisher	Reed Warbler
9	**Shoveler**	Osprey	Moorhen	Kingfisher
10	Marsh Harrier	**Greylag Goose**	Reed Warbler	Little Egret

Round 3: How do I get my food?

For each bird below, say whether it **dives below the surface** or **uses its long neck** to get it food.

11 **Grey heron**

Uses long neck

12 **Dipper**

Dives

13 **Moorhen**

Dives

14 **Coot**

Dives

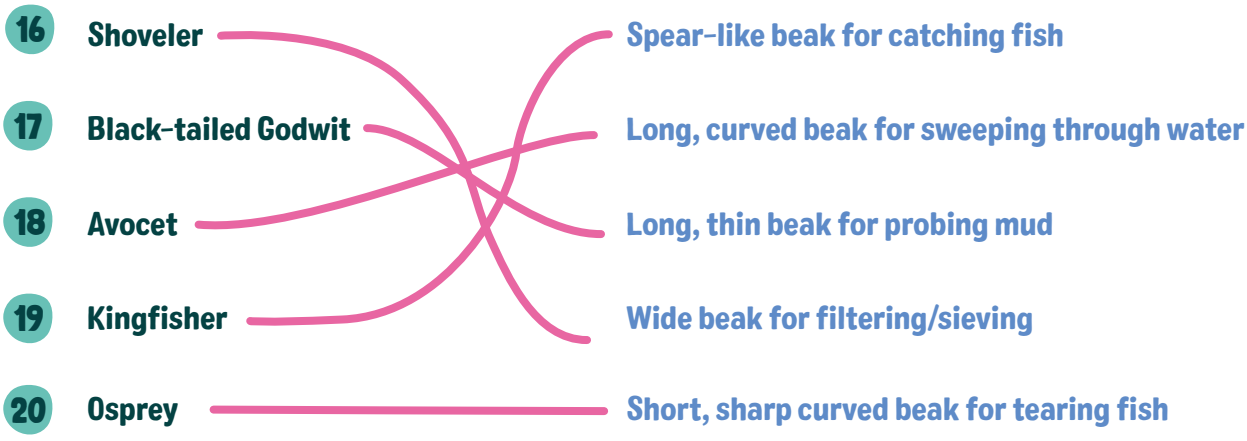
15 **Mute swan**

Uses long neck

Round 4: How do I use my beak?

Q Can you match each **Bird** with **How it uses its beak to feed?**

Draw lines to match them up.



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