

Killifish Manual



- Introduction
- How to Hatch the Eggs
- How to Raise Killies
- How to Breed Killies
- Food for Killies
- Brine Shrimp Hatchery



Introduction to Killifish

Killifish, or killies for short, belong to the order Cyprinodontiformes or egg laying toothcarps. The name "killi" is derived from the Dutch word meaning "creek". Killies, in other words, are "fish from the creek". But the name is a misnomer as killies, which can be found in almost every part of the world, also live in ponds, streams, rivers, bays and estuaries, basically, wherever there is water and sometimes even when there is none

There is a good reason, however, why killies do not usually have common names. Using scientific names is the only way to keep track of lineage and identity. Thanks to the conscientiousness and efforts of killie breeders worldwide, most killie species have been kept pure.

Broadly speaking, killies can be divided into 2 categories, the Non-annuals and the Annuals. Supposedly, Non-annuals prefer soft acidic water while Annuals will only thrive in hard alkaline water.

Non-annuals would include killies like the *Aphyosemions*.

Annuals, as the name suggests, are killies that usually would not live longer than a year or so. They come from countries with distinct wet and dry seasons. One of the most beautiful of all Annuals is the [Nothobranchius rachovii](#)

[Nothobranchius](#), as they are often called, comes mainly from Africa. When the rainy season is over and the ponds dry up, the fish die but their eggs will be waiting in the mud for the next monsoon season. When the rains fall and the pond fills up, the eggs hatch and the [Nothobranchius](#) live again.



How to hatch the Eggs of Killies

Peat moss is the most common medium used to incubate killifish eggs. The incubation time varies with different species but it should be quite safe to assume that eggs of the Nothobranchius will hatch in 6 to 8 weeks when kept at 29 degrees Centigrade.

The peat should always be stored in a dark and cool place. A foam box is best because it will keep the temperature constant. Eyed-up eggs are a sure indication that the eggs are fully developed.



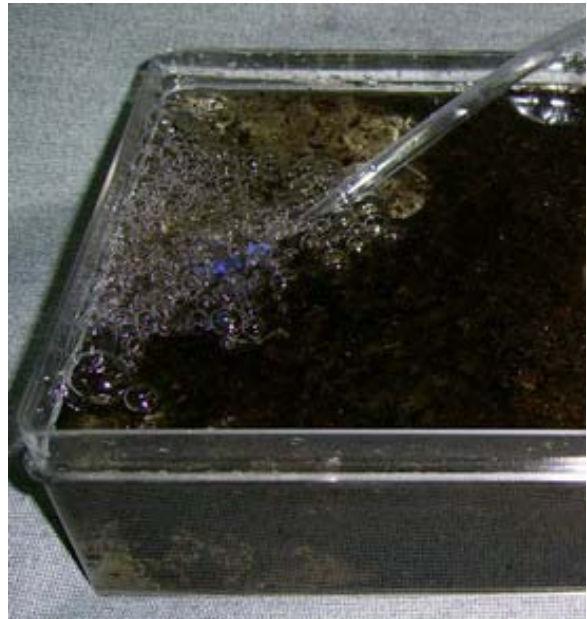
When you are ready to hatch the eggs, do not separate them from the peat when you wet them. The eggs won't hatch without the peat.



When "eyes" appear in the eggs, it would mean it's "Hatching time". But even if you cannot spot the eyes, it's okay to wet the peat if you think the eggs are fully developed.

To wet the peat, fill up a plastic tray with aged water to a depth of about 5 cm. I usually use water from an established fish tank.

