

Year of the Rainbowfish

A monthly column about Rainbowfish by Derek Tustin

Breeding Rainbows

As I write this, it's actually early July, and in the past this has been the most successful time of year for breeding for me as I put species of Rainbowfish out in the pond and let nature take its course. In doing so, I've successfully breed *Melanotaenia boesemani*, *Melanotaenia australis*, *Melanotaenia misoolensis* and *Chilatherina fasciata*. I've put more out this summer (*Glossolepis incicus* 'albino' and *Melanotaenia boesemani* once again), but am also undertaking some more concentrated efforts inside as well. In October I'll be writing about my acquisition of the extremely rare *Melanotaenia oktediensis*, and they are one of the species I'm really trying to propagate. It's interesting, because inside I've had accidental spawnings of *Melanotaenia kamaka*, *Melanotaenia parva*, *Melanotaenia misoolensis* and *Chilatherina sentaniensis*, but am finding that the more I work at it, the more elusive the results are becoming. Of course it could be that there are issues around the fertility of the *Melanotaenia oktediensis*, but the failures and frustrations have really made me take an in-depth examination of all aspects of the breeding of Rainbowfish.

It is my hope that the following will lay the groundwork for understanding how easy (in most instances) breeding Rainbowfish can be, and encourage you to try breeding a species (or two, or three) of your own. (Please note that my experience with breeding Rainbowfish is limited to the *Melanotaenia*, *Chilatherina* and *Glossolepis* species. The following details are for the most part derived from those experiences along with some research. However, while some of the information is transferable to the other species previously presented, I would strongly encourage you to undertake detailed research should you try and breed ***Iriatherina weneri* or any of the *Pseudomugil* species.**)

Background

Almost every Rainbowfish sold in the aquarium hobby today is captive bred. I have been following the trends and publications over the last several years, and while species are still being wild-caught (some for the first time), there is actually very little collection occurring that is available to the hobby globally. Australia is under an import / export ban, so any of the species native to Australia are not being exported to the rest of the world. (What few species native solely to Australia that are in the global hobby were exported prior to the ban coming in to effect.) As regards New Guinea, it must be remembered that the native environment (dense rainforest) and the lack of modern infrastructure (few roads and small remote airports) combined with the difficulty in obtaining gathering and export permits, means that the organization and successful execution of gathering expeditions is infrequent at best. What little that does occur (usually by individuals like Heiko Bleher, who acquire permits to collect from



Iriatherina weneri

the appropriate governments) results in the few specimens caught being provided to a designated breeder or collector's choice to raise a first captive generation. Once sufficient stock exists, they are slowly released for sale, usually within the Rainbowfish community, but this often takes two or three years.

In Nature

I think from my articles detailing the different species of Rainbowfish, you have a fair understanding of the vast numbers of species that exist. Rainbowfish as a group make up the vast majority of freshwater species occurring in Australia and New Guinea. However, while much is known about the various species in captivity, relatively little is known about Rainbowfish in their native habitat. In fact in many instances (most notably those species occurring in New Guinea) little is actually known about the native habitat, let alone how Rainbowfish behave in that native habitat. What we do know regarding the husbandry, care and breeding of Rainbowfish is based for the most part on the observations and records of those aquarists who keep the different species that are available, along with some logical inferences on what is believed to occur in the wild.

In nature Rainbowfish breed when conditions are best suitable for the survival of fry. Usually this period is during the spring / summer months of November to May (remembering that as Australia and New Guinea are in the southern hemisphere, the seasons are reversed). These months correspond with the rainy season, which results in swollen rivers, an increase in water area available (which in turn provides an increase in the riparian vegetation available for the laying of eggs and subsequent protection of fry from predation), and an increase in the diversity of aquatic flora and fauna suitable for the diet of Rainbowfish. It should further be noted that there is a variation from geographic region to geographic region when Rainbowfish will spawn, and different areas undergo ecological changes at different times. For instance, mountain streams will swell sooner given mountain run off, and lowland rivers will swell later.

As winter turns to spring and then to summer, the daylight (photoperiod) grows longer, the water temperature rises, the water quality improves and the availability of food increases. It follows that in captivity, an increase in the photoperiod, raised water temperatures, excellent water quality, and excellent nutrition will lead to breeding.

Male Rainbowfish can be very territorial, and will establish and defend chosen spawning sites. In the wild these sites include submerged logs, rocks and vegetation (both permanently submersed and riparian that becomes submersed during raised water levels).

