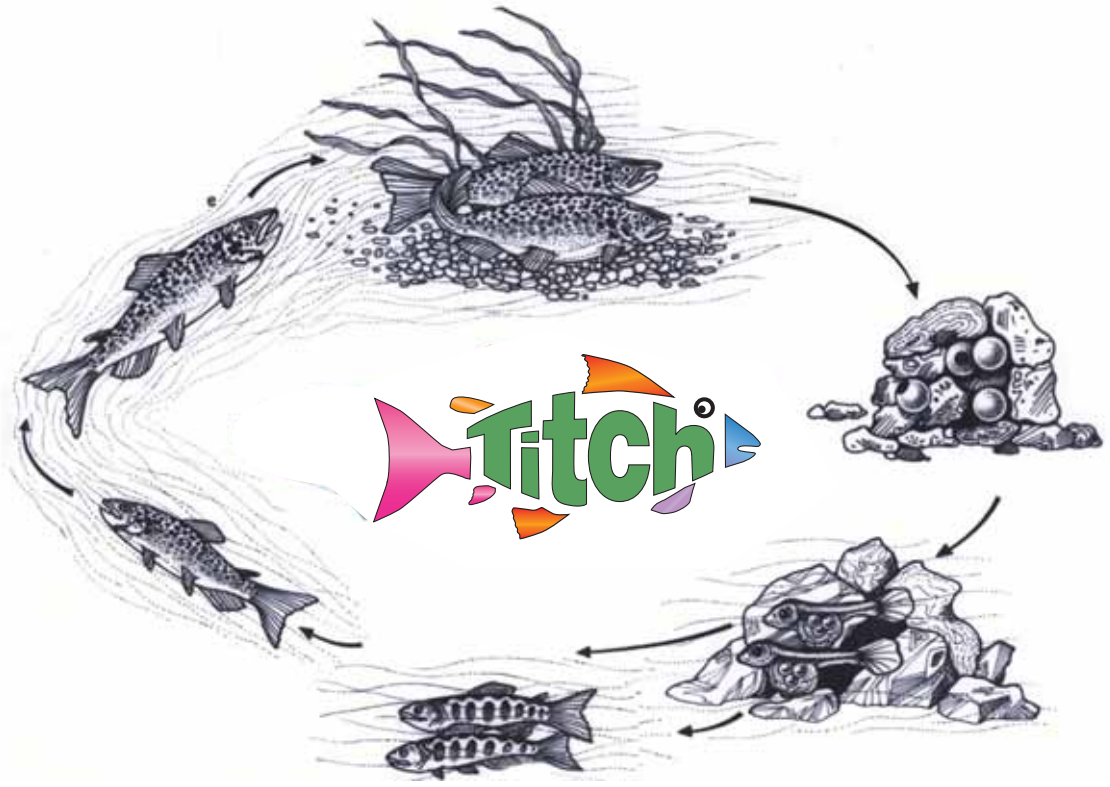
Trout in the Classroom Project

A guide to hatching fish in schools and releasing them into your local river

TROUT JetSet® UK IN THE CLASSROOM

TAKING NATURE INTO SCHOOLS



IN PARTNERSHIP WITH

Environment Agency

Introduction

Trout in the Classroom is a groundbreaking initiative that was developed by JetSet and Thames 21 on the River Wandle in London and now places manageable self-contained trout, salmon and sea trout hatching aquariums into selected schools throughout Britain. Students follow the development from eggs, to alevin, to fry in the school environment and then release them into their local river

Hatching trout in the classroom is a hands-on activity that captures children's imaginations and helps connect them to wildlife management issues problems and possibilities for solutions. This project can facilitate learning across the school curriculum. It is also an activity that will encourage interest in and ownership of the children's local environment

This manual provides the information you need to help you through the process

In every case the JetSet team will visit your school to install the hatchery system. We also like to talk to the children and explain the benefits and their role in making this exciting project an enjoyable experience. It is also important that we tell the children why it is so important for their environment.

