

 WHAT DO GARLIC AND GOLDFISH HAVE IN COMMON?	 BEAUTIFUL: THE YELLOW FLAG	 LARVAE – JUVENILE? A QUESTION OF FIN RAYS	 Brain-teaser!	AQUALOG PRIZE COMPETITION
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REPORT



Keep more gobies!

by Roman Neunkirchen

There are some 2000 species of gobies on our planet. Most of them live in the sea, but there are also numerous, often brightly-coloured, species in freshwaters.

The species seen here is called the spotted sleeper goby, *Dormitator maculatus*. It is distributed along the Atlantic coast of the Americas, from the US state of Carolina south to Brazil. It is a coastal fish, which, rather like the scats (*Scatophagus* spp.) can adapt to any degree of salinity. Thus it is found not only in totally fresh water, but also in brackish and sea water. Such fishes are termed euryhaline.

In view of its origin, this sleeper goby (the name may refer to the reflective layer of pigment across the iris, which gives the impression that the fish is asleep) does not require a particularly high water temperature: 20–24°C is perfectly OK, but somewhat higher for breeding.

Males and females are easily told apart. The male (the upper fish in the photo) has larger fins with more distinct white edges. With a maximum eventual size of about 25 cm, the spotted sleeper goby is one of the largest members of its tribe. It becomes sexually mature at about 8 cm, so it can be kept and bred in a standard aquarium. It spawns in cave-like hiding-places. Unfortunately the fry are extremely tiny, and to date there is no record of successful rearing.

In nature the spotted sleeper goby feeds largely on decaying plant material. In the aquarium it can be fed without any problem on appropriate dried and frozen foods.

photo: A.C.S.archives

news flash

The Hikari danio – a splendid new import

(fs) Danios are one of the mainstays of the aquarium trade. Zebra danios, leopard danios, Malabar danios, etc are peaceful, wonderfully coloured, and lively – and hardy with it – in short, ideal aquarium fishes.

The "Hikari danio", recently imported for the first time, originates from a politically very unstable area of Myanmar (= Burma), the Mergui Region. Foreigners risk life and limb if they venture there. The Hikari danio is very closely related to *Danio kerri*, or could even be a particularly beautiful variant of that species – a view shared by the globe-trotting danio specialist Fang Fang of the Stockholm Museum. Eventual size is about 5 cm.



photo: Frank Schäfer

TERRARISTIC



photo: F. Schäfer

The short-tailed dwarf chameleon *Rhampholeon brevicaudatus* (MATSCHIE, 1892)

by Frank Schäfer

Modern vivarium techniques mean that it is possible to maintain and breed species where this would have been unthinkable just a few years ago. As late as the 1980s it was thought quite impossible to keep stone corals in the marine aquarium, yet today large numbers are being bred in captivity. A similar quantum leap has been achieved in the field of chameleon maintenance. Various species are today being bred in

considerable numbers. However, the 180 or so forms (species and subspecies) known include interesting and easily maintained types, some of which are available in the trade as wild-caught specimens. These are usually in good condition when imported, and hence readily acclimatised without complications.

Chameleon = Chameleon?

No way! Every species has its own

special requirements. And hence every intended purchase should be researched in advance in the literature (book tip at end of article).

The short-tailed dwarf chameleon discussed here grows to about 7 cm and originates from damp wooded areas in eastern Tanzania. It lives in the immediate vicinity of the ground, although it is an accomplished

to be continued on page 2

POND

The goldfish was the first true aquarium fish, and no matter how you feel about it personally, there is no denying that without it there would probably no mass-hobby today.

Aquarium fish or pond fish?

Both! But in terms of the number of cultivated varieties that exist, only a relatively small number of forms are suitable for the garden pond. All goldfishes – including veiltails,

The garlic of the aquarium hobby

by Harald Jahn

Goldfish and garlic have one thing in common – you either love it or hate it. There is no middle ground. It is traditional for the trade to start stocking both common and fancy goldfishes again in the spring – reason enough to devote a few lines here to these pioneers of the aquarium hobby.



above: Calico (Variegated) Eggfish or Nankin (Kyonoshiki)
photo: B. Kahl



right: Black & White Goldfish
photo: F. Teigler / A.C.S. archives

telescope-eyes, and all the others, whatever their names – are, zoologically speaking, the same species, whose scientific name is *Carassius auratus* in each and every case. With its increasing popularity as a household pet (the technical term is "domestication"), the body shape of



Red Celestial

photo: B. Kahl

many of the individual varieties changed considerably relative to that of the wild form. Only those with the original elongate body form of the wild-type goldfish are suitable for year-round pond maintenance. These include the common goldfish and the comets. Fully-scaled varieties are, as a rule, somewhat less cold-sensitive than scaleless and partially scaled varieties such as the shubunkins.

