THE SECRET LIFESPAN OF ANIMALS

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TO EDUCATORS AND PARENTS

LESSON PLAN

1. SORTING FROM THE SHORTEST- TO LONGEST-LIVED ANIMALS

This is a fun and simple activity designed to teach students about the diversity of lifespan across the animal kingdom. With an ageing global population, there is growing interest in biomedical ageing research, with lots of media attention devoted to new drugs and therapies designed to combat ageing. Exploring lifespan through the lens of long-lived animals is an engaging way to teach kids about some of the lesser-known wonders of the natural world, and get them to think about ageing in the process.

The 12 cards attached feature a range of animals with vastly differing lifespans. Print these off and pin them to a corkboard, blu-tack them to a wall, or peg them to a string for students to place and rearrange in order of shortest- to longest-lived. How close did they get? Were there any surprises? Can they see any trends (e.g. bigger animals tend to live longer) — and anything that looks like it breaks these trends?

Depending on age range and interest, you can stick to a simple format where kids focus on the animal facts and invent their own species or extend it to get older students thinking critically about the implications of lengthening lifespan.

2. INVENT YOUR OWN SPECIES

This can be followed by a drawing activity where kids make up their own animal species and assign it a lifespan. In the past, children have come up with a range of fun designs with interesting justifications for why their species lives for a certain length of time — e.g. *Toothicent*, with a lifespan of 10000000000 centuries, because it was good at brushing its teeth; or *Axo-burger*, whose lifespan "depends if anyone gets hungry".

3. IMPLICATIONS OF LENGTHENING LIFESPAN

Insights from long-lived animals have helped to contribute to the growing developments in anti-ageing research. You can follow this activity with a question for the class: is living longer a good thing? Why or why not?

This question can be quite polarising; some people want to live longer, hoping for more time with their loved ones and more opportunities to explore the world, learn new things, and appreciate more art. Some, on the other hand, are concerned about the impact of a growing population on a straining planet, and the concentration of wealth and power that might come with a lengthened human lifespan. This question could spark a lively debate amongst students. You could finish by asking them the question: if they could choose how long they'd live for, how long would it be? Draw a line on a whiteboard and mark where people fall in the spectrum to get a nice visual representation of the average ideal lifespan of your class.

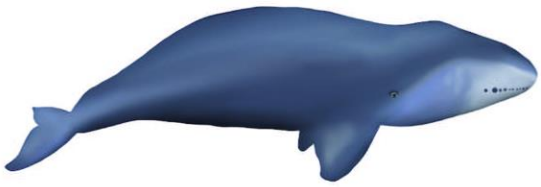
Below, you can find the activity worksheets and answers for the activities suggested.

SORTING FROM THE SHORTEST- TO LONGEST-LIVED ANIMALS

ACTIVITY

The 12 cards below feature a range of animals with vastly differing lifespans.

Can you arrange them in order of shortest- to longest-lived animals?



Balaena mysticetus
(bowhead whale)

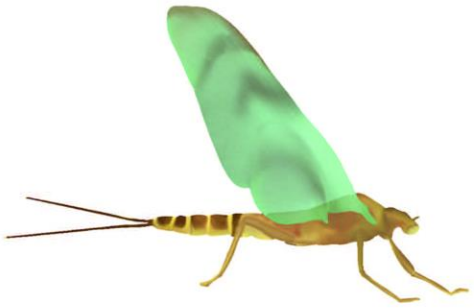
Drosophila melanogaster
(fruit fly)

Elephas maximus
(Asiatic elephant)

Somniosus microcephalus
(Greenland shark)

Heliconius hecale
(tiger longwing)

Homo sapiens
(human)



Doliana americana
(American sand-burrowing mayfly)

Mus musculus
(house mouse)

Heterocephalus glaber
(naked mole-rat)

Proteus anguinus
(olm)

Arctica islandica
(Ocean quahog)

Passer domesticus
(house sparrow)