Female Rainbowfish will swim through an area, encountering and evaluating males of their respective species as they do so. The male Rainbowfish will swim to the female and court her by extending his dorsal and anal fins (thereby creating the illusion of being larger), intensifying his colouration, and in many cases flashing a "breeding stripe". (The breeding stripe is a coloured band that runs from the snout of the Rainbowfish along the spine to the first dorsal fin. This stripe, which can be a variety of colours [white, yellow, orange, pinkish red, light blue and various other shades in between] will rapidly flash on and off.)

The male will then swim around the female in all his glory, fins extended, and will make sideways motions to the female. Should the female be feeling frisky, her colouration will also intensify, although to a lesser degree than the male. She will then enter the spawning location, followed by the male. He will press against the side of the female, both will tremble, and eggs are expelled directly onto the chosen spawning medium.

The female will then move on, and then male will stay with the eggs. He will attempt to entice other females to spawn with him, and continue to guard all eggs laid at his chosen location. Unfortunately, Rainbowfish aren't very skilled at egg guarding, and often other fish will eat them. In the wild a given

population of Rainbowfish will spread eggs over an extensive area, effectively increasing the probability that some eggs will survive.

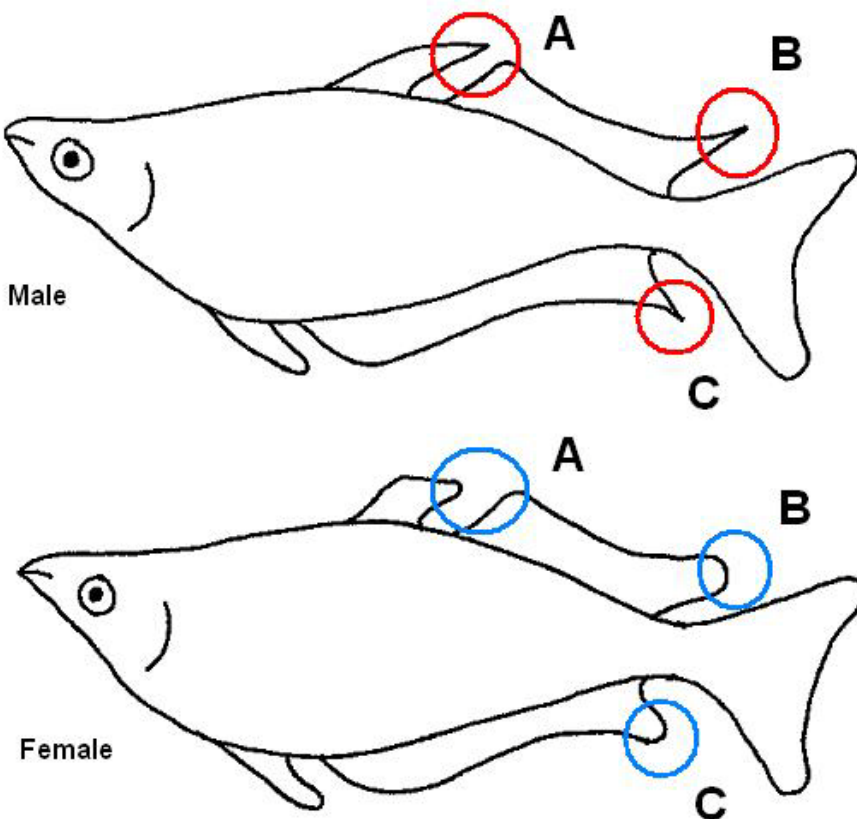
Set-Up

So, Rainbowfish breed in the wild, have numerous partners available and a wide area in which to deposit eggs. Unfortunately, in captivity, it is almost impossible to duplicate the conditions of their native habitats. Fortunately, they are very adaptable and will readily breed in home aquaria.

Sexing Rainbowfish

The first step in breeding Rainbowfish is to make sure that you have males and females.

Sexing Rainbowfish is incredibly easy in some circumstances and much more difficult in others. In general, it is easy to determine the gender of fish over a year and a half in age. Males are larger, become more deep-bodied over time, and in general are much more colourful. *Glossolepis* species in particular are very easy to differentiate, with the males being vividly coloured, and the females usually being silver. However, several species are very similar in appearance and are difficult to sex, and others do not colour up until they are over a year and a half old. This means that determining the gender of some Rainbowfish, especially juveniles and fish under a year of age, is difficult. The best way to sex Rainbowfish in these categories is by looking at their finnage.



