Who Ate the Ammonite?

Activity adapted from Earth Learning Idea, Earth Science Education Unit, Keele University

Suitable for KS2 – Year 3 rocks and fossils topic, Year 4 food chains topic

The aim of this activity is for students to create a food web of Jurassic aged organisms using the feeding information provided and stickers/cut out images. Once the food web has been completed children should work out which creature could have eaten the ammonite.

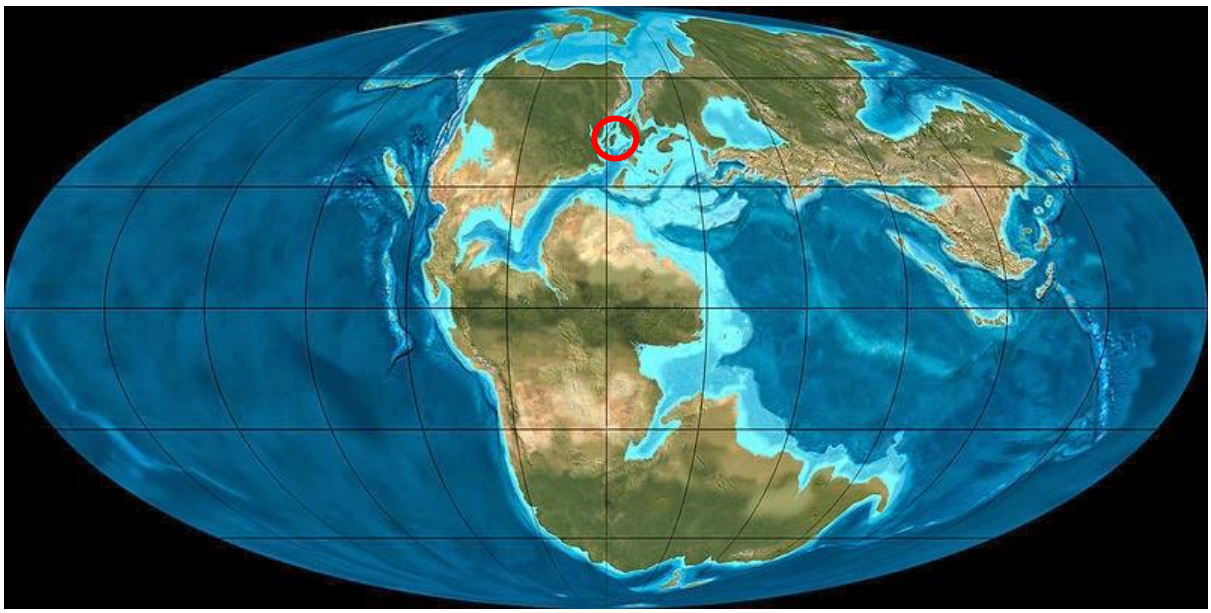
Learning outcomes

- Understand how organisms can become fossils
- Understand that different organisms lived on Earth 200 million years ago, some of which can be found as fossils.
- Understand that climate, sea level and position of continents can change over millions of years.
- Build up a food web in trophic levels from producer to consumer.
- Realise that energy is transferred up the trophic levels from producer to consumer.
- Realise that trophic levels do not equate to where the animal lives in the water column.

Background information (discuss with students before starting activity)

- When was the Jurassic period?
- What was the climate like in Britain during this time?

The Jurassic period was between 201 and 145 million years ago (Ma). At this time Britain lay between 30° - 40° north of the equator (modern day - between 50° - 60°). Its climate would've been much warmer and more humid. Sea levels were also higher in the Jurassic which meant that much of Britain was covered by a warm shallow sea. Can demonstrate using Jurassic paleogeography map.



- How do animals turn into fossils?

