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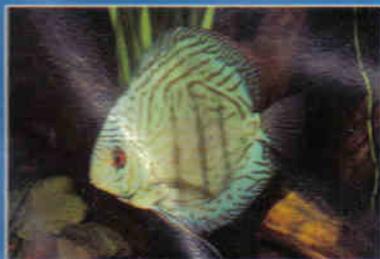
GUIDE TO

guide to tropical freshwater, brackish,

AQUARIUM

and marine fishes

FISH



MARY BAILEY AND GINA SANDFORD

The
New Guide to
Aquarium Fish

*A comprehensive and authoritative
guide to tropical freshwater, brackish,
and marine fishes*

Mary Bailey and Gina Sandford



ULTIMATE
EDITIONS

Cichlids

Cichlids (family Cichlidae) originate primarily in tropical America and Africa, with a few species in the Middle East and Asia. They are mainly freshwater fishes, though a few species require or tolerate brackish conditions. Size - adult Standard Length (SL) - ranges from 2 cm to 91 cm ($\frac{3}{4}$ in to 36 in) with a similar diversity in form, diet, and behaviour. Some species are very colourful and are thus attractive aquarium occupants. Many aquarists are, however, attracted by their interesting behaviour, character, and apparent intelligence; large specimens in particular can become genuine pets.

Cichlids can be divided into a number of more or less discrete groups, based largely on geographical distribution, but also habitat, size, diet, and behaviour. Before discussing the major groups, however, we must present an overview of "cichlid psychology" — how they behave, and, more important, why. A thorough understanding of this is essential to their successful maintenance.



This Cichlid is one of the smallest, *Lamprologus ocellatus* a tiny Lake Tanganika shell-dweller. This is a male female are even smaller



Who's watching who? Cichlids, especially large ones, show considerable interest in the world outside their tank, and can become real pets. This is a female *Nandopsis do\ii*, one of the largest species and a real character.

Cichlid Behaviour and Its Management

All cichlids practise brood care, guarding both eggs and young. This ensures a high survival rate, so clutch size is small compared to that in egg-scattering fishes, which rely on sheer numbers of eggs for genetic survival.

Cichlids have two brood-care strategies: substrate brooding and mouthbrooding. In the former, (normally) adhesive eggs are laid on a "spawning substrate", for example a stone, plant, or piece of wood; then guarded against predators, kept clean by regular "mouthing", and fanned with the pectoral fins to ensure a constant supply of oxygenated water. Both parents may share these duties, or one (usually the female) may concentrate on tending the eggs while the other guards the breeding territory. When the larvae hatch they are often placed in a pre-dug nursery pit, and sometimes moved at regular intervals to new pits. Once free-swimming, the fry may be escorted around in search of food, or allowed to forage, independently but under supervision, in the breeding territory. Brood care usually



Teleogramma brichardi is a cave-spawning rapids cichlid from the Zaire (Congo) River. The large eggs are opaque even when fertile, and are tended by the female alone. The fry are correspondingly large.



Cichlids are noted for their brood **care**: *Pelvicachromis pulcher* (the krib) is easy to keep, easy to sex, and easy to breed, and can be kept in the general community. This is a female guarding fry.

continues until the parents are ready to spawn again (which may be from 10 days to several months, depending on the species).

This strategy is often known as "substrate spawning", and is further divided into "open brooding" and "cave brooding", according to the location of the spawning substrate. It requires a strong pair bond which may last for a single spawning episode, a breeding season, or life. In some species a male may bond with several females ("harem polygyny"), each holding her own breeding territory within his "super territory".

Mouthbrooding, by contrast, protects the eggs and young in the mouth of one or both parents until they are old enough or large enough to stand a good chance of survival alone. Mouthing and fanning are replaced by the drawing of clean, oxygenated water through the mouth by gill action. This, coupled with a reduction in or cessation of food intake, imposes a considerable physical strain on the parent(s).

The majority of mouthbrooders belong to one of the two main lineages of African Cichlids, the haplochromines, in which eggs and fry are incubated by the female alone (maternal mouthbrooding). Upon release, normally after about three weeks, the fry are often abandoned. Males do not bond with females, but hold spawning territories, often centred on laboriously constructed "nests", from which they display to potential temporary partners. Frequently males hold adjacent territories and compete for females ("arena breeding"). The non-adhesive eggs are laid in the nest. Sometimes they are fertilized



A pair of *Tropheus duboisi* "yellow band" spawning. The female (left) is nuzzling the vent area of the male, ingesting milt to fertilize the eggs already in her mouth.



A brooding female *Haplochromis pyrrhocephalus*, one of the Lake Victoria "haps". Note the characteristic distended (with fry) throat and "pursed" lips.



A *Labeotropheus fuelleborni* (orange morph) releasing her fry.

before collection by the female, but in many species males have ocelli, the colour and size of eggs ("eggspots"), on the anal fin, and in trying to collect these the female ingests sperm, released from the nearby vent, to fertilize the real eggs that are already in her mouth.

In tilapiines, the other African lineage, brooding may be maternal, paternal or biparental, the last usually involving a pair bond and shared territory, as in substrate brooding. Brood care may continue after release, with fry returning to the mouth or being

guarded like substrate-brooder young. Some species have eggspots, while others have evolved different egg dummies such as "genital tassels" and egg-like tips to the pelvic fins. Many tilapiines are, however, substrate-brooders, and where mouth-brooding has evolved it often appears less advanced than in the haplochromines.

Mouthbrooding has also arisen, quite independently, in some American Cichlids but is far less common.

Breeding may be seasonal or continuous. The former is the norm in bodies of water affected dramatically by climatic change, and is often triggered by the onset of the rains and a concomitant increase in food supply and available territory (flooded areas). Piscivorous species may spawn later when their food supply is augmented by fry of other fishes! Some species raise more than one brood during a breeding season, often with the same partner. The pair bond commonly dissolves at the end of the breeding season, with a new partner being selected next time.

Continuous breeding is normally found where changes in the climate have less effect, for example in large lakes. Overpopulation is prevented by cyclical fluctuation in food supply and breeding success; when the food supply is good females produce large clutches, but the resulting population explosion depletes the food supply and reduces breeding success until the food supply recovers. In cap-nvhy constant abundant food may lead to unnaturally frequent and/or large clutches and excessive physical drain on the female, with gill strain a serious danger in mouthbrooders.



Courtship may be stormy. A pair of *Nandopsis octofasciatus* (Qack Dempseys) mouthfighting.

Most cichlids can be induced to breed in captivity (some need little persuasion), but it must be understood that in some species there is a downside to their breeding behaviour. This has given the entire family an often undeserved reputation for being difficult, destructive, aggressive, and so on. The worst problems can be avoided by understanding the reasons for their actions and taking their behavioural (as well as physical) needs into account.

Digging is a natural and instinctive part of cichlid behaviour, and attempts to curb it, for example by having no substrate, are cruel. "Aquascaping", sometimes with uprooting of plants, is often a necessary preliminary to breeding - the construction of nursery pits or nests. Large cichlids may try to remove intrusive decor and equipment by brute force - and worse still, succeed! In general, the larger the species, the greater the extent, and likelihood, of disruption.

Plants can be protected by planting in pots, or between rocks and/or pebbles; or omitted. Equipment can be fixed in place, and heavy, immovable, decor used. The environment should be tailored to natural behaviour - you will never achieve the reverse!

A fish which needs to hold a private territory to attract a mate (mouthbrooders) or raise a family (substrate brooders) will quite justifiably regard tankmates as competitors, intruders, or potential fry-predators, and do its best to eliminate such threats. Even if the aquarist is aware of the need for an exclusive territory, he rarely comprehends the amount of space required by substrate brooders. Although some small species are content, in nature as well as captivity, with an area 30-40 cm (12-15 in) in diameter, many others occupy an area the size of a good-sized room in the wild, and while they are obliging enough to make do with



Substrate spawners such as *Amphilophus citrinellus* often dig nursery pits.



Mouthbrooders dig too, some building huge crater nests.

a 120 x 40 cm (48 x 15 in) aquarium, they draw the line at sharing it. So, although many species can be included in general or cichlid communities, it must be accepted that some need their own aquarium.

Sometimes the hostility of the

territorial male extends to the female. In nature a female can simply swim away from a male when she does not wish to breed. To stay is to indicate interest. In the aquarium she cannot swim away, the male assumes she wants to breed, and when she rejects his courtship he attacks her like any intruder -but she has nowhere to go, and may be killed. So, unless the tank is rather longer than natural territorial diameter, care must be exercised with sexually mature adults; the problem can often be solved by using a clear divider to separate them until the female responds to the male's display.

Where aggression between the sexes is likely, or absence of sexual dimorphism makes sexing impossible, it is best to grow on six to eight juveniles together and let them pair naturally. This makes for greater compatibility. "Spare" fishes can be rehomed.

Even with a compatible and bonded pair, perhaps with eggs or fry, the male may suddenly turn on the female if they are alone in the aquarium. His prime instinct is to defend his territory and family against intruders, but if there are no actual enemies to repel, this may be turned upon the only suitably sized fish available - the female. This can be avoided by placing the tank adjacent to one containing fishes large enough to pose a threat, or by partitioning off part of the breeding tank with a clear divider to accommodate a "target fish". Target fishes must, however, always have adequate living space, and never be exposed to actual aggressive contact.

The novice cichlid breeder is often devastated when hitherto •: - :ve parents suddenly eat



Occasionally even *Apistogrammas* have to be "contained" with a divider.

their young. In the wild fry gradually wander further and further afield until eventually they become independent. Often there is not room for this to happen in the aquarium; the parents tolerate the youngsters until either the latter grow large enough to represent competition, or the urge to breed again renders them a potential threat to the intended brood. Fry must be removed before this stage if they are to be grown on.

With arena-breeding mouth-brooders, where territory is not needed for fry-guarding, territoriality can be turned on itself by crowding, so no male can claim a significant area except when his motivation peaks in the presence of a "ripe" female. Often these fishes cannot be kept alone in single pairs as the male then harasses the female to death in his attempts to persuade her to spawn; again her presence implies willingness. In the crowded mouthbrooder community, however, males have plenty of distractions and females can "hide" among the other fishes. Such an aquarium is a hive of activity, and it is generally best to move brooding females to individual small brooding tanks until fry release.

Territoriality is usually greatest

towards conspecifics, as they are the chief competitors for suitable habitat, mates, and breeding space. Next come other cichlids, especially those of similar size and appearance - often members of the same genus-. Non-cichlids are often a threat only to the brood, but not to the chance to breed, and are ignored if they keep their distance.

Care must be exercised in introducing new fishes to any tank in which a cichlid holds territory; again conspecifics and similar species are most likely to fare badly. "New" fishes include former residents which have been absent for -a period - for example while brooding. They will have become strangers and have lost their position in the tank hierarchy.

By now you must be wondering if cichlids are worth the hassle, but this doubt will evaporate the first time you see a pair with young, or watch a mouthbrooder release her fry. Many a confirmed fish-hating partner has softened at the sight! Moreover many species *can* be kept and bred without problem in a general community. We trust, however, it is quite clear that you must always research behaviour as well as environmental requirements before making any purchase.

GROUPS OF CICHLIDS

Central American Cichlids

This group comprises several genera closely related to the South American genus *Cichlasoma*, and assigned to it until recently. The earlier name, and also Heros, is still commonly used. Their distribution encompasses lakes, rivers, and streams •in not only Central America but also the southern United States and some Caribbean islands. The water in these regions is normally hard and alkaline (pH 7.5-8.0), and still or with a slow to moderate flow. The maintenance/breeding temperature is 24-27°C (75-80°F).

All are monogamous, seasonal substrate brooders, with a fairly large territorial requirement - a diameter roughly 5 to 10 times adult male length. Many are highly competitive, and only the smallest species are suitable for a Central American community, and then only in a large (120 cm/48 in) tank. **NONE IS SUITABLE FOR THE GENERAL COMMUNITY.** They should never be mixed with their Amazonian cousins, whose temperament and water requirements are completely different, though some can be housed with some cichlids from hard water areas of north-west South America. Digging is often frequent and extensive.

Males are usually larger than females and have longer finnage; one sex may be more colourful than the other. Ideally pairs should be given their own quarters, at least for breeding, with 80 cm (30 in) the minimum tank length for the smallest species. The males of some large species may represent a serious danger to the females.



Archocentrus nigrofasciatus, the ever popular "convict cichlid", is small but highly territorial, probably because of heavy competition for breeding sites in the wild.



Copora nicaraguensis is relatively peaceful, and aspects of its breeding behaviour are unique among Central Americans. Shown here is a female.



Thorichthys pasionis, like its better known cousin *Th. meefei* (the fire-mouth), has "eye-spots" on its gill-covers, which, when the latter are flared, make it look like a much larger fish.

A *Paraiheraps fenestratus* female. This attractive herbivore is not yet as widely available as the popular *P. synspilum* (Quetzal cichlid). *Archocentrus*, *Neotroplus*, and *Herotilapia* (7.5-18 cm/3-7 in) are omnivorous cave brooders, feeding on invertebrates and some vegetable matter. Apart from *Herotilapia* and *Archocentrus centrarchus*, they tend to be very belligerent for their size.

Thorichthys (10-15 cm/4-6 in) breed in caves or other sheltered sites (for example, between rocks, or beneath overhangs) and are insectivores.

Chuco, *Copora*, *Paraneotroplus*, *Tomocichla*, and *Theraps* (13-30 cm/5-12 in) are also cave brooders, but occur in faster-flowing water than other Central Americans. They require a rocky habitat. *Paraneotroplus* are herbivorous and the others largely insectivorous. *Copora nicaraguensis* is unusual for a substrate spawner in that its eggs are non-adhesive, laid in a pit, and taken into the mouth for cleaning.

Herichthys, *Paratheraps*, and *Vieja* (20-35 cm/8-14 in) are herbivorous open brooders, generally with little sexual dimorphism. Although peaceful in relation to their size, they require spacious (minimum 120 x 50 cm/48 x 18 in) private breeding quarters. *Amphilophus* (20-30 cm/8-12 in) are bottom-sifting omnivores. Some of these open brooders are extremely intolerant of con-specifics or similar-looking con-generics, and males may be a serious threat to females.

Nandopsis and *Petenia* (15-75 cm/6-30 in), the "guapotes", are open-brooding predators with piscivorous tendencies. They are solitary except when breeding, and are therefore intolerant of other fishes. Bonded pairs, however, are often highly tolerant of each other, and will unite to exterminate any competition.

Medium/large South American Cichlids

Most of these are found in the Amazon and Paraguay river systems, as well as rivers in the Guianas, with water chemistry generally soft, and pH ranging from extremely acid (pH<5.0) to slightly alkaline. Soft slightly acid water is a good starting point. Although several species have been acclimated to hard water, the correct conditions are normally required for breeding.

Maintenance temperature is 26-27°C (78-80°F).

In these regions cichlids are not the dominant predators and are rarely found in open water (where they would be easy prey for other fishes, birds, and reptiles); instead they occupy the margins of permanent bodies of water - lakes, rivers, and streams - where they can shelter among overhanging vegetation, roots, and fallen trees. Some are found beneath floating islands of plant debris. Most prefer still or slow-moving water, and do not appreciate bright lighting.

When the rains come the surrounding forest is flooded to a depth of many metres, offering an immense area of additional feeding and breeding territory. In consequence most species breed seasonally and may require a series of triggers (large water changes, increased food supply, and raised temperature) to induce breeding in captivity. During the dry season a comparative shortage of habitat means that many live in shoals, so territoriality is usually a problem only during breeding, and is then not excessive, as in the absence of any need to fight for breeding territory competitiveness has remained minimal. Sexual dimorphism is unusual, and females of



Aequidens sp. cf. *rivulatus* (the green terror) comes from north-west South America, where the water is harder and more alkaline than in the Amazon system. Its temperament is more like that of Central American cichlids.

many species will often "pair" in captivity in the absence of a male. Digging and bottom sifting are common (except in *Symphysodon*, *Pterophyllum*, and *Mesonauta*), and plants may be disturbed.

A number of species originate in the harder, more alkaline waters of north-western South America, where there is no significant inundation and breeding territory is often at a premium. Species from this region are sometimes more territorial; these are the only South American cichlids suitable for mixing with Central Americans, and then only with caution.

Cichlasoma, *Aequidens*, *Bujurquina*, and *Krobia* (the "acarás") are small to medium-sized (10-18 cm/4-7 in) omnivores. *Bujurquina* are primitive biparental mouthbrooders, the rest are substrate spawners, sometimes utilizing a cave. Some *Aequidens* come from the northwest and may be aggressive.

Geophagus, *Satanoperca*, *Gymnogeophagus*, *Biotodoma*, *Acarichthys*, *Guianacara*, and *Retroculus*, (the geophagines or "earth eaters") (10-30 cm/4-12 in) are a highly variable group with breeding strategies ranging

from substrate spawning through biparental mouthbrooding to advanced arena-breeding maternal mouthbrooding. They are found throughout tropical South America. Most are bottom sifters and require a fine substrate. *Retroculus* inhabit fast-flowing water. Because of the diversity of the group, it will be necessary to research specific requirements.

Heros ("severums"), *Hypselecara* (chocolate cichlids), *Mesonauta* (festive cichlids), *Hoplarchus* (parrot cichlids, not to be confused with "blood red parrots" which are probably of hybrid origin), and *Uaru* (triangle cichlids), are medium to large (18-45 cm/7-18 in), rather peaceful Amazonian cichlids, often



An unidentified member of the *Geophagus surinamensis* complex. This group was for a long time thought to be a single species with both substrate spawning and mouth-brooding populations, but is now known to include several species.



Uaru amphiacanthoides fry, like those of *Symphysodon* (discus), feed on parental body mucus, but in this species the behaviour is not obligatory. *Uaru* fry eat anything, in quantity, and rapidly become "little bellies with fins". Adults are "gentle giants".

even when breeding provided the tank is large (over 180 cm/72 in).

Heros and *Mesonauta* are often sold as general community fishes, but their ultimate size (20-30 cm/8-12 in and 18-20 cm/7-8 in respectively) will mean a rethink later on. *Heros* are partially vegetarian, and *Uaru* will denude a planted aquarium overnight, as well as digging enthusiastically (they are, however, great characters!). The others are omnivorous. All are open-brooding substrate spawners; *Mesonauta* spawn on the underside of floating vegetation/debris in the wild, and, uniquely, lead their fry from below rather than above.-All but *Uaru* were formerly included in the genus *Cichlasoma*.

Astronotus ocellatus (oscar) are large (up to 38 cm/15 in), destructive, territorial, Amazonian open brooders, and are extremely popular because of their character. They are best kept singly or as pairs in a single-species tank in which everything but the gravel has been rendered immovable. (Minimum tank size 100 x 40 cm/36 x 15 in for a single fish, 120 x 40 cm/48 x 15 in for a pair.) They are totally unsexable (and females will



Astronotus ocellatus (the oscar), often purchased by beginners ignorant of its habits and eventual size, is a common cause of "multiple tank syndrome".

"pair") so a group of fry should be grown on to obtain a pair. They are prone to become habituated to individual foods unless the diet is varied, and to serious digestive upsets if fed an unsuitable diet (for example large amounts of pellets). They are naturally piscivores, but also relish insects and earthworms.

Pterophyllum (angels) are probably the most popular cichlids, and common members of the general community. They are leaf-spawning substrate spawners, peaceful, easy to keep, and non-destructive. They may, however, eat very small tankmates. They originate from the Amazon system, as do their close relatives *Symphysodon* (discus or pompadours), and both are commonly found sympatrically. Nevertheless a remarkable mythos has evolved regarding discus, implying that they are difficult fishes, something which is given the lie by their thriving in general communities when placed there by the aquarist ignorant of their "special requirements". In this one case we suggest you avoid homework in the first instance, and if you want to keep

discus, simply provide a well-planted Amazonian aquarium, smallish peaceful tankmates, and a varied diet including pond foods. Discus fry initially feed - exclusively on parental body mucus and cannot be raised away from their parents.

Crenicichla (pike cichlids) is a highly variable genus, which is increasing in popularity now that aquarists are realizing that piscivorous does not necessarily mean aggressive (though some species are). Size ranges from 7.5 to 60 cm (3 to 24 in), and habitat from rapids to slow-moving forest streams and still lakes. All are predators, most lurking under a root or overhang until prey passes. Juveniles and small species eat invertebrates as well as fishes, but the aquarist must be prepared to feed live fishes to wild adults, at least initially. All are sexually dimorphic substrate spawners. **THEY MUST NEVER BE INCLUDED IN THE GENERAL COMMUNITY** or with other fishes less than two-thirds their own size (including each other!); they are best avoided by beginners, and, given their diversity, must be individually researched.

South American Dwarfs

These are small cichlids (up to 10 cm/4 in) from still or slow-moving streams and pools in rainforests and savannahs east of the Andes; their range, and consequently general biotope conditions, coincides to a large extent with that of the larger species covered above. All are seasonal substrate brooders; most are strongly sexually dimorphic in size, coloration, and finnage, with the male the larger, showier fish. All are vulnerable to predation on account of their size, and are nervous in captivity unless plenty of cover - plants, caves, bogwood - is provided and lighting is moderate. The use of "dither fishes" - shoals of small characins which help instil confidence that no predator is in the vicinity — is recommended.

Soft, slightly acid (pH 6.5) water is suitable for maintenance of all species, though some may require greater acidity for breeding. A few species have become acclimated to hard alkaline water, but high pH is best avoided. Water quality should be excellent and the temperature 25-28°C (77-82°F). A fine substrate should be used to permit the minimal digging essential to breeding in some species. All species feed on invertebrates and relish pond foods when maintained in captivity.

Apistogramma, *Apistogrammoides*, *Taeniacara*, and

- *innacara* are cave brooders, the rest of these often practising semipolygyny. *Microgeophagus* (*piichromis*), *Crenicara*, *rossus*, *Laetacara*, and *dthracara* (keyhole cichlids) are open brooders, utilizing stems, leaves or stones, always in a sheltered spot. Single mated pairs can be kept in 60 cm

(24 in) or 50 cm (18 in) aquaria. A "dwarf community" is possible, but as territorial requirements (38-50 cm/15-20 in diameter per pair, 25-30 cm/10-12 in per female in *Apistogramma* harems) would restrict its population to a small number of small

fishes, these peaceful non-destructive cichlids can instead be housed in the general community. Males are often very competitive so one per species per tank is a good rule. Fry of some species are tiny and may need infusorians as their first food.



Apistogramma nijsseni, (the panda dwarf cichlid), is like most "Apistos", strongly sexually dimorphic. The male is much larger and blue. The jet black pelvic fins of maternal *Apistogrammas* are used to signal to the fry.



Each "wife" in an *Apistogramma* harem occupies a small (30cm/12 in diameter) breeding territory, centred on a cave, in the male's "super-territory". Here two female *A. cacatuoides* dispute an internal boundary.



Apistogramma caves should have small entrances. The male is not allowed to enter, and uses his tail to fan sperm in - a low ceiling will ensure the eggs are "in range". After spawning, the female walls herself in until the fry are free-swimming.



The rainforests and savannahs of South America are vast, and *Apistogrammas* tiny and secretive, so many species probably remain to be discovered. *A. norberti* (this is a male) is a recent discovery.



Nannacara anomala is a rather neglected dwarf which breeds successfully in hard alkaline water. The colourless juveniles seen in dealers' tanks blossom into attractive orange females (above) and turquoise males.

East African Lake Cichlids

The water of the East African lakes is generally hard and alkaline, although actual conditions vary from lake to lake. Lake Victoria is only moderately hard with a neutral to slightly alkaline pH; water clarity is poor and quality unexceptional. Lake Malawi is moderately hard (8-10 dH) and alkaline (pH 7.5-8); Lake Tanganyika is harder (15-20 dH) and more alkaline (pH 8-8.5). The waters of these last two vast "inland seas" are extremely clear and pure, and surface turnover by waves produces a very high oxygen content. In captivity a temperature of 26-27°C (78-80°F) is appropriate.

All three lakes contain a number of biotopes, the chief being rocky shoreline, sandy shoreline with *Vallisneria* beds, muddy river estuaries, and open water. Pelagic species from the last of these are generally predatory, and not normally maintained in aquaria. Those from muddy bottoms are given a sandy substrate in the aquarium for reasons of cleanliness.

Generally speaking, it is not good practice to mix cichlids from different lakes unless one's knowledge and experience are such as to permit sensible temperament matching. Each lake contains a number of discrete groups of cichlids with morphological and behavioural similarities, plus numerous "individualists". Care must likewise be exercised in mixing such groups.

Virtually all Lake Malawi and Lake Victoria cichlids are maternal mouthbrooding haplochromines, while Lake Tanganyika cichlids are thought to be of tilapiine ancestry, and include both substrate spawners and mouthbrooders of various types.

Breeding may be continuous or seasonal, depending on diet. For reasons of space we can cover only the main groups here.

The best-known group of Lake Malawi cichlids is the Mbuna, which are found in close association with areas of rocky shoreline, from which they rarely stray. The genera normally kept are *Pseudotropheus*, *Labeotropheus*, *Melanochromis*, *Labidochromis*, *Petrotilapia*, *Iodotropheus*, and *Cynotilapia* (7.5-18 cm/3-7 in). They are highly competitive and should be kept in a large (absolute minimum 1 m/36 in) densely populated community with huge quantities of rockwork. Filtration and water-changing must be correspondingly efficient.