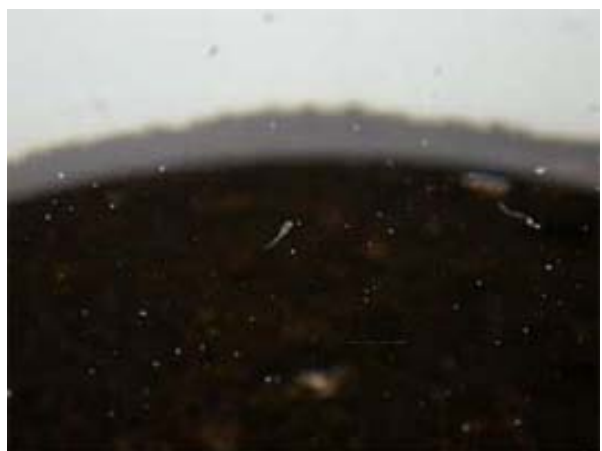
Pour the peat into the "hatching tray" and gently break up the lumps. When the peat has settled to the bottom, scoop away the floating debris. It's important to keep the surface of the water clear or else it will be very difficult to spot and catch the fry when they hatch. But be careful when removing the floating debris. Although eggs should sink, some may be attached to the floating peat.



If the timing is right, you should see fry within a few hours. If not, wait at least 2 days.

The fry won't be able to swim very well when they are newly hatched. For a few hours, they will be just lying on top of the peat, making wriggling movements.

Do not catch them immediately but wait a few hours for them to become "free-swimming" before transferring them into a "raising tray". This is where the fish will be raised until they are about 3 weeks old.





The best tool for transferring fry is a turkey baster. Eyedroppers, sold in pharmacies, can be used for catching fry too. The only drawback with an eyedropper is that you will have a lot more *fun* chasing the fry around.

Be very gentle when transferring fry. Rough handling can lead to broken backs and dead fish. It is not a good idea to use a net to transfer fry as the fish may suffer shock and trauma when removed from water.

Be sure to have some Java or Christmas moss in the "raising tray". Moss encourages the growth of infusoria and also serves as a "security blanket" for the fry.

To promote infusoria, Put a drop or 2 of liquidfry into the water. It's also useful to have some snails in the tray as their droppings are food for infusoria. Do not put too many fry into one tray or else the mortality rate will be high.



Two days after wetting, dry the peat and bag it. Chances are very good that there will be more fry when you wet the peat again in another 2 weeks. Some eggs, by nature, will not hatch during the first wetting or even the 2nd and 3rd wetting. It's known as diapause, mother nature's back- up system to ensure that in the event of a false or freak shower, not all the fish will be wiped out when the pond dries up again.

It's always a good idea to mark down the species and the hatching date on the raising tray, more so if you are raising more than one species of killie.

How to Raise Killies

There is no need to provide aeration or filtration in the "raising trays." I never change the water in the trays. I only top them up with aged water as the fry grow. Remember to use only aged water. If you add water straight from the taps, all the fry will be dead the next day. I age my water by letting it stand in a bucket for at least 2 days.

The fry do not take well to water changes. Changing water, checking on the trays several times a day, overfeeding or moving the trays about unnecessarily can result in massive die-offs.



One of the best food for *Nothobranchius* fry is Artemia. I feed only once a day during the first week.

Do not overfeed as too much uneaten brine shrimp can contaminate the water and kill the fry.

Microworms and vinegar eels are suitable fry food too but it can be a hassle harvesting them. Swollen bellies are a sure sign that the fry are eating well.

Fish rarely starve to death. More often than not, it is overfeeding that kills them. Do not be over-zealous when feeding the fry.

Raise the water level as the fry grow. Always keep an eye out for dead fish and remove them from the tray as soon as you spot them. Killies are good jumpers but the fry won't jump so there is no need to put any cover on the tray.



Do not leave your "raising tray" directly under the sun. It can get too hot for the fry as still water heats up in a very short time. Usually, a layer of scum/oil will form on the surface of the water. It won't do any harm to the fish but if it bothers you, remove it by sliding a sheet of newspaper over the surface.



When the fry are 2 weeks old, I supplement their diet of baby brine shrimps with chopped tubifex worms. That's when their growth rate starts to accelerate. At 3 weeks of age, the fry are ready to be transferred into a proper tank.

I use small tanks to raise the 3 week old fry to adult stage. My tanks are about 20 litres in volume. I usually try to grow some plants inside the tanks. Floating plants are good for killie tanks too as they help prevent the fish from jumping.