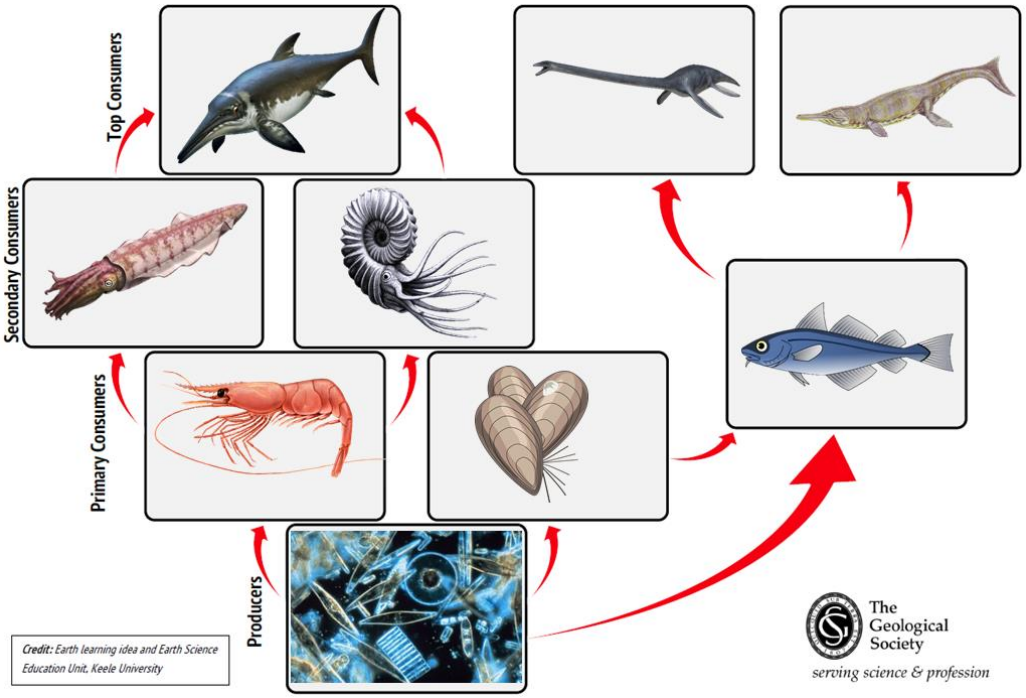
Fossils are the preserved remains from animals and plants that used to live on Earth. Fossils can form in a few different ways (preserved in amber, ice, tarpits) but they form when an organism dies and is buried quickly in soft sediment like mud, in a calm, watery environment like at the bottom of a lake or sea bed. Being buried quickly means that the dead organisms are not eaten by scavenging animals or eroded too much by wind, waves, rain or ice. Over time layers of sediment build up on top of the organism, water is squeezed out of sediments and minerals contained in the water alter the hard parts of the organisms (bones, teeth, leaves, shells etc.) turning them into fossils. Over time, due to plate tectonics, continents collide with each other and rocks can be faulted and folded. Rocks that used to be at the bottom of the sea can be uplifted onto land. In these rocks we can sometimes find fossils.

Activity

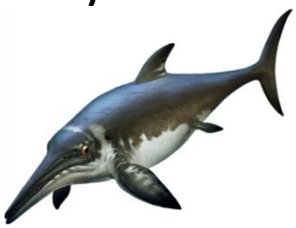
- Need to have sticker sheet/ images sheet to cut out, feeding information sheet, food web base sheet and magnetic board with magnets (optional). To save paper students could also write the names or draw pictures of the animals in the correct boxes.
- Students will need to work out 'who ate who' in the Jurassic seas. They should use the feeding information to work out where the animals fit on the Jurassic food web. Arrows on food web indicate the direction of energy/food transfer.
- Students may or may not have studied food webs/food chains at school. If not, use modern day examples to explain what food chains and food webs are (simple diagrams showing how energy is transferred from producers to consumers). Producers are organisms that can make their own energy from the sun (autotrophs), whereas consumers are organisms that must eat others to get energy (heterotrophs). Plants are producers and are always found at the start of a food chain. Animals are consumers.
- Briefly explain what the different organisms are.
- When placing stickers/ writing names, children should start at the bottom of the food web with the simplest producers (phytoplankton) and work their way up the food web.
- It's important to remember that the fish eats more than one other creature – the food web will only work out if the fish is in the far right hand side box.
- After completing their food webs children can work out which animal ate the ammonite. Correct answer is the ichthyosaur.
- If time you could discuss where the different animals might have lived in the Jurassic oceans and why not all of the Jurassic animals would've been able to eat the ammonite. If you have the magnetic board, children can move the magnets around to place the animals in their correct habitats.

