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Safety information

Make sure that small children do not get hold of any parts of the kit and keep pets away. Furniture, etc. can be damaged by splashes of water and persistent dampness. For reasons of hygiene, wash hands after coming into contact with the contents of the pool.
WARNING! Never leave the magnifying glass in the sun unattended – this could cause a fire! Never look directly at the sun either through the magnifying glass or with the naked eye. There is a risk of blinding! Keep instructions and packaging in a safe place as these contain important information.

Dear Parents,

This experiment kit is designed to be suitable for children aged 8 and upwards to work with on their own. However, it is important that you also support and supervise your child. It is best to read the step-by-step guide through together before starting to experiment. Please make your child aware that they are handling living creatures and that these should be treated with care and attention. Be patient, try again if something does not work straightaway.

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Prehistoric animals as housemates

Triops are strange and interesting creatures that date from the time of the dinosaurs. This experiment kit allows you to breed, feed and observe them at home. First of all, you must create a habitat for them where they will feel comfortable.

A place for Triops

WHAT YOU NEED

- **Pool**
- **Starter sand**
- **Sand**
- **Wooden spatula**
- *Small bowl*
- *Some bottles of still mineral water that are high in calcium and low in sulphate (e.g. brands such as Volvic and Vittel, others are available) or distilled water.*
- *Heat lamp: standard lamp or clip lamp with 60 Watt bulb or mains voltage halogen lamp (GU 10 cap)*
- *Timer switch*

THIS IS WHAT YOU DO

1. Find a spot for the pool where it will remain undisturbed (think about younger siblings and pets!). It needs to be placed on something that can stand getting wet in case it gets splashed. The pool needs to be easily accessible, so that it is easy to handle and you can observe the Triops comfortably.

2. Separate the breeding region from the rest of the pool using the gate.

3. Now place approximately a quarter of the contents of the bag of starter sand in the breeding region of your pool. Shake the bag beforehand so that all the components are mixed together well. Do not rinse the starter sand like normal sand! (See point 4)

4. Rinse about half of the contents of the bag of normal sand a few times by gently stirring it in the bowl in plenty of tap water using the wooden spatula. Leave it to settle for approx. 5

WARNING!
The pool must not get too hot. Do not place in direct sunlight or near a heater. Place in a cool room in summer.

seconds and drain the cloudy supernatant water in the sink. Use mineral water (or distilled water) for the last rinse.

5. Pour the sand into the pool (the easiest way of doing this is by using a small amount of mineral water) but only into the large main pool.

6. Fill the pool with mineral water to approximately 1cm below the edge. The water level should always stay the same - this means you will have to keep refilling it later on.

7. Place the lamp on the pool so that it is stable and cannot tip over, and set the timer so that the aquarium is lit up for at least 12 hours a day, preferably for 16 hours.

QUICK EXPLANATION !

Triops need clean water and sand, as well as light and warmth from the lamp. You then have all the essentials in place for breeding your Triops.

HINT!
For fun you can also place decorative items such as colourful stones or glass marbles in the Triops pool. However, they must be completely waterproof and clean (make sure there are no residues from cleaning agents).

WARNING!
Detergents or other impurities must never get into the Triops pool! Make sure your hands have no hand cream or soap residues on them.

Warm and cosy

TIP!
If you breed Triops during the warm months of the year, you probably won't need a heat lamp. The room temperature and the number of daylight hours are enough. However, make sure that the pool is lit, but not in direct sunlight.

WHAT YOU NEED

› **Thermometer**
› *Heat lamp*

THIS IS WHAT YOU DO

1. Place the thermometer in the notch provided.
2. Position the lamp so that it does not shine directly onto the thermometer. The light should be around 20 to 30 cm away from the surface of the water.
3. After a few hours, take a reading from the thermometer. It should be between 23 and 27°C.
4. Move the lamp back if the water temperature is too high. If the water temperature is too low, push the lamp nearer.
5. Keep trying until the temperature stays in the correct range for several hours.