The natural diet consists largely of algae and the aquatic invertebrates living in it, plankton from the water column, and, in some species, more bizarre items such as the fins and scales of other cichlids. Diet and water chemistry/quality require careful attention to avoid the condition known as "Malawi bloat".

Breeding is spontaneous, the only major problem being premature death of females at the hands of over-attentive males; this can largely be avoided if the set-up is as stipulated and two or more females per male are provided. Brooding females are best removed to a brooding tank soon after spawning.

Aulonocara (peacocks) (9-11 cm/3V2-4V2 in) live on the periphery of rocky areas and over open sand. Males are highly coloured, but females are drab olive. They have enlarged sensory pores on the head which enable them to detect invertebrates in the substrate by a form of sonar; they capture the prey by diving into the sand. Their aquarium should



Labidochromis caeruleus is one of the most peaceful of the Mbuna. It feeds on invertebrates which it picks from the algae coating the rocks, as shown here. The minimal black in the fins indicates that this is a female.



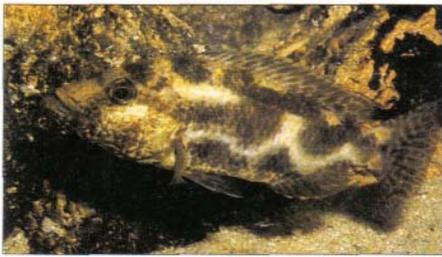
Pseudotropheus zebra occurs in several colour forms (morphs), some of which may prove to be separate species, and some of which are partially sex-linked. Most individuals of the white (W) morph are female, but this is a male.



Aulonocara sp. (sunshine peacock) from Maleri Island, Lake Malawi. This species lives at the interface between rocks and sand, using the former for shelter and the latter for hunting invertebrates.



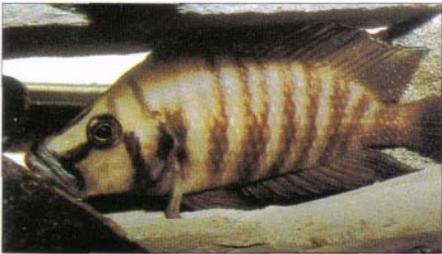
Cyrtocara moorii (blue dolphin) is a popular "Malawi hap".



The blotched pattern of *Nimbochromis livingstonii* simulates a decaying fish corpse. This predator lies on its side on the sand, playing dead until prey approaches.



Julidochromis transcriptus is one of the smaller "Julies"; like other members of its genus it can (and does) swim both upside down and backwards, always with its belly towards the nearby rock surface.



Altolamprologus can be shy until they have settled in, which may take months rather than days. The male *A. compressiceps* (above) is very much larger than the female, and the same is true for other members of the genus.



Shown here is a *Neolamprologus buescheri* male guarding his fry, which have been brought out of the parental cave to forage.

contain some rockwork and a substrate of fine sand. They are inoffensive cichlids whose females are rarely at any risk from males, and should not be housed with the far more boisterous Mbuna who will intimidate them. It is also unwise to mix peacocks of similar appearance as you will be unable to identify the different females, and the males also seem to have difficulty - hybrids are not uncommon. Suitable tankmates are *Lethrinops*, which sift the substrate for food, and members of the Utaka group.

The latter consists of species of the genus *Copadichromis* (10-18 cm/4-7 in), like many other Malawi cichlids formerly included in the genera *Haplochromis* and *Cyrtocara*, both names being still commonly used. (*Haplochromis* is now properly restricted to Victorian cichlids, and *Cyrtocara* to a single Malawian, *C. moorii*.) Utaka are relatively peaceful zooplankton feeders and are found over sandy substrates.

Other popular haplochromines include *Cyrtocara moorii* (20 cm/8 in), a rather peaceful invertebrate-feeder, commonly known as the blue dolphin; *Dimidiochromis compressiceps* (20 cm/8 in), a remarkable compressed cichlid which lurks in *Vallisneria* beds and preys mainly on small fishes and insects, although it is said to eat the eyes of other fishes (hence the common name of "eye-biter"). It rarely shows this tendency in captivity where rations are normally good, and is in fact a rather timid fish); and *Nimbochromis* (18-25 cm/7-10 in), cichlids with a blotched or spotted pattern which feed on small fishes and insects, and can be

rather aggressive on occasion. These "haps" all require a large and fairly open set-up with some rockwork.

Lake Tanganyika offers a similar variety of biotopes, but here the chief occupants of the rocky zones are small (4-15 cm/1 1/2-6 in) cave-spawning substrate brooders of the lamprologine genera *Lamprologus*, *Lepidio-lamprologus*, *Neolamprologus*, *Altolamprologus*, *Chalinochromis*, *Julidochromis*, and *Telmatochromis*. They are mainly invertebrate feeders which require a rocky set-up similar to that for Mbuna, but this should not consist entirely of tufa, which is too rough to provide a suitable spawning substrate. Territorial requirements are generally fairly small, but must be respected; for example, a 120 cm (48 in) aquarium will house only three or four pairs of 5-7.5 cm (2-3 in) fishes. Separate rock piles help to delimit territories. Alternatively, pairs can be given a tank of their own (60-100 cm/24-36 in, depending on size). One cannot generalize regarding the temperament and habits of these fishes as one can with Mbuna, so any potential purchase must be individually researched. It is, however, unwise to house more than one pair of any species in a single tank, or to house them with look-alike congeners.

Digging is normally minimal. Many species are what are termed "trickle spawners" producing frequent small broods. The fry from previous spawnings are allowed to remain in the breeding territory until they reach "competitive size" (usually just over 2.5 cm/1 in), and guard their younger siblings, often without parental assistance.



In the wild *Lamprologus signatus* lives and breeds in tunnels which it excavates in areas of muddy lake bottoms. Luckily, it seems to be just as content to use shells instead in the aquarium. This is a male; females lack stripes and are deeper-bodied.

Shell dwellers are small lamprologines (chiefly *Lamprologus* and *Neolamprologus*) which use the empty shells of *Neoihauma* snails as shelter and breeding caves, and must always be provided with suitable shells (for example those of edible snails, obtainable from delicatessens). They are invertebrate/zooplankton feeders. Territorial requirements are normally small, and a pair (or small group for colonial species) can be accommodated in a 60 cm (24 in) tank or as a non-competing addition to the rock-dweller aquarium. Different species have different habits and should always be researched.

Cyprichromis and *Paracyprichromis* (7.5-10 cm/3-4 in) are peaceful plankton-feeding maternal mouthbrooders which live and spawn in open water near rocks. A small shoal is ideal for tenanting the otherwise empty upper regions of the rock- or shell-dweller tank.

Eretmodus, *Spathodus*, and *Tanganicodus* (goby cichlids) are small (7.5-10 cm/3-4 in), biparental mouthbrooders which inhabit the surf zone where waves break on rocky shores. They can be scrappy among themselves, but a pair can be kept in the rock-dweller tank



Tanganicodus irsacae, a goby cichlid (below), with a pair of *Ophthalmotilapia ventralis* (featherfins) (above). "Gobies" are good fishes for the Tanganyikan community, but featherfin males rarely show their glorious colours under such circumstances.

instead of (not as well as) one of the substrate-spawning species.

Ophthalmotilapia, *Cyathopharynx*, and *Cunningtonia* (featherfins) are medium-size (15-20 cm/6-8 in) maternal mouthbrooders, in which males have egg dummies on the tips of their much elongated pelvic fins. They feed on small particles of anything and inhabit the margins of rocky zones where they build crater nests of sand, sometimes on rocks. They are best kept as a single-species group consisting of a large male, one or more smaller males, and five or more females, in a large (minimum 150 cm/60 in) aquarium.

Tropheus and *Petrochromis* are maternal mouthbrooders and the Tanganyikan analogues of Mbuna, with similar habits and requirements. It is best not to keep them with the substrate-spawners, except in small numbers in very large tanks, as their boisterous activity can intimidate. *Cyphotilapia frontosa*, another rock-dwelling mouth-brooder, grows rather larger (25 cm/10 in) than most aquarists realize, and, although peaceful for its size, eats smaller fishes (for example small rock dwellers) given the opportunity.

Many Lake Victoria cichlid



Cyphotilapia frontosa (and its mouth) is far too large for the community of small rock-dwellers. Brooding females should be isolated - not because of harassment by the male, but because he will eat the fry.

species have become extinct following the introduction of the predatory *Lates niloticus* (Nile perch), and many of the survivors are endangered. Only a few species are available to aquarists; some imported for the aquarium trade are undescribed and often lack biotope data, though surplus stock from captive breeding programmes (for example in zoos) is generally better documented. Most of the available species are *Haplo-criomis*, with *Astatoreochromis* also represented.

The aquarist lucky enough to obtain these cichlids has a responsibility to try to breed them, and there is some liaison between hobbyists and scientific institutions to this end. Each species must be researched where possible, otherwise maintenance and breeding are a matter of careful trial and error. Because water clarity in Lake Victoria tends to be poor, these cichlids can be very timid when exposed to aquarium conditions (clear water, bright lighting); this can sometimes be remedied by keeping them in single-species groups so that competition between males counters shyness. This may, however, be impossible with highly territorial species.

African Cichlids Dwarf species of the genera *Pelvicachromis*, *Nanochromis*, *Manochromis*, *Limbochromis*, cave brooders), *Anomalochromis* (open brooder), and *Parachromis* (cave or open) are West African forest analogues of South American dwarfs, and require similar living conditions (and can share a tank), although in the wild *Nanochromis* is found in rocky habitats. Strong sexual dimorphism is again the norm, with females generally the smaller and more colourful, and often responsible for initiating courtship. Like their transatlantic cousins they are excellent community fishes, although they require slightly more territory per pair. Single pairs can be kept alone in 60 or 80 cm (24 or 30 in) tanks, except in the case of *Nanochromis*, where males are rather aggressive towards females except when breeding, so that two or three females per male and a 1 m (36 in) tank per group is desirable.

Chromidotilapia are sexually dimorphic pair-bonding mouth-brooders, with either or both parents incubating depending on species. Although they can grow to 5 cm (6 in) they are rather small and peaceful and excellent community fishes despite their size. They require the same conditions as dwarfs.

Steatocranus, *Lamprologus* (not to be confused with Lake Tanganyika species), and *Tideo-Timma* (rapids cichlids) are small cichlids (7.5-15 cm/3-6 inch) found in rapids in the Zaire (Congo) River and its tributaries. They swim-bladders have atrophied and the resulting lack of buoyancy enables them to rest in

eddies and behind rocks instead of being swept away by



Pelvicachromis taeniatus "Nigeria" is one of several known geographical populations (possibly distinct species). Like its close relative *P. pulcher*, this species is strongly sexually dimorphic: shown here is a male.



A male *Nanochromis nudiceps*, a recently imported species. A very similar, but quite obviously different, species, *N. parilus*, has been available for some years under this name. Females of both species are much deeper-bodied, and, when ripe with eggs, look as if they have swallowed a glass marble.

the fast-flowing water. Because of the nature of the habitat, little is known of natural behaviour; stomach contents indicate a diet of aquatic invertebrates. All are cave-brooding substrate spawners. Water should be fairly soft and slightly acid to neutral, with a temperature of 26-27°C (78-80°F). A high oxygen content is desirable, but not strong currents - remember these fishes prefer the calm spots in the torrent. Although wild individuals may be territorial towards



Teleogramma brichardi is easily sexed by the broad white upper edge to the female's tail. At breeding time her bands disappear and her belly becomes a beautiful salmon-red. Despite its bottom-dwelling habits, this species is an accomplished jumper and requires an aquarium with a tight-fitting cover.

conspecifics, and males hostile towards females, this aggression seems to abate naturally once they have become used to each other. If necessary, use a clear divider during their first months in captivity. Tank-bred specimens are more amenable to company from the outset. Several species, notably *S. casuarius*, have proved suitable for the general community. They do not harm plants, rarely dig, are peaceful towards non-cichlids, and breed readily even in hard alkaline water.

Other African Cichlids

Hemichromis (jewel cichlids) are monomorphic open-brooding substrate spawners, highly territorial, and with piscivorous tendencies. In the wild they occur in a variety of biotopes from western forests to Egyptian oases, and do well in fairly neutral water in captivity. A single pair per tank (minimum 1 m/36 in, well-planted) is the rule, and even then they may fight.

The "tilapias" consist of four genera: *Tilapia*, *Oreochromis*, *Sarotherodon*, and *Danakilia* (the last not yet imported). They are found throughout Africa and into the Middle East, occurring in various water chemistries, including brackish, and are noted for their tolerance regarding water chemistry and quality. They are medium to large fishes (20-35 cm/8-14 in) with strongly herbivorous habits and prodigious digging abilities, and a tendency to precocious breeding and the production of huge broods. Thus, while they are ideal for fish farming for food, they have limited popularity in the aquarium.

Tilapia are substrate brooders; large males of some species can be extremely belligerent, including towards females. *Oreochromis* are arena-brooding maternal mouthbrooders. Males, however, represent no threat to females and they are normally kept in pairs. *Sarotherodon* are mouth-brooders which pair and hold a breeding territory, and depending on species either or both parents may brood.

Fluviatile haplochromines include *Astatotilapia burtoni*, *Pseudocrenilabrus multicolor* (Egyptian mouthbrooder) and *P. philander*, which are the only **three** species widely available. All



Hemichromis guttatus (the jewel cichlid) has diminished in popularity since the advent of equally colourful and less troublesome species. Like other *Hemichromis* it is a solitary predator by nature, and thus not a community species, although often sold as such.



Sarotherodon melanotheron is a recently imported mouthbrooding "tilapia". The fish in the background is an unidentified substrate-spawning *Tilapia* species.

are maternal mouthbrooders, fairly peaceful, and undemanding regarding diet, water chemistry and quality, providing a low pH (<6.5) is avoided. *Pseudocrenilabrus* can be kept in a general community — they will chase each other but not other fishes. *A. burtoni* can be kept with similar-sized lacustrine haplochromines (but not Mbuna). Madagascar cichlids are

medium to large, and most closely related to *Tilapia*. All five genera - *Paratilapia*, *Paretroplus*, *Oxylapia*, *Ptychochromis*, and *Ptychochromoides* - are endemic to Madagascar and all are substrate spawners. All are endangered in the wild, but fortunately interest in the aquarium hobby has led to the collection of stock for captive breeding, and at least one species is now available in the aquarium trade. It must be stressed that anyone lucky enough to obtain any of these cichlids has a responsibility to provide optimal conditions and make every effort to breed them. They come from a variety of biotopes so research into specific requirements is essential.

Note: Members of the Asian cichlid genus *Etroplus* (chromides) are dealt with in the chapter on brackish water fishes.

Catfishes

Catfishes are arguably the most diverse of all fishes, in body form, lifestyle, size, and distribution. There are over 2000 different species, principally from tropical freshwaters, but also from temperate climates and marine waters. Indeed, catfishes are to be found in every continent and ocean with the exception of the poles. With such diversity, only generalizations can be given in this brief introduction, but this same variety can also be the catalyst for a deeper interest on the part of the aquarist in this group of fishes.

Often catfishes are seen as quirky or a little unusual, more often than not due to their strange body shape, and are frequently accused of being poorly coloured. Mother Nature did not design her catfishes as ostentatious commercial items. They were designed to survive, and in that she was successful.

Most catfishes are benthic, that is, they are found principally at the bottom of the water column. Here the water flow is at its slowest (the fastest currents are usually at the water's surface) but turbulence is greater. This is due to the drag of the water over the substrate, compounded by sunken debris such as fallen trees and rocks. While this environment may seem a little inhospitable, it does offer a variety of foods, and fewer predators are to be found.

In these murky turbulent waters the catfish has to protect itself from environmental factors. Scales would easily be dislodged as a fish is buffeted against



Panaque nigrolineatus (royal plec) is a clumsy swimmer. It has three rows of bone plates either side of its body which make the body fairly inflexible and therefore swimming difficult.

debris, leading to infection and possible death, therefore no catfishes have scales. Instead, they are covered either in thick skin with a copious covering of mucus, or with bony plates.

Catfishes invariably have stout pectoral and dorsal fin spines. In many species these fin spines can be locked. A characteristic that provides several advantages: it offers stability as the catfish rests its pectoral fins on the substrate; locked spines enable the catfish to wedge itself into a crevice or hollow; and with the fin spines fully erect it presents a predator with a bigger and more protected prey. The spines can also spell problems for an unwary aquarist, creating a hazard both to a net, as they become entangled, and to a handler's hands. Do not underestimate the sharpness of many catfish spines. Not only can the tip be sharp, but the edges are often serrated, compounding any wound inflicted.

The mechanisms used to lock these spines are ingenious, highly engineered structures. The dorsal spine has a small locking bone just in front of its base. Once the spine is erect and this locking pin is in place, only voluntary action by the catfish

will unlock it. The pectoral spines on many species are even more complex, with the fin spine articulating on a ball joint which is so close fitting that by twisting the spine the ball seizes in its surrounding socket.

Those species whose bodies are covered in bony plates do not have the flexibility of movement required to permit prolonged swimming. Their actions when seen in the aquarium seem ungainly and laboured. This is most apparent in many of the South American loricariid catfishes, for example *Farlowella* sp. (twig catfishes, aptly named for their resemblance to twigs). These herbivores spend most of their time grazing on algae, and their body form allows them to blend into their natural forest creek biotope, away from the eyes of lurking predators.

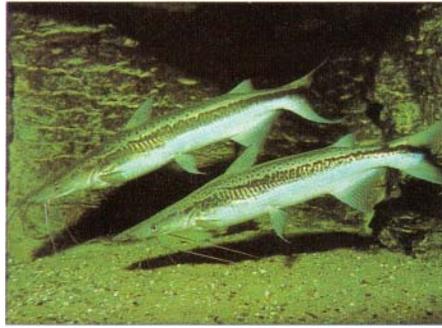


The pungent fin spines of *Astrodoras asterifrons* (star-gazing dorad) act as a deterrent to predators.

Catfishes in the Aquarium

All catfishes have barbels: whisker-like filaments surrounding the mouth. It is this feature, resembling feline whiskers, that has given the Siluriformes the common name of catfishes. There are great variations in the form and number of barbels, dependent on species. Most species have two to four pairs of barbels, usually filamentous, but sometimes fringed with smaller branches as in the African *Synodontis nigriventris* (upside-down catfish), or built into large sucker-like lips.

Irrespective of their form, the barbels are highly sensitive taste organs, used in the search for food. Because some species sift the substrate, careful selection of gravel or sand must be considered, otherwise these delicate organs may become abraded or cut. Fine sand, as used in filtration plants in swimming pools, is ideal as it does not affect the water chemistry. Do not, under



Sorubim lima (shovel-nose catfish) uses its long, sensitive barbels to detect prey. The maxillary barbels are used to triangulate on its target, usually a live fish, before it lunges. This species should be kept with fishes too large for it to eat.

any circumstances, use builders' sand as it has sharp particles and compacts easily.

As a general rule, long barbels, such as those found on *Sorubim lima* (shovel-nose catfish) are an indication that these species may prey on smaller fishes. A similar assumption can be made regarding catfishes with large mouths. *Chaca bankanensis* (frogmouthed catfish) has very small barbels but an extremely



Although *Chaca* sp. (the frogmouthed catfish) has a placid nature, it is a fish to be wary of as it is a fearsome predator. It can be spotted lurking amongst dense vegetation, patiently waiting for any unsuspecting prey to pass within reach.

wide gape, enough to capture a fish more than half its own size.

With over 2000 species of catfishes from which to choose, there is something for all tastes. Sizes can range from little more than 2 cm (³A in) to in excess of 2 metres (6¹/₂ feet). While some species are unsuited to the confines of all but the largest public aquarium, there are many that will flourish and breed in the aquarist's tanks.

All species of catfishes, even the few that swim in mid-water, require areas of seclusion where they can retreat to hide or rest. These can be provided by the use of bogwood or water-logged vine roots, as well as rockwork and dense planting. With any heavy aquarium structure, such as rocks, make sure it will not be demolished by the catfish undermining the substrate as it sifts the gravel.

Some early aquatic literature suggested that catfishes were mere scavengers, and so were ideal substitutes for a filter. However, nothing is further from the truth. Although catfishes forage for any food they can find, they do, like all fishes, require proper nourishment. Without this they will languish and die.



Although *Synodontis* sp. are commonly referred to as upside-down catfishes, relatively few species actually swim upside-down. *Synodontis nigriventris* (upside-down catfish), however, is one that does.

Corydoras, Brochis and Aspidoras

These small, armoured catfishes are ideal inmates for the community tank, where they will swim in small groups in search of food.

Corydoras, with over 100 different species from which to choose, are often the first cat-fishes to be kept. *Dianema lon-gibarbis* (porthole catfish) and *Dianema urostriata* (flagtailed cat) belong to the same family as the *Corydoras*, but grow to 14 cm (5½ in). They are placid fishes, and again are well suited to life in a furnished aquarium. Very similar, though smaller than most *Corydoras*, are the *Aspidoras* with only a dozen or so species.

Brochis, on the other hand, with three species, are generally larger than *Corydoras*, about twice the size, but like the latter are peaceful. These catfishes are found throughout most regions of tropical South America, and are regularly imported for the aquarium. They have two rows of dermal bone plates on each side of the body, almost completely encasing the fish. Two pairs of short barbels are well suited to sifting the substrate for food; longer, more slender or more complex barbels would be quickly damaged or abraded. These barbels form a funnel into the mouth as



Dianema urostriata (flagtailed catfish) is easily distinguished from its near relative *D. longibarbis* (porthole catfish) by its black- and white-striped caudal fin. It likes a quiet aquarium with plenty of shelter.



One of the most beautiful species of *Corydoras* is *C. barbatus*. A mature male has more vivid coloration, thickened fin spines, and cheek bristles.

the catfish eats, giving it a taste of what is about to be ingested, and allowing it to identify items to be discarded.

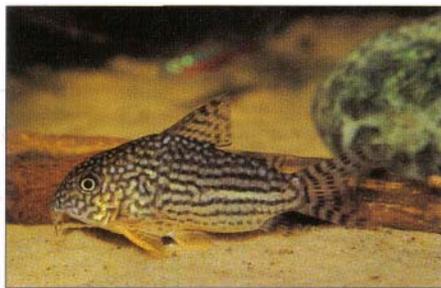
Corydoras and its relatives are often observed dashing to the water surface and back to the bottom of the aquarium. The reason is that this group is able to survive in poorly oxygenated waters by supplementing the dissolved oxygen extracted by the gills with atmospheric air. This is gulped in as the fishes break the surface and stored in the hind gut, which is highly vascularized. Here direct oxygen exchange into the bloodstream is undertaken.

Corydoras surfacing in this way in the aquarium does not necessarily

mean low levels of dissolved oxygen in the tank: it seems to be a reflex action irrespective of necessity. A good indication of the condition of any of this group is the presence of a body sheen, which is visible on all healthy specimens.

Brochis are larger than *Corydoras*, and distinguished by their longer-based dorsal fin: *Corydoras* have only 6 to 8 dorsal fin rays, whilst *Brochis* have from 10 to 17. The only species of the three to have been bred in small numbers is *Brochis splendens* (emerald catfish), the smallest member of this genus, and the one most often offered for sale.

All these species are best kept



Corydoras sterbai (Sterba's *Corydoras*) is a highly desirable and much sought-after fish. If you intend to breed them, you must keep two males and one female.



It is essential to have mature and well-oxygenated water if you wish to maintain *Corydoras* in tiptop condition. Shown here is *Corydoras loxozonus*.

In small groups of four to eight specimens. They benefit from being one of the few catfishes active in the daytime, whereas many other groups are nocturnal. Ideal foods for these catfishes are small aquatic invertebrates such as Cyclops, Tubijex, and Daphnia, supplemented with commercial flake or pelleted foods. Such a diet is recommended for conditioning the fishes for breeding.

Breeding Corydoras

Sexing *Corydoras* is fairly easy. In adult specimens, the female has a fuller, more robust body compared to the more slender male. This is more apparent when viewed from above. Many, though not all, *Corydoras* show dimorphism in the ventral fin shape, with females exhibiting fan-like finnage, and males with spear-shaped ventral fins. The easiest species with which to start a breeding programme is *Corydoras paleatus* (peppered catfish). This species is also the variety most commonly found in a local aquarium dealer's tanks.

In order to breed *Corydoras*, it is recommended that they be removed from the community tank into a small tank away from other species. Whilst *Corydoras* will spawn in the community tank, there is always the probability of the eggs being eaten by other inmates. The breeding tank need be no larger than 10 litres (2½ gallons) capacity, with a fine sandy base, and sparsely decorated with one or two broad-leaved plants. Filtration of some kind is essential. Introduce the *Corydoras* at a ratio of two males to each female. A trio is preferable to six specimens in this size of aquarium.

Often, if in breeding condition, they will require no



Corydoras paleatus (the peppered catfish) is a popular catfish with beginners. If fed correctly, it is also one of the easier *Corydoras* to breed.



Corydoras are shoaling fishes, and as *C. kadeni* (shown here) is no exception you should keep several specimens of *Corydoras*, not necessarily, but preferably, of the same species in your tank.

inducement to spawn, but if they seem reluctant, gradually lower the water level of the tank by 30 to 40 per cent over five days. On the sixth day replace what has been removed with fresh water of a marginally lower temperature. This is to imitate the natural environmental conditions of *Corydoras*, who spawn at the onset of the rainy season.