Trout in the Classroom Procedure

The programme aims to raise fish in conditions that are as close to nature as possible. This approach leads to healthy fish and gives students an accurate, close up understanding of trout and salmon reproduction

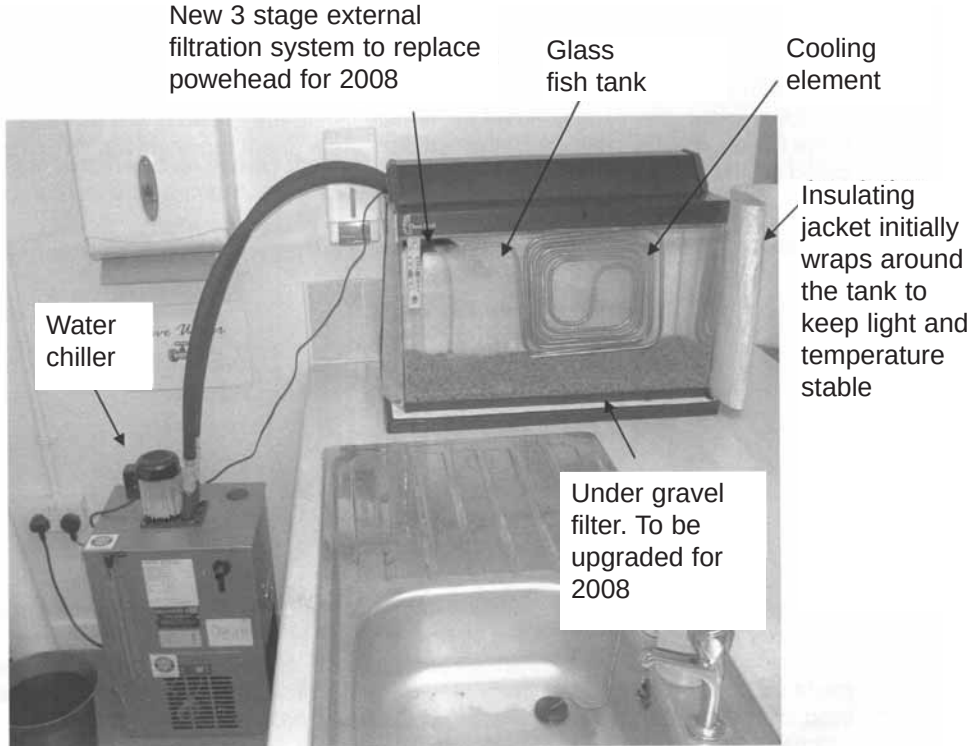
Nature's Way
Brown trout spawn during the winter and will shed their eggs in November or December. They spawn in rivers and streams that have very clean flowing water with sediment free gravel bottoms. Spawning trout shed (lay) their eggs into shallow depressions excavated by the female fish in the gravel of the riverbed Once the eggs have been shed, the fish bury them under more gravel. This 'nest' is called a redd.

The cold flowing winter water bubbles over rocks and gathers oxygen from the air. This clear water flows through the clean porous gravel and provides adequate circulation and oxygenation for the eggs. Were heavy siltation to occur the eggs might suffocate. The flowing water prevents siltation and also removes any waste product or pollutants that would otherwise build up around the eggs and newly hatched fry.

When the eggs hatch, the fry still have a large yolk sac attached to them that supplies them with nourishment. At this stage they are called alevins. They remain safely hidden in the gravel for the early part of their development. Only when the yolk sac is almost used up do they venture out of the gravel and into the river or stream in search of food.

Our Way
How do we recreate these natural conditions in a classroom?

The photograph below shows a classroom hatchery system in situ.
Glass tank
Water chiller
Polystyrene jacket
Undergravel filter
Cooling element



Water chiller
To cool the water in the tank to a river's winter temperature, a modified beer chiller is used. This large box contains pretty much the same technology that is used in a household fridge. However the box also contains a reservoir of water and a water pump. It is this reservoir of water that the chiller cools. The cold water is then pumped through a pipe and around a metal chiller coil and then back to the chiller reservoir. The coil is placed in the bottom of the tank under the gravel where it cools the water. The water in the chiller never mixes with the water in the tank. The chiller is fitted with a thermostat so it only operates when the tank water needs cooling. This means that the tank's temperature can be maintained at any level we choose. To start with the tank water temperature will vary between 5 and 10˚C depending on location to simulate the winter temperature of the river where the trout lay their eggs in the wild.

Insulating jacket
The tank is also fitted with a lid and insulating jacket covering two sides. This insulates the tank from the room helping to maintain its temperature and making it easier for the chiller to keep the water cold. It also prevents too much light getting into the tank, which can damage the developing eggs that, in the wild, would be buried under gravel. **The jacket is removed permanently after three to four weeks.**

External 3 stage advanced Fluval filter system
This will be introduced as an upgrade for the 2008 season. This should greatly increase fry survival by reducing possible instances of ammonia build up. We constantly evolve the system to maximise efficiency. This external filter replaces the more complicated under gravel filtration system and should simplify the technique.