The basics of aquarium maintenance
Although, as already mentioned, the body shape of some of the individual goldfish varieties varies considerably, the most important behavioural traits remain unaltered. Thus, for example,

all goldfish like to rummage in a soft substrate, and for this reason at least part of the substrate in the goldfish aquarium should consist of fine sand. Moreover all goldfish are greedy feeders, and hence the goldfish aquarium will rapidly become cloudy without an efficient filtration system.

Say no to goldfish bowls!

Even though, from the TV adverts and daily "soaps", it may appear to once again be fashionable to imprison goldfish in round glass bowls, this is and will remain cruelty to animals and is not proper fishkeeping. For starters,

to be continued on page 8

from page 1: The short-tailed dwarf chameleon

climber. In the terrarium it prefers low-sited branches for climbing and rarely ventures higher than about 20 cm off the bottom. A high level of humidity and not too high a temperature (about 24°C) is necessary for its maintenance. This chameleon will not drink from a bowl, so it is necessary to ensure that the animal receives water on a daily basis by regular spraying.

Aggression

As a rule chameleons are highly intolerant of one another. In a number of species the unavoidable and permanent sight, through the glass, of a conspecific in the adjacent terrarium can be enough to cause long-term stress and death through kidney failure.

However, in this respect *Rhampholeon brevicaudatus* can be considered a peaceful species. A bottom area of about 60 x 30 cm is adequate for a pair kept together.



photo: R. Neunkirchen

Feeding

The feeding of dwarf chameleons is problem-free. The best food is crickets of appropriate size, which are eagerly taken. It is important to sprinkle this live

food with a powdered calcium/ vitamin supplement (e.g. **Reptivite** from **ZooMed**) on a regular basis! Chameleons have an enormous food requirement, and dwarf species are no exception.

Breeding

There are no reports of this chameleon being bred successfully in captivity. The species is an egg-layer.

Lighting

There is no need to install a permanent light in the terrarium. I prefer to site the terrarium for forest-

dwellers so that about half of the container receives natural sunlight for 2-3 hours per day (assuming the sun shines, of course!). Under these conditions the animals themselves can choose the light and temperature that suits them. But it goes without saying that care must be taken to avoid overheating where this method is used.

Companions

Choosing companion animals is never easy. Dwarf chameleons can easily and rapidly feel threatened. Even the terrestrial stage of the green aquatic salamander (*Notophthalmus*

viridescens) is likely to be regarded as a danger and subjected to the typical chameleon lateral threat. Moreover,

dwarf chameleons are slow feeders, hence they are better kept by themselves.

TIP



This book is intended to introduce chameleons to the widest possible public, and hence its emphasis is on their beauty and their extraordinary characteristics. At the same time there are many chapters on the background of modern herpetology and terrarium maintenance, so that the whole is a kind of mosaic of "chameleonology".
Chameleons - Nature's hidden jewels by Petr Neccas
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amtra clean war in news 38

FISHDOC

Fish diseases and their most important symptoms

by Dr. Markus Biffar, med. vet.

In the following 6 to 7 issues of AQUALOGnews we plan to discuss the most important fish diseases that occur in the aquarium, along with information on diagnosis and appropriate treatment, in a manner that is easy to understand but nevertheless scientifically correct and as comprehensive as possible.

The format used will be based not, as is often the case in the hobby literature, on the pathogens responsible for disease, but instead on the symptoms they cause, which can be recognised with little effort even by less well-versed laymen.

In this, the first article in the series, it is therefore necessary to provide a number of basic and general details regarding the diseases that occur in fishes, what causes them, and their effects on the fish organism, and thereby to create a better understanding of the various methods of treatment.

What causes fish diseases?

By far the majority of diseases in the aquarium can be attributed to pathogens. By pathogens are meant any small organisms – in the case of fishes mainly bacteria, fungi, and parasites – which colonise the skin, gills, and/or the internal organs and proliferate there, thus causing damage to the fish in a huge variety of ways.

Thus many pathogens feed on cells or cell components, for example those of the skin or fins of the fish, and thereby cause varying degrees of damage. Others, such as gill and skin flukes, or anchor worms and fish lice, penetrate the skin or the particularly delicate gill filaments, and are thus able to “tap into” the blood vessels. This allows bacteria to enter the bloodstream and

released into the fish by most pathogenic bacteria and the damage these in turn cause. Intestinal parasites such as *Hexamita* and many worm species compete with the fish for nourishment from the food ingested by the fish, feeding on this in the gut before the fish is itself able to digest it properly and absorb the nutrients it contains. The result is often emaciated fish that do poorly despite a good diet and undisturbed food intake.

How do ornamental fish medications work?