Often the males will excitedly follow the female around the tank as she looks for a suitable spawning site; this is a good indication that spawning is to commence shortly. One of the males will then position himself directly in front of the female in the classic T-formation. The two fishes will shudder while the female releases a small number of eggs which are clasped in her ventral fins (hence her expanded ventral finnage). The male simultaneously releases sperm to fertilize the eggs. The female then places the adhesive eggs onto a

flat surface that has been cleaned prior to spawning. This may be on the plant leaves, or more often than not, on the side of the aquarium. Whatever the anchorage point is, it will be in the upper part of the water column, not on rocks or the substrate.

At this point it is recommended that either the adult fishes or eggs be removed. The eggs can be removed using a razor blade or something similar, taking great care to avoid damaging them, and placed in a plastic sieve of the type available from most aquarium shops. The sieve is then suspended just below the water surface. The **water** in the sieve is constantly replenished by means of an air-operated sponge filter, in order to ensure that the eggs are always in well-oxygenated water. They hatch within about 48 hours.

After absorbing their yolk sac the young fry can be transferred to a small, unoccupied aquarium, and fed newly hatched *Anemia* (brine shrimp), and as they grow, offered *Daphnia* and crumbled flake foods.

Once you have mastered one of the commoner easy species such as *Corydoras paleatus* (the peppered *Corydoras*) you can move on to one of the more difficult species like *Corydoras panda*. This fish was named on account of its coloration: it looks a lot like a panda, with black eye patches on a light body.

To breed this lovely creature you will need to use a similar set-up to that used for the peppered *Corydoras*, but include a number of artificial mops on the bottom and hanging from the top. More often than not *Corydoras panda* will spawn into one of these, rather than out in the open. It is then an easy job

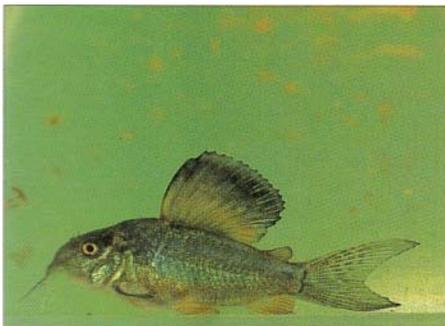
to carefully pull the eggs off the mop and hatch them in the same way as before. This species is not so prolific with only 20 or so eggs produced each spawning, instead of up to 100 for the common species. It also tends to be seasonal in its spawning habits, so no matter how carefully the fishes are conditioned no spawning activity will take place until the correct time of the year - the onset of the rainy season.

Breeding Aspidoras

Aspidoras are generally smaller than *Corydoras*, and although similar, differ from the latter in minor anatomical characteristics of the skull that are not superficially apparent. Aquarium care is similar to that for *Corydoras*.



Once you have successfully bred some of the *Corydoras*, *Aspidoras pauciradiatus* could provide you with another challenge. Use a pair rather than a trio when attempting to spawn them.



Juvenile *Brochis splendens* look so different from the adults that, to the untrained eye, they might be mistaken for *Corydoras* and have often been sold in the trade as sailfin *Corydoras*.

Breeding *Aspidoras* has proven a little more difficult than breeding the commoner species of *Corydoras*, but it is on a par with many of the wild-caught *Corydoras*. The aquarium should be set up with soft water and a mop suspended from a corner of the tank. This should be positioned so that its top is just beneath the water's surface. Additional mops can be positioned on the bottom of the aquarium to provide cover for the adults. It is best not to use a substrate in the breeding tank.

Sexing *Aspidoras* can be achieved in the same way as for *Corydoras*, but the differences in the finnage may be a little more difficult to identify. When selecting potential breeders choose a female which has a nice plump body and a male which is active and showing good coloration. In this case use only a single pair instead of the trio suggested for *Corydoras*. The breeding pair should be placed in the breeding aquarium and conditioned on plenty of live foods.

Aspidoras usually spawn during the early hours of the morning before sunrise, so you are most likely to find the eggs first thing in the morning. They are amber coloured and will most likely be laid in the mop just under the water's surface. The adult pair can now be removed to another aquarium, together with the mops from the bottom of the breeding tank. While the eggs will hatch if left in the mop, they will be more prone to fungus because of the lack of water movement. It is far better to carefully remove the eggs from the mop and spread them out on the aquarium bottom. Using this method virtually 100 per cent of the eggs will hatch.



Brochis splendens (emerald catfish) is an impressive and attractive fish to keep. Healthy specimens will have a greenish sheen over the body and the barbels will show no signs of abrasion.



Brochis britskii (Britski's Brochis) is a more recent import and can be hard to acclimatize to aquarium conditions. It is a fish for an experienced aquarist rather than a beginner.

A good spawning will produce in excess of 100 eggs. These hatch on the fourth day and the fry will be free-swimming a day or two after that. The fry will eat newly hatched brine shrimp as a first food, followed by other live and commercial foods. If well fed the babies will reach 3 cm (1¼ in) long in only 10 weeks.

The newborn fry look rather like small tadpoles, because their finnage has not yet developed properly. The dorsal, adipose, anal, and caudal fins are joined together into one long fin, which surrounds the rear half of the body. As they grow this "super-fin" splits into four separate parts with the anal fin differentiating first, followed by the dorsal and then the tiny adipose fin.

Loricariids: the Sucker-mouthed Catfishes

The loricariids, from South America, are a most disparate family of catfishes, in both shape and size. All exhibit an under-slung sucker mouth and most are herbivorous. The mouth is used to attach themselves to solid objects to avoid being carried away in the current, as they are particularly poor swimmers. The body is encased in body plates that develop from skin folds in the early fry stage, which in later life make swimming a difficult and laborious chore.

Smaller varieties of loricariid make excellent show fishes in the community aquarium. The graceful, slender *Farlowella* (twig catfish) and *Rindoricaria* (whip-tailed cats) are particular favourites, and always readily available. *Ancistrus*, too, are fine additions and prosper well in the planted aquarium. Also highly recommended are the *Otocinclus* and *Parotocindus* catfishes which rarely exceed 3 cm (1^T/₄ in).



The eyes of *Rineloricaria* sp. have adapted to bright conditions. An omega-shaped lobe, which can be raised or lowered at will, reduces the amount of light entering the eye to prevent burning of the delicate retina.



Several small loricariids, such as the *Otocinclus paulinus* shown here, are particularly well suited to the smaller community aquarium. This species likes soft, slightly acid water that is not too warm and has a high oxygen content. The fishes will often be seen resting near the return from a power filter.

Many species of *Hypostomus* can grow to in excess of 30 cm (12 in). Although these peaceful herbivores are too large and cumbersome to be housed in the planted community aquarium, they are ideal catfishes for keeping with larger Central and South American cichlids. Some of the larger *Hypostomus* are known to aestivate (a form of "hibernation") in the absence of water; as their natural water supplies evaporate in the dry season, they burrow into holes in a riverbank, cocooned in damp mud, awaiting the return of the rains.

Intermediate between these two size ranges are *Panaque* and *Sturisoma*, the former being too boisterous for the community tank, and the latter, although growing to around 20 cm (8 in), having the elegance to grace any planted aquarium. *Panaque* can also be a little quarrelsome towards other members of its

own species, and even territorial, patrolling what it considers its own area of the tank.



For the larger aquarium, *Hypostomus* sp. (plecs) are popular and often sold as an alternative to *Gyrinocheilus aymonieri* (algae eater). What most people fail to realize, however, is just how quickly a small specimen can outgrow its accommodation.



The prime requisites for keeping « *Parotocindus macuhcauda* are a well-matured) furnished aquarium, an efficient filtration system, regular water changes, and plenty of green foods.

Feeding Loricariids

Care for all loricariids, particularly the smaller and intermediate size species, is similar. The majority are herbivorous, and are useful in ridding the tank of green algae. In return for removing the algae they replace it with abundant excreta, which can in turn be beneficial to plant growth. The amount of algae growth in most aquaria will not, however, be enough to supply all their dietary needs, and will require supplementing with commercially produced, vegetable-based flake foods. An alternative, and one much appreciated, is to feed them peas and lettuce.

Frozen garden peas should be first placed in water hot enough to defrost them. Take each individual pea and pinch it between thumb and forefinger so that the two inner halves are separated from the outer skin. The inner parts are used and are quite a delicacy, relished by other species of fishes as well.

Another delicacy for loricariid catfishes is lettuce, particularly the outer leaves, which should first be washed and gently crushed

in the hand to break down the cellulose, prior to placing in the aquarium. Plant the leaves in the substrate or weigh them down with a small rock attached with a rubber band, otherwise they will float out of reach of the sucker-mouthed catfishes. Lettuce will also distract the sucker-mouths from broad-leaved plants, which can be damaged by their constant rasping. When feeding lettuce, make sure you are not feeding varieties that have been treated with chemicals. Spinach can also be offered, but we have found that it breaks down fairly rapidly in water, leading to filter blockage and water pollution.

The addition of wood to the aquarium is most beneficial to this group of catfishes. Some species rasp the wood, creating their own hollows into which to retreat, therefore any wood used must be unvarnished to avoid poisoning the fishes. Wood is almost essential if keeping *Farlowdla*, *Sturisoma*, and *Rineloricaria*, all of whom spend most of the day resting on it in the mid-water level.



Rineloricaria sp. (whiptails) can be sexed: males have thicker pectoral fin spines. Eggs may be laid on the glass and it is possible to see the fry developing. When the eggs are ready to hatch the parents may mouth them prior to the event.



Of all the loricariids, *Sturisoma panamense* (regal whiptail) is possibly one of the most popular. Their flamboyant finnage and size make them particularly suited to the large, well-planted community aquarium. The fish shown here is a juvenile. As they mature the finnage and coloration improves.



It is not unusual for aquarists to keep and breed *Rineloricaria* sp. (whiptails) without identifying the species.

Breeding Loricariids

A number of the smaller species can be bred in captivity. A good starting point is the *Ancistrus*. The aptly named bristlenosed catfishes can be readily sexed as adults: males have a display of tentacle-like growths on top of and around the snout, hence their common name. Females also have similar but smaller growths confined to the edge of the snout. *Ancistrus* also have interopercular spines on the side of the head, near the base of the pectoral fin spine. These are particularly large in males and are erectile. They are used in territorial disputes between adults. Adults can be mildly territorial



Ancistrus temminckii (bristlenose) breed with little help from the aquar-ist, provided you have a pair. The first indication that they have bred will be the emergence of their fry. These 10 day-old fry are quite gregarious.



A brood of young *Ancistrus temminckii* (bristlenose) will strip a large lettuce leaf down to the ribs in half a day, so be sure you have a constant supply of fresh leaves. At three weeks old the fry are beginning to be more independent.

amongst themselves, and the number kept, especially for breeding purposes, should be restricted to one pair. Breeding can be undertaken in the community tank, which is certainly easier than isolating them in specially prepared conditions. They will determine the spawning site, usually a hollow in the base of a piece of bogwood. If the hollow is not the right size it will be enlarged by rasping.

The amber-coloured eggs are attached to the walls of the hollow and guarded by the parents from predation by other fishes. After about three days the fry emerge. Their bright amber yolk sacs make them conspicuous to other fishes, so parental care is continued until the sac disappears and the fry have developed a mottled colour pattern to aid concealment. When they are ten days old the fry will venture into the wider world and the parents relinquish their protection. Often the first sign of any breeding activity is when the ten-day-old fry emerge into the tank.

Lettuce leaves, as described above, make ideal fry food. One lettuce leaf can support about two dozen juveniles for a day.

Rindoricaria and related genera (whiptailed catfishes) are also fairly straightforward to both keep and breed. They have slender bodies and are often found attached to wood, rocks, and broad-leaved plants. The mouth structure and barbels on these catfishes vary from species to species, but essentially they all have large sucker mouths with patches of fine rasping teeth, usually with simple (unbranch-ed) barbels. Some species, such as *Pseudohemiodon laticeps*, a veritable giant of a whiptail, have a delicate array of branched barbels.



Ancistrus temminckii (bristlenose) -the fish above is a male - is often purchased to rid a tank of algae. But when this is depleted feed your bristlenose plenty of vegetable foods or it will eat your plants.



Some loricariids have very ornate barbels such as those seen on this *Pseudohemiodon laticeps*. One of the largest whiptails, they are quite difficult to keep, being very particular about water quality. They need a fine sand substrate so that their delicate barbels are not damaged.

Some whiptail catfishes, such as the male of another giant species, *Loricariichthys*, cany their eggs in a mass attached to their lips.

These last two species are only rarely imported; most of the species available grow to less than 15 cm (6 in) in length, and are well suited to life in the planted aquarium. In many ways their habits, requirements, and breeding are similar to those of *Sturisoma* (regal whiptails) and *Farlowella*. In all cases, clean water with a moderately fast flow is essential and can be provided by a power filter. Feeding is the same as for *Ancistrus*, that is, a principally vegetable diet.

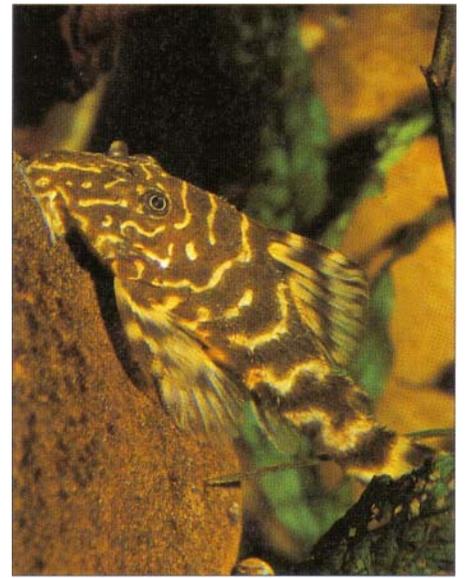
Sex can be determined as males of certain species, particularly *Sturisoma*, but also some species of *Rindoricaria* and *Farlowella*, develop cheek bristles. In several *Rindoricaria* species sex can be determined by studying the pectoral fins: those with fins that incline downward along the back edge are female; while the male's pectoral fin slopes upward.

They select their own mates, often for life. Spawning activity starts with the male cleaning a suitable flat surface. This will often be the aquarium glass, usually at the back of the tank where there is less activity. Once the site is cleaned to the satisfaction of the male he entices the female to it. She lays the adhesive eggs in a mass on the clean breeding site, and the male follows over the eggs in order to fertilize them. Generally it is the male who remains to guard the eggs, but in some species both parents may undertake the task. Infertile eggs, and eggs that accumulate

dirt, are constantly removed by a parent to avoid contamination of the healthy eggs. They also fan the eggs with their ventral fins, and this gentle current of water helps wash away debris as well as oxygenating the eggs. When they have hatched, the fry, which look like miniature replicas of their parents, should be fed a vegetable-based diet, especially soft lettuce leaves.

Despite their small size, which makes them well suited to life in the furnished community tank, particularly one well planted, *Otodndus* and the similar *Parotodndus* are rarely, if ever, bred in captivity. As with the previous species, moderate water movement, with reasonably high levels of dissolved oxygen, is recommended.

Other species of loricariid to look for are those of the genus *Peckoltia*, of similar shape to *Andstrus*, except that they lack the bristles on the snout. There are no reports of aquarium



Scientists have reclassified this species, formerly *Peckoltia* (clown plec) as *Panaeue maccus*. This territorial species needs space.

spawnings of these, but surely success will come with time. It is mainly a matter of discovering the trigger. Some species of *Peckoltia* exhibit particularly striking colours.

Similar to *Peckoltia* is *Hypancistrus zebra*. Only recently discovered, this catfish is very vivid in its livery of ivory white body with wide black bands. Unfortunately, the law of supply and demand often makes these fishes a little expensive, though usually as demand drops after the initial introduction in the trade, so too does the price.

Many new species of loricariids have been discovered in recent years, so many in fact that ichthyologists (scientists who study fishes) have a back-log of species to name and describe. These newly discovered fishes are given code numbers initially, just as a point of reference. For instance, *Hypancistrus zebra* was at first known simply as L46 before it was given its scientific description - a pretty ignoble name for such an attractive and impressive fish.



If you have a healthy bank balance then this fish is for you. *Hypancistrus zebra* still commands a high price, which is unfortunate as few aquarists can afford to purchase several specimens in order to try and breed them.

The Banjos

Dysichthys (banjo cats) belong to the South American family Aspredinidae. They live in the leaf litter found in shallow forest waters, where their resemblance to dead leaves helps to conceal them. These small fishes (less than 12 cm/4³A in) are often available to the aquarist, and are at home in the furnished aquarium, where they burrow into the substrate leaving just their eyes showing. Although rarely active, the sight of a few of them rising from the sandy substrate when food is offered is appealing.

Right: *Dysichthys* sp. (banjos) are inoffensive and reclusive. Mainly active at twilight, they venture out to feed on worms and other small invertebrates.

Below: A substrate with wood and leaf litter allows them to hide and forage.

Feeding Banjos

Feeding is straightforward, as anything is accepted, particularly thoroughly washed *Tubifex* worms. They are not aggressive, and eat only very small fry, and then only if one passes close

enough to be eaten without any effort expended in chasing. Only a few, vague reports exist of breeding in captivity. Most of these suggest that a depression is made in the substrate in which the eggs are laid and protected.



Doradids: the Talking Catfishes

Doradids are usually called talking catfishes due to the noise they can make, but they are not the only catfishes to employ noise as a form of communication. Doradids achieve this in two main ways. One method is to stridulate the pectoral fin joint by partially locking it while moving the fin spine. This movement need not be great to make a lot of noise.

Another is the so-called "elastic spring mechanism", a muscle that links the anterior of the swim-bladder to the rear of the skull. This muscle is rapidly contracted and relaxed causing the air-filled swim-bladder to resonate. The sounds are used in a variety of ways. They are often heard as the fish is being caught at the dealers, and again as it is transferred to your tank. Noise is also used to locate conspecifics in the vastness of their South American waters. Sound travels further in water than in air.

A particular characteristic of the doradids is the single row of plates down each side, each supporting at least one backward-projecting thorn. These are used for protection, and make handling a little difficult. The use of nets is not recommended as the fish becomes entangled, and the net then has to be carefully cut free. They are best moved by



Newly imported specimens of *fiatydoras costatus* (humbug catfish) require small, regular feeds to settle them in and build up their strength.



Amblydoras hancocki (Hancock's talking catfish) is a small, inoffensive dorad. It is quite at home in a community of medium-sized fishes.

hand, but even this is not without problems, the main one being the serrated pectoral spine, which can easily trap unwary fingers between it and the thorned plates on the body — a lesson once learnt, never forgotten. The trick is to grasp the caudal peduncle in one hand while supporting the body with the flattened palm of the other (ensuring stray fingers are well away from the "pinch zone"). This method works well with the larger doradids (some, for instance *Megalodoras irwini*, reach more than 60 cm (24 in)), as well as the smaller species.

There are about 80 different doradids of various sizes, some too big for all but large display aquaria. There are, however, a selection of small doradids suitable for some home aquaria. Few



Astrodoras asterifrons (stargazing dorad) is a rare import. This placid, thorny little character adapts well to aquarium life.

have been bred in captivity. Possibly the most common species encountered is *Amblydoras hancocki* (Hancock's talking catfish), a relatively small (about 10 cm/4 in) doradid that is peaceful, though it should not be trusted with fry-sized fishes. It is principally an insectivore, with a preference for chironomid larvae (bloodworm) and *Tubifex*, but accepts commercially produced pelleted foods.

They are best kept in small groups of three or four, and spend most of the daytime hours hidden, so provide wood or rockwork, preferably the former, with lots of nooks and crannies in which they can hide. Another good addition to the tank is waterlogged dead beech and oak leaves. With this litter overlying the substrate *Amblydoras* will be



Agamyxis pectinifrons is a greedy feeder and it is not unusual for it to gorge itself until it looks as though it has swallowed a golf ball.

seen more often during the day, burrowing under the leaves in search of food.

None of the doradids are active predators, but many grow large and may eat smaller tank-mates. The relatively small *Platydoras costatus* (white-lined dorad) can grow to 15 cm (6 in) and will eat small fishes if given the opportunity. *Agamyxis pectinifrons* (spotted dorad), if allowed to, will gorge itself to such an extent that it appears to have swallowed a golf ball. Both these species are rarely seen during daylight hours. *Megalodoras irwini* and *Pseudodoras niger* are both giants, and are usually expensive, even as juveniles. As they grow large, a correspondingly large aquarium should be planned. *Megalodoras irwini* is often slow-growing, and can be slow to acclimatize. It may not eat for a week or so after being introduced to the tank, but seems none the worse for wear after fasting. Young specimens are reputed to eat snails, but pelleted food is accepted. Beware, *M. irwini* can grow to over 60 cm (24 in), and at this size demands on filtration can be high.



Although it has the potential to grow into a large fish, *Megalodoras irwini* causes few or no problems once it has settled in an aquarium.



Opsodoras stubeli uses its fimbriated barbels to sweep the substrate in search of food. It is especially fond of small worms and crustaceans.

Pseudodoras niger can grow to 70 cm (28 inches) or longer, but even at this size they are "gentle giants". Obviously they are unsuited to the community tank, mainly because of the damage they would wreak on plants as they moved around. Small live-bearers (mollies) have been kept

in the same tank as 50 cm (20 in) specimens with impunity. They are best kept in twos or threes rather than in isolation. They will happily accept pelleted foods. Although they take quite a long time to grow, the wait is more than compensated for by their longevity.



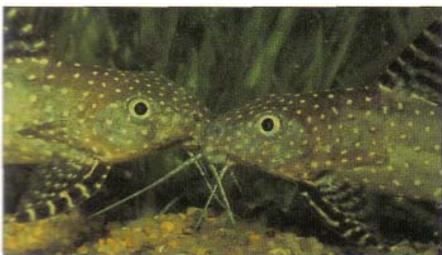
Although this fish will grow in excess of 70 cm (28 in), even in an aquarium, *Pseudodoras niger* is really a "gentle giant".

The Glass Catfish

Kryptopterus bicirrhus (Asian glass catfish), is unusual in a number of ways. As its name implies, it is transparent and some internal organs and the skeleton can be seen. It is also one of the few catfishes that is not benthic (bottom-dwelling), remaining in mid-water. The body is compressed, similar to most other pelagic fishes, rather than depressed. They are shoaling catfishes that must be kept in small groups, not individually, otherwise they will not feed. At rest, *Kryptopterus* remain in mid-water at a slight angle, head uppermost, but when swimming the body is horizontal. Water conditions are the key to their viability. The water should be crystal clear, well oxygenated, moderately fast flowing, and not too alkaline. Most planted aquaria are ideal for keeping glass catfishes. Flake foods are acceptable, but should be supplemented with *Daphnia*, *Cyclops*, and/or freshly hatched mosquito larvae.



Kryptopterus bicirrhus (Asian glass catfish) should be kept in small shoals as they often refuse to feed and become reclusive if kept alone.



Synodontis angelicus (angelic catfish) can be quarrelsome, so keep two of **them only** if space permits.

Upside-down Catfishes

Some species of the family Mochokidae are often referred to as "upside-down cats" because they swim inverted. While many of the mochokids can swim in this way, less than half a dozen of the hundred or more species do so regularly. The advantage of swimming inverted is the ability to catch insects on the water surface, as the mouth is on the underside of the head, and one species, *Synodontis nigriventris*, also takes in atmospheric oxygen.

One of the species that stays upside-down on a long-term basis is *Synodontis nigriventris*. One of the smallest members of this family, growing to around 5 cm (2 in), it is peaceful enough for the community tank, but is best kept in small groups. Provide an overhang such as a rocky cavern, or better still a piece of wood with the overhang near the water surface. Here they will rest inverted, and be visible during the day. Most of their feeding activity occurs at dusk. Small surface-dwelling invertebrates such as mosquito larvae and pupae are recommended, though flake food is also accepted. They have not been bred in captivity.

Most of the other mochokids grow larger, to over 20 cm (8 in), and can be too boisterous for most planted community tanks. There are, however, some species worthy of consideration. One of these is *Synodontis angelicus* (angelic catfish). Its distinctive coloration and markings make it a much sought-after species. Rarely do two specimens have similar markings. Some are spotted, others show light, reticulated bands, with all kinds of patterns in between. They can grow up to 20 cm (8 in). An aquarium



Synodontis multipunctatus (cuckoo catfish) lays its eggs near oral-incubating cichlids which then look after them - hence "cuckoo catfish".



Hemisyndontis membranaceous (moustache catfish) uses its membranous barbels to search for food.

furnished with rocks providing many hiding places is required. Two adults in a confined tank may indulge in territorial battles, but in the larger aquarium this does not normally happen.

For those who wish to include a catfish in their Tanganyikan or Malawian cichlid collection, a good choice would be *Synodontis multipunctatus* (cuckoo catfish). The common name is derived from their breeding strategy: the eggs are released near oral-incubating cichlids such as *Tropheus duboisi* when they are breeding, and the eggs of both species are picked up and cared for by the cichlid. Even as newly hatched fry, the *Synodontis* are cared for in the mouths of the cichlids. Water conditions need to be similar to those for Tanganyikan/Malawian cichlids (alkaline), and the tank furnished with rockwork. Many *Synodontis*, including this one, are sexable. Males have a short genital papilla near the vent.

