

## Information For Students Who Are Answering The Tortoise Quiz

World Turtle Day is the 23<sup>rd</sup> May

There are between 40 and 50 different breeds of tortoise in the world, differing in various shapes and sizes, and they are found, in the wild, on all of the continents in the world, except for Antarctica and Australasia.

They have colonised a wide array of habitats including deserts and arid grasslands to wet evergreen forests and volcanic islands. There were tortoise species around at the time of the dinosaurs and even a Giant Tortoise breed who were hunted by Giant Alligators.

A lot of people have heard of Lonesome George the Galapagos Giant Tortoise who was the last of his known endangered species when he died in South America. The other giant tortoise species in the world comes from the Aldabra Atoll in the Seychelles, a tiny island in the middle of the Indian Ocean, near Madagascar.

Tortoises are reptiles, just like snakes and crocodiles, which means that they need to bask in the sun for hours everyday, to warm up and get their blood flowing, before they begin moving around. If your family has one as a pet then you will probably have seen it sitting under a heat lamp to simulate the sun's warmth on cold days. Their shell acts as a natural solar panel for them and as the blood pumps through the veins beneath the shell it heats up and then continues around the rest of the body to warm the rest of the animal through.

They are Diurnal animals, which means they move around during the daylight hours and sleep at night. They are part of the family of Testudines, which is Latin for tortoise. A group of tortoises is called a Creep.

They are also Crepuscular so they are more active during the early morning and evening, when it is cooler, this is important because tortoises can't sweat so they thermoregulate (cool down and warm up) either by sitting in shade or out in the sunshine. If you have a tortoise of your own, at home, you will probably recognise some of these behaviours.

In the UK, the easiest way to identify turtles, tortoises and terrapins is that Turtles live in the sea, Tortoises live on the land and Terrapins do both but mainly use freshwater rather than sea water.

Their arms, legs and head are covered in bony scales, this is for protection from the weather, their environment, and predators. The body is surrounded by a hard shell of made up of individual shields called Scutes, which have merged together. These Scutes are made of Keratin and this is the same material as your hair, horses hooves,

rhino horn et is made up of. A tortoise cannot come out of its shell. Shell and body are fused together and if you try to remove it then you will kill the animal, very painfully, it would be the equivalent of you being skinned alive, so please do not try.

Every year, when the tortoise grows, it will produce several rings around each scute. These can look very much like tree growth but you cannot count them to age the tortoise, as they will produce more some years and less other years, depending on how much food there is available for them, so it is not a reliable method. Tortoises have 38 scutes, they will not grow any more than the ones they had when they were born, they will just keep adding rings around each one, so that as the tortoise gets bigger, these panels get larger.

These scutes are porous and part of the tortoises thermoregulation system. So, it is vitally important that you do not put any oils, or sunscreens, onto their shells as it blocks these tiny pores up and the tortoise can end up overheating. You may think you are being nice to the animal but if you do oil its shell and then put the tortoise out in hot sun, after you have done it, you can end up frying the tortoise! If you want to do something nice for the tortoise, gently pour a shower of water over it on a hot day, it will help it to cool down and refresh it. Shade in your tortoise pen is just as important as heat is because tortoises cannot sweat to cool down.

The Carapace is the top of the shell- the domed bit. The underneath is called the Plastron and this is what you measure to tell the size of a tortoise. The bit at the side, joining the two together, is the Bridge. They have a blood supply and nerves going to their shell so they can feel you touching them, so if you stroke them gently they will be happy but if you start hitting them with your hand they will be more upset and want to get away from you.

As a general rule tortoises do not like to be picked up for long periods. However, most tortoises like to have their neck scratched, the giant breeds particularly like this and they will stand up tall on all four feet, this is known as Finching and it allows all of the native birds to come and peck off parasites from all nooks and crannies, so it is like them going for a pamper session at the spa.

There are 52 bones in a tortoise's body and 23-30 of those are just in their shell, depending on the size of the animal. A tortoise is a vertebrate animal, which means its backbone is fused to the inside of its upper shell.