Once you have sexually mature fish, sexing via finnage is actually very easy. First, look at the first dorsal fin. If it is pointed (or much less rounded) and overlaps the second dorsal fin, then it is a male (refer to circle “A” in the attached diagram). As a secondary indicator, look at both the trailing (posterior) edge of both the second dorsal fin and the anal fin (refer to circle “B” and “C” in the attached diagram). The posterior rays in both of these fins will be elongated and often form a very prominent point.

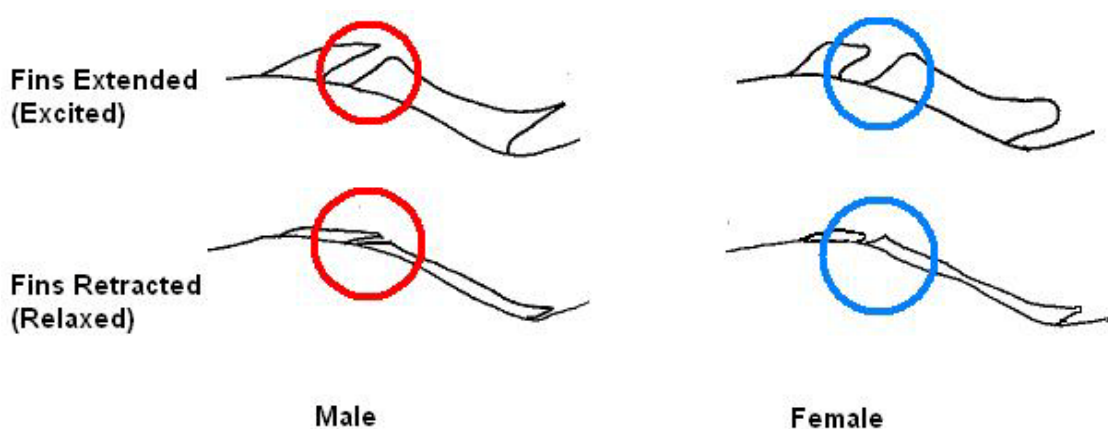
So;

- Males are larger
- Males tend to be more colourful

- Males will have an overlap of the posterior edge of the first dorsal fin and the anterior edge of the second dorsal fin
- Males will have elongated rays (often forming a prominent point) in the posterior edge of both the second dorsal fin and the anal fin.

As you can see, determining the gender of a Rainbowfish is reliant on being able to examine their finnage when displayed.

However, Rainbowfish only display their finnage when they are excited, such as during feeding, sparring or during mating behavior.



First and Second Dorsal Fins - Males vs. Females

This display of finnage will usually not be seen in most locations where you can readily acquire stock, such as when fish are found at auctions or at local aquarium stores.

But even when the fins are in a relaxed position, tight up against the body, it is possible to distinguish differences between the genders. In males the first dorsal fin will lay overlapping the second dorsal fin when relaxed, and in females the first dorsal fin will lay against the spine stopping before or just at the second dorsal fin. In short, if there is an overlap, it is a male, if there is a gap, it is a female.

Breeding in a Breeding Tank

The next step is providing the correct conditions and environment. I'm assuming that you already have excellent water quality. (I personally perform a 25% water change on Wednesdays and a 50% water change on Sundays. A bit overboard I admit, but it provides excellent water quality.)

Some advocate separating the males and females for a period prior to breeding, and this is an excellent idea if you have space and resources to do so. By separating the males from the females, it will increase the number of eggs when they are reintroduced and start breeding. It is recommended that in a breeding situation you have 3 males and 2 or more females. (With only two males, one will tend to become dominant, preventing the other from breeding. If you only have one male it will stress out the female with constant attention.)

Place the males into your chosen breeding tank, leaving the females in either the permanent tank or in another holding tank. The tank itself (assuming you are going with a 3 males / 2 females) should be a minimum of 15 gallons. (If you use a larger tank, the males will be able to establish their own territory or you will be able to keep more males and females.) While the temptation may be present to include some decorations, the tank is best left as featureless as possible, with only a heater, your chosen filtration, and some spawning mops or breeding friendly plants. (Remember that Rainbowfish will lay their eggs in a variety of locations, including plants and on rocks and logs. By restricting the only possible laying location, you will ensure that the eggs are actually there, and portable should you need to do so.) As Rainbowfish are excellent jumpers, the tank should be covered. Water temperature should be between 79°F Fahrenheit - 86°F (26°C Celsius - 30°C) with the preferable temperature being 82.5°F (28°C). (Note that this is the preferable temperature for most Rainbowfish, not all. Some species, such as the Mountain Rainbowfish [*Melanotaenia monticola*] prefer cooler temperatures on