Other Catfishes of General Interest

With over 2000 species from which to choose, only a very small selection can be described here. Other species to look out for are *Pimelodus pictus* (angelic pirn), often sold as a community aquarium catfish, with a striking silvery body and black markings. This South American naked catfish grows to about 14 cm (5 1/2 in), and is fairly active during the day. Adult specimens may eat very small fishes, but juveniles are usually harmless. They can, like many catfishes, be extremely



A midwater swimming, shoaling catfish, many people make the mistake of buying only one or two specimens of *Eutropiellus buffei* (African debauwi cat) with the result that they quickly pine away.

difficult to handle owing to their sharply pointed dorsal and pectoral fin spines. If these puncture your skin the mucus of the fish can cause mild blood poisoning, which can be quite painful for an hour or two.

The family Pimelodidae, of which *P. pictus* is an example, includes large carnivorous catfishes such as *Sorubim lima* (shovel-nose), a sleek fish with a flattened snout, wide mouth and long barbels. As an adult can grow to 50 cm (20 in), only juvenile specimens are suited to the domestic aquarium. An even bigger species is *Phractocephalus hemioHopterus* (red-tailed catfish), growing to 1 metre (3 feet). In recent years small (5 cm/2 in) specimens have been offered for sale, a practice that has led to public aquaria being swamped with offers of sub-adults as the fishes outgrow their owners' tanks. To keep any large animal, be it a fish, dog, horse, or whatever, is a commitment that cannot be shirked. Always, no matter what fish you are buying, make yourself familiar with its demands and satisfy them.

For those with an appetite for adventure, how about *Malapterurus electricus* (African electric catfish). Adult specimens, which grow to 40 cm (16 in), can generate a discharge of up to 200 volts. The electricity is developed in a biological battery composed of modified muscle which surrounds the body, from just behind the head to the base of the tail. The fish uses this discharge to stun prey and for defence. Afterwards it takes about 10 to 15 minutes to recharge. It is a sedentary fish, rarely moving from its chosen lair. Needless to say, it is unwise to keep it with other fishes, and special handling is required.

From the above examples it would seem that catfishes need to be avoided, but this is far from the truth. There are many other species that offer grace or curiosity, and are well suited to life in the community aquarium. *Eutropiellus debauwi* (African debauwi cat) is very much at home in this kind of habitat. With an undemanding diet and best kept in shoals, they make excellent additions to the tank.



Although it is a beautifully coloured fish, consider keeping *Phractocephalus hemioHopterus* (red-tailed catfish) only if you can provide it with suitably large accommodation and life-support systems.

Cypriniformes

The Cypriniformes are a large group and include some of the most popular aquarium fishes such as barbs, rasboras, danios, loaches, the freshwater sharks (for want of a better term), and the goldfish. Ichthyologists have identified over 2000 or so species, but this has to be an approximation because they are considered a taxonomic minefield. Cypriniformes are native throughout Africa, Europe, Asia, and the southern part of North America, and have been introduced as sport and/or food fishes throughout the world.

Cypriniformes have a series of bones linking the swim-bladder to the inner ear, which gives them extremely sensitive hearing. This assemblage is known as the Weberian Apparatus, and is present in the characins (Characiformes) and catfishes (Siluriformes). Cypriniformes also develop tubercles on their heads and some parts of their bodies. This is especially true of species which live in

fast-flowing waters. These tubercles have a hydrodynamic function, reducing the drag of water flowing over the body. During the breeding season, mature males of some species also develop tubercles

on their heads and these may have a sexual function, perhaps by intimidating the female. Some species also make migratory spawning runs and develop tubercles at this time, so in the past these fishes either reason that they are either a combination of the smaller species are ideal for tropical or

cold water aquaria. In general, the easiest way of dealing with the Cypriniformes is to divide them into tropical and cold water varieties.

TROPICAL CYPRINIFORMES

Barbs

African and Asian barbs have been exploited by the aquarium trade for many years. Wild stocks of some species such as *Barbus titteya* (cherry barb) from Sri Lanka are very low, but the species is still widely available in the hobby, due to captive breeding. The majority of the small barbs are bred by the thousand in fish farms in the Far East, South Africa, eastern Europe, and Florida. Captive-bred fishes are easier to transport and not as sensitive to changes in water conditions as wild fishes, and so are easier to acclimatize.

Barbs are found in all bodies of water, from streams and rivers to lakes, and are shoaling fishes.



The ever-popular *Barbus titteya* (cherry barb) is now rare in the wild and virtually all aquarium stocks are supplied from fish farms. Males are a deep cherry red when in breeding condition whereas females are red/brown. Males do not bicker with each other so keep a group of both sexes to see them at their best.



Some fishes are bred commercially to enhance certain features as is the case with this *Brachydanio frankei* (leopard danio) which has been selectively bred to elongate its finnage.



Although a large fish, *Cydocheilichthys apogon* is quite peaceful and may be kept with other, similar-natured fishes in a large community aquarium.

***Barbus tetrazona* (tiger barb) has a reputation for aggression. Keep a shoal of at least eight to prevent them chivvying tankmates.**

Applying this to the aquarium, when purchasing fishes you should get a group of six to ten, more if you have room. A sparsely planted aquarium is ideal as this allows plenty of swimming space in the mid to lower levels. With the exception of *Barbus tetrazona* (tiger barb), most small barbs are compatible with equal-sized fishes in the community aquarium. Tiger barbs are noted for their quarrelsome nature, but even this can be overcome provided they are kept as a shoal of eight or more in a large aquarium, when, as they are so busy chasing each other, they leave the other fishes alone. Only if kept in smaller numbers do they really cause any trouble.

With some of the medium-sized species, keep the aquarium well covered as they may jump, especially if chasing around at feeding time.

For small aquaria (up to 60 cm/24 in) we recommend *B. titteya* (cherry barb), *B. gelius* (golden dwarf barb), *B. cumingi* (Cuming's barb), *B. oligolepis* (checker barb), *B. conchoni* (rosy barb), *B. fasciatus* (striped barb), *B. "odessa"* (Odessa barb), *B. schuberti* (golden barb), and *B. ticto stoliczkae* (Stoliczka's barb) which are all less than 7.5 cm (3 in) when fully grown and will live happily with small tetras, danios, and the smaller livebearers.

When trying to breed *Barbus "odessa"* (Odessa barb) make sure you have a compatible pair: males should be at least 18, females 12, months old.

If you wish to try something a little more delicate, then perhaps *Barbus barilioides* (blue-barred barb) is for you. Reaching 5 cm (2 in) at most, it is more demanding than most barbs as regards water conditions, requiring mature, soft, slightly acid water but if you can provide this in your community aquarium, and the other inmates are small and very peaceful, it is well worth trying six or seven of these fishes. If kept in lower numbers they are not happy, they cease feeding and hide away.

For larger tanks (up to 1m/36in) some favourites are *B. arulius* (arulus barb), *B. everetti* (clown barb), *B. filamentosus* (black-spot or filament barb), and *B. orphoides*. Young specimens of these fishes are more colourful than adults, for example, young *B. filamentosus* are coppery with dark vertical bars, brilliant red on the dorsal and bright red tips to the caudal fin.

Keep *Barbus cumingi* (Cuming's barb) in small shoals, because they will react with each other and form a focal point in the aquarium.

Adults are silvery with a pink sheen over the body and a black spot just in front of the caudal peduncle. As some compensation for this, male *B. arulius* and *B. filamentosus* develop extensions to the dorsal fin rays as they mature.

For aquaria longer than a metre (36 in) the choice has to be *Barbus schwanenfeldi* (tinfoil barb). This elegant fish grows to over 30 cm (12 in) long, but, unless you are prepared to give it plenty of space, is really only suited to public aquaria.

Feeding barbs is simplicity itself. They are true omnivores, but, given the choice, they do prefer green foods and may nibble at your plants. They have a pair of barbels at the corner of their mouths which they use to help detect food in the substrate. They do not have teeth in their mouths, but use pharyngeal teeth (situated in their throats) to crush food.



Juvenile *Barbus arulius* (arulus barb) are often overlooked in dealers' tanks as they do not show their true colours and extended fins until later in life.

Breeding Barbs

In some species, for example *B. oligolepis*, telling the sexes apart is easy: in general, the males are more highly coloured and slimmer than females, but in others, for example *B. schwanenfeldi*, it takes one to know one because there are no external sexual characteristics.

Barbs are egg scatterers and are among the easiest fishes to breed. For the novice aquarist *B. conchoni*, *B. oligolepis*, and *B. schuberti* are excellent fishes to try and spawn. Some deposit their eggs over gravel, others shed them through plants. A pair will break from the shoal and shimmy together in mid-water, shedding clouds of eggs and milt, or go through the same procedure among thickets of fine-leaved plants. There is no parental care, the eggs being left

to fend for themselves. In the community aquarium such a bounty of food sends the other occupants scurrying about in search of eggs and the parents will even eat their own spawn. Successful breeding can be achieved in a specially prepared breeding aquarium so the eggs can be scattered over marbles, through mesh, or in plants, and the parents removed before they can consume the fry.

You will need plenty of live food and a lot of space to raise the fry, as a single pair of *B. conchoni*, for example, will produce several hundred eggs.

Below top: *Barbus oligolepis* (checker barb) is one of the best barbs for the community aquarium.

Below bottom: *Barbus schuberti* (golden barb) is a peaceful fish that will settle in well in a community tank.



For movement in a large aquarium, nothing is more impressive than a shoal of *Barbus schwanenfeldi* (tinfoil barb). They make excellent companions for large, sedentary catfishes.



Purchase young *Barbus filamentosus* (black-spot or filament barb) and grow them on yourself. Feed them on a varied diet of live, frozen, and green foods to get good specimens.



Male *Barbus nigrofasciatus* (ruby barb) are larger and more intensely coloured than females, especially when ready to spawn. Provide them with a well-planted aquarium and include some floating plants to reduce the light level.



A timid fish, *Barbus eugrammus* (striped barb) likes soft, slightly acid warm water; it can be kept with other peaceful fishes.

Danios

Danios are very similar to barbids but are much slimmer-bodied. They are Asian fishes and are found in large shoals in fast-flowing waters. In the aquarium they prefer the upper layers of the water and may be seen cruising around all day. Most people buy just a couple, but with only two much of the beauty is lost as the fishes have no others to display to. They are peaceful, ideal community fishes.

They are insectivores and their upturned mouth is ideally suited to taking insects from the water surface. Fortunately for us, they are not fussy about food and will take flake and frozen foods without any hesitation. Bred by the thousand in commercial fish farms, albino and long-finned strains of *Brachy-danio rerio* (zebra danio) and *Brachydanio albolineatus* (pearl danio) have been developed. These strains are not quite as hardy as the wild type and require slightly higher temperatures. Both zebra and pearl danios are small fishes, the pearl not exceeding 6 cm (2V4 in) and the zebra 5 cm (2 in).

Danio aequipinnatus (giant danio) is larger, growing up to 10 cm (4 in), and a truly magnificent fish for the larger community aquarium. When they are well fed with plenty of live foods such as mosquito larvae and bloodworm, the blue/green background colour on the body is overlaid with golden yellow spots and bars.

Right: *Brachydanio rerio* var./*rankei* (spotted or leopard danio) was formerly known as *B. frankei* and thought to be a species in its own right but is now considered a variety of *B. rerio*. There is also a long-finned form of this fish.



Brachydanio rerio (zebra danio) needs to be kept in a shoal, with particular attention being paid to water quality if kept for any length of time.



Fed on a variety of small live and frozen foods, *Brachydanio albolineatus* (pearl danio) will display its best colours and may even breed.



Danio aequipinnatus (giant danio), formerly known as *Danio mala-baricus*, is an active shoaling fish which requires a spacious aquarium.



Tanichthys albonubes (white cloud mountain minnow) is easy to keep and breed, even in a small aquarium.



Breeding Danios

Danios are prolific and very easy to breed. Males are slimmer and have more intense coloration than females, and often you can separate just a pair to do the job, but, as the male drives the female very hard, some people prefer to shoal spawn them. Set up your breeding aquarium with either marbles over the bottom or some Java moss, so that the fishes can scatter their eggs, but cannot eat them. No parental care is practised. As with the barbids, ensure that you have good supplies of small live foods, starting with infusoria and newly hatched brine shrimp, ready for the fry. Make sure the breeding tank is well covered as the fishes can be so active that they leap from the water.

White Clouds

A small fish that is often kept with danios, and has the same maintenance and feeding requirements, is *Tanichthys albonubes* (white cloud mountain minnow), which is found in streams in the White Cloud Mountains of China. A most accommodating little fish, it can be kept in cool conditions, (as low as f 6°C/60°F), and some people keep them outside in pools during the summer. Fishes that have been kept outside have more colour than those kept in aquaria, and this may be due to the abundance of natural foods, from insect larvae to algae.

Tanichthys albonubes breeds in the same way as the danios but ignores its eggs, so, left mostly to their own devices in a well-planted species aquarium or pool, they will multiply rapidly. The white cloud mountain minnow is probably one of the best egg-laying fishes a novice could try.

Rasboras

This group of fishes is one that is, by and large, overlooked by most aquarists, and yet there are a fair number of them in the trade. Inhabiting both still and running water, large shoals can be seen near the surface. They are found in southeast Asia and the Indo-Australian archipelago. In the main they are insectivores, but will take flake foods. Give them a varied diet, especially if you are going to attempt to breed them, and include small live foods or frozen *Daphnia*, and similar-sized items.

Rasboras can be divided into two groups by body shape; those which are long and slim, almost torpedo-shaped, and those which are deeper-bodied. Among the deeper-bodied group of rasboras are some of the best known: *R. heteromorpha* (harlequin), *R. hengeli*, and *R. vaterifloris* (pearly rasbora); while the slim-bodied species include *R. borapetensis* (red-tailed rasbora), *R. pauciperforata* (red-striped rasbora), *R. maculata* (pygmy

rasbora, spotted rasbora), and *R. trilineata* (scissortail).

The majority of the rasboras can be kept in the community aquarium, but a few require a little more attention to water conditions and are really suited only to a species aquarium. One such is the tiny *R. maculata* which grows to 2.5 cm (1 in) at most. These little fishes require soft, acid water and copious amounts of small live foods if you are to maintain them for any length of time, and even more so if you hope to breed them.

Others more particular about water quality, especially when it comes to breeding, are *R. vaterifloris*, *R. pauciperforata*, and *R. heteromorpha*, which all require soft, acid conditions.

Breeding Rasboras

With the exception of *R. heteromorpha* and *R. hengeli*, pairs make spawning runs through fine-leaved plants until they have produced all their eggs, which stick tightly to the plants. The parents can then be removed. It

takes about 30 hours for the eggs to hatch and the tiny fry hang from the water plants. Only when they are free-swimming should very small foods be offered.

Both *R. heteromorpha* and *R. hengeli* place their eggs on the undersides of broad plant leaves - *Cryptocorynes* are favourites. These eggs also take up to 30 hours to hatch and the fry can then be raised on very fine live foods.

Pair compatibility may be a problem in some species. If your fishes fail to spawn, try giving them different partners. It is worth noting that some pairs will not breed until they have been together for a few days, *R. maculata* being a classic case.



Rasbora hengeli makes an excellent community fish if kept with other small peaceful fishes. To see them at their best feed live foods.



Above: *Rasbora heteromorpha* (harlequin) have a novel method of spawning: upside down on the underside of leaves.



Rasbora vaterifloris (pearly rasbora), from Sri Lanka, requires warm, soft, slightly acid water.



Right: Provide *Rasbora trilineata* (scissortail) with plenty of swimming space - and a tight cover, else they may jump out of the tank.

"Sharks" and Flying Foxes

Both "sharks" and flying foxes are popular in the aquarium hobby. The best known are *Epalzeorhynchus bicolor* (still, incorrectly, known as *Labeo bicolor*) (red-tailed black shark), whose striking coloration -velvety black body and scarlet caudal fin - is all that is needed to sell it; and *Epalzeorhynchus* (formerly *Labeo*) *frenatus* (red-finned shark, ruby shark) which has, as one of its common names suggests, red fins and a dark brown body. The "shark" part of their common name derives from their shape and the manner in which they swim, cruising the aquarium in a shark-like manner, and not from their eating habits! Although popular, they are not ideal community fishes. Both can be quite belligerent and will pick on other fishes, as well as each other, shredding fins and generally bullying them. When fully grown at about 12 cm (4³A in) they can really cause a lot of damage, so keep them only with other fishes large enough to take care of themselves, such as the medium-sized barbs and cat-fishes. True omnivores, they will eat anything.

Far less trouble, though larger, are *Balantiocheilus melanopterus* (silver or Bala Shark) at 35 cm



Balantiocheilus melanopterus (silver or Bala shark) is a fish that is prone to leaping from the water so ensure that you have a tight-fitting cover glass to keep them in. Floating plants will help discourage jumping.



Epalzeoryhynchus bicolor (red-tailed black shark) are the villains of the community aquarium. Many aquarists fail to appreciate the damage they can cause.

(14 in), *Labeobarbusfestivus* (diamond shark, festive Apollo shark) at 20 cm (8 in), and *Osteochilus hasselti* at 30 cm (12 in). Although these are large fishes, they are peaceful. Many people often keep juvenile specimens in their community tanks, acquiring larger accommodation for them as they grow. Given plenty of space, growth is steady. They like clean, clear water with a reasonable flow, such as that from a power filter. Feeding is no problem: they are omnivores but do have a liking for green foods and will graze on algae or nibble at plants. *Osteochilus hasselti* is particularly fond of Java moss and will keep the rampant growth of this in check. If you



Epalzeorhynchus frenatus (red-finned shark) is less of a nuisance than *E. bicolor* (red-tailed black shark), but should nevertheless be housed with similar-sized fishes, and given a varied diet.

do not have many plants in the tank or if the fishes are grazing too heavily on them, lettuce leaves make a good alternative. The fishes tend to ignore them if they are left to float but, if planted they are classed as fair game and eaten. Do ensure that you have a good cover on the aquarium as these fishes will jump, especially if frightened.

Members of the genus *Labeo* are generally referred to in the trade as sharks. For those of you who like big fishes, *Labeo chrysophekadion* (black shark) may be worth considering keeping. Growing to 60 cm (24 in), this deep-bodied shark is a very powerful, active creature that can be quarrelsome, so is best kept



Captive breeding has produced an albino strain of *Epalzeorhynchus frenatus* (albino red-finned shark) but unfortunately has done nothing to improve its disposition towards other fishes.



Consider keeping *Labeo chrysophekadion* (black shark) only if you are willing to provide a very large aquarium. The growth rate of these creatures is phenomenal.

alone. Even at half this size it requires a 100 x 50 x 50 cm (36 x 18 x 18 in) aquarium and a filtration system to match. Unless you feel you can cope with this, it is best left to public aquaria to maintain. It is omnivorous but likes a predominance of vegetable matter in its diet. In southeast Asia the flesh is considered to be very good eating, and it is an important food fish. There is a small African *Labeo* that is highly prized among aquarists, *L. variegatus* (harlequin shark, variegated shark). Growing to only 30 cm (12 in) at most, it is much more manageable and much more attractive as a juvenile. Youngsters are mottled dark brown over a light cream to beige background and there are traces of orange/red in their fins, but as the fishes mature they lose this colouring and turn grey. Small specimens tolerate other fishes but they can become aggressive when mature. It is one of those fishes that are best grown up along with their tankmates rather than trying to introduce medium- to large-sized fishes into the adult shark's territory. An omnivore, it is no trouble to keep or feed.



Very active fishes, *Epalzeorhynchus kallopterus* (flying fox) need space. Give them a well-planted aquarium in which each individual fish can establish a territory.

Epalzeorhynchus kallopterus (flying fox) is an ideal fish for the larger, well-planted community aquarium. Although loners, several specimens can be kept in the same aquarium without fights breaking out, provided they can define their territories. Flying foxes are almost too good to be true: they are tolerant of other fishes, graze algae but do not chew at the plants, and are tolerant of most water conditions as long as extremes are avoided. Their occasional tendency to dash around may, however, be unsettling for some timid species.

The Algae Eater

Gyrinocheilus aymonieri is sold under various names: Indian algae eater, Chinese algae eater, and sucking loach. To the newcomer it seems to be the answer to all his problems - a fish that will eat algae. Small specimens are fine in the community aquarium, but it is potentially a large fish (25 cm/10 in plus) and it grows quickly, becoming more and more boisterous, digging out depressions in the gravel, and even sticking itself on to the sides of larger fishes much to their annoyance. Damage to the victim's protective mucus (some sucking loaches even develop a taste for this "food") may result, creating a potential site for infection. Youngsters hang from the sides of the aquarium using their sucker mouths, looking like rows of little thermometers. To permit them to breathe while holding station, there is a small spiracle on the head that allows water to pass into the mouth and out over the gills yet still allows enough suction for the fish to hold on. As well as eating algae, *G. aymonieri* will eat small invertebrates, flake, and frozen foods.



Young specimens of *Gyrinocheilus aymonieri* (algae eater, sucking loach) are often kept to rid a tank of algae. Unfortunately as they grow they become far too large and boisterous and harrass other fishes.

Loaches

Being bottom-dwelling species, the loaches are either eel-like or have a triangular body cross-section, their flat bellies being in contact with the substrate. Loaches may have very small scales covering all the body; be partially scaled, in which case the scales are missing from the underside; or naked. When you think about it, the absence of some or all of the scales is a very sensible arrangement, because if scales were present on the belly of the fish, they would be dislodged as the fish moved over rocks and sharp gravel, leaving it open to infection.

Their distribution ranges across Europe and Asia down to, and including, the Malay archipelago, and also includes the extreme north of Africa (Morocco). The main genera encountered by aquarists are: *Acanthopsis*, *Acanthopthalmus*, *Botia*, *Cobitis*, *Lepidocephalus*, *Misgurnus*, and *Nemacheilus*. With such a wide range, from the temperate zones down to the tropics, some genera, for example *Misgurnus*, contain species that are suited to tropical aquaria (for example *M. anguillicaudatus* - Chinese weatherloach) and others (*M. fossilis* - European weatherloach) which should be kept in a coldwater aquarium.

With the exception of some



Acanthopsis choiorhynchus (horse-faced loach) likes to bury itself in the substrate, which therefore needs to be fine-grained.



B. macracantha (clown loach) is a firm favourite among hobbyists. Aquarists often fail with this fish because of poor water conditions and low temperatures, and are rarely aware of its potential size.

Nemacheilus species, loaches have a bifid (two-pronged) spine beneath the eye, which they can erect and lower at will. These spines are quite sharp and can inflict damage on other fishes as well as becoming entangled in nets. Loaches will often erect the spines when frightened and many a transportation bag has been punctured in this way. To reduce the chances of the fishes being able to puncture the bags make sure that the corners are taped up. A loach will also use its spines to defend its territory: in the aquarium they like to hide away in caves which they defend against other fishes.

The mouth is surrounded by three or four (depending on species) pairs of barbels which are covered with taste receptors, which aid the fishes when they are searching through the substrate for food. In the wild, their



Botia modesta (orange-finned loach) is a nocturnal fish. Feed after "lights out" while the room light is still on.



The colour patterning on *Botia lohachata* (Pakistani loach) can vary considerably. In captivity these creatures can be quite argumentative, and if keeping several provide plenty of hiding places.

diet consists primarily of small worms and insect larvae, but in captivity they will take flake and tablet foods as well as small frozen and live foods and algae. They are also very fond of fish eggs and will try and steal these even if the parents are guarding the eggs.

Many loaches are able to use their intestine to take oxygen from the atmosphere, and so can survive in waters that are low in oxygen. They are also very sensitive to barometric pressure and this may cause them to dash about the aquarium at times. *Misgurnus* (weatherloaches) are probably best known for this (hence their common name).

In the aquarium, provide your loaches with a soft substrate. Some, such as *Acanthopsis choiorhynchus* (horse-faced or long-nosed loach) like to burrow under the sand until only their eyes are visible. Caves among rocks and plant roots are also desirable, so that each fish can have a small territory. Most loaches will live in harmony with other fishes, but some, notably *Botia berdmorei* and *B. lohachata* (Pakistani loach), quarrel amongst themselves and, just to be different, *B. modesta* (orange-finned loach) picks fights with other fishes, preferring to

shoal with its own kind. During these disputes, clicking noises can be heard. It is thought that these may be caused by rapid jerking of the bifid spine in its socket.

The *Eotia* genus is well represented in the aquarium by species ranging in size from the small *B. sidthimunki* (dwarf loach, pygmy chain loach) which grows to only about 5 cm (2 in), up to the very impressive 30 cm (12 in) long *B. macracantha* (clown or tiger loach). These two species are popular among aquarists, *B. sidthimunki* because its size and gentle manner makes it ideal for the community aquarium, even with very small species, and *B. macracantha* because of its outstanding coloration.

Botia sidthimunki (pygmy chain loach) is relatively easy to keep and feed in a mature aquarium. They are shoaling fishes and several should be kept together. Unlike the other members of the genus, *B. sidthimunki* will spend time resting on plant leaves or twigs just above the substrate, or swimming in a shoal in the mid-waters of the tank during the day. At feeding time they will greedily take small live foods such as *Daphnia* and bloodworm as well as flake and tablet foods. A variety of foods and maintenance of good water conditions seem to be the key to



No community aquarium should be without a small shoal of *Botia sidthimunki* (chain loach) swimming about or resting on wood and plants.