The fry won't jump but adults will. And they will jump through the narrowest of gaps.



You will never hatch every egg you get nor raise every fry you hatch. It's very much a numbers game. In nature, for every fry that reaches adult stage, hundreds perish. So be happy if you can raise 75% of your fry to the adult stage.

How to Breed Killies

Nothobranchius breeds easily. The females are prolific egg-laying machines. A fish with such a short life span will, by nature, not be fussy about sexual partners or water conditions during spawning. There are many different types of breeding bowls you can use.

A simple plastic bowl (ice cream tub) that comes with a lid is the most suitable. The lid helps prevent the peat moss from being scattered all over the tank when the fish are spawning. Cut a round hole in the lid to a diameter of about 5 cm.

Do not cut too small a hole as the fish can injure themselves scrapping along the edges when they enter and leave the bowl.



Peat moss is available in most nurseries and some supermarkets. Do not confuse peat moss with peat. The former is fluffier. You can also use peat but it won't be suitable for killies that are "peat divers". Before putting the peat moss into the breeding bowl, boil it first. This sterilises the peat and removes the oil. Cool the peat moss with running water before putting it into the breeding bowl.

Nothobranchius are "peat spawners". They lay their eggs just slightly below the surface of the peat unlike "peat divers" which actually dives head first deep into the peat to lay their eggs.

When conditioned well on live food, Nothobranchius become sexually matured in about 2 months. Separate the males from the females if you are not ready to collect their eggs because in the absence of a breeding bowl, Nothos will lay their eggs in the gravel or on the bottom of bare tanks.

I will usually put one male with several females into a bare tank of about 20 litres when I want to breed the fish.



To prevent velvet, I add 2 tablespoons of salt to the water. I find that velvet always strikes when the fish are in a breeding tank. I'm not sure but I think the peat moss softens and acidifies the water, thereby creating the conditions in which velvet thrives.



If you are using a plastic container as a breeding bowl, put in a small rock to weigh it down. Rocks are useful as Nothobranchius like to press against something hard when they are spawning. Fill the bowl halfway with peat moss and top it up with water. Allow some time for the peat to sink and scoop away the floating debris. Gently put the bowl into the breeding tank. Some peat moss will usually float out from the bowl. Do not bother about siphoning away the loose peat as it's going to be messy anyway when the fish starts spawning.

If the fish are sexually matured and if they were not too stressed when transferred into the breeding tank, spawning takes place almost immediately. The male will cajole the females to go into the breeding bowl with him by flaring and showing off his colours.

If the female is willing, she will swim into the bowl and the male will press her down until the lower halves of their bodies are buried underneath the peat moss. They will remain motionless for a while before making a jerking movement and separating. That would be the signal that an egg has been laid. A female will usually lay several eggs before leaving the bowl. One female can lay up to 30 eggs in a day.



Food for Killies

Feeding Adult Killifish

Brine Shrimp

This food is a staple of many killie fishrooms. In some areas live adult brine shrimp can be purchased. These are a good nutritional source and are eagerly taken by most killies. As they live in strong salt water, they are less likely to carry parasites and bacteria harmful to freshwater fish. Frozen brine shrimp are widely available and widely used. They are readily accepted by most fish but, as with any non-live food, care must be taken not to overfeed.



Daphnia

This little crustacean is one of the most widely used live foods. Daphnia can be cultured artificially, at least in limited quantities, but most aquarists collect them from pools and ponds. A drawback to use of daphnia collected in this way is the danger of collecting other organisms potentially dangerous to aquarium fish. Daphnia are said to act as a laxative for fish and, like other foods, daphnia should not be fed exclusively.



Mosquito Larvae

This is an excellent live food for killies, although available only seasonally. They may be collected from standing water and ponds, either by swiftly passing a net through the water near the surface, or by collecting the egg "rafts", which can be allowed to hatch in a container of water in the fishroom. Many aquarists recommend culture of mosquito larvae by leaving out a container of water, which is allowed to become green with algae. The egg rafts or larvae are then collected under controlled conditions. Care must be taken to avoid allowing the larvae to complete the life cycle and become mosquitoes. That is a good way to make yourself unpopular with the neighbors and should be avoided because of the mosquito borne West Nile virus. As with the collection of other live foods, there is a risk of introducing fish enemies with the food.