Inside their shell they have all the same organs that we do, in roughly the same locations. A male tortoise's testicles are also located in their shell and not outside with their tail. Interestingly, tortoises cannot cough, as they do not have the chest muscles to do so.

Nearly all tortoises have 4 toes/nails on the front and 5 on their back feet, these help them to gain traction to walk over uneven ground, a bit like their own running spikes.

They can retract their heads directly back into their shells to protect themselves from threat. With most tortoises, their neck is made up of 5 Vertebrae, which are arranged in an 'S' shape. This is so that they can pull all of their head and neck inside their shell and then pull their feet protectively across the gap, like closing a door and nothing can get to them to hurt them. However, with the two giant species, the Aldabra and Galapagos, because of their longer necks, they have 8 Vertebrae and they are in a 'Z' formation.

Tortoises have their lungs in the top of their shell and they take up about 1/3 of the available space. So, if they roll over onto their back then all of the weight of their internal organs is pressing down on their lungs and they can Asphyxiate. If your tortoise rolls over onto its back, put something next to it like a stone, or even just your finger so that it can hook a leg around it and haul itself back over. This is a better way of helping, rather than just rushing in to turn it over yourself. Self righting is learned behaviour for a tortoise and if it happens to the animal again, and you are not around to rescue it, then teaching it how to self right could save its life.

Giant tortoises have a resting heart beat of about 6 beats per minute, with an average lifespan of 177 years, compared to mice who have a resting heart beat of 240 bpm and live for only 5 years. In contrast, humans have a resting heart beat of 60-70 and live for 70 -80 years. Even when a giant tortoise is doing something like hauling its immense weight up a hill it would still only have a heartbeat of around 25 bpm.

Why do tortoises hiss? It is not a nasty thing, it is simply because it is such a tight fit inside their shell that they have to release some air in order to fit their head and neck back inside. If they do it naturally they breathe out gently but if the tortoise is startled then they pull in sharply, the rapid release of air comes out sounding like a hiss of aggression.

Tortoises don't have teeth, instead they have a beak at the front and a serrated saw to cut through their food, they don't chew it but take one bite and swallow it down whole. They need to eat hard food like carrots or regularly chew on tough grasses, like hay, so that their beak will naturally wear down. If it becomes overgrown it can impact on the animals ability to eat. A healthy tortoise mouth should be pink and clear inside and they will not be cooperative to let you look.

Many tortoises live in harsh environments, where it is very dry and not a lot of natural rainfall occurs. Therefore they have developed the ability to survive on very little water. You may notice that your tortoise does not drink very much, most of the time they will get their moisture from the food that they eat but it is still a good idea to make sure they have access to a small bowl of water all of the time, especially when its hot weather so they can bathe in it too. However, don't always put it in their pen in the same place, if you move it around then they have to look for it and this is a form of enrichment for them, to keep things interesting in their small world.

For the species of tortoises who hibernate every winter, in a long sleep. It is important that the tortoise has a warm bath before it goes into hibernation. And again shortly after it has woken up, during the spring, to rehydrate it and help get its systems fired up and ready to eat once more. It is also important that you don't feed your tortoise for two weeks before you pop it in its box for hibernation, that way the food in its stomach will have passed through its system and the water from the warm bath can flush it through. It is better if the tortoise does not go to sleep for several months with a full stomach because that food is going to begin to decompose and rot inside the animal, over that length of time, and this is something which kills many tortoises every year.

Hearing in a tortoise is quite good, their ears are behind a flat scale - just behind their eyes on their head. Eye sight is all round vision and favoured to the red and yellow side of the spectrum, which is why they love to eat dandelion flowers.

Strawberries and tomatoes make good tools to use as training treats because they make them take an interest. Take care if you are walking around in their pen wearing red toe polish though, they could think you are a strawberry and chase after you!