Acanthophtalmus sp. (kuhli loaches) need a fine substrate in which to burrow, and may infiltrate filters - don't throw them away during maintenance!

keeping these fishes healthy.

Botia macracantha (clown loach) is a much more difficult fish to maintain. Because of its gregarious nature, the keeping of several individuals, as opposed to one or two, is a good start. Their size makes them suited to the large aquarium, but if you can grow them to 15 cm (6 in) or 20 cm (8 in) in captivity you are doing well. If stressed they are susceptible to white spot and any treatments should be used with caution - do not, under any circumstances, exceed the manufacturer's dosage instructions or the "cure" may prove fatal to your clown loach. *B. macracantha* is happy with a temperature in the 25-28°C (77-82°F) range.

Of the slim-bodied species, *Acanthophtalmus* species (kuhli loaches) are very popular. The trouble is, once you put them into the aquarium they disappear into the gravel, under the under-gravel filter plates, even up the intake pipe of external power filters if you forget to replace the strainer. They are, however, ideal for the community aquarium as they cause no problems, but you do need to keep three or four of them if at all possible as single

specimens are not so bold. They do come out to forage for food or rest among the plants, but, because of their burrowing habits, are probably one of the worst fishes to catch. They take live, flake, and frozen foods and growth from a skinny boot-lace into a rounded worm-like fish is rapid - an 8-10 cm (3-4 in) fish is a good-sized specimen. These fishes have been bred in captivity: they produce bright green eggs which are stuck to plants near the water surface.

The weather loaches are more seasonal imports and are among the larger loaches. *Misgurnus anguillicaudatus* can attain 50 cm (20 in) although 20-25 cm (8-10 in) is more usual in the aquarium. It is found from the Amur region of Siberia down through China, Korea, Hainan, and even Japan, and seems to prefer colder conditions, although it will tolerate temperatures up to 25°C, (77°F) for a short time in summer. Typical loaches, much of their time is spent buried in the substrate. Breeding occurs in late spring or early summer. The eggs are laid on plants or fibrous roots and left to fend for themselves.

COLDWATER CYPRINIFORMES

Continuing with the loaches, *Nemachdus barbatus* (stone loach), *Misgurnus fossilis* (European weatherloach), and *Cobitis taenia* (spined loach, spotted weatherloach) are ideal for coldwater aquaria. Maintenance is the same as for their tropical cousins except that the temperature should be kept below 20°C (68°F).



Nemacheilus barbatus (stone loach) is often fished for by children and, along with *Gasterosteus aculeatus* (stickleback), is one of the first fishes they are likely to try and keep.



Cobitis taenia (spined loach) is another "first fish". Both of these loaches require cool, clean, clear, well-oxygenated water to survive in captivity.

The Goldfish

Kept by man for many, many years, *Carassius auratus* (the goldfish) is probably the best known of all aquarium/pond fishes. The wild form of this fish is a dull green to brown animal with little to recommend it as a potential aquarium fish, but a mutation occurred which developed lovely gold patches on the body which eventually turned the whole fish gold. The goldfish had been born. Its first recorded breeding in Europe took place in Holland in 1728. In its native China it has been domesticated even longer (since around 800 AD), and many fancy strains have been developed. The standard goldfish is the ideal pond fish, developed from the wild green/grey specimens into the reds and golds we see today.

Man has developed a multitude of variants with both single and double tails and various colours. Generally speaking, the single-tailed types, including the common goldfish, comets, and shubunkins, are excellent pond fishes. Small specimens of these types also make good hardy aquarium fishes which may live in excess of twenty years. The double-tailed varieties are much more delicate and are best kept at warmer temperatures

(10-15°C/50-59°F; thus they will not overwinter in an outdoor pond) in an aquarium, where their fine body shapes and finnage forms can be better appreciated.

Goldfishes are tolerant of most water conditions but a large aquarium is required if you are to keep them well. The old-fashioned goldfish bowl is not suitable: it has limited surface area for the uptake of oxygen into the water, no room for a filtration system, and insufficient swimming space. An aquarium is far better to keep a goldfish happy, and there are companies which produce a package which contains everything including the tank and filtration system -you just add fishes, plants, and water. Goldfishes are noted for being messy, greedy feeders that produce a lot of waste. Needless to say they require a very efficient filtration system to cope with this. There is a good range of goldfish foods available but don't forget to include some vegetable matter as well as live or frozen foods in their diet.

Do not try and overcrowd your fishes as this places a great deal of stress on them. If conditions become too warm and the dissolved oxygen level falls, the fishes will gasp at the surface, their fins will become clamped to their bodies, and signs of fin congestion (bloodshot bases to the finnage) will appear. A partial water change to lower the temperature, and a check on the filtration system, will usually counteract the problem, which could, however, also be indicative that your fishes are overcrowded.

Carassius auratus (the goldfish) comes in many man-made varieties such as this long-tailed form. Colour, shape, and fins many vary.



Breeding Goldfishes

Breeding goldfishes is relatively easy. In the garden pond it should occur naturally and some of the fry may survive to maturity. To breed under controlled conditions, condition your chosen pair well on live foods. When ready to spawn the male will develop tubercles on his head, operculum, and pectoral fins; the female will be noticeably rounder.

Use a 100 x 30 x 30 cm (36 x 12 x 12 in) tank with spawning mops suspended in it so that the pair can swim through them, depositing and fertilizing the eggs as they do so. Once spawning is complete the pair can be removed and the eggs left to hatch. Feed the fry copious amounts of small live foods. Allow plenty of space for growing on, and cull the numbers rather than crowding if only limited space is available.

Captive breeding has resulted in some, to our way of thinking, horrendous strains being produced. Some have enlarged, bulbous eyes (celestial and bubble-eyes) and these require special care, ensuring there are no sharp objects on which the fishes can damage themselves. Yet others have been bred to enhance cancerous growths on their heads (lionheads).

The choice is yours as to whether or not you wish to keep these types.

Koi Carp

Some of you may be tempted to keep *Cyprinus carpio* (koi carp) in an aquarium and we would like to advise against this. Koi are potentially large fishes best housed in large purpose-built ponds with powerful filtration systems.



Some *Carassius auratus* (goldfish) varieties are bred not only for body shape but also for colour as in this "black moor". These highly line-bred fishes are more delicate than the standard goldfish or comet and are best kept under more controlled conditions in an aquarium rather than in a garden pond.



A twin-tailed goldfish is, again, a fish for the aquarium. Hobbyists, especially in the Far East, have selectively bred these fishes to such an extent that many can no longer swim properly because of the excess drag produced by their over-elongated finnage.

Bitterling

The various subspecies of *Rhodeus sericeus* (bitterling) are available during the summer months and are ideal for the aquarium as they are easy to keep, and feed on just about any small foods. They also have an unusual method of breeding, and need a swan mussel to spawn in. This alone makes them worth the effort.

When ready to breed, males are almost olive green along the top of the head and the back, with iridescent shades of blue, pink, and violet along the flanks. Females are yellower and show an ovipositor. Breeding is stimulated by a rise in water temperature to about 22°C (72°F).

Use a tank with a sand substrate and thickets of plants, and several live swan mussels (*Anodonta* sp.). The male keeps nudging the mussel with his mouth to stimulate it to remain open, while the female places her ovipositor in the mussel's outlet valve and deposits her eggs. The male follows, swiftly shedding his milt over the mussel and thereby fertilizing the eggs. Some 30 days later the fry leave the mussel and have to be raised on very fine live foods.



This Far Eastern bitterling, *Rhodeus ocellatus* (Hong Kong bitterling), is popular with coldwater fishkeepers. It requires similar conditions to its European counterpart.

Recent importations

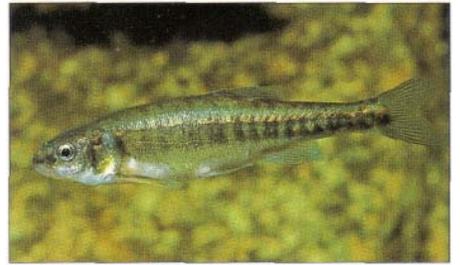
Over the last couple of years some unusual fishes have been arriving from the Far East. One of these, *Myxocyprinus asiaticus*, is a large cyprinid (family Catostomidae) from China. Sold under the name Chinese sailfin, small specimens are highly coloured and very attractive; they are marbled with brown on a lighter cream or beige background, and the high dorsal fin makes them most appealing. The problem is that these small, endearing, 15-20 cm (6-8 in) fishes grow to more than 60 cm (24 in), so unless you can cope with this, leave them to public aquaria.

If you are going to try your hand, it is important to keep these fishes on the cool side and ensure that they have a very good filtration system to maintain water quality. Feeding does not seem to be fraught with any difficulties as the fishes accept flake, frozen, and live foods.

North America has also been the source of some unusual species such as *Notropis lutrensis* (shiner) and *Phoxinus erythrogaster* (southern red-bellied dace). Both are stream fishes that adapt well to aquarium conditions provided the tank is not overcrowded. They like high levels of oxygen and a good flow of water, so it is essential to maintain your filtration system well as any deterioration in water quality will lead to the demise of these fishes. The aquarium should have a sand or gravel substrate with pebbles and thickets of plants to provide cover. They are omnivorous, and flake, live, and frozen foods will all be taken, but ensure that you do not over-feed to the extent that uneaten food pollutes the water.



This North American fish, *Notropis lutrensis* (shiner), requires cooler temperatures in winter than in summer.



***Phoxinus phoxinus* (minnows) are common in unpolluted European streams. Given clean, cool, well-oxygenated water they can be a welcome addition to the aquarium.**

The males of *N. lutrensis* are far more colourful than the silvery females. During the breeding season, the male develops tubercles around his snout. The fishes breed over sand, the pair depositing their eggs and then leaving them to fend for themselves.

Phoxinus erythrogaster is a very colourful fish that displays best if kept in a shoal. The males are much more highly coloured than the females, with their sides and bellies becoming deep red or sometimes yellow. These fishes spawn in the spring over open sand areas.

In order to encourage both these species to breed it is essential to keep them at cooler temperatures over the winter, say 10°C (50°F) for *P. erythrogaster* and 14-15°C (57-59°F) for *N. lutrensis*, as warming of the waters seems to be one of the triggers for spawning.

Cyprinodonts

The cyprinodonts are a large group of relatively small fresh-and brackish water fishes. Because they have teeth in their jaws they are often referred to as toothcarps. Aquarists tend to divide them into two groups, those which produce live fry (livebearers) and those which lay eggs (killifishes).

Most of the livebearers in the aquarium trade belong to the family Poeciliidae, but other, not necessarily closely related, families are also livebearers, including the Anablepidae, Goodeidae, and Hemirhamphidae.

In this section we will be dealing with only those fishes which are Cyprinodonts, so half-beaks will be found in the Miscellaneous chapter. One other livebearer you will have to look for elsewhere is *Anableps anableps* (four-eyed fish); these require very specialized brackish conditions, so full details regarding their lifestyle and captive requirements may be found in **the** brackish chapter.

Although you will find killifishes in this chapter, you may find it a little more difficult to locate the real thing! Despite their often stunning beauty, their (largely undeserved) reputation for being "difficult", specialist fishes has led to few dealers stocking them. Do not be deterred - locating unusual **fishes** often adds to the fun of our hobby.

Gambusia holbrooki (mosquito fish) have been used in biological pest control, being introduced to eat mosquito larvae and hence curb the spread of Malaria.

LIVEBEARING TOOTHCARPS

These livebearers will probably be the first fishes encountered by the novice aquarist, although they are not necessarily the best fishes for the new fishkeeper. Yet some will survive and breed in a newly set up tank - "cultivated" platies are probably the best for this, followed by guppies and cultivated swordtails.

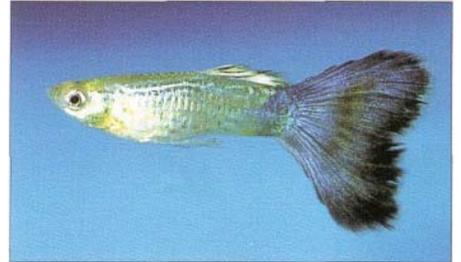
The Poeciliidae

Most of the livebearing fishes encountered by the hobbyist belong to this "American" family. We use the term "American" because representatives are native to the southern states of the USA, Central America, and South America as far south as Argentina. They are also native to many of the Caribbean islands. This is not, however, the limit of their distribution.

Originally, the guppy hails from northern South America, Barbados, and Trinidad. It is now bred commercially in many countries, from the fish farms of the USA to those of the Far East,



Poecilia sp. (sailfin molly) such as this male are large fishes which can reach 10 cm (4 in). Needless to say they need a spacious aquarium.



The ever popular *Poecilia reticulata* (guppy) has become a nuisance in some areas as escapees have populated local waterways.

Israel, and Europe. Accidental escapes from these fish farms have allowed the guppy to extend its range in recent times, but in the days of the British Empire guppies were introduced all over the tropics to eat mosquito larvae and help reduce the risk of Malaria. Later *Gambusia holbrooki* were found to be more efficient for this purpose and were introduced to many parts of



the world. Indeed the common name of *Gambusia holbrooki* is mosquito fish because of this connection. In recent times the resulting damage to native species of fish has become apparent, with dozens in decline or close to extinction because of these introduced fishes. Nowadays the mosquito fish is also dubbed "fish killer" and sometimes even referred to as "biological pollution" because of the damage it is doing to native faunas.

Since all livebearers use internal fertilization of the eggs as part of their reproductive strategy, they have had to evolve a method of transferring sperm from the male to the female. In Poeciliids the anal fin of the male is developed into a gonopodium, a sexual organ formed by the fusion of the third, fourth, and fifth rays of the fin. At its tip there are various spines and hooks which are often called "holdfasts", and which are used by the male to hold on to the female during mating. At this time the gonopodium is directed forwards and a groove formed down which the sperm is channelled to the cloaca of the female.

In all livebearers, the young fishes develop in the body cavity of the female and are born fully formed and able to fend for themselves. Since they are so well advanced at birth it is not necessary for them to produce hundreds of young at a time; broods vary but 20 to 40 seems to be the average. Large female swordtails, however, have been known to produce over 250 fry at one time. Interestingly enough, females of most, if not all, species of the Poeciliidae are capable of storing sperm, so



Xiphophorus

Xiphophorus maculatus (platy) is an accommodating fish suited to the community aquarium. Several varieties are available.



The tiny *Heterandria formosa* (mosquito fish), on the other hand, is best kept in a planted species aquarium with alkaline water.



Xiphophorus helleri (swordtail) will breed without any assistance from the aquarist. Ensure your aquarium does not become over-populated.



Xiphophorus variatus (platy) is quite prolific. They like a varied diet that includes some green foods.



many successive broods can be produced from a single mating. In this family the best known genera are *Poecilia*, which includes the guppy, and *Xiphophorus*, which includes the platies and swordtails.

Xiphophorus variatus has been bred to produce not only different colour forms but also different finnage shapes. This fish is a pin-tail form. *Xiphophorus* varieties will readily interbreed, but careful line-breeding is required to maintain these fancy strains.

Guppies

Wild guppies are small fishes; the males have splashes of colour on their bodies and the females are a dull grey/brown with a dark triangular "gravid spot" near their vent. These wild forms bear little resemblance to the man-made guppies with which we are familiar today. Indeed, one could be forgiven for thinking that the latter are an entirely different fish. Their fecundity and swift maturation has made them ideal candidates for the breeder, especially the commercial breeder, and many colour forms have been produced. Not content with line breeding for colour, the males have also been bred to enhance body size and finnage shape and size. More recently attention has been paid to the females, and these formerly somewhat drab creatures are now available with colourful tails, and even with colour starting to spread onto the body. Unfortunately, a problem which is encountered from time to time with some of these highly coloured females is that the colour has been artificially induced by the use of hormones.



To maintain colour and finnage forms of *P. reticulata* you must separate young **males** and females as soon as possible so as to control who breeds with whom.

A side effect of this is to make them sterile.

In the aquarium, the commercially bred guppy requires a well-planted aquarium with companions that will not bully it or nip at its flowing fins. Several males kept together may tear at each others' fins, so try to keep both sexes - it gives them something else to think about! They are not too fussy about water conditions provided it is not too soft, and as for their dietary requirements, anything they can fit in their mouths will do. Guppies are true omnivores which are capable of eating anything which comes their way. They have a long gut and no discernible stomach which means they can eat only small amounts at one sitting, but will be looking for their next meal within the next half hour. To appease this almost continuous hunger they are often seen "nipping" at plants but, although this can be annoying, they rarely do any real damage, preferring to take algae off the leaves rather than tear the actual leaves. Even so, tender new shoots sometimes disappear. Feeding some lettuce or peas will



Male and female *Poecilia reticulata* (guppy) are easy to tell apart. Males have a gonopodium and more flamboyant finnage (top two fishes); the females are dull in comparison.

often help solve the problem, as will a multitude of small feeds throughout the day. Various live foods are also avidly consumed, including their own young.

In the aquarium females will drop their young at monthly intervals and provided there is shelter in the form of plenty of fine-leaved plants that reach up to the surface, or a layer of *Riccia*, some of the fry will survive. Alternatively, females can be moved into special breeding traps or tanks to give birth.

If you want to maintain the colour strains or finnage forms you will need to set up special breeding aquaria where you can monitor the fishes and check which ones you wish to breed with which. If all forms are kept together you will end up with a horrible mish-mash of fin shape and colour, because they will readily interbreed.

Platies and Swordtails

Platies and swordtails are almost as fecund as guppies. As in the guppy, a female can produce several broods from a single impregnation, and again, like the guppy, they have been manipulated by commercial breeders to produce variations in colour and finnage.

Platies like harder water and they will cope with the conditions of a newly set up aquarium, so they can be one of the first fishes that are used to mature the system after the nitrite peak has been passed. They like plants, both as cover and as food, but prefer to graze on soft green algae. This fondness for algae can be used to our advantage as they will help overcome the algal bloom that often occurs in a new aquarium. Despite this fondness for plant matter, these fishes too are true omnivores and require regular feeds of a good quality flake food as the basis of their diet, plus live or frozen foods if they are to achieve their full potential.

There are a number of different wild species of platy but only two are generally found in retail outlets. These have been extensively hybridized together, and with the common swordtail, to produce a number of colour forms and fin types. Once a fish has been hybridized with another species, the scientific name ceases to apply to the descendants no matter what they look like. Aquarists, however, still use the scientific names of the fishes that these cultivated forms resemble. The most common types available are listed below.

In the *Xiphophorus maculatus* type we get such varieties as red, blue, comet, and wagtail (this last has to be a hybrid because it requires the combination of the



Being easy to breed and swift to mature, *Xiphophorus helleri* (swordtail) is cultivated by fish farmers to develop different colour forms such as these black individuals.



Green swordtails such as these are considered closest to the wild stock. Here we see the characteristic well-developed sword on the smaller male.



Fish breeders have also developed lyre-tailed forms of the swordtail, as seen here.



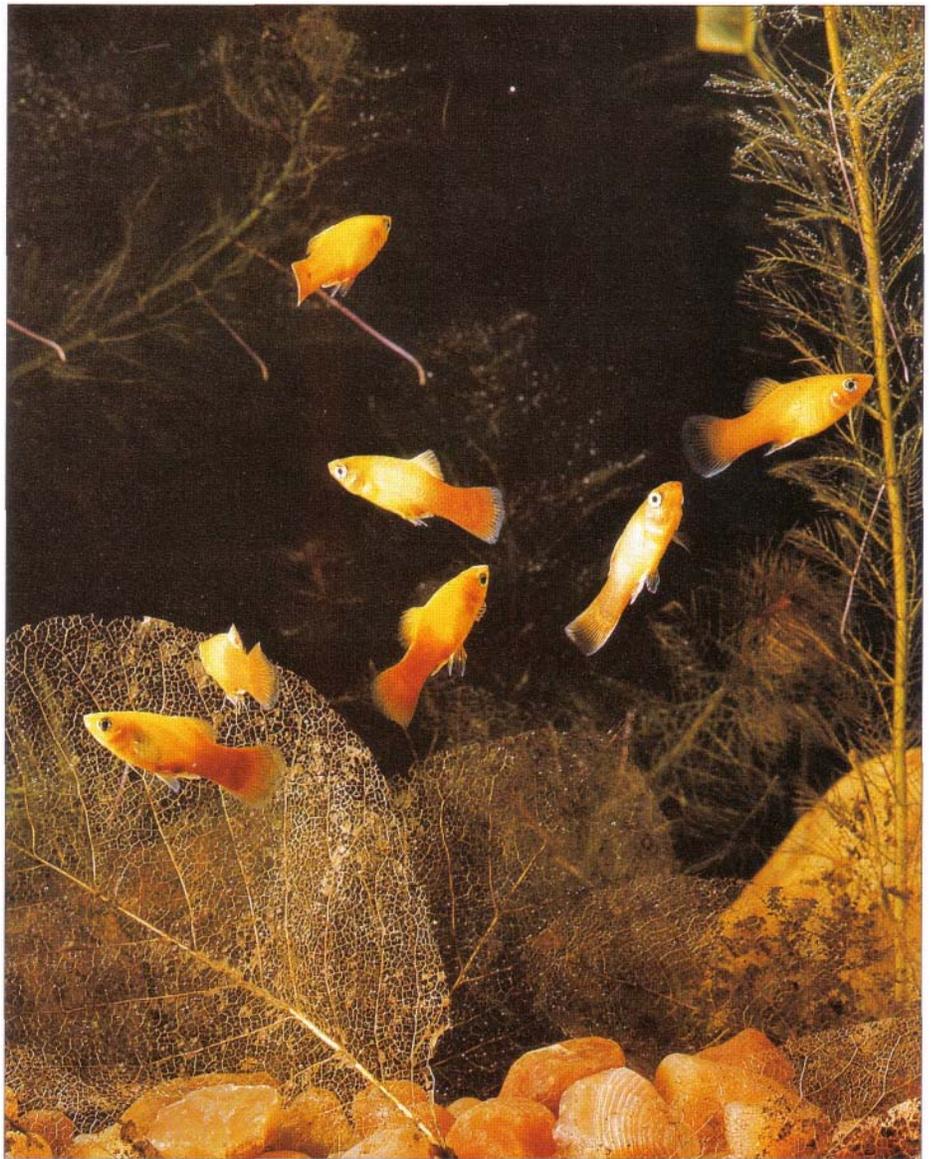
The red swordtail is still the most popular form but it is very hard to obtain quality stock.

comet gene from this species of platy with a swordtail gene from the common swordtail); and from *Xiphophorus variatus* come the sunset, marigold, tiger, and tuxedo varieties, among others. All these varieties cross easily so you often find that you have a colour that doesn't really conform to any named type, but if you like it, that's fine.

Xiphophorus helleri (cultivated swordtails) are like large versions of platies. The males may be identified by their gonopodia and also, as they mature, by their sword, an extension of the lower rays of the caudal fin. It is a common myth that swordtails undergo a sex reversal in later life, with females developing a gonopodium and sword. This myth stems from the fact that many swordtail males take much longer to "sex out" than others of the same size, and thus appear to be females - until the sword and gonopodium eventually develop. Occasionally old females will cease to breed and develop a gonopodium and sword just like a male. These fishes, however, are unable to father fry and still do not truly change sex.

Xiphophorus helleri has, like the platy and guppy, been exploited by the trade, and several fancy fin forms are commonly available. These include the double sword (sometimes called double-sword) and the high-fin also called Simpson and topsail). These come in a multitude of varieties, including red, black, tuxedo, albino, and red-eyed red.

They need a fairly large aquarium as they are very active **fishes**, especially if several males **are** kept together, because they **will** be continually posturing to



Check the dealer's tanks carefully when purchasing your fishes and ensure that they are healthy. They should show no signs of ill health such as clamped fins, rapid breathing, or scratching.

each other and displaying to females. Thickets of plants are useful, not only to provide sanctuary for the female who wishes to give birth or retreat from the attention of a male, but also for the other fishes in the aquarium to get out of the way if they want to. During these bouts of frantic activity the fishes may jump, so do ensure that you have a tight cover on the aquarium.

Hard water is a must to maintain these creatures for any length of time, but do not add salt to it (this also applies to guppies and platies). In soft

water the fishes often seem not to develop properly. Other than that, they are very easy to keep and breed. One word of warning on the breeding side: a fully grown female can be 10 cm (4 in) or more in length and is much too large for the plastic breeding traps sold for livebearing fishes. If confined to one of these contraptions she may become so stressed that she damages herself trying to jump out, or may fret and even die. Far better to use a specially converted aquarium using the same principle.

Mollies

Now to one of the more spectacular members of this family, the sailfin molly. There are three species of sailfin molly of which two are common in the hobby, *Poecilia latipinna* and *Poecilia velifera*. As with the cultivated platies and sword tails, they have been hybridized over the years to develop more colour varieties.

They like hard, alkaline water: but failing this a little salt can be added. About a level 5 ml spoonful (1 level tsp) per 4.5 litres (1 gallon) is sufficient, though they will tolerate a lot more. Indeed, sailfins are at their best in brackish to marine conditions, and marine aquarists often use mollies to mature new systems. Before adding salt to your community it is vital to ensure that the other fishes and plants will tolerate it. If not, then set up a special tank for your mollies.