average, and therefore the breeding temperatures, while higher than normal conditions, should be less than the range stated above. In short, research your fish before you try and breed.) For breeding purposes, the photoperiod should be about 16 hours of light a day. The pH, while not critical, should be above neutral, preferably around 7.5. Filtration, especially to provide aeration, is essential. Most recommend a sponge filter, but I have also had success in using an Aquaclear filter set to low. This works best in larger tanks, so not to create too much agitation for fry when they do hatch.

Keep the males and females separate for a period of two weeks, making sure that you are feeding them high quality food, at least once a day, but preferably twice.

At the end of the two week separation, reintroduce the females and watch nature take its course.

The Spawning Medium

As mentioned, in nature Rainbowfish will spawn on logs, rocks, plants and the submerged roots of marginal plants. In a controlled breeding environment, you want to be able to provide a suitable spawning location, but also provide something that is portable as well. Most breeders of Rainbowfish will use a spawning mop for controlled breeding.

A spawning mop is essentially a grouping of yarn that either floats or sinks to the bottom of the tank where Rainbowfish will deposit their eggs. The majority of mops are attached to cork or Styrofoam floats that permit the mop to remain suspended in the water. Some are not attached to floats and remain on the bottom of the tank. (*Editor's Note: See "DIY: Spawning Mops" in this month's edition of Tank Talk.*)

Should you desire a more natural spawning medium, especially one that will grow in aquariums as opposed to ponds, you might consider the use of one of the various aquatic mosses. Java moss (*Vesicularia dubyana*), Christmas moss (*Vesicularia montagnei*) and flame moss (*Taxiphyllum* sp. 'flame') are all suitable and have the added benefit of housing microscopic organisms that will provide food to the newly hatched fry.

For outdoor ponds, success can be found in the use of water hyacinth (*Eichhornia crassipes*) or water lettuce (*Pistia stratiotes*). The roots of both of these floating plants remain suspended below the plant, and Rainbowfish will readily deposit eggs therein.

Of course, if you have an unplanned breeding, the Rainbowfish will have used any location and any surface they found suitable.

An alternative spawning medium is stiff-bristled bottle brushes. One of the problems is that the majority of Rainbowfish are egg eaters. That is, once the eggs are deposited, they will start eating them, especially if they have not been well fed. Therefore, it is necessary to remove spawning mops on a regular basis to a hatching tank to ensure that some eggs survive. If you find that your Rainbowfish are feasting on eggs almost as soon as they are laid, you may consider the use of the stiff-bristled bottle brush. The bristles still supply a location for the depositing of eggs, but also act as a deterrent to the Rainbowfish accessing the eggs to eat them.



If you are using an artificial spawning media (spawning mops or bottle brushes), make sure that you thoroughly sterilize them before using them a second time. If you are using a natural spawning media, then only use it for a specific species, and do not place it in another container with a second species.

The Eggs

So, you've got males and females that have been well conditioned, and a location for them to lay their eggs. The fish should display the same behaviours as they do in nature, and soon you will have a bunch of eggs.

You need to examine the spawning medium preferably a number of times a day. (Remember that Rainbowfish will eat their eggs, and if you examine a mop a number of times, you are likely to find eggs before they are eaten.) Rainbowfish tend to spawn most in the morning, although they will continue to spawn throughout the day. Females will usually only lay 1 to 5 eggs at a time. The number of eggs laid in total by a female during a spawning cycle can vary from 40 to upwards of 100+. This variation is highly dependent on the age of the fish, the given fish's general health, and the feeding regiment used to condition the fish. You should cease breeding and return the adults to the permanent home once the number of eggs produced in a day is noticeably reduced, or if you see the female acting in a reserved manner or hiding from the male.



The eggs will be similar in appearance to small glass beads, slightly amber in colour, and about 1 to 2 millimetres in diameter. The eggs are “negatively buoyant”, or in other words they sink. However, the eggs are laid with short adhesive threads that attach them firmly to the spawning medium.