Tortoises have a third eyelid, which you do not often see but it is used to protect the eye in harsh environments, like when there is a lot of sand blowing around.

Smell is a tortoise's primary sense, they use it to sniff out food, or to find a receptive mate. As a tortoise's shell cannot expand when they breathe, they use their front arms to pump the air in and out of their lungs, through their Nares (nostrils). This movement can look rather like they are shrugging their shoulders. Their nose should be clear, any discharge is a cause for concern and the tortoise needs to see a vet.

A long neck allows the tortoise to reach more food, and where most tortoises come from there is not an abundance of food, so this could be a life saving evolutionary design. Most tortoises are Herbivores feeding on grasses and leafy greens, flowers and an occasional piece of fruit. Tortoises should not be fed on lettuce as there is no nutritional benefit in it for them. They require a balanced diet to keep them healthy, too much fruit is bad for them but is good as an occasional treat. Weeds like Dandelions, Ribwort and Plantains are excellent food for all breeds, you can get seeds off the internet and put them in your tortoise's pen so you can grow your own. This also provides enrichment for the tortoise as it has to forage and find the food, rather than you just placing a convenient pile in front of it to feed on.

Tortoises only have a small brain, in the 17<sup>th</sup> century an Italian scientist, called Francesco Redi, removed the brain of a tortoise and it lived for 6 months. Please do not try this, you don't want a Zombie tortoise!

Tortoises are one of the longest living land animals. A tortoise like you would see

for sale in a pet shop, and may have at home, could live for 50-80 years- the same as you. The giants can live for 100-200 years and that animal could outlive your grandchildren. The oldest Aldabra tortoise is thought to have been 255 years old when he died in Kalipore Zoo in India in 2006.

The current oldest tortoise is a Aldabra Giant Tortoise called Jonathan who lives on St Helena and is 191

The heaviest known tortoise, is a male Aldabra living in Forth Worth Zoo in Texas, called Big Al, who weighs 363kg.

You can tell the difference between most male and female tortoises because males have a much longer tail and a concave shell underneath them, which means that it curves inwards and make it easier when they climb on the females back during mating. If it were flat they would slide right off the side and probably roll over and die as a result of not being able to self right.

After mating the tortoise will lay eggs, these will be buried in a hole that she has dug using just her back feet, it is very tiring for her to do, so don't interrupt her if your tortoise ever lays eggs. Most common breeds of tortoise will lay up to 6 eggs, it does depend on the size of the mother as to how many she can fit inside her shell because it will not swell up like a human mothers stomach does. Once she has laid the eggs and covered them over she will have nothing more to do with her babies. When they emerge after several months of incubation, in the warm ground, they are perfect little miniatures of their parents and totally independent.

They have a egg tooth on the front of their beak which they use like a tin opener so that they can cut through the shell and hatch out, when the time is right, they then have to dig their way to the surface for their first breath of fresh air. When they hatch they still have their embryonic sac attached to their belly button, this is the yolk from the egg and contains enough nutrition for their first week out of the egg. By that time they should have found the strength and mobility so that they can seek out proper food. They eat leaves and weeds, as they get older, but the babies may feast on worms or insect larvae too, for extra protein to help them grow strong.

A tortoise that is not feeling well will be tucked up inside its shell, and huddled away in a dark corner, feeling sorry for itself. It needs a warm bath to rehydrate it and a heat lamp to get it warmed through. Offer it some of its favourite foods to tempt it. If, after repeated treatments like this, the tortoises attitude and body language has not improved, or it has not eaten anything, after several days then it needs to go to a vet, for tests, to see if there is any underlying cause or if it needs medical treatment. Keep an eye out when it goes to the toilet, if it is excessively runny or excessively dry and it has trouble passing poo then, again, it would benefit from seeing a vet.

## Giant Tortoises

Tortoises are Race Dimorphic, which means there is a difference in sizes between the males and the females. With the smaller species, of tortoises, like the ones you may have at home, it is usually the females that are larger than the males. However, with the giants the males can reach over 250kg when full grown and an adult female would be around 100kg lighter.