Tubifex Worms

Tubifex worms are small worms that live in filthy places, such as sewage run-offs and the like. They can be collected from such sites, or purchased from some stores. Tubifex are an excellent food for killifish, but they carry the reputation of transmitting a variety of diseases. This risk may be reduced somewhat by holding the worms for a time in a shallow tray through which cold water runs. In this way evacuated matter and detritus from dead worms are washed away.



Blackworms

Blackworms are similar to, but distinct from, tubifex worms and are also an excellent food. They can be purchased, either from a store, or directly from companies that grow them for profit. Some of these producers are associated with fish farming operations. Others are dedicated purely to growing blackworms. Those associated with fish farms may be more likely to transmit fish diseases. Like Tubifex, blackworms carry a reputation for transmitting diseases. However, some breeders swear by them. Blackworms may be maintained for some time under running, cold water or refrigerated in dishes with enough water to barely cover them.



White Worms

White worms (*Enchytrae*) are another excellent live food for killies. Possibly they too can carry parasites or pathogenic bacteria but, because they are cultured, this is less likely than it is for tubifex and blackworms. It is said that white worms are fatty, and that they should not be fed exclusively for that reason. There are many methods for culturing white worms. Starter cultures can be obtained from other hobbyists and they are often listed in the Fish and Egg Listing of the AKA's *Business Newsletter*. Typically, these worms are cultured in a mixture of potting soil and peat moss, usually about 50:50. However, some hobbyists use garden soil, leaf mold, etc. It is best to sterilize the substrate before starting the culture. One way to do this is to place the mixture in a plastic bag and heat it in a microwave for a few minutes. After cooling the substrate is placed in a box, allowed to cool, sprinkled with water until thoroughly damp, and the starter added. The worms may be fed baby cereal or boiled oatmeal, but the most commonly used food is break soaked in milk or in yeast water (a milky suspension of yeast in water). These worms do not like high temperatures, the ideal being about 50 °F. Worms may be collected by picking them out, if the culture is a good one, or by placing some of the substrate in a strainer over a container of water. A light bulb is positioned over the strainer, which drives the worms through the strainer and into the water. The worms can be washed, then fed to your killies.



Fruit Flies

Two fruit fly (*Drosophila*) mutants, vestigial wing and flightless, make excellent food for killies. By virtue of the mutations they bear, they cannot fly. They can crawl, though, so it is advisable to feed just enough that the fish will eat them immediately. These flies are usually cultured in some sort of bottle into which a fruit fly medium, with a sprinkle of dry yeast, has been placed. The bottle is plugged with a piece of plastic sponge, or some such thing, after the flies are added. After some days larvae will appear, which then pupate, and eventually adult flies will emerge, at which stage they can be fed to the fish. Fruit fly medium can be cooked, but this is a time consuming and messy business. Instant medium can be obtained from biological suppliers such as Carolina Biological, and is much easier to use. A starter culture of flies can be purchased from similar sources, or obtained from other hobbyists. Starter cultures, again, are often listed in the F&EL.



Beef Heart and Paste Foods

Beef heart, trimmed of fibrous tissue and fat, can be frozen, then grated to produce "worm-like" pieces. Many hobbyists use beef heart as the basis for a prepared food containing vegetable matter, vitamins and other additives. Others prepare similar paste foods based on shrimp and fish. These are fed as small pieces or gratings. Care must be taken to feed only as much as will be eaten immediately, as remnants of this type of food can quickly foul the water. Here is a [recipe](#) for a (non-beef heart based) paste food. Recipes can also be found on the [Krib](#).



Dry Foods

Many quality dry foods are available in the hobby today. Killies have a reputation of being reluctant to eat dry foods. However, some will eat them readily, and others can be trained to do so. The advantage of commercial dry foods is that they contain a balance of nutrients, including vitamins.

