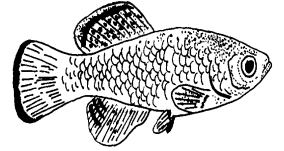
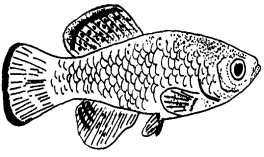
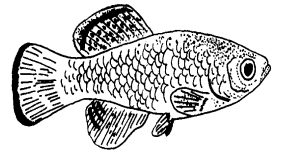


# Killifish Manual



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# Introduction to Killifish

## "We were all beginners once; we're all beginners still"- quote from The AKA Beginner's Committee

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. The real reason these fish are known as killies is because their names can really kill; trying to remember them is pure murder. Just kidding of course, but killie names can be quite a mouthful sometimes. Just try saying "*Simpsonichthys*" or "*albimarginatus*" and you will know what I mean.

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. Unlike almost all other tropical fish which have been cross-bred to death, there is no "Jin Gang Killie" or a "Half Moon Killie". So never cross your killies. If you do, don't ever distribute the hybrids and don't ever, ever sell the eggs.

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.

But let me tell you a little secret - Other than adding salt into breeding tanks, I don't do anything to change the water chemistry in my killie tanks. In other words, all my killies live in waters of Ph 7 and Kh 0. They also say killies will only breed in low temperatures, something like 25 degrees centigrade. I don't have air-conditioning and I can't afford chillers, so the temperatures in all my tanks are about 30 degrees centigrade most of the time, sometimes even higher. I have not bred every one of my killies yet but I have succeeded with quite a few.

Non-annuals would include killies like the *Aphyosemions*. If you should come across a killie in one of Singapore's fish shop, chances are it is an *Aphyosemion australe*, one of the few killies to have a common name, the Lyretail. The Non-annuals lay their eggs on aquatic plants or spawning mops.

It is highly unlikely though, that you will ever come across a female Lyretail here. Many local fish shop owners and importers foolishly believe that if they sell the females, hobbyists like you and me will get to breed the fish and undercut their market. Heck, there is no point keeping the fish if you cannot breed them.

It is a vicious cycle. People in the business refuse to sell females; hobbyists cannot breed the fish and eventually lose interest; fish shop owners claim killies won't sell because nobody is interested. It is really no surprise that in sunny Singapore where there are more than 400 fish shops, there is no killifish scene to speak of.

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*.

Nothos, 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 I hatch the Eggs of the Nothobranchius

*"Add water, make fish" - quote from my good friend, Susan Auferi*

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 styrofoam box is best because it will keep the temperature constant. But it's also okay to keep the eggs inside a bedroom drawer. 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. For reasons which are not fully understood, the eggs won't hatch without the peat.



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

No harm will come to undeveloped eggs subjected to repeated wetting so long as you dry and bag the peat again.

To wet the peat, fill up a plastic tray (20 cm X 20 cm) with aged water to a depth of about 5 cm. I usually use water from an established fish tank. Plastic trays of different sizes are available in Singapore from sundry shops.

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. But don't try to look for a turkey baster in Singapore. As far as I know, there are none available. The 3 basters I own came to me from the US of A. 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. If you are planning on buying a turkey baster from an online store, I would recommend you get the one with the angled tip.

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. I usually have my "raising trays" ready a few days before I wet the eggs.

To promote infusoria, I 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. I usually will not have more than 20 fry in a 20 cm by 20 cm raising tray.

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 I raise the *Nothobranchius*

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.

Notho fry do not take well to water changes. I find that a certain amount of neglect works best when raising Notho fry. Changing water, checking on the trays several times a day, overfeeding or moving the trays about unnecessarily can result in massive die-offs.



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 Notho fry won't jump so there is no need to put any cover on the tray.



One of the best food for *Nothobranchius* fry is [baby brine shrimp](#). 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. A few drops of baby brine shrimp from a turkey baster is sufficient food for 20 fry in a 20 cm X 20 cm 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. [Micranthemum micranthemoides](#) or [Hygrophila difformis](#) are plants that can be grown quite easily without having to provide CO2 injection or artificial lighting. Floating plants like [Duckweed](#), [Salvinia natans](#) and [Ceratophyllum demersum \(Hornwort\)](#) are good for killie tanks too as they help prevent the fish from jumping.

Notho fry won't jump but adults will. And they will jump through the narrowest of gaps. So if you don't want to find your fish all dried out on the floor, cover the tank with a plastic mesh or something.



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 I breed the *Nothobranchius*

*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.



When conditioned well on live food, Nothos 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. (That's the way how it should be for us humans too, don't you think? I wish.)

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.



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.

Nothos 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.



If you are using a plastic container as a breeding bowl, put in a small rock to weigh it down. Rocks are useful as Nothos 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.

If you are using many females, there will be many eggs in the breeding bowl after a few days. But if you have only a pair, it would be better to leave the bowl in the tank for a week at least. I feed the fish with live tubifex and [baby brine shrimp](#) when they are in the breeding tanks.