The Giant species of tortoises can grow up to 1.2 metres in length. In comparison, the smallest species of tortoise in the world, the Speckled Cape Tortoises from Western Africa, will only be around 8cm when fully grown. This makes it 15 times smaller, in length, than its distant giant cousin.

The giants walk on average at 0.2-0.5km/h, which is about a slow human walk but considering their size they cover a lot of ground with one step, so they move faster than you expect. Whereas the smaller breeds take more steps to cover the same ground so it looks like they are rushing.

There used to be 12 species of giant tortoise in the wild, now there are only 2 true giants. Man has played a large part in the extinction of the others, due to taking them for food to feed the old fashioned sailors, on their long voyages, or to be used for their oils by the whaling industry as well as being poached as part of the pet trade.

The giant tortoise can remain alive without food and water for up to a year, so the sailors were fortunate to have fresh meat to slaughter, as the live animals were stored in the hold of the ship, which improved their own diet and health.

Aldabra Giant Tortoises come from Aldabra Atoll which is off the east coast of Africa and 285 north west of the Island of Madagascar. Aldabra is only 8 metres (26ft) at its highest elevation above sea level, and so is at great risk from rising water levels caused by climate change. The island is the worlds 2<sup>nd</sup> largest Coral Atoll and is 34km (21miles) long by 13km (8.1miles) wide, which is just a little thinner but about the size of the Isle of Wight.

An Atoll is a ring shaped Island, including a coral reef, which encircles a lagoon. The largest Coral Atoll in the world is The Great Chagos Bank in the South China Sea, near the Philippines.

Unusually the Aldabra Giant Tortoise is top of the food chain on their home island, but as there are no apex predators on the Island this large reptile has become the most influential animal on the Atoll. They perform a similar function as to an Elephant on the mainland. They are used by many plants as a valuable method of pollination because they browse food, grasses, trees and bushes and then distribute the propagated seeds, via their poo, after they pass through its digestive tract, across the

island. Such is their influence that their intense grazing actions have put pressure on natural flowers to alter the way they pollinate, so the tortoises can't take flower heads off too soon, making them directly responsible for plant evolution taking place.

Also, as their big bodies lumber about they also forge pathways and corridors, through the undergrowth allowing smaller species ease of movement around the island too, as they follow in the tortoises wake. A bit like The Highways Agency putting in new road systems! This is known as being a Keystone Species.

Aldabra is a harsh place to live, with low amounts of food available to the tortoises and even less access to regular fresh water, for that they have to wait for the monsoons to arrive. Monsoon season is November to March. However with 300 miles of open water surrounding them, and not being good swimmers, there is no where else for them to easily go.

The Atoll of Aldabra was formed about 125,000 years ago when the volcano first erupted and material was deposited on the sea bed, the eruptions continued to grow until the cool larva finally broke the ocean surface. Coral grew around the island at sea level and when the old volcano subsided beneath the sea, a Coral Atoll was formed.

The land contains varied habitats consisting of large mangrove swamps, which provide vital shade for the tortoises in the hot temperatures and these mainly border the lagoon which they love to wallow in through hot parts of the day. However, the tidal water of the lagoon is also teeming with Black Tipped sharks and Manta Rays, with millions of tonnes of water rushing in and out twice every day means that sometimes the tortoises can get swept out to sea on the tide.

It is not just the Giant Tortoises that are of unique importance to the area. Reportedly there are 307 different species of plant and animals on Aldabra, many of them are unique. One of the largest populations of nesting Green Sea Turtles, in the Western Indian Ocean, lay their eggs on the small beaches. In 2011 a paper published on the nesting Green Turtle showed an increase of 500-800% in last 40 years. This is largely due to the fact that since the 1980s Aldabra has been a UNESCO World Heritage Site and the animals living there are protected by legislation.