Foods for Newly-Hatched Killifish Fry

Newly-Hatched Brine Shrimp

Virtually every breeder of killifish uses newly hatched brine shrimp (nauplii of *Artemia*) as a food for fry. Many killie fry can eat them as a first food, and even small fry can eat them after a few days on infusoria. *Artemia* eggs are available commercially, from aquarium stores and other suppliers. Essentially, the aquarist hatches these eggs by incubating them in a salt solution (6-8 tablespoonfuls per gallon). A number of methods have been described. One method is to hatch the eggs in a tray, using a light to attract the newly hatched shrimp. Others hatch the fry in jars, aerating the salt solution. A popular variation today is to use inverted clear plastic soda bottles (2 liter), from which the bottom has been cut. A piece of tubing is glued into a hole drilled in the cap and used to aerate the solution. The inverted bottle can be held in some sort of frame, often one holding two bottles. A useful advance in hatching brine shrimp, especially those of lower grade, is dechoriation, in which the "shells" of the eggs are removed before hatching. Again, methods vary, but the one described here is used by a number of aquarists. A cup of cool water is placed in an inverted soda bottle hatchery (as described above) and one teaspoonful of brine shrimp eggs is added. This is allowed to bubble gently for about an hour. One cup of concentrated bleach (such as Chlorox) is added and the solution bubbled vigorously for 6 minutes. During this time the suspension of eggs will turn from brown to orange. The suspension of eggs is then run off the hatchery and strained through an ordinary white handkerchief. The eggs are rinsed thoroughly with cool water, then returned to the hatchery, in which the salt solution for hatching has been placed. This suspension is bubbled at a moderate rate. The eggs will hatch after 24-36 hours, depending on temperature. Temperatures of 72 to 80 °F are suitable. The hatched shrimp are collected by straining through a handkerchief. The advantage of this method is that very high hatch rates are almost always achieved, even with brine shrimp eggs that give only modest hatches without dechoriation.



Microworms

Microworms are another excellent first food for killifish fry. Starter cultures are often listed in the F&EL. To culture them, baby cereal is added to a suitable plastic container (say a one pint translucent container of the type often used to sell food). Water is added to make a paste. A little dry yeast is sprinkled onto the paste and the starter added. After some days microworms can be seen crawling up the sides of the container. They can be scraped off with a finger or a small stick and fed directly to the fry. After some time the culture will begin to sour, at which time a new one should be started.



Vinegar Eels

These tiny worms are also an excellent starting food for fry. They have the advantage of staying suspended in the water, where they can live indefinitely. They are easy to culture, but more difficult to collect than microworms. To culture a large jar, such as a one gallon pickle jar, is almost filled with a 50:50 mixture of cider vinegar and water. A small piece of apple is added, and the started culture added. After some days thousands of tiny worms can be seen suspended in the vinegar. These cultures will go on for many months with little or no attention. To feed, the worms must be strained

through a fine material such as filter paper and rinsed several times to remove the vinegar, which would otherwise acidify the hatch water.



Infusoria

Infusoria is the collective name given to a host of tiny organisms that live in naturally conditioned water. Green water, for example, contains such creatures. For feeding newly hatched fry that are too tiny to take the foods described above, green water may be cultured, or cultures of paramecium may be maintained. Paramecium starter cultures may be obtained from biological suppliers, or again through the F&EL. To maintain a culture, a large jar, such as a one gallon pickle jar, is nearly filled with chlorine free water (tap water allowed to stand to remove chlorine), and a few dry peas and a sprinkle of baby cereal added. After a couple of days the water will become cloudy due to bacterial growth. The paramecium starter is then added. Over several days the paramecium will increase in number. They can be seen as tiny white "splinters" suspended in the water. The culture is fed a few dry peas every week or two. To feed to fry, some are drawn off with a baster and added to the fry hatchery. Paramecium cultures often smell quite bad for the first week or so. After that they become less objectionable. This author prefers not to use a culture until the "bad" smell, which is due to bacterial growth, has passed. Other hobbyists use corn husks to culture paramecium.



