BRISTOL AQUARISTS' SOCIETY

GOLDFISH BREEDING

The following article describes a method adopted over many years and the one that has always proved successful. Other breeders may vary from this method, and can be just as successful - there are no hard and fast rules.

Summertime - planning for the following spring

You must start thinking about breeding as early as July or August of the year before you intend to breed. The reason for this is that you must consider what type of fish you want to breed; I would recommend, for the beginner, that a singletail type fish is selected. It is wise not to try and deal with too many varieties at once, so I would suggest that you choose just one or two types and concentrate on them.

July and August is the best time to purchase fish, as this is the time when the breeders are selling their surplus stock. One can buy six or more young fish at a reasonable price and grow these on for the future. This also gives you a good chance of getting both sexes from the same strain. The minimum number of adult fish of one strain that I would recommend at this time would be two females and three males, because it is very easy to lose one or two fish (for numerous reasons, e.g. a long hard winter or when applying heat after the winter when the fish have less resistance to disease). There is very little chance of replacing fish in February or March.

Over-wintering of fish

The next stage is to feed the fish up, so that they have enough body mass to see them through the winter and leave them strong enough to prepare for spawning in the early spring.

For those who keep their fish outside or in a fish house, you will notice that at the end of October and into November your fish are beginning to slow down and do not require the same amount of food. This is the time to 'clean' your fish and separate the males and the females.

The solution that I use to clean the fish is one measure of Terramycin, 80 drops of Formaldehyde and 6 drops of copper sulphate in 4 gallons of water at the right temperature and not forgetting the aeration. After the fish have been in this solution for 20 minutes they are transferred into another container of clean water. In the meantime, your tanks must be given a thorough cleansing with bleach or Milton sterilizing fluid, but be sure that they are completely rinsed out afterwards. (NOTE: omit cleaning if you do not feel confident about it, or if you keep your fish in very clean conditions throughout the year).

For the next two, or two and a half months, the fish should receive practically no food; perhaps a little live food (e.g. daphnia), if the weather is good, but no dry food. If a lot of live food is not available, you could substitute a high protein flake or pellet food. During this time, keep an eye on the fish: if they appear to be suffering due to severe cold or very long periods of cold weather, a little heat may be applied; this must be done very gradually and no more than is absolutely necessary.

Springtime - preparing for breeding

If you decide, say, that you would like to put your fish together for spawning on the 1st of April, then you must subtract six weeks from this date and that gives you the date upon which you should start to raise the temperature by a couple of degrees. Continue to do so each day until the temperature reaches 65 degrees Fahrenheit (18 degrees Centigrade). During this time the fish will start looking for food: start with small quantities of live food and high protein food, increasing the quantity as the temperature rises. Good aeration is required and any excess food must be removed.

A 3 ft (90 cm) or a 4 ft (120 cm) tank is quite suitable for breeding and this must be prepared at least a week before the fish are put together. If possible, leave the tank empty for a couple of weeks, as this will kill off any disease; otherwise, it must be thoroughly cleaned with bleach, Dettol or Milton fluid. All traces of cleansing fluids must, however, be removed afterwards - keep rinsing until all smells have gone. The tank can now be filled to a depth of six inches, with a new air stone to aerate the water. In the meantime, the spawning medium can be prepared: this can consist of bunches of nylon wool, unravelled nylon pan scrubs, natural plants or nylon wool.

Selecting the fish

Now comes the big day when the fish can be selected and put together in the breeding tank. First, select the female: she should be heavy at the rear and protruding on the left-hand side of the body. Try applying a little pressure near the anal area, the body should be very soft.

Next is the turn of the males. It is advantageous to use two males to one female, because this will give you a better fertility. They should be chosen for their chasing ability and a good indication of their condition is the presence of breeding tubercles on their gill plates and pectoral fins. The fish must then be put through the same treatment as when bedding them down for the winter; this is to make sure that they will not pass on any disease or parasites to the fry.

Spawning the fish

At all times the water temperature that the fish are being transferred into should be at least 65 degrees Fahrenheit (18 degrees Centigrade). The ideal time to introduce your fish into the breeding tank is in the early evening and then the temperature should be raised gradually until it reaches 70 degrees Fahrenheit (20 degrees Centigrade). Sometimes the fish may start chasing during the first night and spawn the next day, but more often than not spawning takes place a few days later. Fish can be stimulated by putting in fresh water from a hosepipe under pressure; this is best carried out at night-time.