Poecilia latipinna is native to the southern USA and down into Mexico, and tolerates lower temperatures than are considered normal for "tropical" fishes (20-24°C/ 68-77°F). It is best to keep the cultivated forms at the upper end of this range. There are several colour varieties, for example, gold, black, and albino. The wild form is greenish with iridescent spangles on its flanks, but specimens with black speckling are also found, and it was from these that the black molly forms were developed.

Males are clearly distinguishable by their gonopodium and majestic dorsal fin. When courting a female, the male flashes his fin up and down to attract her attention. Fry are produced every four to five weeks. Move the female to a special aquarium, with thickets of fine-leaved and floating plants, to give birth,

after which she can be removed.

Poecilia salvatoris (liberty molly) (for many years thought to be a form of *Poecilia sphenops*), occurs in Guatemala and Belize. Not often seen, it is a beautiful fish with red, black, and white dorsal and caudal fins. It is hardier than the sailfin types and will tolerate soft water without the addition of salt.

The black molly is the result of crossing a black form of *P. latipinna* with *P. sphenops*. This popular hybrid comes in several varieties including the lyretail and the balloon.

Maintaining Mollies

Mollies are easy to keep provided you maintain good conditions. If water quality deteriorates, the temperature is too low, or there is a combination of these factors, mollies are often the first to show signs of distress, for example fins clamped to their bodies while they move listlessly or even rest on the bottom or "shimmy" on the spot. If the

temperature turns out to be correct, then a partial water change will usually rectify the problem.

Like other Poeciliids, mollies are true omnivores, eating just about anything which comes along. It is often recommended to add plenty of green food to their diet, and some people even suggest that it is difficult to maintain them in really good health without it. This, however, is simply not the case. Many specialist molly breeders feed no additional vegetable matter but nevertheless successfully breed and raise thousands to adult size. Mollies will browse on lettuce, peas, algae, and soft-leaved aquarium plants when nothing better is available, but this is because they are hungry all the time. Live foods such as *Daphnia*, bloodworm, and mosquito larvae are consumed with relish, as are minced fish and frozen foods. Feed as often as possible to obtain the best growth rates.



A hybrid fish, the outcome of a cross between *P. latipinna* and *P. sphenops*, the black molly is easy to keep provided you keep it warm and pay careful attention to maintaining good quality water.



Belonesox belizanus (pike livebearer) is highly predatory and best kept in a species aquarium. It prefers live foods.

Other Poeciliids

Amongst the Poeciliids there are four other species which bear special mention: *Alfaro cultratus* (knife livebearer), *Belonesox belizanus* (pike livebearer), *Heterandriaformosa* (mosquito fish), and *Limia melanogaster* (black-bellied or blue limia).

The Knife Livebearer

The knife livebearer has two rows of scales along the lower edge of the caudal peduncle which look like the blade of a knife. Pale in colour, the iridescent sheen on the bodies of healthy fishes makes them well worth keeping. Males grow to about 5 cm (2 in) and females 7.5 cm (3 in). They can be successfully kept in a community tank with peaceful fishes of similar size.

Females produce up to 100 young every month or so. The parents are cannibalistic but floating plants will help cut down on fry losses. Remove the fry to a rearing tank as soon as you see them. Because of their nervous disposition, it is unwise to move a heavily pregnant female.

These fishes do best when fed live foods but will also take flake foods. Feed the fry on newly hatched brine shrimp.

The Pike Livebearer

The pike livebearer is a different fish altogether. Males grow to about 10 cm (4 in) and females to about 18 cm (7 in). They are out-and-out carnivores, taking anything that moves, from insect larvae to small fishes and even their own kind. The jaws literally bristle with very fine teeth. It is possible to wean them on to dead foods but this takes time and patience.

Their very nature dictates that they should be kept in a species aquarium. Typical ambush predators, they like to lurk in the seclusion of plants and lunge out to take their prey. Their potential size dictates a roomy aquarium. The water should be warm (26-28°C/79-82°F) and kept clean by means of good filtration and regular partial water changes.

Females should be allowed to give birth in a nursery tank and then returned to the main aquarium. As many as 250 fry may be produced by a large female. Getting sufficient small live foods for the youngsters can be a problem as they will eat day-old guppies as well as *Daphnia* right from the start, and if they do not get enough, they will eat each other. To minimize cannibalism, plant the rearing tank heavily.

The Mosquito Fish

Heterandria formosa is one of the smallest of livebearers: males reach only 2 cm (³A in), and females 3.5 cm (P/8 in). It is native to North America from Florida to North Carolina.

Provide a well planted species aquarium and hard alkaline water at a temperature of 20-24°C (68-77°F). They can be kept outside during the summer and this enhances their brown colouring, perhaps due to the constant supply of live food.

Fry are produced on a "conveyor belt system", with embryos at every stage of development at any given time, so that fry are born one or two at a time on a continuous basis. They are very large in relation to the mother and able to take small live foods. This method of reproduction (superfoetation) gives them a much better chance of survival.

The Black-bellied Limia

Mature females of *Limia melanogaster* have a blue-black patch covering half the belly near the anal fin, and numerous black vertical bars on the flanks. The dorsal has several black crescent markings. In males the lower half of the body, from the gonopodium to the tail, is deep bluish black. His flanks and dorsal fin markings are as in females and the dorsal and caudal fins are yellow to orange.

Black-bellied limias like a well-planted aquarium with efficient filtration and regular partial water changes. The temperature should be between 22-26°C (72-79°F), and the diet varied.

From 10 to 50 fry are produced monthly, and they will feed on small commercial foods and newly hatched brine shrimp within an hour of being born.

KILLIFISHES

The egg-laying cyprinodonts have always been regarded as difficult because they are believed to require special conditions, namely soft acid water, but while this is true for some species it certainly isn't the rule for all of them. Many are exceptionally colourful and this alone makes them good aquarium fishes, but to see them at their best requires dedication on the part of the aquarist. It takes a lot of time and patience to maintain banks of small species aquaria, remove eggs from spawning mops, or dry out peat and then raise the fry. For those of us who have kept killifishes the work involved is worth it. If you haven't very much space, then try with a single species tank.

In nature, killifishes are found throughout the tropics with one exception, Australia, and some have even entered the temperate zones. Most are small fishes, but a larger one that is becoming a fairly regular import is *Lamprichthys tanganicanus*, from Lake Tanganyika, which can grow to 13 cm (5 1/2 in). This is a really beautiful fish, with a pale yellowish body overlaid by brilliant blue spots in the male, or silver spots in the female. This is a hardwater killifish which will fit in well with other fishes of a similar size, although it is best kept in a school of 6 to 10 individuals.

Killifishes are predominantly insectivores, and a supply of live foods is very important as some will refuse to take anything that doesn't move. *Daphnia*, *Cyclops*, and mosquito larvae are the usual standbys, but you can also hatch brine shrimp eggs, or culture whiteworm and microworms, to feed to your

fishes. Feeding is very important if you are to achieve any success in breeding them, and this applies not only to getting the adults into condition but also to growing on the fry. It is frequently a lack of attention to correct diet rather than water quality that brings about the demise of many killifishes (and so deters the amateur aquarist from continuing with these fishes). Another factor in their demise can be a poor choice of companion fishes. For example, the trailing finnage of the males is far too great a temptation for some of the barbs which will harass the killifishes, damaging their fins. This can lead to a fatal infection or to the killifishes being bullied to the point where they are prevented from feeding. Needless to say, most species are best kept in a single-species aquarium.

Substrate Spawners

Sometimes referred to as "annual fishes", these killies inhabit ponds that evaporate during the dry season so that the adult fishes perish. To ensure the survival of the species, the fishes spawn in the substrate and the developing eggs remain in the dried-out mud until the next rains. Not all the eggs hatch at the first wetting. This is because if the first downpour turned out to be a freak shower and the pond then dried up again, the fishes would die out. Some of the eggs, therefore, need a second or even third wetting before they will hatch, thus securing the survival of the species.

Aphyosemion oeseri deposits its eggs on fine-leaved plants. Alternatively use mops and pick off the eggs, ready for hatching in another tank, which should be filled with water from the breeding aquarium.



Cynolebias nigripinnis (Argentine pearl fish) should be kept in a species aquarium. Males are more



Pterolebias sp. are South American substrate spawners. Males are larger and have longer finnage than females.



Aphyosemion sjoestedti (blue gularis) should be kept in soft, slightly acid water. They spawn in the substrate. highly coloured than females.



Aphyosemion deltaense can be aggressive. Ensure the female is ready to breed before putting a pair together.



In the aquarium, some substrate spawners ("annual" fishes) can live for longer than a year because their water source does not dry out.

Examples of this method of reproduction are the South American genera *Cynolebias* and *Pterolebias*, and the African genus *Nothobranchius*. Each species has its individual requirements, for example water temperatures and exact storage time for the eggs, so you will need to check up on these, but we will give you some general guidelines for breeding these fishes.

Breeding Substrate Spawners

The males are larger than the females with intense coloration and extended finnage; in total contrast, the females are normally a pale grey/brown and much smaller, so it is easy to tell whether or not you have a pair. It is normal to have to buy them in pairs, but if you are trying to breed from them, it is best to have one male and two females. This is because the male will drive the females very hard when spawning, and by introducing two females into the aquarium he has to divide his attentions between them.

Prepare the breeding aquarium with a peat substrate 4-5 cm (1 1/2-2 in) deep and add a couple of clumps of fine-leaved plants such as *Elodea* or *Myriophyllum* as cover for the females. The water should be mature, soft, slightly acid (the peat will do this), and about 25 cm (10 in) deep. Sometimes it is necessary to boil the peat before using it in the aquarium so that it will sink. Boiling also sterilizes the peat, so the eggs are less likely to suffer from any bacterial or fungal infections.

Condition the parents well with plenty of live foods such as *Daphnia* and insect larvae. When the females are full of roe place them in the breeding tank and allow them to settle before adding the male. His courtship display to the female consists of displaying his fins and posturing. If she is ready to spawn, the pair will dive into the substrate, the male clasping the female with his fins. In some species the pair disappear beneath the surface of the substrate, but in others the fishes seem just to push the eggs down into the peat. Once spawning is complete, the female will appear very thin and rest on the bottom. Remove her to another tank to recover and feed her well. The male should be placed in another aquarium until the female is ready to mate again.

Now you can drain the water and peat from the spawning aquarium through a net. An old pair of tights is useful for this but make sure there are no holes or ladders in the bit you are using, and don't forget to check with the owner first to make sure you can have them! Squeeze the water out of the peat so that it is damp and crumbly, then check it for eggs. Depending on the species, these will be small brown or white spheres about 1 mm (1/32 in) in diameter. Assuming that you find some, you can then store the peat and eggs in a plastic bag for the recommended time for that species. This is usually 3-4 months. LABEL THE BAG WITH THE SPECIES NAME, AND DATE IT. There is nothing more annoying than taking a guess at what's in the bag and how long it has been in the bottom of the airing cupboard. Eggs should be stored at



***Nothobranchius rachovi* (Rachow's *Nothobranchius*) is an African annual. Feed them plenty of live foods.**

a temperature of about 22—24°C (72-75°F); the bottom of the airing cupboard is usually ideal but make sure by leaving a maximum/minimum thermometer in there for a while, and checking it each day to see what the average is.

After the requisite period of storage the eggs can be hatched. But before you start hatching them, prepare your fry food by setting up a brine shrimp culture so that the eggs hatch to coincide with fry needing to be fed -many fry have been lost because fry foods were not ready at the right time.

Place the peat/egg mix in an aquarium and add rain water which has been warmed to about 22°C (72°F). With any luck, within 24 hours you will see fry emerging. If you don't, then add some live food, e.g. *Daphnia*, to the aquarium; these will decrease the oxygen content of the water and this should trigger hatching. The fry of most species are large enough to take newly hatched brine shrimp as their first food. Don't forget to dry the peat out again and store it for another month before re-wetting as there may still be some dormant eggs in it.

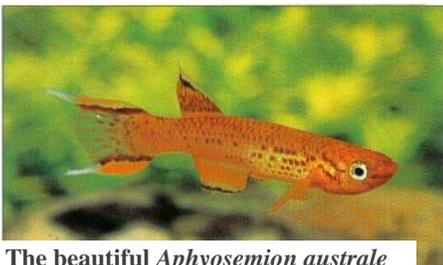
Popular species of this type of killifish include *Nothobranchius guentheri*, *Nothobranchius rachovi*, *Cynolebias bdloti*, *Cynolebias whitei*, and *Cynolebias nigripinnis*.

Breeding Plant Spawners

The killifishes which lay (or, more correctly, hang) their eggs from plants are considered easier to breed. Again set up a breeding aquarium, but this time use a gravel substrate and either fine-leaved plants or spawning mops. Most people use spawning mops as they are more convenient than plants and can be removed every couple of days to harvest the eggs-

Spawning mops are made of yarn attached to a cork or polystyrene float so that the yarn hangs down into the water. Alternatively, they can be attached to a stone so that the yarn floats upwards. You will need to check where the fishes spawn - up in the plants or near the substrate - so that you can position your mops accordingly. If you don't know, provide both types.

Again, condition the parents well on live foods before placing them in the breeding tank. The male will chase the female through the plants/mops and some eggs will be deposited at each pass. Check the mops every couple of days and pick off the eggs. Some species lay them close to the knot at the densest part of the mop, others lower down the strands. Place the eggs in shallow containers (small ice cream containers or margarine



The beautiful *Aphyosemion australe* (Cape Lopez lyretail) is available in two different colour forms. This is the orange form.



Procatopus similis (Nigerian lampeye) is a shoaling fish which must be kept in well-maintained water. They are not easy to keep and a diet of live foods is beneficial.

tubs are ideal) with water from the breeding tank to hatch. The containers can be kept on top of the aquarium or floated in it - either way they should not get too hot or too cold. On hatching, feed the fry on newly hatched brine shrimp, but be sure to keep the fish-hatching containers clean and free from debris by regular, small, partial water changes. Once large enough the fry can be moved to an aquarium to grow on.

This method of reproduction is practised by many members of the genus *Aphyosemion* and these highly coloured fishes are much prized amongst hobbyists. Popular species which are sometimes found in retail outlets include *Aphyosemion australe*, *A. gardneri*, and *A. striatum*. Other recommended species include *Epiplatys dageti*, *Epiplatys sexfasciatus*, and *Rivulus cylindraceus*. All require soft slightly acid water

Unlike *Epiplatys annulatus* (clown



killifish), *E. dageti* (above) are ideal killifishes for beginners as they are easy to keep and breed.



A timid fish, *Epiplatys singa* (spotted *Epiplatys*) needs a quiet planted aquarium. Use aged water for water changes as they are sensitive to too much new water.

for breeding. Hard water species which breed in the same way include *Cyprinodon macularius*, *Cubanichthys pengellei*, *Fundulus chrysotus*, and *Profundulus labialis*.

Other Spawning Methods

As with all groups of fishes there are exceptions to the rule. This is certainly true of killifish reproduction, and there are many species which do not fit into the two neat groups described above. *Xenopoecilus* species, for example, use internal fertilization of the eggs which are then expelled by the female and hang from her vent like a bunch of grapes. They remain attached for the full 15 to 20 days it takes the embryos to develop before they hatch. Fishes that reproduce in this way are sometimes known as "egg-laying livebearers".

Another species which bucks the trend is *isjordanellefloridae* (American flagfish). In this species the pair lay their eggs at the base of a clump of plants or in a fanned-out depression in the substrate (sand is the best substrate for this). Spawning continues for several days after which the female should be removed. The male continues to look after the eggs and young until they are large enough to fend for themselves.

Killifishes for the Community Aquarium

Despite their reputation for being difficult, it is possible to keep some killifishes in a community aquarium, and here three species spring readily to mind: *Aplocheilichthys lineatus* (sparkling panchax), *Pachypanchax playfairi* (Playfair's panchax), and *Oryzias latipes* (rice fish or medaka). These are surface-dwelling species, so they make a useful addition to the aquarium in that they occupy an area of the tank that is usually ignored when buying fishes.

Aplocheilichthys lineatus (sparkling panchax) really live up to their name: the iridescent yellow spots on the scales shimmer in sunlight. These are true surface dwellers; they have long, straight backs with the dorsal fin set well back. Males are larger and more colourful than females, but the chief distinction between them is the six to eight vertical bars on the posterior half of the female's body. Predatory by nature, they feed almost exclusively on insect larvae and insects that fall on the water's surface. Whenever possible, and especially if trying to



Rivulus milesi (yellowtail panchax) will proliferate in a well-planted species aquarium. This fish is a male; females are plainer.

breed them, feed live foods, especially mosquito larvae which they love. Fortunately for the aquarist, if you do not have a good supply of live foods, they will also take flake and frozen foods which they catch as the food sinks. They don't, however, like to feed from the substrate. Being predatory, they will eat small fry so don't expect to find many young guppies or sword-tails surviving in your aquarium if you choose to keep sparkling panchax.

A layer of floating plants will help discourage the sparkling panchax from jumping and will



Cyprinodon variegatus (sheepshead minnow) is found along the eastern seaboard of the USA in brackish water.

provide a spawning site. They tend to leap when feeding or if chased by other fishes, but the plants give them a retreat where they can hide instead of leaping about.

Although they will spawn on plants in the community aquarium, you can also put spawning mops in the tank and the fishes will usually lay some of their eggs on these. The mops can then be transferred to shallow containers for the eggs to hatch. If you are using Indian fern (*Ceratopteris thalictroides*) or water lettuce (*Pistia stratiotes*) as floating cover, the fishes will spawn amongst the dangling plant roots. In this case, the plant can be removed but do replace it with another one. If you have the time, you can pick the eggs off the mops or plant roots. Hatching takes about two weeks, and when the fry hatch they are quite large and will accept such foods as newly hatched brine shrimp and powdered flake. A more natural alternative is to float rafts of mosquito eggs in the hatching containers; as the tiny mosquitoes hatch, the young fishes feed on them.

Do not keep the fry in their hatching containers too long or



Aplocheilichthys lineatus (sparkling panchax) is an easy to keep surface dweller. They thrive on a diet of mosquito larvae. Be sure to keep the aquarium tightly covered — these fishes jump when frightened.

they will become stunted. Prepare a growing-on tank with water from the main aquarium and use a filtration system that will give a gentle flow. The water should be shallow but can be deepened as the fishes grow. You should see the young fishes in a small shoal, swimming in the water flow, and if you add some small floating plants such as *Riccia* these will give them somewhere to hide.

Pachypanchax playfairi (Playfair's panchax) is found in the islands of Madagascar, Zanzibar, and the Seychelles. It is a pretty fish, whose dark body has bright iridescent spots. They are territorial and can be aggressive but, provided they are kept with similar-sized fishes (say 5-7.5 cm/2-3 in) in a well-planted aquarium they usually do no harm. They occupy the upper levels of the tank and like to lurk amongst the plants. Keep the aquarium tightly covered because they do jump.

If happy in the aquarium, they will breed. The eggs are laid on plants and the adults are cannibalistic towards both their eggs and the resulting fry (they will eat smaller fishes of any kind), but with plenty of plant cover a few fry will survive. Alternatively, the fishes can be maintained in the community aquarium but then transferred to a specially set up tank, containing plenty of plants for breeding, should you wish to raise a lot more fry. When spawning is complete (5-7 days), remove the parents and leave the eggs to hatch. A good pair may produce up to 200 eggs which hatch in about 12-14 days. The fry will feed avidly on live foods so ensure you have the brine shrimp ready.

Oryzias latipes (rice fishes) are

lively shoaling fishes that need to be kept as a small shoal otherwise they will pine away. Small, 4 cm (1½ in) at most, they make ideal community fishes as long as there are no larger fishes to bully them. Ensure that the tank is well planted and that you have a tight-fitting cover glass as rice fishes may jump. Feeding them is no problem as they take commercially prepared flake and frozen foods, although they do seem to benefit from live foods, developing a really bright sheen all over the body.

Males are larger than females, with a metallic blue sheen on the body and larger dorsal and anal fins. Their anal fin may have slightly extended rays giving the edge a ragged appearance. There is a gold form of this species as well as the normal wild form. Other species include *Oryzias melanostigma* and *Oryzias cdebensis*.

These creatures have an interesting way of reproducing. First of all they internally fertilize the eggs a few hours before the latter are expelled by the mother (another "livebearing egglayer").



Pachypanchax playfairi (Playfair's panchax) is a large killifish which can grow to 10 cm (4 in). Females are slightly smaller than males and are more uniformly coloured. They spawn on plants, producing large numbers of eggs, so ensure you have sufficient space for the resulting fry.

When the female finally produces a bunch of eggs, they remain attached to her by a thin thread until such time as she brushes against a plant, to which they then adhere. She actually looks as if she has a cluster of eggs stuck to her vent, and may carry them for a couple of days before finally attaching them to a plant. The fishes spawn regularly, with a bunch of eggs being produced on a weekly basis, but if the opportunity arises, they will eat them. So if you wish to raise them in any number they should be spawned in a separate aquarium and the eggs carefully removed from the female's vent as soon as you see them. They are then placed in one of the small containers mentioned above. Once the eggs hatch the fry can be reared in the same way as other killifishes.

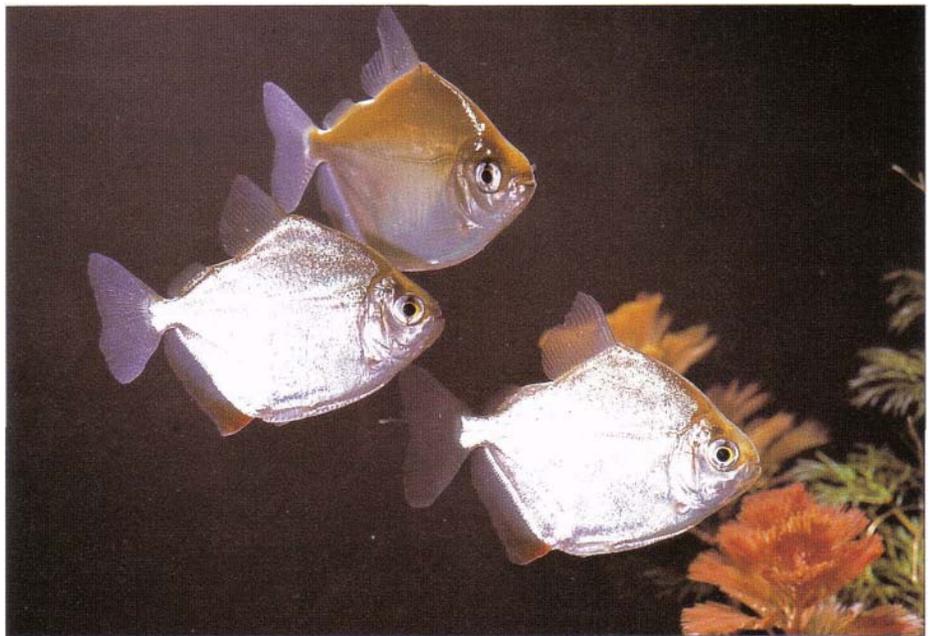
Sometimes the eggs fail to hatch or the fry stop feeding. There is no obvious reason why this should be, as other aquarists have great success with them in a wide range of conditions from soft acid to hard alkaline water.

Characins

The characins are a large group of freshwater fishes found in South and Central America and Africa. They are characterized by the Weberian Apparatus (the linkage of bones between the swim-bladder and the inner ear) that allows them to hear high frequency sounds. Although most characins have an adipose fin (a small fin on the back between the dorsal and caudal fins, the function of which is unknown) there are a few genera in which it is lacking, and just to confuse the issue even more, in one or two species, for example, some pencilfishes, some individuals have an adipose fin and others do not.

Characins are divided into 11 families, according to Eschmeyer (1990). Other authors recognize 14 to 15, but for our purposes it makes little difference, and there is no doubt that ichthyologists will go on debating the numbers of families for years to come. There are at present about 30 genera with some 200 or so species in Africa, and 250 genera with over 1000 species in Central and South America.

Their methods of feeding and diet vary greatly; there are the out-and-out predators such as *Hydrocynus goliath* (African tiger fish, wolf tetra), and *Phago* sp. (fin- or tail-biters); herbivores such as *Prochilodus* and *Distichodus*; and insectivores, which include the majority of the species. Most of the characins we keep in our tanks are insectivores, which will feed quite readily on live, frozen, and flake foods. The predators,



Larger, shoaling species require plenty of open water in the aquarium. Always check on their dietary requirements: some are herbivores and require supplementary feeds of lettuce, spinach, or prepared vegetable diets to deter them from eating plants.



Not often available, *Hemigrammus ulreyi* (Ulrey's tetra) is simple to keep provided you have soft, slightly acid water. If fed live or frozen mosquito larvae, they will develop an intense golden yellow line along the flanks and a sheen on the body.

however, can cause a bit of a moral dilemma as some of them will accept only live fishes. So; do you feed them live fishes or do you starve the predator? The decision has to be yours. The rule is, if you can't feed it, don't try and keep it. Probably the most difficult characins to keep in captivity are members of the genus *Phago*. These are usually referred to as fin-biters or



Ever popular, *Nematobrycon palmeri* (emperor tetra) is well suited to the densely planted aquarium. Being an insectivore it does not harm plants and provided you have some *Vesicularia dubayana* (Java moss) or fine-leaved plants they may spawn.

tail-biters, and this is precisely how they feed, by taking chunks out of the fins of other fishes.