Occasionally, I give them live [bloodworms](#) as a special treat. If you want to collect many eggs, feed only [live food](#). Frozen food is not live food. Frozen food to a killie would be like canned food to a human. It does nothing for the libido. If you don't believe me, ask the fish.

I change the water frequently, about half the volume of water every 2 days. Killies will lay many eggs if they are healthy and happy so keep the water in the breeding tanks clean and give them as varied a diet as possible.



To keep the water in the breeding tank clear, I use a simple [sponge filter](#). Some fish shops in Singapore sell a kind of sponge filter that is L shaped. It's a good filter to use in a breeding tank as it can be attached to the sides of the tank, thereby saving space.

When there's peat moss in the tank, it's advisable to wash the sponge filter frequently because it will choke in no time. But always use the tank water to do this as you don't want to kill off the \*good\* bacteria living in the filter.



# How I collect the eggs of the Nothobranchius



When you think there are enough eggs in the breeding bowl, take it out from the breeding tank. Quite often, fish will be inside the bowl. Remove them and take away the rock. You can check for eggs by stirring the peat with your finger. Eggs should be clearly visible if they are there.

Pour the peat moss through a coffee filter. Let the water dripping out from the coffee filter collect in the breeding bowl. Swirl the peat around with this water and pour the peat through the filter until there's no peat left. Do not leave any peat in the bowl or you may lose some eggs. Every egg is precious.



Let all the water drip out and then give the filter a good squeeze. Eggs are tough and can take some rough handling but don't squeeze too hard. Put the peat on several sheets of newspapers. Check the coffee filter for eggs. Quite often, eggs will be attached to the sides of the filter.

The best time to look for eggs in the peat would be at this moment when the peat is still wet. Spread the peat out on the newspapers and the eggs will stand out clearly if they are there. Wet eggs glisten so they are easily seen. Even if it's just for an hour or 2, it becomes much more difficult to spot the eggs if you look for them later. Notho eggs are fairly large and can be easily seen with the naked eye.

Weighs about 60 kilograms and 1.6 metres in length. I'm talking about my wife, not the egg (duh). That's her finger.

Eggs vary in colour and some may look opaque and unfertilised but as far as I know, eggs are good as long as they are not fungused.





Keep the peat covered between several sheets of newspapers and leave to dry for 24 hours. Do not leave the newspapers under the sun as the peat may dry too quickly. If the amount of peat is small, 24 hours may be too long a period.

The right dryness is important. The peat should not be soggy wet, neither should it be bone dry. If the peat is too damp, the eggs may become fungused. If too dry, the eggs may die and disappear into nothingness.

Keep your eyes on the peat, not the girl because the next picture on the "[Incubation](#)" page will show the difference between wet and dry peat.

# How I incubate the eggs of the Nothobranchius

The right dryness would be when the outer edges of the peat turns brown in colour. The peat should not stick to your hand if you run your fingers through it.

I hope you have been paying attention to the peat in the last picture and notice the difference. If you have been distracted by the peat, I mean girl, click [here](#) to see the wet girl again. Err, I mean wet peat, of course.

Shucks, Christina can be very distracting, don't you think?



To bag the peat, roll up the newspaper to form a funnel and insert the opening into a thick plastic bag. Hit the newspaper gently and let the peat drop through the opening. Always check for eggs that may be stuck to the newspaper after all the peat has been bagged.

Do not use ziplock bags to store the eggs as moisture will escape through the thin plastic and the peat will become too dry.

Give the plastic bag a good shake to break up any clumps in the peat and then roll it up like a "poh piah" (spring roll). After a few days, there will be condensation on the insides of the bag. Keeping the peat close to the plastic is to keep the moisture close to the peat, thereby preventing it from becoming too dry.

Use a scotch tape to hold the bag in its rolled up position.



Put the bag holding the peat into a ziplock bag and label it accordingly. Mark down the species, the date the peat was collected and the expected wetting date. Do not use markers to write on the plastic as there is a risk that the alcohol from the marker's ink will seep through the plastic and poison the eggs.

Store the bag in a styrofoam box where it is dark and cool. Check the peat once every 2 weeks by opening up the plastic bag. If there is a lot of condensation, it would mean the peat is too wet. In such a case, dry the peat again by leaving it between several sheets of newspapers. If the peat looks too dry, drop a small piece of wet paper into the bag before rolling it up again. The moisture from the wet paper will spread through the peat and keep it moist.

Opening the plastic bag and fluffing the peat once in a while is good for the eggs as fresh air is allowed in. Eggs cannot develop if they are deprived of oxygen.

Egg development time depends on the temperature the eggs are stored and the dryness of the peat. At 29 degrees Centigrade, *Nothobranchius* eggs should be fully developed in 6 to 8 weeks.



Alternatively, you can also store your peat inside plastic containers. Plastic containers have an advantage over plastic bags in that they are very air-tight so no moisture would be lost. They take up much more space though.

As with plastic bags, always remember to label your containers with the name of the species, the date the peat was collected and the expected date of hatching.