The fish will start to spawn early in the morning, and will generally carry on until midday. Do not be in a hurry to separate them if they stop chasing because they will periodically stop for a rest and then start again. Care must be taken to guard against any fish that eat the eggs - these must be removed as soon as possible.

Hatching the eggs

On completion of spawning, transfer the fish to a fresh tank with the water at the same temperature; this can then be lowered gradually. On the second day, you will notice that some of the eggs have a furry appearance; these are the infertile eggs and can be ignored. The fertile eggs have a clear appearance and after the first two days you will notice two little black eyes with a curved black line, which is the body structure.

These eggs are very hard to see, but do not despair. If you can only find a few, there will be many more when they hatch out and are free swimming. At 70 degrees Fahrenheit (20 degrees Centigrade) it will take 4 days for the eggs to hatch out. Many of the fry will lie on the bottom of the tank, some will cling to the sides of the tank and others will hang from the spawning medium. The fry carry a food sack, which will support them for two days. After this time they will become free-swimming and will start looking for food.

Feeding the fry

The best food at this stage is brine shrimp. This is cultivated by using a large glass jar (e.g. a toffee jar) with 4 pints of water and 2 large tablespoons full of common salt. Dissolve the salt in the water and add 2 teaspoons of brine shrimp eggs. This must be kept at a temperature between 75 and 80 degrees Fahrenheit (23 - 25 degrees Centigrade) with strong aeration. It will take between 36 to 40 hours for the brine shrimp eggs to hatch, so start preparing brine shrimp to be ready for when the fry go looking for food. Next, remove the air stone and leave the jar to stand for 10 minutes; the brine shrimp will settle at the bottom of the jar and can be removed by siphoning through a fine tube and filtering through a fine piece of nylon material.

After the first week, the spawning mops can be removed by turning them slowly upside down and gently shaking to make sure that no fry are still attached.

It is very important to start culling the young fish as soon as possible, giving the good fish more room and not wasting resources on substandard fish.

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BREEDERS' NOTES

BRISTOL SHUBUNKIN

Obtaining stock

There are some 50 hobbyists in Britain breeding the Bristol shubunkin, and present-day strains, some of which go back 20 years or more in the hands of the same breeders, are thought to have good colour, although some are a little dark overall; some strains are thought to lack a large enough tail, others are slightly deep in the body. All strains these days, though, have good strong tails that do not droop with age.

Hobbyists new to breeding initially acquired 10-20 young fish from established breeders to get them going, and now run breeding stocks of some 10-30 individuals with an even balance between the sexes. Naturally, breeders retain their very best stock, so initial acquisitions, although from good local strains, had room for improvement, and from time to time breeders have acquired further stock from either local breeders or other societies for outcrossing to improve their strain; outcrossing has more often than not proven advantageous.

Selecting for desired characters

About 1,000-5,000 fry are typically produced per breeder in a season and about 10-25 are retained, giving a ratio of about 200:1 (i.e. 1 in 200 is very good in quality and kept for future showing and breeding). A number of breeding schemes are followed, e.g. father-with-granddaughter, mother-with-son, but always the best fish are used, sometimes irrespective of relationships.

The colour and overall body shape are the first characters to improve as a result of selective breeding, and the large tail is the hardest character to achieve. It is not necessarily the rule that good fish produce good young, which can be a puzzle, and improved characters, if not carefully maintained, will deteriorate - in fact the fish, if left in large numbers to themselves, would steadily revert to wild type. Some find that improvements in the tail lead to deepening of the body, and it is a skill to achieve a good balance of characters in accordance with the standard.

Breeding

Preparations for the breeding season start in February-March, some leaving it until April. The sexes are separated so that pairing is controlled. Some pairs are left to spawn naturally, whilst others are hand-spawned (i.e. the owner aids the release of eggs and spawn by gentle pressure above the cloaca), particularly when, for example, it is wished to breed more than one male with a certain female. Adult fish are fed flake, pellets, earthworms, frozen bloodworms and other frozen foods to condition them. Fry are fed on brine shrimp for the first 2-3 weeks, then live daphnia and crumbled flake; some breeders have lost fry when weaning them off brine shrimp onto crumbled flake, and live daphnia proves very successful in averting such losses.