The various pathogens should be combated as promptly as possible, as only thus one can be sure that, firstly, the germs and parasites causing the disease are prevented from



A puffer with white spot (Ichthyophthiriasis). photo: E. Schraml / A.C.S. archives

find their way to the internal organs, e.g. the liver, spleen, and kidneys, of the fish. The symptoms of disease that they trigger in the affected fish will depend on the one hand on the strictly mechanical damage to the tissue of the affected organ, and on the other on the effects of the toxic (poisonous) metabolic products

proliferating excessively; and secondly, that the fish does not become so weakened by the disease that its immune response is unable to provide effective help. The most sensible therapy always combines an uncompromised immune response with carefully applied medication.

The object of medication is to weaken or damage the pathogens to such an extent that the defensive cells in the bloodstream, e.g. the macrophages and phagocytes, can devour the pathogens in question and transport them away. Because medications have not only the desired effect, but also other, undesirable, side-effects, from a veterinary viewpoint it is preferable to follow a specific course of therapy using carefully selected agents rather than dosing at random with a mixture



A severe case of fungus on the mouth of a needle fish. photo: F. Teigler / A.C.S. archives

of medications of variable compatibility. The new amtra range of medications, medic 1 to medic 5, offers just such a method of treatment using proven

and thoroughly tested agents in a set of individual medications which can, if necessary, and depending on the specific clinical picture, be used safely in combination.

In the next issue of the AQUALOGnews we will discuss in some detail the symptom complex comprising clamped fins and fin rot, as well as the appropriate methods of treatment.

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MARINES

Halichoeres iridis RANDALL & SMITH, 1982

by Joachim Frische

right: Although even when full-grown they appear rather delicate, the overall impression given by adult *Halichoeres iridis* is one of toughness.
below: *Halichoeres iridis* is suited to life in the reef aquarium not only because of its adaptability, but also because it can be used to combat planarians.
photos: J. Frische



Acclimatisation in aquaria that have been running for only a few weeks:

The aquarium environment should be sufficiently established that it will have developed a thriving macro-fauna and -flora. The aquarium should be mature, i.e. the first anemones should have been introduced and successfully adapted to aquarium life.

Feeding: Young specimens will eagerly and unhesitatingly take artificial foods of every kind.

Susceptibility to ectoparasites: It is unlikely that ectoparasites will stand a chance with healthy, vigorous fishes. The intact mucus coating protects the wrasse from such pathogens, but this is not the same thing as immunity.

Tankmates: There have been several reports of this species attacking the fringes of clams. There is no conclusive evidence that this results from dietary deficiency. Peaceful towards other fishes, including other wrasses, although if new wrasses are introduced, the threatening behaviour of *Halichoeres iridis* leaves no doubt as to who owns

the aquarium! But to date there have been no published reports of injuries resulting. If introducing a conspecific the basic rule applies that the new fish should be smaller, and then, at least in my experience, no complications are likely.

Eventual size: According to divers, maximum length in nature is about 11 cm.

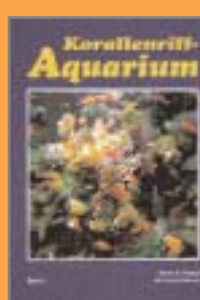
Activity level: A species that is permanently on the search for food and which thus presents a constantly changing picture to the onlooker.

Other noteworthy characteristics: The different age-related phases, as well as the sexes, all exhibit the same coloration. Occasionally very small specimens have a slightly different colour pattern, but are still clearly recognisable as belonging to the species *Halichoeres iridis*. A carefully constructed decor, into which the fishes will like to retire at regular intervals, is important, as is a fine substrate in which these wrasses will spend the night. A number of aquarists have reported that *Halichoeres iridis* can be used to

combat red planarian worms – important information, when we consider how rapidly these worms can lead to problems. There have been many reports that certain species of planarians can be dangerous to hard corals.

Recommendations: I would recommend this species for the beginner, as it presents no problems either in its feeding or during the acclimatisation phase; is peaceful, and, if well fed, it poses no threat to invertebrates. Aquaria of 500 litres upwards are suitable for creating an environment for *Halichoeres iridis* that will satisfy all the requirements of this interesting wrasse.

TIP



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PLANTS

Named after a goddess – the yellow flag

by Peter Hoffmann

Few reed-like plants can compare with the yellow flag for beauty, so is it any wonder that nothing less than the name of a goddess would do?

When the renowned naturalist Carl von Linné originally described the yellow flag, because of the splendid colour of its flowers he spontaneously named it after Iris, the Greek goddess of the rainbow. On the other hand, he selected the specific name *pseudacorus* (Greek: pseudos = false, akoros = reed), again not without justification as when irises are not in flower there is a certain resemblance in the foliage!

A wide distribution

We can only speculate as to where the Swedish naturalist, founder of our universal system of nomenclature (genus and species name) for plants and animals, first obtained specimens of the yellow flag, as the species is widely distributed: all of Europe except the Arctic regions, plus north Africa and western Asia; in addition it has been introduced to North America.