Once you see eggs in the spawning mop, remove the mop from the breeding aquarium and transfer it to the hatching tank. An alternative method is to physically remove the eggs from the mop and transfer them into a smaller container floated within the breeding tank. This protects the eggs from predation but still maintains the general conditions under which they were deposited. The eggs themselves are relatively robust, and can be removed from the mop by gently grasping the egg between two fingers and pulling the adhesive strand from the mop. This can be a bit tricky and takes a bit of practice, but results in the same mop being able to be continuously used. Make sure that your fingers are extremely clean before attempting this, as any contamination can lead to fungus developing on the eggs. If you do use a floating container until the fry hatch, you should still have very slow aeration of the water (which permits oxygenation of the eggs, and encourages water movement to keep any contaminants from settling on the eggs), and ensure that you still maintain high quality via partial water changes. Also, there is some evidence that Rainbowfish eggs that are exposed to full light will not hatch, or if they do, the fry will be handicapped. If you float the container in the breeding tank, or place the eggs in another tank, ensure that they are not exposed to direct lighting.

As mentioned previously, you want to keep the temperatures relatively high in the hatching tank. Lower temperatures result in a longer incubation period. Depending on the species and the temperature, the average incubation period ranges from five to twelve days, and for the majority of the species available, you should expect a fertilization rate of 70% to 80%. You will be able to identify eggs that have not been fertilized as they will quickly develop a cloudy milk colour. Very soon after, they will appear “fluffy”

as they rapidly become fungused. You should remove any infertile eggs immediately, as the fungus can quickly spread to other eggs, killing them in the process.

One preventative tactic that is often employed by some Rainbowfish breeders is the addition of Methylene blue (a treatment for fungal infections) to the egg container, one treatment being all that is usually required. Still, the removal of any fungused eggs manually is still more effective than relying on a chemical treatment, but it is more time consuming. If you experience a high number of fungused eggs in the three days after the eggs are laid, the majority of the eggs will likely be infertile. A high number of infertile eggs is usually attributable to either infertility of the adult Rainbowfish, or water quality issues.

On the other hand, eggs that have become fertilized will remain clear until they begin to develop “eye-spots”. Those in the Rainbowfish community refer to this as being “eyed-up” and it indicates that you are well on your way to having a successful hatching.

The Fry

You need to keep a careful watch on the eggs to know when the fry hatch. They fry will be 3 to 4 mm in size and are almost completely transparent. It is much easier to see them if you examine them in a bare-bottomed tank from above.

Immediately after hatching, the fry will swim (sink) to the bottom of the tank where they will remain for one or two days, before swimming to the surface, where they will spend the next week or so in the one centimetre immediately below the surface.

When the fry hatch, they will have a yolk sac that will provide nourishment and sustenance for the first two days. It should be noted that the depletion of the yolk sac is when the fry will return to the surface in search of food.



Melanotaenia boesemani fry

Providing sufficient food for fry is one of the most challenging aspects of raising Rainbowfish fry in the first couple of weeks of life.

It is recommended that liquid fry food be the first food, followed by small foods such as powdered spirulina, JBL Gold Pearls or Hikari First Bites, and then later by larger food such as live brine shrimp. The feeding regimen that I have successfully used is as follows;

Week 1

Wardley's Essentials Fry Food (liquid fry food)
Powdered spirulina
JBL Gold Pearls

Weeks 2 - 3

Powdered spirulina
Hikari First Bites

Weeks 3 +
Powdered spirulina
Hikari First Bites
Sera Vipagran Baby
Live baby brine shrimp

I try and feed as often as possible, but find that with fry if I feed them four times a day, I realize good results. With my work schedule, I tend to feed at around 7:00 AM (when I leave for work), 5:00 PM (when I return home), 8:00 PM and 11:00 PM.

In relation to maintenance of the fry rearing tank, you still need to maintain excellent water quality, but as the fry are very sensitive to changes in water chemistry, you need to do more frequent water changes of smaller amounts. For the first two months I change 10% of the water every other day using water that is pre-conditioned. I usually take that opportunity to siphon any debris from the bottom of the tank. In using a siphon around fry, you have to be careful as they are very easily caught while siphoning. Before discarding the waste water, check it for fry, and return any that were inadvertently caught back into the rearing tank.

I personally advocate the inclusion of snails in any fry rearing tank. Some recommend mystery snails (*Pomacea bridgesii*), but I have also successfully used Malaysian trumpet snails (*Melanoides tuberculata*), common pond snails (*Stagnicola* spp.) and nerite snails (*Nerita* spp.). They will eat food missed by the fry, and as an added advantage can be used to maintain colonies of infusoria (and excellent initial fry food), which feed on partially digested snail waste.