Culling

Culling (selecting individual fish for retention or not) starts when the fry are 4 weeks old, when the pinks and bronzes are removed, together with deformed fish - bronzes are fish that have reverted to wild type colouration, and pinks are fish with no colour at all.

A second cull is carried out when the fry are 8 weeks old and a third at 12 weeks, selecting for colour and body shape, and further culls in late autumn to early spring the following year, when the quality of the tail is becoming apparent.

Housing

Fish are kept in tanks in fish houses (greenhouses plumbed for easy water changes) and ponds. Neither is heated at any time. Some breeders change 100% of tank water over the course of each week, using either all tap water or a 50-50 mix of tap water and pond water (which some feel is advantageous). Local water in the Bristol area is now very good, and it is usually left for a few days rather than treated; the water is slightly alkaline (pH of about 7.7) and medium-to-hard.

Keeping

Bristol shubunkins suffer little in the way of diseases, parasites or other problems (compared with some other types of fancy goldfish), and are very hardy, becoming very tame. Some live for 15 years or so.

Improving

Most breeders' objective for improving the Bristol shubunkin is to advance the size and shape of the tail closer to the standard.

COMMON GOLDFISH

Only one BAS member regularly breeds the common goldfish: his strain is a very deep red with colour extending throughout the fins and with fairly deep bodies. They are very similar in outline to the wild ancestor, which is hardly surprising.

The original fish were bought from a water garden centre 30 years ago: a thin but very red male and a deep-bodied yellow female. In the early years there were two successful outcrossings using fish from other members, for colour and shape enhancements; since then the line has been isolated from outside influences and consistently wins the common goldfish class at all the major shows.

About 30 mature fish are kept for breeding, with an even balance between the sexes. Two spawnings are made per season totalling about 4,000-5,000 fry of which about 100 are kept, giving a return of 45:1, a ratio which compares very favourably with other types such as fantails and lionheads. These 100 are kept for two years as it takes that long for the quality of the body colour to become apparent - it is difficult to produce good colour in young fish; eventually the very best 20 of these are kept, giving a return of about 250:1 to achieve show quality fish. These ratios well demonstrate the ease of breeding good common goldfish compared with other types, but the difficulty of breeding the very best, show-winning fish.

No particular breeding scheme is used; rather, the best-looking fish are chosen. Once a high quality strain is achieved then it is relatively easy to maintain, although in this strain the depth of colour has slowly declined over the last 10 years (although you wouldn't think so when you see the fish!) and it may perhaps be time for another outcross to re-fix the colour.

The breeding season starts in May. The fish are conditioned on earthworms and if it is a cold spring then the tanks are heated to 65°F. The sexes are separated for 2-3 weeks and put together the night before the chosen spawning day, although sometimes spawning takes 2-3 days. The fish are left to it, there are always enough fertilized eggs in the tanks for maintenance of the strain.

Thereon the adults are fed carp pellets whilst the fry are fed LiquiFry, Tetra Baby Food and then Bemax. Little culling is necessary as the common goldfish has a simple shape and defects are slight, it's just a matter of keeping the best and finding homes for the rest.

The fish house is only ever heated to prevent freezing over in the all-glass tanks; in the years of metal-framed tanks they were allowed to freeze over - common goldfish are very hardy (provided the water is not too shallow). No filtration is used as water changes are 75% in the winter months rising to 100% in the summer months; for beginners, however, filtration is recommended. The tanks are cleaned in the spring for spawning. No pests or diseases have been seen for many years as the fish are not brought into contact with any other fish: this experience contrasts with that of veiltail breeders, whose fish seem to pick up gill flukes from tap water sometimes.

The common goldfish is an easy, hardy fish (obviously, provided that you follow the basic rules of fishkeeping - thousands of goldfish purchased from shops or won at fairs die each year) and lives for 10-12 years, although they can live for over 30-40 years. However, it is easy to knock off scales through mishandling which is a setback at show time, but they re-grow.

FANTAIL

Fairly good quality fantails, unlike the rest of the twintail goldfish types, can be bought from many shops and at a reasonable price, so they - and the common goldfish - are a sensible starting fish for the novice breeder; that said, it is very possible to buy poor quality fish from many shops, so it helps to know what a good fantail should look like! A few specialist shops sell high quality fantails, although often with finage too long for the ideal, show-standard fantail.