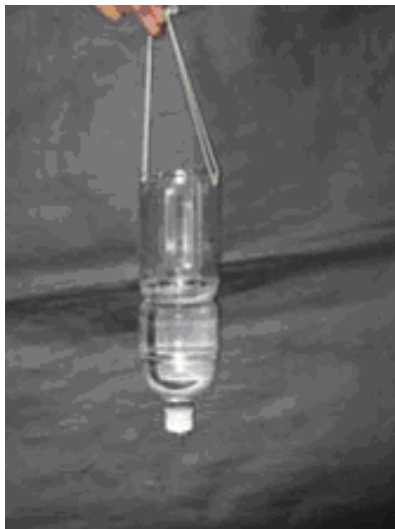
Grindal Worms

Grindal worms are an excellent food for young fish, that is for partially grown fry. They are cultured in a similar manner to white worms, but prefer higher temperatures, about 70 °F being ideal. To culture them, prepare a bed of 50:50 potting soil and peat moss (sterilized by microwaving and allowing to cool). The mixture is thoroughly dampened with water until it is not quite wet. The starter is added and the worms are fed with a sprinkle of baby cereal daily. A piece of glass is laid on the surface of the culture and the box closed with a lid. As the culture develops the worms congregate on the glass sheet, and can be scraped off with a finger to feed. An alternative method for culturing grindal worms is to use plastic foam ("sponge") as the substrate. A suitable type is the "egg crate" foam often sold as mattress pad. A piece of this material is placed in a plastic food storage box, and water added such that the foam is damp at the surface. The starter culture is added and the culture fed with a sprinkle of baby cereal. The lid is placed on the box. Ideally, the inner surface of the lid will just touch the surface of the foam. The culture is fed lightly each day. After some days, worms will be seen congregating on the lid, where they can be collected for feeding to the fish. The advantage of this method is that there is no soil contamination and the cultures do not become invaded by house mites, which are a common problem in conventional grindal worm cultures, as well as white worm cultures.



Brine Shrimp Hatchery

To rig up your own brine shrimp hatchery, these are the items you will need - A 1.5 litre plastic bottle (preferably, one with many ribs and grooves on its sides), a one-way gang valve, a bit of string and an air pump.



Cut off the bottom one-third of the plastic bottle. Use a sharp object to make a small hole in the cap and then force the one-way gang valve through it. It won't leak and you don't have to use silicon if the size of the hole is slightly smaller than the gang valve. Punch 2 holes at the other end of the plastic bottle and pass the strings through them. Fill the bottle with water and check for leaks.

To hatch brine shrimp eggs, fill up the hatchery with about one litre of water. Add one tablespoon of salt and a small scoop of brine shrimp eggs. Connect the valve to an air pump and aerate the solution for 24 hours. The solution should turn a bright red colour, indicating that most, if not all, the eggs have hatched.





To harvest the baby brine shrimps, close the gang valve and add half a litre of tap water to the hatchery. Disconnect the tubing and wait for 5 minutes. If all goes well, 3 layers will form in the solution. Egg shells will form the top layer; clear water will be in the middle layer and the baby brine shrimps will congregate at the lower one-third of the solution.

Release the gang-valve and let the solution flow into a bottle. As the water level in the hatchery drops, the egg shells stick to the sides of the bottle and voila, what comes out through the gang valve are pure baby brine shrimps.



You can either use a turkey baster, dropper or a brine shrimp net to feed your fish with the baby brine shrimps. I find it's better to use a turkey baster as dipping a net into one tank after another is a sure-fire way to contaminate every tank if one is diseased.

The nutritional value of baby brine shrimps drops dramatically a few hours after hatching. So do not leave your baby brine shrimps in the hatchery for too long. If possible, feed them to your fish as soon as they hatch.

For more information about Brine Shrimp Hatch, <http://websvirginia.com/angels/hatchshrimp/index.htm>