QUICK EXPLANATION

Triops need a temperature of between 23 °C and 27°C for hatching. (Later on, 20°C to 25 °C is ideal, which is around room temperature.) If it is too cold, they will develop slowly or not at all. Temperatures that are too high are even more dangerous. This can easily result in a lack of oxygen. For this reason the water temperature has to be at the correct value before the Triops eggs are introduced.

TIP!
If the thermometer displays 'strange' values, see the information on the inside back cover.

TRIOPS EGGS

From egg to larva

WHAT YOU NEED

- **Triops eggs**
- **Magnifying glass**
- **Syringe**
- *Sheet of white paper*

QUICK EXPLANATION

The Triops eggs swell up in the water and come to life. After one or two days, some of them will hatch into Triops larvae. To start off with, these are almost invisible – you only know they are there mainly due to their twitching movements. Hooray! The Triops have arrived!

THIS IS WHAT YOU DO

1. The starter sand should be added and the temperature should be set at least 24 hours after the pool has been set up.

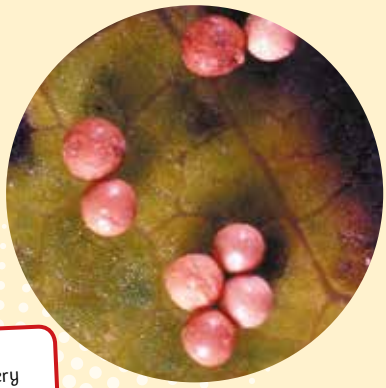
2. Now the Triops eggs can be put into the water: Tap the little canister a few times on the table so that the eggs gather in one place and then open the lid very carefully. Place the sheet of paper underneath so that you can retrieve any eggs that fall out.

3. Put about 10 to 15 eggs (about a quarter of the contents of the canister) into the breeding station.

4. Take a look through the magnifying glass. Tiny, dark pellets will now be floating on the water. If any of them stick to the edge of the pool, rinse them off using the syringe.

5. Now you have to wait and watch closely!

Triops eggs under the magnifying glass



WARNING!
You must be very careful when working with the Triops eggs as they are extremely small and can easily get lost.

How they live and what they need

A peculiar way of life, but one which has proved to be successful. Triops are among the oldest animal species. They lived around 200 million years ago, for example in the puddles which formed in dinosaur footprints!

Using "puddles" as your habitat brings both benefits and problems. The benefits are that there are no hungry fish in puddles and not much competition for food. The problem is that these mini areas of water dry out within a few weeks, and what then?

Triops have solved this problem cleverly:

- Once they have hatched, they grow very rapidly and this is because they are in a rush. They only live for 70 to 90 days. In no time at all they develop into adult animals which are able to lay eggs again.

- They have saved the time used for searching for a partner, something which takes up a lot of time and energy for other animals. Virtually all animals are female and are able to lay eggs without males.

- The dried eggs are incredibly resistant. They can wait for decades until their hollow in the earth fills up with water again and they come back to life.

KEY WORD "TRIOPS"

You can use this set to breed the Triops species *Triops langicaudatus*. They live in river floodplains, pools and rice fields in America and Asia. A different species of Triops is native to us here in Europe, specificially *Triops cancriformis*. These prefer slightly lower temperatures than your Triops and are slightly larger.

DID YOU KNOW?

The size of your Triops depends on several factors. Triops that live in groups are smaller than those that grow up on their own. They grow larger and quicker under optimum conditions (temperature, feed, water quality) than under more harsh conditions. Therefore, don't be surprised if one time your Triops are smaller than your friends' or your last attempt. Simply try again!

Horseshoe crabs

DID YOU KNOW?