Be that as it may, even today all biologists and botanists, if they want to be totally precise in their nomenclature, append a capital L after the scientific name *Iris pseudacorus*, so that the initiated will immediately know who first described this plant.

Wet feet

Yellow flags – flag is an alternative name for some irises – will grow

anywhere moist: in the shallow areas of our ponds, in marshes and ditches, as well as water meadows and damp woodlands.

Cattle farmers are less than enthusiastic about this, as the leaves and creeping rhizomes contain



photo: P. Hoffmann

substances that are toxic to their livestock. In the past these tannin-rich plants were used for dressing hides, and also in herbal medicines. For this reason we should warn our children to take care and keep our pets away from these flowering beauties!

Protected, but not particularly rare

Like many plants of our German marshy regions, the yellow flag is protected – but this does not mean it is rare, especially in lowland regions. Quite the opposite – in places where there is still suitable habitat, it usually occurs in large numbers and during May and June transforms banks and ditches into a sea of yellow blossoms. On closer examination the flowers appear rather untidy: large tongue-



photo: P. D. Sicka

(the anthers usually ripen a day before the stigma). As one might expect in an aquatic plant, the end-products of all this, the brown seeds, float and are carried away by waves and currents!

In the garden pond

The trade offers a number of varieties, with varying degrees of colour in the flowers.

Just as in nature, flags prefer damp or wet areas around the garden pond, or can even be grown in the shallows. A suitable substrate is a mixture of garden soil and compost. Because these plants generally multiply rapidly – if their environment suits them – they should not be planted too close together, as otherwise they will soon need thinning.

As well as the yellow flag there are other interesting Iris species, for example *Iris sibirica*, whose deep blue

flowers confirm that Linné certainly knew what he was doing when he named the genus after the rainbow.

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TIP

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like petals droop outwards (these are known as "falls"), while other smaller ones stand upright.

The latter create several "alleys" through which pass bumblebees, hoverflies, and other visitors to the flower, thus ensuring cross-pollination

con of Water Chemistry Oxygen Content

The function of oxygen in water

The oxygen dissolved in water gets there in two different ways: directly from the atmosphere and through the oxygen output of aquatic plants. Even with 100% oxygen saturation, the total dissolved oxygen content of the water is less than that of air, the ratio being approximately 1:20! Almost all lifeforms in the aquarium and in the garden pond require oxygen in order to maintain their life processes.

The oxygen-uptake capability of the water is largely dependent on various other water parameters, including organic pollution and temperature, which both play a significant role. While fresh water at 10°C can dissolve approximately 11 mg of oxygen per litre, the same water at 30°C can take up only some 7.5 mg per litre.

The significance of oxygen in the aquarium hobby

Although all aquatic creatures and plants, and the majority of bacteria, require oxygen for their metabolic processes, it is nevertheless important to avoid a very high oxygen content in the water. Because the oxygen content of the water directly affects the oxidation of many substances dissolved in water, it plays an important part in whether a substance is dissolved in the water or becomes insoluble and precipitates out. For example, even at average oxygen levels iron precipitates out as insoluble Fe³⁺ and is no longer available for use by plants – hence it is important to look at the subject from all angles. Thus in both the biological system aquarium and the garden pond there should be oxygen-rich as well as oxygen-poor zones, as is illustrated particularly clearly by the example of the biological filter: only with the aid of high oxygen concentrations can nitrifying bacteria convert toxic ammonia and nitrite to harmless nitrate. But the opposite applies during denitrification, the next stage in the natural water purification process, as only in the absence of dissolved oxygen do denitrifying bacteria break down nitrate to produce gaseous nitrogen.

Adjusting the oxygen content of the aquarium or garden pond

Because the most effective oxygen uptake occurs at the interface between the atmosphere and the water, ie at the water's surface, movement of the latter is the simplest and most practical method of ensuring that the water contains adequate quantities of essential oxygen. This is particularly true where the fish population is high, and absolutely essential at high temperatures. For this reason not only the aquarium, but also any garden pond containing fishes, should always be fitted with an efficient biological filter whose outlet should be sited at the water's surface to cause surface movement. Where ponds are concerned, on very sunny days the high level of oxygen production by photosynthesising plants can result in oxygen supersaturation, but this can easily be countered by switching off the pump or moving its outlet to beneath the surface, so that there is no longer any surface movement. Because at night the plants take in the oxygen that they produced during the day, movement of the water's surface is again required in order to avoid a short-term oxygen shortage.



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REPORT

A Question of Fin Rays

by John Dawes

We often hear or read of a particular species exhibiting certain characteristics during the "juvenile stage". We all appear to accept this term in its broadest sense, i.e. meaning "young", just as we accept the term "larva" for a fish during its first days of life. But, how much thought do we give to this acceptance? Personally, I've always given it a great of thought.