How bacteria can get into the system - even after we have dechlorinated the water and disinfected the set up?

There are several ways this can happen.
- Bacteria are tiny; they are found everywhere and reproduce very rapidly.
- Bacteria and other organisms are easily distributed through the air. They quickly recolonise the gravel as it is dried.
- Airborne organisms colonise exposed areas of the hatchery and enter the water through its surface. This also applies to a bucket of water that is left standing as it de-chlorinates.
- Human hands easily transfer micro-organisms into the water during set-up and monitoring activities.
- The dormant stages of some micro-organisms are not killed by a weak bleach solution. When fresh water is added they emerge from their dormant state.

To give the fry their best chance of surviving the hatchery must be set up at least two days before the eggs arrive. This will allow time to ensure that everything is working as it should.

There you have it! Using the tank, chiller and 3 stage external filter system you can create an in school controlled environment that will mimic exactly the conditions required for the natural development of trout, salmon and sea trout eggs into fry.

How we set up your hatchery

Early considerations

Decide where you want to place your hatchery tank. Once set up it will be impossible to move safely without emptying it of water. A quiet corner where it will receive little heat, bright light or other disturbances such as bumping or jarring is best. The chiller unit should be beside or below the tank. Once switched on, the chiller will hum and occasionally make gurgling noises. It is worth considering whether this chiller noise will disturb anyone using the room where the hatchery is set up. The chiller and external filter system will need to be plugged into the mains electricity and left on for the duration of the project. You will need an uninterrupted electricity supply with two sockets or a double adaptor.

Washing

If the hatchery system is to be used year on year you will need to thoroughly wash the aquarium, gravel and any previously used equipment; i.e. tubing, thermometers, net, turkey baster, buckets and any other equipment that will come into contact with the aquarium water. A solution of 1:400 bleach to water is recommended. All the equipment must be rinsed with clean water several times to remove all traces of bleach.

Ideally a new tank would be purchased for subsequent years this is not an expensive element of the hatchery and as cleanliness is a priority with fish rearing, this may be advisable.

Assembling your hatchery (this will be done for you in the first year) but for subsequent years.

- Place the tank on its polystyrene sheet.
- Place the chiller unit in its final position. It will be very difficult to move once it is filled with water
- Attach tubes to each end of the chiller coil.
- Fit the coil into the base of the tank.
- Attach the chiller coil tubes to the inlet and outlet of the chiller
- Fill the chiller unit with water.
- Rinse the gravel thoroughly to remove any fine particles.
- Spread the gravel about 3cm deep, so as to cover the chiller coil. Larger pebbles can be placed on top of the gravel to better replicate natural conditions.

SAFETY REMINDER:
To avoid the possibility of the plug (either air pump or power head) getting wet, position the hatchery to one side of the wall socket. Arrange a drip loop in the cord. The drip loop is the part of the cord that hangs beneath the socket. If water travels along the cord, it will drip off at the loop, preventing it from coming in contact with the socket.

- Attach the thermometer inside the tank below the water line using the suckers provided.

- Fill the tank with water to a level very slightly below the aquarium hood. If you are using tap water let it stand for 24 hours to allow the chlorine to dissipate or add de-chlorinating chemicals to the water.

- Attach the polystyrene cover around the tank. Replace the lid. You may need to cut bigger holes in the lid for the chiller tubes.

- Plug in the powerhead and chiller unit and check they are working properly. Set the chiller by pressing the two grey buttons together. These are located on the front left of the chiller. When the number flashes use top and bottom buttons to raise and lower temperature respectively. When 10˚C is reached, press both buttons again to set temperature. (New system may vary)

- Make sure the electrical connections are safe and secure. It is worth labelling the plugs to ensure they are not accidentally switched off. If either the equipment is switched off for any length of time, the eggs and fry may perish. Simple checks can prevent this at the end of the school day.

Monitor the system
Allow the system to run for at least two days before receiving the eggs. Confirm that the system is operating properly.

Stabilise the aquarium's temperature by adjusting the chiller's thermostat if necessary. The temperature you will require for your hatchery will depend upon your geographical location. This could vary from approximately from 5 to 10˚C. We will advise.