One successful breeder bought 8 fantails from a shop six years ago: the fish had good colour, body shape and finage but not-so-good tails. He has stuck with his original fish rather than make any outcrosses and now has a breeding stock of 20 fish (10 males, 10 females). As a general rule, pairing is mother-to-son, but always the best fish are selected for breeding. In six years no improvement in the strain has been noticed, but nor has there been any deterioration, and they were quality fish to start with.

The fish start chasing in March and are mostly left to spawn naturally, with perhaps 10% hand-spawned for specific pairings. The adults are fed on pellets, daphnia and frozen bloodworm; the fry are fed on brine shrimp for the first 2-3 weeks and then on porridge, daphnia and pellets.

The first cull is carried out when the fry are 4 weeks old, selecting for twin tails; a second cull is made at 8 weeks selecting for body shape and tail shape; then a third cull at 12 weeks selecting again for body and tails; a final cull at 16-20 weeks selects for colour. Out of 3,000 fry bred each year 20 or so are kept, giving a return of 150:1 which is similar to the success ratio for lionheads and Bristol shubunkins.

The young are raised in tanks in the fish house, then brought on in ponds where they over-winter, being very hardy. Water changes in the fish house are typically 100% weekly on a continuous flow system. Trouble from pests and diseases is usually minimal, owing to the high degree of isolation from other fish or other bodies of water.

Fantails live for about 10 years and, as described above, are hardy fish, happily living outdoors in ponds.

LIONHEAD

Some lionhead strains have been in the hands of individual breeders for 50 years, and these were passed on from uncles, grandfathers and other family members. The starting quality of the stock was therefore very good. Strains kept are mostly pure red, and some have a small amount of white in them. Breeding stocks of up to 40 adult fish are kept, with about 150 babies being prepared for the following year.

Outcrossing has featured fairly frequently, mostly in the form of swaps between members; one breeder some time age incorporated a black lionhead into his red stock which - perhaps unexpectedly - had a beneficial effect on overall colour. No particular breeding scheme is followed; rather, the best adult fish are selected for breeding. Sometimes a strain does not spawn in a particular year, the reason for this remaining unknown.

It is not easy to improve lionheads. In good strains, out of 1,000 fry about 50 will be worth keeping; of these, about 5 will be up to show standard, which is a ratio of 200:1; this return is compatible with ratios for other types such as Bristol shubunkins and fantails. The most difficult characters to maintain are the divided tail and the clean, smooth back with no dorsal fin. Good strains seem to remain in a steady state, suggesting that outcrossing may be the only way to improve stock for certain characters.

The fish start the spawning process in ponds, whereupon breeders bring them into clean tanks in their fish houses and hand-strip chosen pairs, to control matches. Standard foods are fed to adults and fry. The most popular flakes are Aquarian and King British. Daphnia are fed when available.

The first, major cull is for single tails, spiky dorsal contours, pinks and bronzes; thereafter culling is progressive over the ensuing year.

The young fish are brought on in ponds and are hardy enough to over-winter outdoors. There is always some natural wastage over the winter, and some owners lose a few females to over-amorous male frogs in early spring. Fish are brought into fish houses only if a very cold spell is forecast, and in some cases are routinely brought inside in January/February to escape the frogs.

Few water problems are encountered in the area these days. Tap water is allowed to stand and then used for both tanks and ponds without trouble.

As breeders do not generally buy fish from pet shops, few diseases are introduced. Gill flukes can be troublesome, but early culling to reduce stock density and regular water changes keep the problem down.

Lionheads are hardy fish in southwest Britain (Bristol, Gloucestershire and Somerset) with its mild winters, and live for 7-8 years on average.

VEILTAIL

The calico veiltail is the main form bred by BAS members, some of whom have been developing strains for 30 years. In the late 1960s and early 1970s it was difficult to acquire good starting stock, as high-quality veiltails were rare (and they are not so common now, either).