I've often wondered, for instance, precisely at what stage a larva ceases being a larva and, similarly, a young fish can actually be called a juvenile. The length of time will, of course, vary from species to species, with fast-developing ones reaching each stage much more rapidly than their slower-developing counterparts. But what are the characteristics that separate one stage from another?

I was therefore particularly interested in a scientific paper that I recently came across: 'Embryonic and larval development of a substrate-brooding cichlid *Cichlasoma dimerus* (HECKEL, 1840) under laboratory conditions'. Published in the *Journal of Zoology, London* (2000) 252; 481-493, this paper is a detailed report by F. J. MEJIDE and G. A. GUERRERO of the Animal Embryology section of the Department of Biological Sciences at the University of Buenos Aires, Argentina. It describes all the different stages that a fertilised egg of this species goes through, followed by an account of the life stages of the larvae, up to the point when the official juvenile stage is reached.

'Loose' Definitions

In total, the authors describe 22 main stages, starting with the zygote (fertilised egg) and ending at the juvenile stage, which, in this species, takes 42 days. I must admit I was a little surprised to learn that it took as long as this for the juvenile phase to begin. Now I know better... I was looking at the wrong clues.

In my mind, the juvenile stage was reached when the fish in question was perfectly mobile, had some colour on its body, possessed a covering of scales, had "proper" fins... etc. At the other end of the spectrum, a larva was a newly-hatched fish, from the point of hatching up to when "proper" fins began to become visible some time later... including the pelvic fins (these always appear after the others).

Straightaway, of course, it becomes evident that these "definitions" are far too loose. Certainly, a juvenile will incorporate the features I've mentioned, just as larvae will exhibit some of the characteristics of a finned individual, but that is not precise enough. According to the MEJIDE and GUERRERO paper, I've been "allowing" too much development at the larval stage and have been a little premature in my view of what constitutes a juvenile.

The Early Stages

When a *C. dimerus* egg is fertilised, the resulting zygote begins dividing within ten minutes of fertilisation. The 64-cell stage is reached in under 5 hours, at which point, differentiation, folding, etc., begin to occur. By the time

the developing embryo is 23 hours old, the beginnings of the tail are visible, the early stages of eye development following some 5 hours later. At 36 hours, the heart starts beating and development continues apace until, at 54 hours, hatching occurs.

This marks the beginning of the larval period. Readers who have bred pit-digging cichlids like Orange Chromides (*Etoplus maculatus*) will be familiar with the characteristics of their newly-hatched, yolk-sac-bearing larvae which are transferred from pit

to pit by the parent fish. The eyes are not coloured up at this stage and the larvae carry three adhesive glands on top of the head. Full eye pigmentation does not occur until the larvae are 4.5 days (108 hours) old, while the adhesive or cement glands continue to be present until the free-swimming stage is reached at around 7.25 days (174 hours). The fins, which have been slowly growing over the previous few days, now become more important, although the fin rays are not, as yet, fully developed.

The yolk sac, though much reduced, is still present at this stage, gradually shrinking over the next few days as independent feeding and breathing begin to become established. By the time an age of 14 days has been attained, the yolk sac will have been almost totally consumed and the dorsal and anal fin rays have become evident - though not fully grown. It is at the point when the yolk sac is totally absorbed that the larva ceases to be a larva.

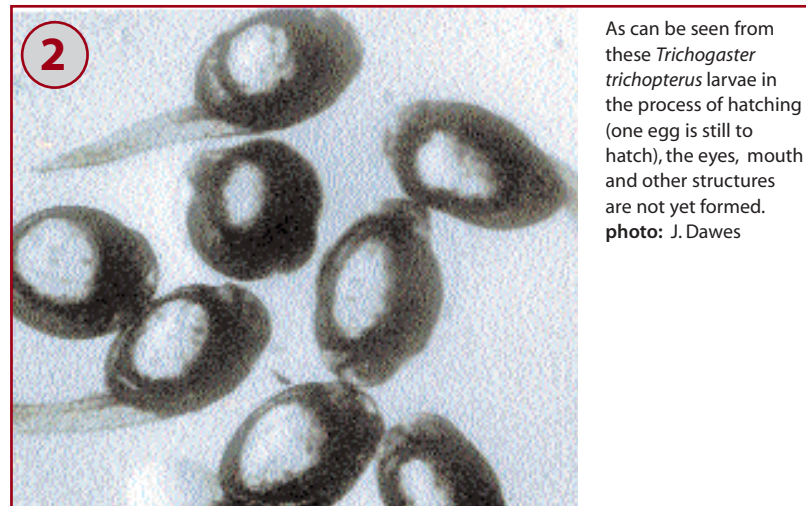
Larva to Juvenile

Over the next 10 - 11 days, the dorsal, anal and caudal fins become more like proper fins and, at 25 days, the pelvic