...that Triops are crustacea? They are not only related to lobsters, crabs, shrimps, water fleas and terrestrial woodlice, but also to Japanese spider crabs, which live on the seabed and can grow up to 4 metres from claw to claw. Horseshoe crabs look quite similar in appearance and grow up to 60 cm long, but are not crustacea. They are related to arachnids.

KEY WORD "BREEDING SUCCESS"

Several factors affect the breeding success of the Triops. It is very important to prepare the sand and water and to have the correct light and temperature conditions. This is because the baby Triops, in particular, are very sensitive. These instructions attempt to make all the conditions perfect for breeding. However, from time to time nature reacts to things that we cannot predict. If one time your breeding attempt is unsuccessful, don't be sad; just try again from the beginning.

KEY WORD "WATER TEMPERATURE"

Adult Triops also survive in cooler temperatures of around 19 °C, but their growth is then slower. Temperatures that are too high are really dangerous! The water in the Triops pool must never become too warm. It must not exceed 27 °C during hatching time and after this it must not exceed 25 °C. Admittedly, the creatures themselves are not bothered by high temperatures of around 30 °C. Puddles warmed by the sun can easily get this hot. However, the warmer it is, the quicker the bacteria breed in the pool. These bacteria live off waste materials or so-called detritus (Triops droppings, food residue, and small dead algae). At the same time, they use up oxygen. If the bacteria now suddenly multiply in the 'warm soup', the oxygen in the pool rapidly disappears and the Triops die in a matter of hours.

Cute monsters

The delicate Triops larvae grow incredibly quickly. However, they must be carefully fed and nurtured, like proper pets. Observing them will become more exciting with each day that passes.

Triops-Nauplius larvae under the microscope

Caring for baby Triops

WHAT YOU NEED

- **Wooden spatula**
- **Baby Triops feed**
- **Adult Triops feed**
- **Magnifying glass**
- *Ruler with measurements in millimetres*

After two days, the Triops larvae are fed.

THIS IS WHAT YOU DO

1. When several larvae are splashing about in the water, move the lamp a little further back from the pool and check the temperature. 20°C to 25 °C is sufficient after hatching - a warm room temperature.

2. Now you can start feeding. Put a very small amount of baby feed (about the size of a sesame seed) in the water using the spatula.

3. You will find a clear feeding plan on the back cover of this booklet. Here it will tell you how to continue with the feeding as the Triops grow up; when you can change to the 'adult feed' and anything else that you need to bear in mind.

4. Observe the Triops carefully through the magnifying glass.

5. Once they are about 1 cm long, you can remove the barrier from the pool.

WARNING!
Do not panic if the larvae, and then later the Triops, reduce in number. These little predators are cannibals!

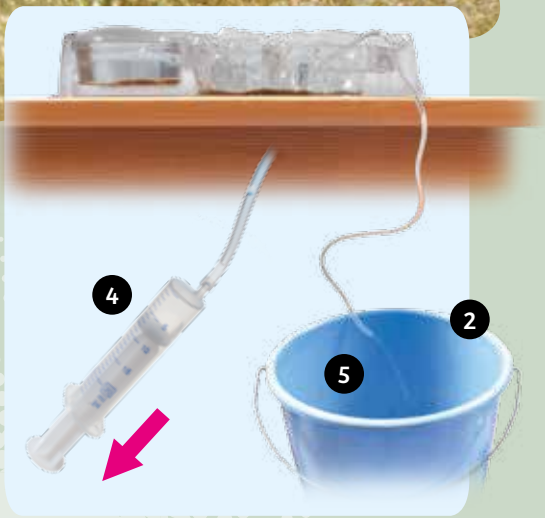
QUICK EXPLANATION !

The Triops larvae live off tiny algae and microorganisms that they filter out from the water. However, the amount of food given must be measured out exactly. You will do your Triops no good if you put too much food in the water. Microbes multiply easily on the leftover food and contaminate the water. However, a slight green tinge to the water is not dangerous.