ANSWERS

1. ***Dolania americana*** — "Mayfly" — 5 minutes
   - While famously short-lived, this 5-minute lifespan (in females of the species) is only once they reach their adult form. However, the nymphs (aquatic juvenile form) live for approximately a year.
2. ***Drosophila melanogaster*** — "Fruit fly" — 70 days
   - Because of their short lifespans, fruit flies have become huge models for biomedical ageing research — it's much quicker to get an "old" fruit fly than an "old" rat! Surprising as it might sound, on a genetic level, there are lots of similarities between fruit flies and humans, so work on *Drosophila* has been hugely influential in ageing research.
3. ***Heliconius hecale*** — "Tiger longwing butterfly" — 290 days
   - Though butterflies are also known to be short-lived, with most living for just a few weeks, tropical *Heliconius* butterflies are among the longest-lived in the world, with some reportedly living nearly up to a year. This is linked to their unique pollen-feeding behaviour, which provides them with much more protein than the average nectar-feeding butterfly.
4. ***Mus musculus*** — "House mouse" — 4 years
   - The house mouse is one of the most important model organisms in all of biomedicine. With a maximum lifespan of 4 years, it takes a lot longer for them to age than a fruit fly — but as mammals, they're much closer to humans, and so are studied for their usefulness in age-related diseases like cancer.
5. ***Passer domesticus*** — "House sparrow" — 19 years
   - Most house sparrows only live for a few years in the wild, but one individual in Denmark was found dead 19 years after the first time it was caught. Despite the fast metabolism needed for their energetic flight, birds can generally live for much longer than similar-sized mammals.

6. ***Heterocephalus glaber*** — "Naked mole-rat" — 31 years
    - Naked mole-rats are relatively close in size to their mouse and rat rodent cousins, but can live almost ten times as long. Scientists think this is linked to their low metabolic rate and resistance to stress.
7. ***Elephas maximus*** — "Asiatic elephant" — 80 years
    - Elephants are known to be extraordinarily resistant to cancer. Researchers think this might be because they have extra copies of a gene called *TP53*, known as the "tumour suppressor gene", which helps to stop cancer from developing. Humans have just one copy of this gene, but some elephants have up to 20!
8. ***Proteus anguinus*** — "Olm" — 102 years
    - Have you heard of the olm? This cave-dwelling salamander is famous for its adaptation to complete darkness, with non-functional eyes but excellent senses of hearing and smell. It's also one of a growing number of species thought to show "negligible" ageing — in other words, unlike us, it doesn't seem to be any more likely to die as it gets older.
9. ***Homo sapiens*** — "Human" — 122 years
    - How old is the oldest person you know? The record for human lifespan is held by Jeanne Louise Calment, who died in 1997 at the ripe old age of 122 years and 164 days. Thanks to improvements in medicine and living conditions, human life expectancy has jumped by several decades in the last century. Most current ageing research is focused on improving the "health span" — the period in which we are alive and healthy.
10. ***Balaena mysticetus*** — "Bowhead whale" — 211 years
    - Bowhead whales are the longest-living mammal, and it's thought that this might be due to enhanced repair mechanisms, which work to undo some of the DNA damage that naturally accumulates over time. Fun fact: research into lifespan in these whales was spurred on in 2007 when an individual was caught

with fragments still embedded in its blubber from a harpoon last manufactured in the 1880s.

11. ***Somniosus microcephalus*** — "Greenland shark" — 392 years

- The Greenland shark is the longest-living vertebrate, with a lifespan of several centuries — some estimates put its maximum lifespan at nearly 500 years! These sharks live in deep, cold water, which makes them harder to study – but some scientists think this cold environment and their resulting slow metabolisms might have led to their longevity.

12. ***Arctica islandica*** — "Ocean quahog" — 507 years

- Thought to be the longest living individual animal, the maximum lifespan for this clam was estimated by counting the annual shell growth rings (similar to ageing a tree!) of a particularly old individual found off the coast of Iceland in 2006. This specimen was named Ming, after the Chinese dynasty in which it was born, and died during analysis of its age.

INVENT YOUR OWN SPECIES

Can you invent your own species and assign it a lifespan?

Draw below what it looks like, write its name and how long it can live.

Species' name: _____

Lifespan: _____

IMPLICATIONS OF LENGTHENING LIFESPAN

Is living longer a good thing? Why or why not?

If you could choose how long you'd live for, how long would it be?