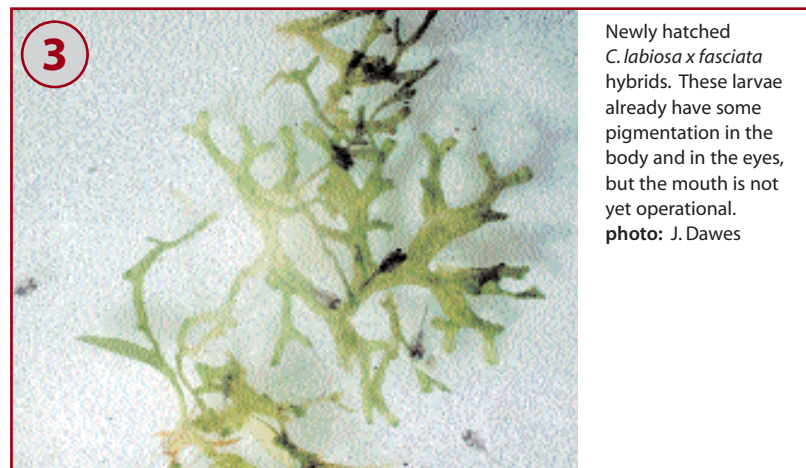
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1 At 18 hours old, this *Trichogaster trichopterus* egg contains a developing embryo (with beating heart) that has not yet reached the larval stage. photo: J. Dawes



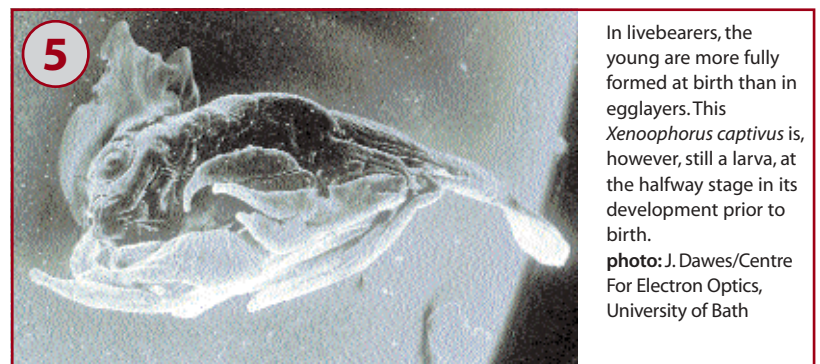
2 As can be seen from these *Trichogaster trichopterus* larvae in the process of hatching (one egg is still to hatch), the eyes, mouth and other structures are not yet formed. photo: J. Dawes



3 Newly hatched *C. labiosa x fasciata* hybrids. These larvae already have some pigmentation in the body and in the eyes, but the mouth is not yet operational. photo: J. Dawes



4 At three days, this *Colisa lalia* is still at the larval stage, although the mouth and eyes are now functional. photo: J. Dawes



5 In livebearers, the young are more fully formed at birth than in egg-layers. This *Xenoporphus captivus* is, however, still a larva, at the halfway stage in its development prior to birth. photo: J. Dawes/Centre For Electron Optics, University of Bath



6 These *Glyptoperichthys* young - seen here feeding off the body mucus of their parent - have a full complement of fin rays and are therefore juveniles. photo: J. Dawes

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POND

The Aerobic Filter

by Harald Bachmann, Rhein-Main-Koi

In a garden pond where fish, especially Koi, are kept, a perfectly working filtration system is indispensable. One unit of this filtration system is the aerobic filter.

This article explains the basic principles of how an aerobic filter works.

Filters whose surface area is pervaded by oxygen-rich pond water are termed aerobic filtration systems, and, because they occupy a relatively large amount of space, are sited outside the pond itself.

Such a system must fulfil the following criteria:

- The volume must be a minimum of about 10% of that of the pond;
- The surface area of the filter, measured in square metres, should equate with a minimum about 10% of pond volume; for example, 40 cubic metres of pond water requires 4 square metres of filter surface area;
- The flow rate should be at least 50% of the pond volume per hour;
- The filter should consist of several chambers, which can be kept separate from each other during cleaning; each chamber should be supplied with ample oxygen-rich water;
- Areas of low throughput should be avoided;
- A vortex should be included;
- The filter should be easy of access;
- In hot weather the filter should be maintained weekly;

- A UV lamp should be installed to eliminate algal blooms (green water);



This 3-chamber-filter (amtra BIOPOND, Professional 15-3) is suited for ponds up to 15,000 ltrs. (with low fish population), and up to 12,000 ltrs. for a Koi populated pond. The first chamber as a Vortex contains brushes, the second chamber filter matting. The third chamber can be individually filled, with a maximum of 25 ltrs. (e.g. amtra CLINOP Zeolith 10 l GT 231). Thus the optimal water filtration is guaranteed. photo: amtra

- Overcrowded ponds should be fitted with additional filter units, e.g. trickle filters, anaerobic filters, nitrate extractors, UV-sterilisers, protein skimmers.