Generally, characins are shoaling fishes (with a few exceptions) that live in clean, clear, running waters. In the aquarium they are sensitive to any deterioration in water quality. They also require water that has a high oxygen content and, again, will suffer if this requirement is not met.

African Tetras

Some of the genera we are concerned with here are *Alestes*, *Brydnus*, *Micralestes*, *Phenacogrammus*, *Arnoldichthys*, *Ladigesia*, and *Lepidarchus*. All require similar conditions in captivity and most make excellent community fishes for the larger aquarium. Always on the move, they need space to swim, so a long, well-planted aquarium is ideal. Create a current with a power filter to give the fishes something to swim against, but don't make it so strong that they are flattened against the opposite side of the aquarium.

Arnoldichthys spilopterus (African red-eyed tetra) grows to about 8 cm (3V4 in). A shoal should include both males and females. Males have more colour and are slimmer fishes; their anal fin is convex and has red, yellow, and black stripes. Females are deeper-bodied and their anal fin is virtually straight with a black tip. They require a large aquarium with plenty of open swimming space. Regular partial water changes, along with plenty of meaty foods such as mosquito larvae and bloodworm (live or frozen), will help to bring mature specimens into breeding condition. A good pair of these tropical egg-scatterers can produce in excess of a thousand eggs. The fry grow rapidly if well fed and can be 5 cm (2 in) long at about two months old.



***Brydnus longipinnis* (long-finned characin) looks its best in sunlight. Be warned - they may jump!**



Young *Phenacogrammus interruptus* (Congo tetra) should be well fed on frozen and live insect larvae.

Another popular species is *Phenacogrammus interruptus* (Congo tetra). Fully grown males are a truly magnificent sight with their extended finnage and delicate hues; by contrast females have short fins. When young they cannot be sexed as all have similar coloration and similarly-shaped fins. It is best to purchase a shoal of youngsters and grow them on, providing copious amounts of live foods, especially mosquito larvae and bloodworm. If you cannot get live foods then frozen are a good substitute. This way you get good quality fishes at a more reasonable price than by buying adults that may be too old to breed anyway. Congo tetras are egg-scatterers, so if they spawn in the community aquarium most of the eggs will be eaten. They can, however, be spawned successfully using mesh and Java moss.

Other fishes you may like to consider, and which require the same sort of conditions are *Brydnus longipinnis* (long-finned characin), *Alestes nurse* (nurse tetra), and *Micralestes acutidens*.



Adult Congo tetras require soft acid conditions and some vegetable matter in their diet.

Two delicate fishes that are also suitable for a community aquarium, provided the other inmates are small and the water is soft and slightly acid, are *Ladigesia roloffii* (Sierra Leone dwarf characin or jelly bean tetra) and *Lepidarchus adonis* (Adonis characin or jelly bean tetra - common names can be confusing). Both are small fishes, *L. roloffii* attaining 4 cm (1½ in) at most and *L. adonis* only 2 cm (¾ in). The main criterion for keeping these fishes is water quality: the water must be mature but without nitrates. A plentiful supply of small live foods is also beneficial, but not essential. Make sure the aquarium is well covered as *L. roloffii* jumps, especially when frightened. Some floating plants are beneficial as they seem to give the fishes a sense of security, making them less likely to jump.

Both species can be bred given the soft acid conditions required for spawning. *Lepidarchus adonis* (Adonis characin) places its eggs amongst fine-leaved plants and they hatch in about 36 hours. *Lepidarchus roloffii* (Sierra Leone dwarf characin) spawns just above a peat substrate. Neither fish is prolific, and the fry of both are very small and therefore require extremely fine, almost powder-fine, foods. Infusoria are good as a first food, followed by newly hatched brine shrimp.



***Arnoldichthys spilopterus* (African red-eye) is a must for the larger community aquarium.**

The *Distichodus*

Distichodus species are well known as plant eaters, but this should not deter you from trying to keep them at one time or another. All seem happy in water conditions of about 10-20 dH, neutral to slightly acid, and a temperature of 23-27°C (73-81°F) is suitable.

Feed them heavily with plant material, such as lettuce, peas, chickpeas, spinach, watercress, and courgette, and also flake and tablet foods. It is not unheard of for them to take live foods such as bloodworm, put in the tank to feed other occupants.

Several species are available to the hobbyist, two of them small. *Distichodus decemmaculatus* (dwarf *Distichodus*) from the Central Zaire basin grows only to 6 cm (2¼ in) at most, but, unfortunately, is rarely imported. This is a great pity as it makes an excellent fish for a community aquarium, being small, peaceful, and quite attractive with its moss-green body and vertical black stripes. The other species available is *D. affinis*, which grows to 12 cm (4½ in) and is found in the lower Zaire basin. It is ideally suited as a companion fish for catfishes and some of the peaceful cichlids.

There are three species which are very similar, all with red fins with spots at the base of the dorsal: *D. affinis* (12 cm/4½ in), *D. noboli* (8 cm/3¼ in), and *D. notospilus* (15 cm/6 in). *D. affinis* has rounded lobes to the caudal fin and the base of the anal fin is longer than the base of the dorsal fin. *D. noboli* also has rounded lobes to the caudal fin, but the anal fin has a shorter base than the dorsal. *D. notospilus* is very similar to *D. noboli*, but the tips of the caudal fin are



You may be tempted to buy a young, highly coloured specimen of *Distichodus sexfasciatus*, but think ahead. Although it will retain much of its colour, this fish can grow to 25 cm (10 in) and at that size it is a powerful creature that needs a spacious aquarium and good filtration. It can also take fright very easily, so make sure you have a tight-fitting hood or cover glass or you may find your fish on the floor.



Distichodus affinis attains only 7.5 cm (3 in), and may be kept with other medium-sized robust fishes such as *Thorichthys meeki* (firemouth cichlid). Feed plenty of vegetable matter otherwise any plants in the aquarium will be decimated.

pointed. Their ranges also differ: *D. affinis* is found in the lower Zaire basin, *D. noboli* in the upper Zaire, and *D. notospilus* from Cameroon to Angola.

The larger members of the genus include *D. lusosso* (40 cm/16 in), *D. sexfasciatus* (25 cm/10 in), and *D. fasciolatus* (30 cm/12 in). These three require a



Young *Distichodus lusosso* are attractively coloured. As they grow these herbivores require larger accommodation and may be housed with some of the larger peaceful catfishes such as *Pseudodoras niger*, with whom they will not compete for food.

large aquarium: 150 cm (60 in) or more long and wide enough for the fishes to turn round with ease. They also require very efficient filtration. These fishes make excellent companions for the larger peaceful catfishes such as *Auchenoglanis occidentalis* (giraffe catfish), large barbs, and/or other large, peaceful characins.

South American Tetras

This is the largest group of characins encountered by aquarists, and includes all the well-known species such as *Paracheirodon innesi* (neon tetra), *Hasemania nana* (silver-tip tetra), *Hemigrammus erythrozonus* (glow-light tetra), *Paracheirodon axelrodi* (cardinal tetra), *Hemigrammus bleheri* (rummy-nose tetra, red-nose tetra), *Hemigrammus rhodostomus* (also known as the red-nose, or worm-nosed, tetra), *Hyphessobrycon erythrostigma* (bleeding heart tetra), *Nematobrycon palmeri* (emperor tetra), *Moenkhausia pittieri* (diamond tetra, Pittier's tetra); and so the list goes on.

The South American tetras are, in the main, small fishes which are well suited to life in the community aquarium. They require soft, slightly acid conditions such as usually prevail in a mature furnished aquarium. Many people fail with them because they are too eager to add



Paracheirodon innesi (neon tetra) is commercially produced by the thousand for the aquatic trade so there is

Excellent water quality is essential for *Hemigrammus bleheri* (rummy-nosed tetra) as they are sensitive to any build up of nitrates.



little fear of decimating wild stocks.

them to a new set-up. The tank needs to have been in operation for several months before adding even the more hardy species such as *H. erythrozonus*. Six months to a year's maturation is best for the more delicate species such as cardinals. They are shoaling fishes, which like the company of their own kind, so rather than buying one or two of this species, one of that, and two or three each of several others, purchase eight or ten of your favourite and maybe six or eight of another. By doing this you will see more of the fishes, as given company they will not hide away in the plants.

Feeding is very simple. They will take commercial flake foods as a basic diet, but, in order to maintain some of the hues on the body, it is essential to feed either live or frozen foods. By varying the diet you will also be able to get the fishes into breeding condition should you wish to attempt to spawn them.

Hemigrammus erythrozonus (glow-light)



is also mass-produced. Before buying check for any resulting abnormalities such as deformed gill covers.



Male *Hyphessobrycon erythrostigma* (bleeding heart tetra) are recognised by their elongated finnage. Keep in soft, slightly acid water.

Breeding Tetras

Of the small tetras, neons have the reputation of being horrendously difficult to breed, and yet the truth is they can be spawned with almost the same ease as many of the barbs. The key to success lies in your choice of potential breeding stock and in how you set up the breeding aquarium.

In healthy well-fed fishes sexing is quite easy. Females tend to be larger and generally more rounded than males. As they fill up with roe this will become even more noticeable. The blue longitudinal stripe will also appear curved on the female, but straighter in the male. It may be a little difficult to see this difference, but body shape should be enough to separate the sexes without too many problems.

Take care in selecting the correct sizes of neon tetras to try to spawn. Big is not beautiful in this case. You need to look for fishes which are just over half grown. The 2-3 cm (3/4-1 1/4 in) range seems best. If you only have a choice between extra large or very small fishes then take a group of small ones and grow them up. It is better to wait a few months than to try to breed fishes which are too old and will never spawn for you.

In preparation for the spawning attempt you need to condition your potential breeders with plenty of live foods, such as *Daphnia* and newly hatched brine shrimp. It is also important to lower the pH and hardness of the water in which your fishes are living, to prevent them from going into shock when they are transferred to the breeding tank; over the few weeks it will take to condition your breeders with live

food you should therefore slowly add rain water or demineralized water to the tank to soften the water and lower the pH.

Your breeding tank does not need to be particularly large (about 50 x 25 x 25 cm (18 x 10 x 10 in) will do), but it does need to be clean, so make sure it is thoroughly cleaned out, before use, with either a chemical disinfectant or very strong salt solution. Whichever you use, make sure all traces are thoroughly washed away.

The aquarium can then be filled with demineralized water or pure rain water. Depending on how you collect the rain water, the hardness reading will be zero or maybe slightly above. If it is above 10 ppm then it has probably been collected from a roof which is made of something which has dissolved in the rain water running off it. In this case, collect again, making sure only pure rain water is collected.

Once the aquarium is filled with rain or demineralized water, add a few handfuls of peat. At first this will float on the surface, but after a few days it will sink to the bottom and in the process stain the water brown. Now check the pH. Ideally it should read between 5.5 and 6.5. If it is too high, then you will need to boil some more peat in a pan of rain water or demineralized water for half an hour and then, once cooled, add this to the aquarium. Alternatively, you can add one of the chemicals available from your local aquarium shop to lower the pH, following the manufacturer's instructions to the letter.

Once the water chemistry has been dealt with, set the temperature at between 24-26°C (75-79°F) and add several

artificial spawning mops made of nylon wool. Ideally these should be new ones or have been carefully cleaned before use.

The breeding tank is now ready for its intended occupants, which are best introduced in the evening, just before "lights out". Hopefully the next morning you should see your pair embracing off and on for a couple of hours. During these embraces the female turns to an almost vertical position with the male wrapped around her. Each time a few eggs are expelled and since they are only semi-adhesive some of them may fall through the nylon mops and drop to the bottom of the aquarium. During a good spawning up to 150 eggs may be laid. As soon as the pair have finished mating they should be removed to another aquarium (with matching water chemistry).

Sometimes a pair will not be ready to spawn as soon as you place them in the breeding tank. In this case leave them for a few days to see if they will spawn. If, after this time, they have still not bred, then remove them and try another pair, or wait for a week and try with the originals again. Under no circumstances should you risk pollution by feeding the adults in the breeding aquarium.

Once the adults have been removed cover the tank with dark brown paper to exclude some of the light. The next day the eggs should hatch; and on the fourth day after spawning the fry will become free-swimming and will need to be fed the very smallest of foods such as infusoria or a liquid fry food, followed after a week or so by newly hatched brine shrimp. Once feeding on brine shrimp, the fry grow quickly and will be sexable after about 12 weeks.



Young *Moenkhausia pittieri* (diamond tetra) look nothing like this beautiful male, but given good conditions, they will mature into quality fishes.



This is the original form of *Gymnocorymbus ternetzi* (black widow): fish breeders have developed albino and long-finned varieties.



Thayeria boehlkei (penguin) are usually seen "hovering" at an angle in mid-water. A shoaling fish, they like the company of their own kind.



A mature aquarium is essential for *Paracheirodon axelrodi* (cardinal tetra). Most failures are caused by unsuitable water.



Here we see the pigmented epigeon version of *Asyanax mexicanus* (blind cave fish).

Pencilfishes

These fishes belong to the family Lebiasinidae and several species are available in the trade at one time or another. They may be kept in a community aquarium, but if the water conditions are less than ideal, or they are prevented from feeding by more boisterous fishes, it is better to house them in species tanks.

Pencilfishes are small and timid surface dwellers, and much of the day is spent motionless just below the surface so that they look like pieces of twig. Only at dusk do they come to life, when they start to feed on insects that have fallen on the surface or on small aquatic invertebrates. Some species will also search the substrate for food, sifting the mud and silt in search of small worms and so on. In the aquarium, they accept flake, brine shrimp, and small frozen foods but prefer live *Daphnia* and other pond foods. As they are most active in the evening, this is the time to feed them.

Ideally the water in the aquarium should be soft, slightly acid, and free from nitrates. Maintenance of good quality water is essential if you wish to succeed with these fishes. The pH may vary between 5.5 and 7.0 provided any changes are gradual. Use a dark substrate, and plant with clumps of *Cryptocoryne* with some floating plants such as Indian fern (*Ceratopteris*



Nannobrycon eques (hockey-stick or three-striped pencilfish) requires soft acid conditions and peaceful companions, and has a preference for live foods.

thalictroides) to keep down the light and also provide hiding places among its trailing roots. The temperature should be in the range 23-28°C (73-82°F).

The colour patterns on their bodies change from day to night; what appear as faint vertical black patches during the day become predominantly black markings at night, while those which were prominent during the day fade away.

Breeding these fishes is difficult but not impossible. The main requirements are a breeding tank with mesh that the eggs can fall through, a clump or two of Java moss or synthetic substitute on top of the mesh, very soft (2 dH or less) slightly acid water (about pH 6.0), dim light, a dark bottom (black paper beneath the tank works well), and a pair of willing fishes. If

everything goes to plan, the eggs will be released and fall through the mesh before the parents can devour them, but sometimes the fishes will not spawn. This is usually because they have not been fed the right foods so that the diet has been lacking in amino acids. Feeding mosquito larvae and *Drosophila* (fruit flies) will usually rectify this. Of the two genera, *Nannobrycon* and *Nannostomus*, the latter is the easier to breed.

We suggest you try *Nannobrycon eques* (hockey stick or three-striped pencilfish), *Nannobrycon unifasciatus* (one-striped pencilfish), *Nannostomus beckfordi* (golden pencilfish), *Nannostomus harrisoni* (Harrison's pencilfish), *Nannostomus marginatus* (dwarf pencilfish), and/or *Nannostomus trifasciatus* (three-lined pencilfish).



The anal fin of male *Nannostomus harrisoni* (Harrison's pencilfish) is more colourful than the female's.



There are several colour forms of *Nannostomus beckfordi* (golden pencilfish), one of the easiest "pencils".



The body colour of *Nannostomus trifasciatus* (three-striped pencilfish) will intensify once they have settled in.

Splash Tetras

The splash tetras belong to the same family as the pencilfishes. Unfortunately the majority are rarely deliberately imported for the aquarium trade but do turn up occasionally in shipments of other fishes. The only one seen on a fairly regular basis is *Copdla arnoldi* (splash tetra, jumping characin), the fish that gives the group its common name. A fairly unassuming fish to look at, males are larger, growing to 8 cm (3 1/4 in), and have more colour in their finnage than females, 6 cm (2 1/4 in).

Copdla arnoldi (splash tetra) is a good community fish which inhabits the mid- to upper layers of the aquarium. If possible, keep a group, or if not, a pair, as their main attraction is their unusual method of reproduction. Water conditions are not critical: keep the hardness below 12 dH and the pH around neutral (so most community aquaria with plenty of plants will suit this fish). Regular partial water changes are essential to keep them healthy. If they become listless or hide all the time this usually indicates a slight deterioration in water quality. A partial water change will rectify the situation.

C. arnoldi (splash tetras) will jump to catch food and also when breeding. The addition of floating plants such as Indian fern (*Ceratopteris thalictroides*), and the provision of a good cover glass, will ensure that they do not leap to their deaths.

Feeding is not a problem as they accept flake, frozen, and live foods, but to condition them for spawning, offer plenty of live and frozen invertebrates such as *Daphnia*, bloodworm, and mosquito larvae; preferably live.

Breeding Splash Tetras

Place a pair in a small breeding tank (this need be only about 50 cm (18 in) long), using water from the main aquarium, and make sure that you have some broad-leaved plants such as *Echinodorus* sp. (Amazon sword plants) whose leaves reach just above the water surface. Place a tight cover glass over the aquarium and make sure the water level allows a small gap between the water surface and the cover glass.

When ready, the pair will swim together and then jump. Pressing their bodies close together and turning belly-up, they deposit a few eggs on the underside of a leaf or on the cover glass. This all happens in a split second and is repeated many times, with eight to ten eggs being deposited on the chosen site at each jump. By the end of spawning there will be a clutch of up to 200 eggs. As these are above the water, the male tends them, splashing water over them every 30 seconds or so, hence the common name. If unfertilized eggs fall off the leaf/cover glass the male ignores them. The eggs hatch after about 60 hours and the fry drop into the water. It takes another 36-48 hours for the fry



Copella arnoldi (splash tetra, jumping characin) is famed for its method of reproduction, in which the pair jump, turn, and press their eggs onto the underside of a leaf. As they like to jump, be sure to cover the aquarium tightly and use some floating plants to discourage this activity.

to absorb their yolk sacs, after which they require small foods such as newly hatched brine shrimp.

Other members of the genus may also be kept in the community aquarium, but their method of breeding is "normal". After conditioning, the pair spawn on a pre-cleaned leaf and the male tends the eggs, which hatch in about 30-36 hours. The fry require fine foods such as infusoria followed by newly hatched brine shrimp.

Copdla guttata (red-spotted characin), a much larger fish (growing to 15 cm (6 in)), places its eggs in a depression in the substrate. Again, the male guards the eggs. On hatching, they should be raised in the same way as the other species.



Usually found near the surface, *Pyrrhulina brevis* (short-lined *Pyrrhulina*) make ideal companions for *Corydoras* catfishes and some dwarf cichlids. They can be quarrelsome when breeding - and they jump!

Hatchetfishes

When you think about surface-dwelling fishes for the community aquarium, usually the first ones that spring to mind are the hatchetfishes of the family Gasteropelecidae. The two genera usually encountered by the aquarist are *Gasteropelecus* and *Carnegiella*. These are easily differentiated as *Gasteropelecus* is larger (up to 9 cm (3¹/₂ in) in the case of *G. maculatus*) and has an adipose fin, whereas *Carnegiella* is smaller (4 cm (1¹/₂ in) in the case of *C. strigata*) and lacks an adipose fin.

These fishes are characterized by their straight dorsal profile, deeply keeled bodies, and pectoral fins set high on the body, looking like wings. "Hatchets" jump, not only to catch insects but also to escape predators. They also "fly": a strong set of muscles attached to the hypoco-racoid bones (the deep "breastbone") enables them to flap their pectorals at great speed when they leave the water.

The two species most commonly available are *G. maculatus* (spotted hatchetfish) and *C. strigata* (marbled hatchetfish).

There are two sub-species of *C. strigata*, from different localities; *C. strigata strigata* is found around Iquitos in Peru, and *C. strigata fasciata* in Guyana. Of the two, the Guyanan fishes are the easier to keep.

Hatchets like a very good flow of highly oxygenated water and will hold station in a current strong enough to start breaking up the softer plants, so try to achieve a happy medium that satisfies the fishes but does not damage the plants. Always keep them in a shoal of at least five fishes: their reputation for being difficult to acclimatize to aquarium conditions is largely due to people trying to keep single or at most two specimens - a recipe for disaster.

Carnegiella strigata (marbled hatchetfish), in particular, is prone to white spot. If at all possible, quarantine the fishes for a minimum of two weeks before putting them in the community aquarium. Check the fishes in your dealer's tank; a reputable trader will have quarantined his or her fishes and offer you only healthy stock.

Unfortunately flake foods are not enough for hatchetfishes,



A surface dweller that likes a powerful flow from an external power filter, *Carnegiella strigata* (marbled hatchetfish) is regarded as "difficult", not only because of the need to provide it with a very varied diet but also because it is prone to white spot.

and it is necessary to take a little time and effort to provide them with live and frozen alternatives. They love fruit flies and mosquitoes, including mosquito larvae, so try and offer a varied diet of this type. Their mouths are upturned, indicating that they are surface feeders; although they will take food as it sinks, they will not forage on the bottom.

C. strigata (marbled hatchetfish) has been bred in captivity. This requires very soft, acid water. The eggs are deposited on the roots of floating plants but some will fall to the bottom. They hatch in 24-36 hours and the fry require very small live foods. Just keeping the parents healthy can be a challenge, so breeding them is even more so.

Two other species are occasionally available, but these are far more delicate than *C. strigata* and *G. maculatus*. They are *C. marthae* (black-winged hatchetfish), from Venezuela, where it is found in small woodland streams, and *C. myersi*, from the Peruvian Amazon and Bolivia.



Gasteropelecus sternida (common hatchetfish) is more suited to a community aquarium although it too requires a very varied diet. Floating plants will provide security, but leave adequate feeding space.

Anostomids

You could be forgiven for thinking that these fishes are surface dwellers, because they have long, streamlined bodies and small upturned mouths. But nothing could be further from the truth. The anostomids, sometimes referred to as "headstanders", inhabit very fast-flowing waters in rocky stretches of rivers. They are found, head down, in narrow, vertical, rocky fissures. In the aquarium provide vertical crevices, which can be constructed from either actual rocks or plastic substitutes to lessen the weight.

Keep anostomids either as a single individual in the community aquarium, or in a group of seven or more. For reasons best known to themselves, they become very aggressive if kept in small groups - a similar situation to that encountered with *Barbus tetrazona* (tiger barbs) (see Cypriniformes chapter). They are predominantly herbivores and will graze on algae and plants. In the furnished aquarium offer lettuce leaves "planted" in the substrate and the fishes will take these in preference to the aquarium plants. Peas are another suitable substitute food. Small aquatic invertebrates such

as mosquito larvae and blood-worms are also relished, and young fishes will take flake foods, especially vegetable flake.

Anostomus anostomus (striped headstander) is the species most often offered for sale. They are stunningly coloured, with dark gold and black stripes running the length of the body and bright scarlet patches at the base of the caudal fin. They adapt readily to aquarium life and will mark out territories in the tank. Provide them with strong filtration - ideally the water should be turned over twice an hour. They are reported to have been bred, but no details are as yet available.

Two other species are occasionally obtainable. *Anostomus ternetzi* is similarly coloured to *A. anostomus*, but is slightly smaller and lacks the red coloration in the caudal fin. It is a more peaceable species than *A. anostomus* and can be kept under similar conditions. *Anostomus taeniatus* also appears now and again, and is likewise a peaceful shoaling fish requiring the same aquarium conditions. It has a single black stripe along the body, with gold above and cream below. At night it changes its colouring to brown with faint cream markings.



Leporinus fasciatus (black-banded Leporinus) may quarrel among themselves, but are peaceful towards other fishes. Largely herbivorous, they may nibble plants.



Often mistaken for an anostomid because of its "head-down" method of swimming, *Chilodus punctatus* (spotted headstander) actually belongs to the family Curimatidae.



Anostomus anostomus (striped headstander) needs to be fed copious amounts of lettuce or peas to discourage it from decimating the aquarium plants.

Abramites hypselonotus (high-backed headstander) is a deeper bodied anostomid. Youngsters will tolerate one another, but when they get to about 10 cm (4 in) plus they can't stand the sight of each other.



Big Beasts

No piece about the characoids would be complete without mentioning some of the larger, more specialized fishes. Of these, the piranhas have a worldwide reputation. They belong to the family Serrasalminidae, which includes not only the carnivorous piranhas but also some large, peaceful herbivores.

Serrasalmus nattereri (red piranha) is a fine example of these fishes. It is the dream of many hobbyists to keep one or more, but few achieve this. Indeed, in some countries, for example the USA, they cannot be imported for fear of escapes, and/or release by irresponsible aquarists, into the wild, because of the danger of feral populations becoming established. This would decimate indigenous fish populations.

They are a fish that needs to be handled confidently but with extreme care - this cannot be over-stressed. If alarmed, their first reaction is to attack and bite, and as they are armed with a fearful set of teeth they can inflict serious wounds. Many a native fisherman has lost a toe to a piranha, but not when swimming in the water; more usually when he has caught the fish and it is flapping about in the bottom of the canoe. Even small specimens will bite.