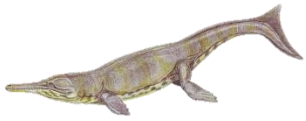
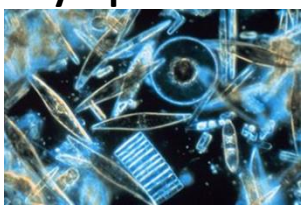
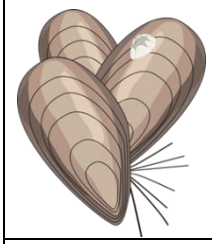
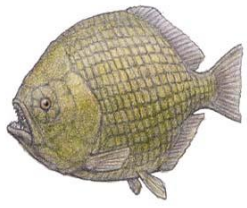
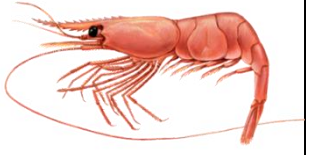
Organism	Where did they live?
Ammonites	live in the deep ocean
Crocodiles	need to lay their eggs on land so live closer to the shore than plesiosaurs and ichthyosaurs
Plesiosaurs and ichthyosaurs	gave birth to live young, they did not therefore have to lay eggs on dry land and could live in the deep ocean. Ichthyosaurs in particular had huge eyes for hunting prey in deep dark waters.
Phytoplankton/ Plankton`	`
Bivalves	mostly live on or in the sea floor sediment, although some are free swimming.
Shrimp	are free swimming so live in the water column – need to eat plankton
Fish	free swimming so live in the water column

Completed food web:



Jurassic fauna information

Ammonites 	- Up until the mid 18th century, ammonites were thought to be petrified snakes and were called 'snakestones' or 'serpentstones'. - The name 'ammonite' comes from the ancient Greeks who believed the shells resembled the horns of the ram. So they were named after the Ram-god Ammon. - Ammonites are squid like animals with coiled shells similar to the modern day nautilus - They are molluscs, most closely related to the squids, cuttlefish and octopuses (coleoids). - Moved by sucking water through the mouth, pumping it over the gills, then squirting it out of a tube below the tentacles, propelling themselves through the water backwards. - Controlled their buoyancy by changing the amount of gas and water inside their shells using a small tube called a siphuncle - Had sharp beaks like modern day squid and may have avoided predation by squirting ink - The soft body of the ammonite only took up the last chamber of the shell. These soft parts are not found as fossils. - Because there are so many different species of ammonite, they are very good index fossils. This means that it is often possible to link a particular rock layer in which a species of ammonite is found to a specific geological time period
Belemnites 	- Squid like animals similar to ammonites but with an internal bullet shaped shell, like the cuttlebone in a cuttlefish. - Had ten arms with hooks for grabbing prey, would've caught small fish and other marine animals - Have been found with fossilised ink sacs so could squirt ink at predators as a defence mechanism - Belemnites were prey for larger marine creatures – plesiosaurs and pliosaurs have been found with belemnite guards and hooks in their stomachs.
Ichthyosaurs 	- Name means 'fish lizard' - Large marine reptiles with long snouts, flippers, sometimes with large dorsal fins, looked like modern day dolphins (convergent evolution) - Huge eyes, largest of any known animal, supported by sclerotic rings (rings made of bone) thought to be for detecting prey in low light at water depths of up to 600m - Evolved from a group of Triassic aged land reptiles that returned to the sea, parallel to the ancestors of modern whales and dolphins. - Lived from 250Ma (Triassic) to 80Ma (Cretaceous) - First complete ichthyosaur skeleton was discovered by Mary Anning and her brother Joseph in Lyme Regis in 1812 – this is now on display at the NHM London and is known to be a species of *Temnodontosaurus* -
Plesiosaurs 	- Large marine reptiles typically ranging from 1-16m in body length - Around from 200-66Ma - Paddle like limbs, powered by strong muscles attached to wide bony plates at the shoulder and pelvis, long neck, small head. - Ate bony fish and soft and hard bodied cephalopods (ammonites, belemnites), jaws strong enough to break shells. - Plesiosaurs are known to have been prey for sharks and mosasaurs known from bite marks in plesiosaur fossil bones and fossilised mosasaur stomach contents - Short necked larger head pliosaurs were fast swimming, apex predators able to grab and rip apart large animals