A suitable filtration system should combine two main functions. In the first place it should mechanically filter out (trap and retain) any solid wastes suspended in the water so that it is virtually free of these during the subsequent purification process. This is achieved by the vortex and the first filter chamber, that containing brushes.

Secondly, the biological, aerobic part should contain media offering an extensive surface area for bacteria to colonise, in order to neutralise dissolved organic products (ammonia and nitrite), or, more accurately, to convert these into relatively non-toxic compounds (nitrates). The chambers

Another genus of bacteria, called Nitrobacter, also colonise the aerobic filter, and are able to oxidise nitrite to the less toxic nitrate, using their enzymes to combine another atom with the nitrite molecule. The resulting nitrate represents the highest degree of oxidation, and is used by plants as a source of nitrogen. Plants are thus able completely to remove nitrogen, in the form of nitrate, from the aerobic water cycle. For this reason it makes sense to supplement the mechanical-biological filtration with a bog garden with a rapid throughput.

The pump output is the governing factor in ensuring the optimal through-put of the aerobic filter (50%

of pond volume per hour), so the correct choice of pump is vital. The figures given above for filter surface area and filter volume, in relation to pond surface area and volume, will determine the turnover rate, governed by pump output, required for the optimal function of the aerobic filter. Filter through-put is, however, largely dependent on the degree of cleanliness of the filter medium and the resistance this offers to the flow. No nitrification is possible in dirt-clogged areas of filter medium (e.g. Japanese filter matting), because of

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the impaired water flow and oxygen supply. For this reason the filtration system should be constructed so that the least possible solid matter penetrates as far as the bacterial breeding area, and to this end a vortex and brush chamber are indispensable to the optimal running of the pond. Even with the best possible

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Love of animals is an essential prerequisite for their care, but there is no substitute for a fund of specialist knowledge.

photo: J. Dingeldein

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TIP



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maintenance of all the filtration units it is inevitable that a considerable amount of dirt will nevertheless contaminate the bacterial substrate. Layers of dead (at least in part) bacteria must be cleared away at regular intervals, in order to ensure optimal flow through the filter medium.

The cleaning schedule will depend on the demands placed upon the filter, or, more accurately, on the amount of food introduced into the pond. Flushing of the settlement chamber should be a daily routine, and, depending on the amount of dirt accumulated, the brush chamber should be cleaned daily to weekly. Again, depending on the degree of dirtiness, the filter matting should be cleaned monthly to quarterly.

It is essential to avoid cleaning all the biological chambers simultaneously, using a system of rotation instead. If, for example, a twin-chambered filter is subject to heavy dirtying, then one chamber should be cleaned during the first week of the month and the other during the third week. The advantage of this procedure is that it avoids cleaning out the entire bacterial flora from the filter, and, in consequence, there will be hardly any fluctuation in the breakdown of organic products in the pond system.

It is, of course, inevitable that flushing and cleaning the filter will destroy a few bacteria, so that the filter will

from page 6: A question of fin rays



Cichlasoma dimerus
photo: F. Teigler / A.C.S. archives

fins become differentiated, i. e. sometime after the completion of the larval phase. The young fish is now said to be at its pre-juvenile stage. It now takes another 17 days before all the fins become fully developed and it is in their development that the key to identifying the commencement of the juvenile phase lies.

Up to now, fin rays have been gradually added to the fins as they've grown in size and efficiency. There comes a point, of course, at which no more rays will be added. In other words, the young fish now has a full complement of fin rays, i. e. it is now a juvenile, with scales on its body, a comprehensive set of pigment cells,

significant ossification ("boning-up") of the skeleton and all the other characteristics that will allow it to grow, without any further "new" major additions, towards adulthood.

The MEIJIDE and GUERRERO paper is a fascinating, in-depth read supplied with superb micrographs and other illustrations. I would therefore urge readers who are as interested as I am in the reproductive goings-on of the fish we keep and breed in our aquaria to obtain a copy.