Fresh water is healthy

WHAT YOU NEED

- **Tube**
- **Syringe**
- **Wooden Spatula**
- *A small bucket*
- *Mineral water, as described on page 4 (at room temperature)*



THIS IS WHAT YOU DO

1. Herd the Triops back into the breeding pool and replace the plastic barrier.
2. The bucket must be placed lower than the Triops pool, preferably on the floor.
3. Now insert the syringe in one end of the tube and hold the other end in the Triops pool. Make sure that it always remains under the surface of the water.
4. The water is sucked through the tube when you pull on the syringe's plunger.
5. When the tube is completely full, hold the end of the tube with the syringe over the bucket and remove the syringe. The water will now run through the tube by itself – as long as no air gets in at the top.
6. You can clean the base of the pool with the tube like a vacuum cleaner. But be careful not to suck up any remaining Triops!
7. Drain out about two thirds of the water from the pool.
8. Carefully fill up the pool with fresh water. Pour the used water down the toilet and flush it away. Then, wash your hands.
9. Remove the barrier and let the Triops back into the main pool.

WARNING!
Water constantly evaporates across the large surface of water. Therefore, top up regularly with mineral water which is at room temperature. In this way oxygen will also be added in.

QUICK EXPLANATION

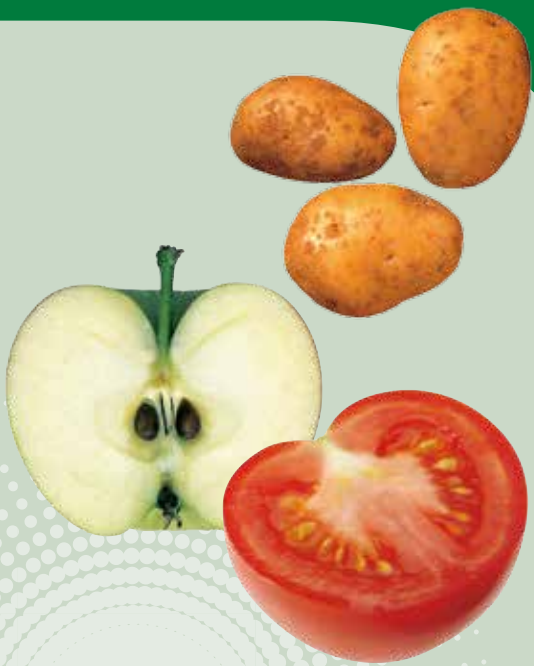
A layer of dead algae, Triops droppings and other waste material builds up over time on the base of the pool. As well as this, a murky transparent 'film' of bacteria can form on the surface of the water. That is why you must change the water now and again – especially if the water turns brown!

FEED TEST

The Triops menu

WHAT YOU NEED

› **Barrier to the breeding station**
› *Different plant-based foodstuffs, e.g. raw potato, carrot, apple, soft-boiled peas, cooked rice, sweetcorn and cabbage*
› *Different animal-based foodstuffs, e.g. raw meat, hard-boiled egg*
› *Live food, e.g. captive bred insects, water fleas from an aquarium shop, sludge worms or mosquito larvae*
› *Tweezers*



THIS IS WHAT YOU DO

1. Put a small amount of the various feeds in the water (a pea-sized amount at the most), but only ever put in one type of feed each day.

2. Watch how the Triops behave. The following day you will be able to see if they have accepted the feed.

3. The next day, you should carefully remove any leftover food so that you do not spoil the water quality.

4. Put one Triops in the closed off section of the pool and offer her the live food.

HINT!
Dried mosquito larvae from an aquatic shop are a delicacy for Triops – but do not give them more than 2 larvae per animal each day!

QUICK EXPLANATION

Triops react differently to different foods. They really love foods rich in protein because this is what they lack in nature. They will dive greedily after live food. In the separate pool, you can watch how they hunt, capture and consume their prey.