Crocodiles 	- The earliest crocodiles evolved in the early Triassic period. They were small, terrestrial, two-legged sprinters, some of them were even herbivores. - By the Jurassic the crocodiles had largely become carnivorous and adapted to living in a marine environment. They had long bodies, splayed limbs, and narrow, flat, tooth-studded snouts with powerful jaws. - *Metriorhynchus* a species of Jurassic crocodile was an opportunistic predator, predating upon fast moving fish as well as slower moving ammonites and belemnites. - Jurassic crocodiles still had to return to land to mate and lay eggs - Unlike modern crocodiles, *Metriorhynchus* lost most of its armour in order to be able to swim faster, so it would've been defenceless to larger predators like the huge pliosaur *Lioplurodon*
Phytoplankton 	- Phytoplankton are microscopic algae and plants that live in the upper sunlit layer (photic zone) of almost all oceans and bodies of water on Earth. - They form the base of the food web upon which nearly all other marine organisms depend and make their own food through the process of photosynthesis. - In photosynthesis phytoplankton use CO_2, water and sunlight to create organic compounds (glucose), which can then be burned as fuel during respiration. - Oxygen is a by-product of photosynthesis, phytoplankton are thought to produce over 70% of all the oxygen in the Earth's atmosphere. - Diatoms are a common type of phytoplankton that evolved during, or before, the early Jurassic period. - Diatoms have thin shells made of silica and are so tiny that they can only be seen by using very powerful microscopes.
Bivalves 	- Bivalves live inside shells with two parts, known as valves that are usually mirror images of each other. These valves open so the animal can feed, and close to give the animal protection. - All bivalves live in water, and most of them are found in the sea. - They feed by filtering out small food particles from the water around them. Most live buried in sand or sediment. Some can attach themselves to hard surfaces or bore into rock. A few can even swim!
Fish 	- *Dapedium* is a genus of fish commonly found in Jurassic aged rocks in Dorset. - They ranged from 9-40cm long, had an oval to near-circular body and their skin was covered with thick, enamel-like scales. - The upper jaw of *Dapedium* was moveable and could protrude from the mouth, enabling a wider gape to capture larger prey. - It's thought that *Dapedium* would have fed on hard-shelled invertebrates, like bivalves and sea urchins.
Shrimp 	- Shrimp belong to the crustaceans, a group that includes crabs, lobsters, prawns etc. - Most crustaceans live in the sea but the family also includes land creatures such as woodlice. - Crustaceans belong to the arthropods, a group of animals with an armoured external skeleton (called an exoskeleton), a segmented body and jointed legs. The hard exoskeleton is the part that's preserved as a fossil. - The first crustaceans evolved over 500 million years ago in the Cambrian period, however prawns and shrimp evolved in the Triassic and Jurassic periods respectively. - Jurassic shrimp (just like their modern day descendants) would've fed by filtering out small food particles, such as plankton, from the water around them.