You can do so by contacting one of the authors,

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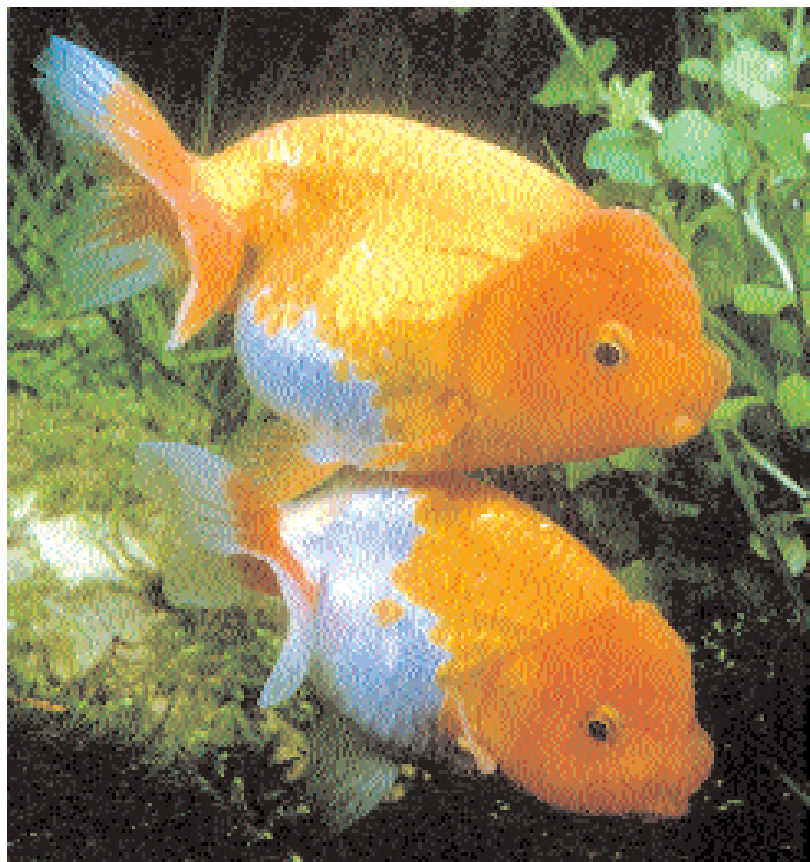
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from page 2: The garlic of the aquarium hobby

the round shape of such a bowl does not permit adequate filtration. Goldfish can live for well over 30 years, but if a goldfish spends two years in a goldfish bowl, then it has not lived for two years, merely served two years of its life sentence. So use such bowls for attractive floating plants, if you find

60 cm aquarium will be adequate, but thereafter it must, unconditionally, have a larger tank. Ideally you should begin, right from the start, with an aquarium size of, say, 150 x 50 x 50 cm. You can, of course, limit yourself to a pair of veiltails in a metre-long, but



Red and White Buffalohead or Ranchu

photo: B. Kahl

them decorative, but not for fishes – the place for fishes is in a suitably-sized aquarium.

Aquarium size
 For the first year of a goldfish's life a

because of the high degree of water pollution this will involve a lot of work performing the constantly necessary water changes. Better to start off on the right foot, and then you can keep 8-10 fishes.

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What is the name of the lionhead veiltail goldfish?

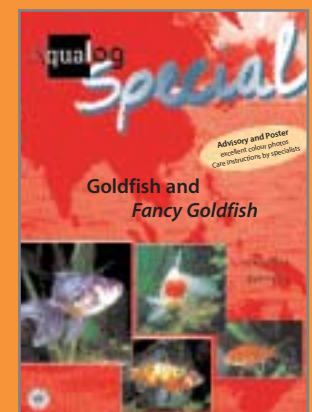
- A: Oranje C: Oranda
 B: Orange D: Oracle



The senders of the first five correct entries drawn will each receive a signed copy of the AQUALOG Special "Goldfish and Fancy Goldfish" by Karl-Heinz Bernhardt. Send your answer to:

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Feeding

Feeding goldfish essentially presents no problems, as they will eat practically anything normally offered to aquarium fishes in general. However, the degree of foreshortening of the body in the highly-developed varieties can lead to digestive problems if the food does not contain adequate roughage. Frozen foods are ideal, and special goldfish foods, in the form of pellets, granules, and flakes, are also eminently suitable as a rule. Take care not to overfeed, as goldfish will often eat more than is good for them!

Temperature

The commonest error, when keeping the highly-developed cultivated forms of the goldfish, is to maintain them at too low a temperature, as "coldwater fishes". Even at 15°C the metabolic rate of some of these fishes is lowered to such an extent that serious damage to their digestive organs can result. It is therefore sensible to select a temperature range of 22 to 24°C when maintaining these highly-developed forms, and merely to reduce the temperature to 15-16°C for a short time during the winter. For a week before this temperature reduction the fishes should be fed sparingly on live foods, the best being water fleas (Daphnia) - and this diet should be strictly adhered to throughout the winter rest period.

news flash

A first-time import: a new croaking tetra

The croaking tetras are amongst the most interesting characin species. They usually practise internal fertilisation. Males have a special "gland" in the tail, connected with mating. These fishes, newly-imported fishes from Peru under the name "Red Adipose Tetra" (the adipose fin is a small fatty fin found in some characins and other groups of fishes, situated between the dorsal and caudal fins) may belong to the species *Acrobrycon ipanquianus* (COPE, 1877). This species lives in clear, flowing waters, and should not be kept too warm (around 22°C).

photo: F. Schäfer



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