One breeder started with two female veiltails and two male fantails, as male veiltails were unavailable. In the first four years only 8 youngsters resembled any sort of veiltail, having short, rather forked tails and short dorsals. Over the next few years the best male offspring were paired with the original veiltail females and gradually the fish acquired the desired veiltail characters. Colour all along was good. Finally, after some ten years, the fish were placed on the show bench and indeed won some prizes, thus confirming that the right approach was being taken. This strain has gone on to win regular prizes when shown, and this account well demonstrates the extraordinary genetic potential of the goldfish for morphological variation: over ten years, the phenotype (morphological form) was shifted from a fantail-veiltail cross to almost pure veiltail.

Some breeders stick to their own strains and have had unhappy experiences with outcrossing; others swap fish amongst themselves sometimes, always being wary of introducing any unwanted characters (for example, the ryukin dorsal contour and head shape), and have outcrossed successfully. All line breeding necessarily involves inbreeding, and disturbing a gene pool that gives healthy fish to Show standard can perhaps destroy years of work if not carefully controlled and undertaken on an initially experimental basis.

Typically about 20 adults are kept for breeding, either an equal balance of the sexes or slightly more males. Veiltails are less hardy than other types (on account of their deep bodies and large finage area) and need gradual temperature changes, so the breeding season starts in the fish house very much under the owner's control. Over the winter, the fish houses remain at slightly above the outside temperature (which is mild in this part of the world) without any heating.

In early March, temperatures are gradually turned up to about 50°F and the tanks are cleaned and the fish are fed to condition them for breeding, the feed being a range of dry foods (flake and pellets) and fresh or frozen meats (earthworms and bloodworms).

Some owners rid the fish of parasites acquired over the winter by immersion in a disinfectant bath (5 mils of Dettol to 4 Imperial gallons of water) for 30 seconds followed by a few hours in a tank of slightly salted water - this apparently drastic treatment is amazingly effective at removing parasites and leaving stock clean and healthy for breeding, but, if you are new to goldfish keeping, take advice from experienced club members before undertaking such disinfection procedures.

Temperatures are gradually raised over the next few weeks to about 65°F and the fish come into breeding condition: the females fatten with eggs and the males develop sex tubercles on the gill plates and the leading edge of the pectoral fins - the sexes are usually separated at the start of the season to control pairings. Tank temperatures should be no higher than 65°F in order not to reduce the dissolved oxygen content of the water.

Some leave selected pairs to spawn naturally, others hand-strip selected fish, a procedure which can get round any shortage of tank space to leave individual pairs on their own. Often, two or

three males are put in with one female, which seems to increase the number and quantity of fertilized eggs; hence the slightly higher number of males kept by some owners. The fish spawn on fresh, clean aquatic plants in the tanks; the plant is then removed to clean tanks and the temperature raised to about 70°F; the eggs hatch after about five or six days.

After the first twenty-four hours living off their yolk sacs, fry are fed infusoria, either prepared at home or purchased (e.g. LiquiFry), for about three days. Thereafter they are fed finely ground flake and small live foods like brine shrimp and small daphnia. Throughout this period, there is a constant danger of pollution from overfeeding; there is also the danger (usually the lesser of the two) of underfeeding very small fry and stunting their initial growth.

After about three weeks the fry are re-housed in fresh, clean tanks and larger grades of food are fed, always taking care not to pollute the water. An excellent food for developing the deep body seems to be porridge oats.

The first cull is carried out at between 6 to 8 weeks, depending upon development. Calico fish colour up sooner than metallics, so the process can start a little earlier with these. Fish with single tails and anal fins, undivided tails, deformities, black irises and other unwanted characters are removed.

Thereafter, culling is progressive, selecting for the fish with the best veiltail characters. Good colour, finage and body shape are equally demanding to achieve; more often than not, a fish will be near-perfect in every respect save one, e.g. a single anal or curled pectoral fins. Although frustrating, one can breed from such fish with care.

By this time the ambient temperature has risen enough for the heating to be gradually reduced until the tanks reach normal water temperature for the time of year, although in some years the fish houses have to remain heated until mid June.

From a spawning of 20,000 about 10 very good adults will be achieved, giving a ratio of 2,000:1; compared with other goldfish types, the veiltail is one of the most difficult to breed to a high standard, but remains very popular and a number of breeders progress to it after success with other types such as the fantail.

Veiltails live for up to 10 years, but are not usually used for breeding beyond the age of five. As already indicated, they are not as hardy as other types and, although they can be kept in ponds, most members keep them indoors or in fish houses in tanks or vats.