Aldabra is a low lying Atoll in the middle of the Indian Ocean. Unfortunately the effects of climate change are causing the polar ice caps to melt, resulting in gallons and gallons of water are being added to the worlds seas. This means sea levels are on the rise around the planet, which will mean that the size if the island will shrink and leave less space for the tortoises to live and plants to grow. With less food available as a result, the tortoises will spend longer starving and be in a poorer condition. Poorer conditioned adult tortoises will lead to poorer conditioned babies and potentially reduced clutch sizes.

The Atoll is made up of 4 main islands, with a tidal lagoon in the middle. Rising water levels will mean that the tide will probably not fully go out each day, which will mean that they will become isolated islands thus severely limiting the range that a tortoise can travel searching for both food and mates. If the population is separated and isolated from each other, in this way, then you will get inbreeding, which will weaken the species.

Tortoises lay their eggs in the ground and the ground temperature incubates them to become hatchlings. However, higher temperature rates, due to global warming, will probably mean greater numbers of clutches failing to hatch. At temperatures over 34 degrees the risk of mortality or deformity amongst the young is significantly higher.

Another issue with higher ground temperatures will mean that the soil and sand above the buried eggs dries out and becomes much harder. This 5 cm hatchling has to dig its way to the surface, once it has escaped the egg, it can take it days or even weeks to achieve this feat. If the ground is harder then they are going to struggle to get through the substrate above the eggs and may well die from exhaustion or starvation or lack of air, before they have even exposed their first toe nail to the world.

Tortoise eggs are subject to something called ESD or Environmental Sex Determination, to give it the full title. This means that the temperature the eggs are incubated at has a direct effect on the sex of the hatchlings. Higher temperatures will definitely create a bias towards one sex, we know that higher incubation temperature generally produces more girls. This means there is going to be an abundance of females and a shortage of males in the wild population. Again, over the long term, you are going to be risking inbreeding.

Drier, hotter, weather means less rainfall. Temptingly, the tortoises are surrounded by sea water but they only get freshwater to drink when it rains, which is why they are forced to fast for several months of the year, already. An increase in temperature will make these wet seasons even further apart and possibly of shorter in duration.

Lack of water throughout the year, for the tortoises, is going to lead to kidney and other health issues. This type of weather will also mean the foliage growing on the Island will burn off quicker too, leaving less food available and less places to find it.

It will also have the knock on effect that the species who pollinate the foliage, that the tortoise eat, will suffer too, meaning less pollination occurs and again causing a shortage of food.

The lack of foliage and natural shrubs and bushes to shelter beneath will also cause the animals to overheat. Yes, they are a reptile and need the sun to heat them up to temperature, but they also need the shade to cool themselves down too, as they cannot sweat, and like us, anything over 30 degrees, for long periods, can be too much for



them.

Natural evolution will ensure only the strongest survive, so the numbers in the wild population will begin to fall, and again, this is going to limit the gene pool that they have available.

Unsettled weather patterns could lead to something like a Tsunami developing, in that region, which could wipe out the whole island population in one go, Aldabra Atoll is only a few metres above sea level now, it would not take much to wash them all into the sea, killing most of the tortoises in the process.

Unfortunately Aldabra is located near to one of the busiest shipping routes on the planet, it would be ever so easy for there to be an oil spill and cause a cataclysmic contamination to the whole area, and potentially wiping out a delicate ecosystem.

Man has caused these problems, for this peaceful animal, and it will be down to man (and woman) to help save them. Tortoises are not the only animal under threat from climate change. As the new generation of potential Animal Conservationists we hope that some of you will be inspired to follow in the footsteps of the esteemed Sir David Attenborough or Dr Jane Goodall and help to save a species, that interests you.

If you are inspired to get a tortoise, please do your research about which breed you are interested in, and the requirements that it needs, to have a happy life living here in the UK. Also consider rehoming a tortoise from a rehoming centre, rather than buying a baby from a pet shop. After all many of these animals will have done nothing wrong, they will have just outlived their previous owners. So we urge you to give them a new second chance home.