Fish are cold-blooded animals. Their metabolic rate is affected by the temperature of their surroundings. Egg development will occur more slowly below 10˚C. Conversely, higher temperatures will speed up the development. However, higher temperatures will increase the chance of bacterial and fungal infection. The hatchery will be more successful if the temperature is kept low.

Use the thermometer in the aquarium to keep a check on the tank temperature as it will be more accurate than the thermostat on the chiller.

Fluctuations in water temperature of up to 5˚C will only stress the fish - higher temperature variations may kill them.

Timescale
The tank must be set up ad filled with water for at least two days before the eggs are introduced.

Trout, salmon and sea trout egg availability are prone to seasonal variation. January to December are the principal breeding months.

When the eggs arrive
Make sure the chiller is switched on 24 hours before the eggs arrive. Each tank will hold between 100 to 250 eggs. The eggs should be at about the same temperature as the tank water when they arrive (within 1 or 2˚C). Using a net or slotted spoon, scatter the eggs gently across the gravel in the tank. The eggs should be exposed to the light for no more than 15min before the tank is re-covered.

The eggs must be checked every day. Any eggs that die will go milky/opaque and must be removed. They can be easily removed using the turkey baster. If they are left in the tank they will start to decay, this will pollute the water and will encourage bacterial and fungal infections to spread to the healthy living eggs. You might like to keep a record of how many mortalities there are and the dates dead eggs or fry are removed (see suggested links to Curriculum).

Other daily checks
- Is the water temperature as expected?
- Is the chiller unit working?
- **The water level of the chiller should also be checked once a week and the chiller topped up if necessary.** This top up water need not be dechlorinated water.
- Ensure that the external Fluval system is switched on and is working properly.
- Is the water in the tank at the correct level and is it clean?
- If the water is at all cloudy or has any unpleasant taint, check the system thoroughly as a water change may be required.

As the eggs develop
The first obvious sign that the eggs are developing into fish will be the appearance of two dark spots within the eggs. These are the eyes of the developing fish. The eggs may well be ‘eyed’ when they are delivered.

When the eggs hatch
The development of the eggs is strongly influenced by the water temperature. A guideline for the hatching date can be calculated using the accumulated temperature units (ATUs). ATUs are calculated by the following formula:
Temperature (˚C) x Days = ATUs

Brown trout should hatch at around 398 ATUs i.e. 10˚C x 39.8 days = 398 ATUs. If we keep the tank at 10˚C for an entire 24 hours, each day the eggs will have been exposed to 10 AT Us. The eggs should reach the eyed stage at 280-300 ATUs i.e. 10˚C x 28-30 days = 280-300 ATUs.

If the water temperature at the hatchery is known, together with the date the eggs were fertilised, it is possible to keep a daily record of the ATUs accumulated by the developing eggs and predict when they will hatch.

Eggs will normally hatch over a period of days. As they do, white foam can collect at the top of the tanks. This substance results from the breakdown of the egg casing by enzymes and will dissipate after a number of days. The newly hatched fish will only be about 1cm in length. They will be almost completely inactive. In the wild at this time they remain in the gravel feeding from their yolk sac.

The cover will need to be kept on for most of the day as light can still damage these newly hatched fish.

Water Change
Once the eggs have hatched a new weekly maintenance task will have to be introduced - the water change.

One full bucket of water should be drained out of the tank and replaced with a bucket of de-chlorinated water at approximately the same temperature of the tank (too cold is better than too warm).

Use the bell siphon to drain the water out of the tank, this will also allow you to hoover up any uneaten food or other detritus from the bottom of the tank. Be careful not to disturb the fish too much while hoovering. Tip; fill the siphon tube and bell chamber with tank water to start the siphon process going as it can sometimes be difficult to start with the plunger.

The simplest way to adjust the temperature of the water and ensure the water is chlorine free is to leave a covered bucket of tap water outside overnight. The chlorine will dissipate naturally and the night-time temperatures will cool the water.

A bucket of water can also be placed in a fridge until it reaches the correct temperature. If it is inconvenient to leave the bucket for a full day you can add a few drops of de-chlorinating chemical to the water.

Why water change?
Ammonia.
Once the eggs have hatched and especially once the fry start to feed, preventing build up of ammonia in the tank is very important. Proteins are essential to produce the powerful muscles that trout use for swimming. Animal cells assemble their required proteins from amino acid building blocks found in foods. Ammonia is the result of the biological