It cannot be overstated that you must maintain excellent water quality. Poor water quality can lead to lower survival rates, increased incidence of disease, physical deformities (bent spines for instance), a wide variation in size of the fry, and slower growth.

But even with excellent water quality, baby Rainbowfish are very slow growers. It takes one year on average for a baby Rainbowfish to reach maturity and a size of 5 cm – 7.5 cm (2" – 2½"). As with most fish, the more space you are able to provide, the larger they will grow.

In general, the *Melanotaenia* species are the easiest to breed, with *Chilatherina* being a bit more difficult, and *Glossolepis* species being very challenging.

Communal Breeding

Rainbowfish are also known to breed in a community tank. I personally have had an unexpected breeding of *Melanotaenia misoolensis*. One day I looked in the tank and saw several fry swimming around the upper corner. I removed them, and then over the following several weeks found more fry, almost on a daily basis. Removing the fry as they are seen will increase survival, but if you have no other fish that will predate the fry, and the parents are well fed, it is possible to have fry grow to maturity in the same tank as the adults. However, you will never obtain the number of fry you would in a dedicated breeding tank.

However, I must add a word of caution. I keep species only tanks, and therefore my definition of "community tank" is a given Rainbowfish species, and other non-Rainbowfish species. I tend to keep a different type of pleco, a school of cory cats (*Corydoras* spp.), and a school of oto cats (*Otocinclus* spp.) in each of my tanks. As Rainbowfish often miss any sinking food, and will not usually eat off of the substrate, I find that having a "cleaner crew" helps avoid pollution from decaying food. However, to many a "community tank" may include several species of the same fish. If you are keeping several species of Rainbowfish in a community tank and subsequently discover fry, do not keep them. One of the major problems in the Rainbowfish community is hybridization. I'll actually be addressing some of

this next month, but for now, please do not keep hybrid Rainbowfish, or if you do keep them, do not disseminate them without clearly labeling them as such.

Pond Breeding

My personally preferred method is to breed Rainbowfish in a pond. Unfortunately our local climate allows at most 4 months of the year (mid-May through mid-September) when this can be accomplished, but even in that short time frame you can obtain a significant amount of fry from one species (150+) or cycle two or three species to obtain fry from a wider variety.

I have bred Rainbowfish in both deck-top tubs and in-ground ponds. I would personally recommend using an in-ground pond as it provides a more stable environment. Regardless of the actual container, you should have excellent water flow and a variety of plants. I find that in addition to spawning in the roots of both water hyacinth (*Eichhornia crassipes*) and water lettuce (*Pistia stratiotes*), they will often spawn in the roots of emergent plants that have grown through containers.

My method is to remove floating plants and placing them in a breeding tank (or tub outside) and to then capture any missed fry by scooping them up in small Tupperware containers and adding them to the breeding tank or tub. You can continue to pull plants every 5 – 7 days, or continue to scoop fry throughout the summer. In 2009 I used this method to breed *Melanotaenia australis* (20+ fry), last summer it worked for *Chilatherina fasciata* (80+ fry) and *Melanotaenia misoolensis* (60+ fry), and this year *Melanotaenia boesemani* (90+ fry).

Rainbowfish Breeding and C.A.R.E.S.

In addition to the satisfaction that you can realize from breeding Rainbowfish for yourself, it should be noted that several *Chilatherina*, *Glossolepis* and *Melanotaenia* species are included on the C.A.R.E.S. Conservation Priority – Species At Risk list, and by breeding these species, you can assist in conservation efforts. (I have noted those that are occasionally available locally with an asterisk.)

- *Chilatherina bleheri* *
- *Chilatherina sentaniensis* *
- *Glossolepis dorityi*
- *Glossolepis incisus* *
- *Glossolepis wanamensis*
- *Melanotaenia arfakensis*
- *Melanotaenia boesemani* *
- *Melanotaenia eachamensis*
- *Melanotaenia lacustris* *
- *Melanotaenia oktediensis*
- *Melanotaenia parva* *



Melanotaenia oktediensis

Conclusion

Breeding Rainbowfish is actually relatively easy. While there are several factors that need to be considered and monitored, each of them is relatively easy to control. I can personally attest that while it can be frustrating to wait for your fish to breed, and then subsequently wait for your fry to grow, the end result is worth it. To see a creature that you have nurtured successfully breed, and to see the next generation grow over time, is an amazing and fulfilling endeavour. I hope you try your hand at breeding Rainbowfish and agree with me.