Collecting Triops eggs

WHAT YOU NEED

- **Wooden spatula**
- *Mineral water*
- *Tablespoon*
- *Small bowl*
- *Large, clean, plastic container, which is as flat as possible, or a flat plate*
- *Sealable storage container*

THIS IS WHAT YOU DO

1. Scoop out as much of the sand as possible into the small bowl.

2. Carefully pour the water from the pool into the toilet and flush it away.

3. Rinse the sand in the small bowl with mineral water at least three times as follows: Add water – stir – let the sand settle – pour away the dirty water.

4. Fill the large plastic container with the sand and place the container to dry on the heater or in the sun. Stir frequently!

5. Once all the sand is completely dry, you can put it in the storage container.

QUICK EXPLANATION !

Triops only have a short lifespan. However, you can keep the eggs that they leave behind and create new life again later on. As you cannot possibly differentiate between the tiny Triops eggs and sand, you simply retain all of the sand. It must all be thoroughly dry, so that the eggs can be kept for longer.

WARNING! You should clean the Triops pool thoroughly with clean water immediately (no cleaning products) and leave to dry completely so that it is ready for the next generation.

BREEDING WITH VEGETABLES

The next generation

WHAT YOU NEED

- **Clean Triops pool**
- **Sand with Triops eggs**
- **Plastic barrier**
- *Mineral water (see page 4)*
- *Heat lamp (see page 4)*
- *Raw carrots or cauliflower*
- *Fine kitchen grater*
- *Kitchen knife*

THIS IS WHAT YOU DO

1. Set up the pool as described on pages 4-6, but without the starter sand and without the normal sand.

2. Grate some vegetables very finely using the grater. This forms your home-made water conditioner. Place a knife-tip amount in the water in the separate pool region. Leave for 48 hours.

3. Carefully spread out some of the sand with the Triops eggs in the separate pool area, preferably around the grated vegetables.

4. Now just wait and see.

QUICK EXPLANATION

In the starter sand, mineral salts are included for the pre-treatment of the water. The grated vegetables assume the same function. They do not serve directly as feed, but they ensure that microorganisms multiply in the water, which are then eaten by the Triops-babies.

WARNING!
You must never release Triops outdoors! They would certainly not survive long at all in our climate and would also be very harmful to our native species.

Diet and reproduction

Triops move constantly – be it gracefully paddling through the water or burrowing in the sand. Only three things matter to them: feeding, growing and laying eggs.

The tiny Triops larvae grow up incredibly quickly. In the initial period, they actually double their size daily. They feed on suspended matter in the water, such as small, microscopic, green algae or other micro-organisms. Triops are omnivores and feed therefore on both plants and animals (just like us). They need plenty of protein for the rapid growth of their bodies. They are therefore crazy about eating animals.

What is more, they also eat each other - and not just the remains of dead comrades in the pool, but also the weaker Triops which are still alive in the pool with them. This makes sense in nature - it is much better that two strong Triops survive, rather than ten weak Triops die before laying eggs. Even if only two or three creatures remain in the pool at the end, it is still a breeding success.

HINT!

Triops shed their skin regularly as they grow. The tiny shed skins then float around in the water. Take a look at them through your magnifying glass – they really show the creature's body structure.

KEY WORD "RESTING EGGS"

Egg production is the main purpose in life for older Triops. Straight after laying, the tiny, red, balls are tacky and stick to grains of sand and parts of plants. In this way, they are well camouflaged and hidden from hungry mouths. Triops eggs can withstand nearly anything, be it drought, heat or frost. They are not even harmed when they spend time in the airless vaccum of space. They actually have to be completely dried out otherwise the tiny Triops can no longer develop. However, once the right environmental conditions are present once again (water and probably the correct temperature), they wake from their sleep – even if this lasted for more than 20 years! Triops have survived as a species in this manner for millions of years – and for the majority of this time as seemingly lifeless eggs.