When transporting them home they should be double-bagged, with a thick layer of newspaper between each of the polythene bags, so that if the fish bites through the inner bag, its teeth will not go through the soggy newspaper and puncture the outer one. Pack them one fish to a bag. Alternatively, transport them in rigid containers such as buckets with lids, and



The villain of the aquarium, *Serrasalmus nattereri* (red piranha) has a reputation to live up to. Whatever you do, do not take chances with these fishes; they have a sturdy set of teeth, and if cornered will not hesitate to lunge at your hand, the net, or anything else that they consider a threat.

again, one fish per container. Another word of warning: do not put your hands in the aquarium if you have any open wounds on them - it is not worth the risk.

In captivity they require a large aquarium with very efficient filtration and a good flow of water. Water chemistry is not critical: soft to medium hard water with a neutral or slightly acid pH is fine. As they are carnivores they produce a lot of high protein waste, so the efficiency of the filtration system is critical. Any deterioration in water quality will stress the fishes. Plant the aquarium with *Echinodorus* sp. (Amazon sword plants) and decorate with large pieces of wood that look like tree roots, to give the fishes some shelter.

Feeding piranhas is simple - they eat anything meaty, alive or dead - pieces of meat or fish are best. For young specimens use small pieces of food, and keep up a steady supply without over-feeding. Remember a hungry piranha is dangerous and will reduce a prey item to shreds. In the wild, piranhas are thought to feed on the fins of other fishes as well as whole ones.

Juvenile *S. nattereri* are silver-bodied with numerous black spots, while the pectoral and anal fins are reddish. As the fishes mature they lose their spots, becoming silvery with a more golden back, and with red on the throat and belly. If you wish to keep a group, it is best to purchase a shoal of youngsters and grow them up together; you will find that a hierarchy develops within the shoal. Provided you don't upset the status *quo* by adding more later, the shoal will flourish.

Serrasalmus nattereri has been bred in large aquaria. They spawn at first light and produce up to 1000 eggs. The male and female guard the nest for the first 24 hours, but the female is then chased away and only the male remains on guard. The young are relatively easy to rear on brine shrimp, but ensure that you have sufficient space to raise them. After about four weeks, they need to be graded by size otherwise the larger fishes will eat the smaller ones. Copious amounts of live foods, in ever-increasing sizes, are needed to raise them successfully.

In the same family, the Serrasalminae, we also find some harmless herbivores, one of the largest being *Piaractus brachypomus* (Pacu). Large fishes that grow to well over a metre (40 in), they are suited to public aquaria rather than the home aquarium. Small specimens are sometimes available, but do give due consideration to their potential size before purchasing one. If you can provide an aquarium of 200 x 60 x 60 cm (84 x 24 x 24 in), with a filtration system to match, you are partway there, but be prepared to move the fishes on to larger accommodation.

Pacu are vegetarians. In the wild their diet consists of fruit and seeds, while in captivity they will eat just about anything "vegetable": bananas, figs, cherry tomatoes, courgette, lettuce, pond weed; their philosophy seems to be, "If it's vegetable we'll give it a try!" They have very inefficient digestive systems and produce waste that forms food for other fishes. The large doradid catfish *Pseudorasbora niger* makes an ideal companion for a pacu and will sift through the detritus when feeding.

On a more manageable level, there are other peaceful herbivores in this family, such as *Metynnis argenteus* (silver dollar), *M. hypsauchen*, and *Myleus rubripinnis*. Under aquarium conditions all reach a reasonable size (10-15 cm/4-6 in). Being shoaling fishes, they make ideal companions for catfishes and loaches. They require plenty of space: an aquarium of a metre (36 in) or longer is required for youngsters, and 120 cm (48 in) or more for a shoal of six to eight semi-adult fishes. Water conditions are not too critical as long as they are soft and slightly acid



A very large fish (1 metre/40 in) best suited to a public aquaria, *Piaractus brachypomus* (Pacu) is related to the piranha but is a harmless herbivore.



Another herbivore, *Metynnis argenteus* (silver dollar), should be kept in a shoal in a large aquarium with subdued lighting. Buy youngsters to grow on, offering vegetable foods.



A peaceful characin that rarely exceeds 10 cm (4 in) in captivity but may reach 35 cm (10 in) in the wild, *Myleus rubripinnis rubripinnis* requires highly oxygenated, clear water.

and warm, up to 28°C (82°F). Make sure the filtration system is efficient and, especially for *M. rubripinnis*, that the water is well oxygenated.

Provide a planted aquarium but use artificial plants or very robust species of live plants such

as *Microsorium pteropus* (Java. fern) attached to wood and rocks, and large *Echinodorus* sp. (Amazon sword plants) and *Cryptocoryne* sp. planted in the substrate. Ensure that the plants are well established and growing vigorously before introducing the fishes to the aquarium. Provided you feed them well on a variety of vegetable foods (they are particularly fond of lettuce) the plants will not be harmed to any great extent.

Metynnis can be sexed by the anal fin, which in males is longer and more highly coloured than in females. They are shoal spawners and relatively simple to breed. The water needs to be soft, (less than 6 dH), acid (pH 6.0-7.0) and warm (26-28°C/79-82°F). These fishes like to spawn among floating plants, and a single female may produce up to 2000 eggs which fall to the bottom and are ignored. The fry are easily raised on small live foods, but many are lost because the average aquarist has insufficient space to cope with such large numbers of fry, both in terms of space and the quantities of food required.

Myleus rubripinnis is another matter entirely. These fishes are not readily sexable and so far have not been bred. They are more difficult to maintain than *Metynnis* because they do not tolerate any build-up of nitrates in the water, and they require higher levels of oxygenation.

Sometimes *M. rubripinnis* is seen with small spots on its body, looking like little tiny blisters about the size of a pinhead. At first they give the impression that the fish is covered with air bubbles but this is not so, they are the sign of a so far unidentified disease.

Anabantids

The anabantids are a large group of fishes found in the tropical waters of Africa and Asia. They are best known for their ability to breathe atmospheric air. The organ that they use for this is known as the labyrinth (hence the common name labyrinth fishes) and is situated on either side of the head in the gill cavity directly above the gills. The fish takes in air from above the water surface and passes it into two chambers, each of which has a rosette-like structure which looks not unlike a sponge. This has a very good supply of blood vessels close to the surface of the structure, and therefore the fish is able to absorb oxygen from the air.

Not only does this air breathing capability allow labyrinths to survive in waters that are oxygen deficient, it allows some of them to travel across land. The most notable of these is *Anabas testudineus* (climbing perch).

Labyrinth fish breeding strategies also reflect the low oxygen content of the water in which

some species live. Some construct bubble-nests to keep the eggs at the surface, others have floating eggs, and yet others hold their eggs in their mouths in a similar fashion to the mouthbrooding cichlids. Each method seeks to give the eggs the optimum conditions for development by keeping them in areas which are higher in oxygen or which will give them the greatest possible degree of protection.

The labyrinths are generally divided into two groups by the hobby: gouramis and climbing perches. The only problem with this arbitrary division is that gouramis can range in size from the 2.5 cm (1 in) *Trichopsis pumilus* (dwarf croaking gourami) to the huge *Osphronemus goramy* (giant gourami) which can attain lengths greater than 70 cm (28 in). This division also fails to take account of the various *Macropodus* (paradise fishes) and *Betta* (fighting fishes) species of which there are a growing number in the hobby.



Trichopsis pumilus (dwarf croaking gourami) is one of the smallest gouramis. Quite delicate, it is best kept in a species aquarium.



Pseudosphronemus cupanus (spike-tailed paradise fish) prefers a well-planted tank and small live foods.

Scientists, however, divide labyrinths into four families: Anabantidae, containing the genera *Anabas*, *Ctenopoma*, and *Sandelia*; Belontiidae, containing *Belontia*, *Betta*, *Colisa*, *Ctenops*, *Trichogaster*, *Malpulluta*, *Parosphronemus*, *Pseudosphronemus*, *Sphaerichthys*, *Trichopterus*, and *Trichopsis*; Helostomatidae, with the single genus *Helostoma*; and Osphronemidae, also containing a single genus, *Osphronemus*.



One of the least demanding anabantids is *Macropodus opercularis* (paradise fish); it is suitable for the novice aquarist.



Ever popular, *Betta splendens* (Siamese fighter) has been line-bred to enhance both the finnage and coloration of the males. Wild males are less splendid.

Gouramis

By far and away the most popular group of fishes among the anabantids are the gouramis belonging to the family Belontiidae. Of these, members of the genus *Trichogaster*, such as *I trichopterus sumatranus* (blue gourami), *I microlepis* (moonlight gourami), and *T. leeri* (pearl gourami), are probably the easiest fishes to keep because they are tolerant of most water conditions. They are medium-sized fishes (10-15 cm/4-6 in) and are well suited to a community aquarium as long as their companions are not too small. Occasionally, however, large adults will bully other fishes and may have to be moved to an aquarium in which they are the smallest fishes. The only other problem which may occur is the gouramis having their ventral fins nipped by their tankmates.

When purchasing them from an aquarium shop, try to buy them in pairs. Some species are virtually impossible to sex as juveniles, but as adults it should be obvious. The easiest way to sex them is to look at the dorsal fin; in males this is slightly longer than in females and may culminate in a point. In *Trichogaster leeri* (pearl gourami) males, not only is the dorsal fin longer and pointed, but the anal fin has extensions to the fin rays, and the throat is a beautiful blood red when the fish is in good condition.

The larger gouramis do not need any special conditions, although they do prefer the water to be on the warm side. Anywhere between 25-28°C (77-82°F) seems to suit them. The aquarium should be heavily planted towards the back and sides, and a few caves can be

created out of rocks or bogwood.

Colisa lalia (dwarf gourami) is another very popular gourami. They are ideal for the smaller community aquarium since they grow to a maximum of about 5 cm (2 in). They are normally sold only in pairs, mainly because the female is an uninteresting silvery colour with pale vertical bars, whereas the male's bars are a brilliant red alternating with blue. The temptation for the novice aquarist is to purchase the highly coloured fish: indeed, he or she may not even realize that the silvery creature is the female.

Other members of the genus *Colisa* are also suited to the smaller aquarium. The one you are most likely to come across is *Colisa sola* (honey gourami). Again females are rather drab, being a pale brown on the back and silver on the belly with a dark stripe running from the eye to the caudal peduncle. Males exhibit a similar coloration when they feel insecure, which they do in a shop tank, but once settled in your aquarium they will soon show their full colour. This consists of a lemon yellow dorsal fin and dark blue-black head, throat, and front portion of the anal fin. The rest of the body and fins is a lovely copper colour. These fishes are delicate, so be patient, and wait until you have more experience and your aquarium is mature before you try to keep them.

We suggest you try *Trichogaster trichopterus* (three spot or blue gourami), *T leeri* (pearl gourami), *T microlepis* (moonlight gourami), *T pectoralis* (snakeskin gourami), *Colisa lalia* (dwarf gourami), *Colisa fasciata* (giant gourami), and *Colisa labiosa* (thick-lipped gourami).



Trichogaster trichopterus sumatranus (blue gourami) may sometimes bully other, smaller fishes. Make sure their companions are large enough to look after themselves.



Trichogaster microlepis (moonlight gourami) can be very timid. This can be overcome by providing thickets of plants and some floating plants for privacy and security.



Male *Trichogaster leeri* (pearl gourami), such as the one shown here, are even more colourful when in breeding dress. Keep these fishes as pairs and, provided there are no boisterous tankmates, they may spawn.



You may wish to keep the west African *Ctenopoma kingsleyae* (Kingsley's *Ctenopoma*) in your community aquarium. Beware: *C. kingsleyae* is far more predatory than the other fishes shown here, and small tankmates may disappear.

Despite being a large fish (it can grow to more than 20 cm/8 in), *Trichogaster pectoralis* (snakeskin gourami) is very peaceful and thus a popular aquarium inmate.

Breeding Gouramis

To breed these bubble-nest builders, you will need an aquarium at least 100 cm (36 in) long for the larger species and 60 cm (24 in) for the smaller ones. Provide some thickets of plants which reach to the surface, and use only minimal filtration to create a very gentle water movement. The plants have a dual purpose: firstly they provide shelter for the female when the male becomes a little too pushy, and secondly, some species add plant matter to the bubble-nest to help bind the bubbles together. It is also important to have a tight-fitting cover glass over the aquarium so that the air space just above the water surface is warm and humid at all times.



Colisa sola builds its nest tucked away in a quiet area and usually near some plants. During construction the male will interrupt his work to display to the female.

Male *Colisa lalia* (dwarf gourami) are far more colourful than the plain silver females. They will sometimes breed in the aquarium but don't expect many fry to survive, especially if there are other fishes around.

The distance between the water and the cover glass should be about 5-10 cm (2-4 in).

Condition the prospective parents well on live or frozen foods. When they are ready to breed, the male will show interest in the female, seeming to be stimulated by the more rounded appearance of her belly. At this time, he will pick a quiet area of the aquarium, usually in a corner or very close to a clump of plants, and start to build a bubble-nest, taking air into his mouth from the water surface and expelling it through his gills. The mucus-covered bubbles float upwards and are kept in a small area by the floating plant leaves. If there is a strong current in the aquarium, the delicate nest will be swept away.

Every so often the male will break off from building his bubble-nest and court the female. This will usually take the form of much fin-spreading and wagging his body to and fro. This shows what a splendid male he is and helps excite the female. By the time the nest is complete she will be so worked up that she will spawn straight away. If she is not ready to spawn, however, they will fight, and the male may tear her fins. In this case you will have to move her out of the

Colisa sola (honey gourami; is easy to keep in a quiet community aquarium, or a species aquarium if you wish to breed them. Condition them on small live and frozen foods and, when ready, they will build a bubble-nest.

breeding set up and try again with another female, or return the original one a week later when she may have reached spawning condition.

Once spawning is under way you are in for a real treat. The pair embrace, with the male wrapping himself around the female and then turning her over on to her back as the eggs and milt are expelled. The eggs are lighter than water and float up to the surface. Once the male has recovered from the embrace he collects the eggs together towards the centre of the nest and carefully encases each one in a bubble of mucus-coated air. When the female has recovered from the embrace she helps collect the eggs. Once this task is complete the pair embrace again. During spawning up to 1000 eggs may be laid by the larger gouramis, but a more average spawning will contain about 250 eggs.

When spawning is complete, the male chases the female away and sets about tidying up the nest. First of all he searches round for any missed eggs and places them in the nest, then he blows more bubbles and builds up the nest even more. Once satisfied all is well, he settles down to wait for the fry to

hatch. This takes about 48 hours after which the fry can be seen with their tails hanging down from the nest. The male now has his work cut out making sure that any which fall out of the nest are caught up and pushed back in.

On the fifth day the fry become free-swimming and capable of looking after themselves. Soon afterwards the male starts to think of them as food rather than family, eating any he finds. Obviously he must be removed before this happens.

The fry of the larger species are easy to raise so long as you have a good supply of small live foods. Infusoria are necessary as a first food, and can be cultured in a separate container using banana skins or other vegetable matter. Alternatively use commercially produced liquid fry food which can be fed directly to the fry and will also create an infusorial bloom in the aquarium. These foods are needed only for the first week, after which they can be phased out and newly hatched brine shrimp used instead. A wide variety of small live foods, such as micro-worm and sifted *Daphnia*, need to be included in the diet to produce good, healthy youngsters. Fine-powdered fry food can be fed as a supplement but if fed to the exclusion of live foods will produce poorer results. The fry will grow fairly swiftly and, as broods can be large, ensure you have enough space to grow them on.

Colisa lalia (dwarf gourami) spawn in a similar manner to the larger species, but the courtship and nest of *C. sola* (honey gourami) are slightly different. Whereas the other species use quite a lot of vegetable matter in



Male *Colisa sola* (honey gourami) are more colourful than females, but youngsters rarely show any colour, so buy a group to grow on.

the nest, honey gouramis tend to use little or none at all. The nest is also much more untidy, but the eggs are kept in a single very tight clump right at the centre of the construction. Courtship is also a little different, with the male standing on his tail, so to speak, with his nose pointing towards the surface. His colours are heightened even more at this time, and he spreads all his fins to their utmost and wags his body to and fro.

In these small species the fry are also smaller, looking like little slivers of glass when they first hatch. Really small fry foods are needed and regular, small feeds throughout the day are better than one or two large meals. Be sure to keep the aquarium clean when feeding heavily, as uneaten food will cause a deterioration in water quality.

A word of warning: one of us, when breeding *Trichogaster*

trichopterus (three spot or blue gourami) for the first time, used an aquarium with very gentle undergravel filtration. Everything was fine while the eggs and fry were in the bubble nest, and even for the first few days when they were free swimming there did not seem to be anything amiss. Then, one morning, a glance into the aquarium revealed a lot of fry trapped in the gravel. They had been resting on the bottom and, even with what appeared to be a very gentle water flow, had been sucked into the substrate with disastrous results - their spines had been damaged. The best part of the brood was lost and a hard lesson was learned. For future spawnings an air-operated sponge filter was used and proved extremely successful. Not only did it filter the tank, but the young fishes were often to be found pecking away at the micro-organisms on the sponge.

Combtails

Bdontia signata (combtails) are not usually recommended for community tanks because as they get older they become somewhat belligerent, especially if they attempt to breed. At this time quarrels may break out between males as they tussle for the dominant female. In a species aquarium, the shoal develops a pecking order. Smaller fishes may be harassed to such an extent that they remain hidden all day. These medium- to large-sized fishes may be kept with others that are able to stand up for themselves.

Combtails will breed in the community aquarium. If several are kept together and they are well cared for, they will pair naturally, find themselves a prospective breeding site, and herd the other fishes out of the way. The eggs are laid in clumps under a plant leaf, usually in a single layer of bubbles. Once free swimming, the fry are very easy to raise as they will take flake and newly hatched brine shrimp. The problems arise as they grow, because the larger ones tend to bully their smaller siblings and it is not unusual to get a large number of runts in the brood.



Belontia signata (combtail) can be belligerent; keep them either with fishes of a similar size and disposition or in a species aquarium. When raising fry remove the larger, more aggressive fishes to allow the smaller ones to grow on.

Paradise Fishes

The first exotic aquarium fish to arrive in Europe was *Carassius auratus* (the goldfish), followed in the 1860s by *Macropodus opercularis* (paradise fish). One of the main reasons this fish survived the journey so far from its native haunts of southeast China and Korea was that it is so hardy. They can comfortably tolerate temperatures down to 15°C (59°F) and have even been known to survive temperatures as low as 5°C (41°F). Unfortunately they are somewhat aggressive towards smaller fishes and adult males will fight as aggressively as Siamese fighting fishes. At one time they were considered "king" of the aquarium world, but that was long ago before the more beautiful, but more delicate, truly tropical species were available. Today you

can still find the "original" species in shops, but there are also a number of different species of paradise fish which are seen from time to time. Most of these are smaller and more peaceful, but lack the lovely blue and red vertical stripes of the original. This coloration makes it even now a worthy addition to the larger community aquarium where the smallest inmate is about 10 cm (4 in) long. As adults your paradise fishes will achieve a maximum size of 12.5 cm (5 in).

Spawning usually takes place under a large leaf at the water's surface. It follows the typical gourami procedure, with the male building a bubble nest, but the female is often badly mauled by the male if she is not ready to spawn, so provide plenty of cover for her to hide in.



Macropodus opercularis (paradise fish) has been available to the hobby since the late 19th century. Its tolerance of poor water quality and low temperatures meant that it could be transported to Europe by ship from its native southeastern China and Korea.

The Delicate Bunch

Several of the smaller species are surrounded by myths and noted for being "difficult". That may be so, but with a little careful planning and preparation it is possible to keep and breed them - homework again! You will, however, need a little more experience before you attempt to keep and breed any of these. They are included here as a challenge for the future!

Sphaerichthys osphronemoides (chocolate gourami) is a fish that one of us cannot resist. They require soft, acid conditions and excellent water quality. It is the maintenance of good water quality that seems to be the key to success with these fishes and with the other small species such as *Trichopsis vittatus* (croaking gourami), so pay attention to the filtration system and remember to carry out regular partial water changes.

It is best to prepare an aquarium specifically for these creatures, ensuring that it is both well planted and that the water is matured before attempting to introduce the fishes. Wood is good for decor as the tannins leaching from it are beneficial to the fishes. In real terms, an aquarium that has been up-and-running for six to nine months is ideal. One of us tends to use a tank previously used for growing on small tetras and once they have been moved on to other accommodation, a shoal of young gouramis can be housed in the mature aquarium thus vacated.

The only adjustment made to the tank is the water temperature, which should be a little higher for the gouramis, around 26-28°C (79-82°F). The size of the shoal will depend on the size

of the aquarium, for example a 50 x 25 x 25 cm (18 x 10 x 10 in) will accommodate 6 to 8 *Trichopsis vittatus* (croaking gourami), and a 60 x 30 x 30 cm (24 x 12 x 12 in) a shoal of 10 to 12 *Sphaerichthys osphronemoides* (chocolate gourami). Although this may seem very few fishes for tanks of this size, it is easy to maintain water quality, and should the fishes become picky towards each other, they have enough space to get out of each other's way. It is preferable to purchase young fishes and allow them to grow on and pair themselves, rather than trying to determine pairs of older fishes.

One of the keys to success with these creatures is in the feeding: they prefer small live foods such as *Daphnia*, *Cyclops*, mosquito larvae, whiteworm, and so on. If you cannot provide these then frozen foods are excellent substitutes. Most of the fishes will accept flake foods which can be used as well as the frozen/live foods.

Some controversy surrounds just how *S. osphronemoides* (chocolate gourami) breeds. This may have something to do with the fact that there are possibly four different types of chocolate gourami, and that each may have a different spawning procedure. Of the two forms which have been observed, *Sphaerichthys osphronemoides selatanensis* is a mouthbrooder in which the male carries the eggs, while the other, *Sphaerichthys osphronemoides osphronemoides*, has been noted as being both a mouthbrooder, in which the female carries the eggs, and a bubble-nest builder.

The chocolate gouramis we worked with were mouthbrooders, in which the female took the



Make sure you keep a careful check on water quality when keeping *Sphaerichthys osphronemoides* (chocolate gourami), because any deterioration can leave these fishes open to bacterial and fungal infections and to skin parasites.



***Trichopsis vittatus* (croaking gourami) derives its common name from its ability to produce croaking sounds. They can be difficult to acclimatize and should be housed in an understocked aquarium and fed with live or frozen foods at first.**

large yellow eggs into her mouth and incubated them and the resulting fry for about 18 days. When released, the fry were brown and yellow and took newly hatched brine shrimp. The male *Trichopsis vittatus* (croaking gourami) constructs a nest close to the substrate in a cave or hollow beneath a large leaf or in a tangle of plant roots. He collects the eggs after spawning and spits them into the nest. He alone cares for the nest and fry. Up to 300 fry may result and they are quite tiny, so prepare plenty of infusoria and, later, newly hatched brine shrimp.

Fighting Fishes

Everyone tries their hand at keeping *Betta splendens* (Siamese fighter) at some time in their aquatic career. Although they are often kept in community aquaria, this is not the right place for them, particularly not for the males. The trailing finnage is a great temptation to other fishes who will often harass the slower-moving fighter and nip or tear his fins. This puts him under stress; often he will refuse to feed and may even develop bacterial or fungal infections on the damaged fins. In the worst eventuality he may hide away and eventually die. Females, on the other hand, seem to be able to fend for themselves in the average community aquarium of non-aggressive fishes.

In retail outlets male fighters are displayed individually, usually in small compartments within a larger tank. Although at first glance this system may seem cruel, it is designed specifically for their safety and well-being, allowing the fishes to display to each other while preventing them from causing actual bodily harm to either party. If kept together they will actually fight to the death. The water in the system is warm and clean, the fishes are properly fed and, even though they have no aeration system, being air



A large bubblenest builder, *Betta bellica* (slender Betta) grows to about 10 cm (4 in). Keep them in pairs.



The male *Betta splendens* (Siamese fighter) diligently guards his bubble nest, adding bubbles as required and retrieving any eggs that fall out.

breathers they are able to cope with the situation.

For anyone who is serious about keeping and breeding fighters, special tanks should be used. These are divided into compartments using sheets of perforated mesh or glass dividers which leave a slight gap at the top and bottom, large enough to allow a flow of water through the whole aquarium yet small enough for the fishes not to be able to get into the next compartment. Using such a set-up, it is possible to provide well filtered water to maintain the creatures in the optimum conditions.

When breeding *Betta splendens*, set up a special tank, which need not be too deep but should contain thickets of plants to give the female cover and also to provide anchorage for the bubble nest. Make sure that the female is well fed and full of roe before attempting to put her with the male. Initially it is best to isolate the female in a jar

floating in the breeding tank. The male will start to construct the bubble nest and from time to time display to the female, spreading his fins and shaking. After a hour or so the nest will be quite large and the female will be excited enough to try to follow the male under it. This is the time to try to introduce her to him. If all goes well, the pair will go back to the nest where the male will wrap himself around the female, so that his vent is in close proximity to hers and then, as the fishes roll slowly in the water, the eggs and sperm will be released. The eggs are heavier than water and will sink towards the bottom. The male will now break off the embrace and catch the falling eggs in his mouth, gently blowing them into the nest; once the female recovers she will join in this task.

The spawning takes several hours to complete, during which time up to 250 eggs will be laid. Once the pair have finished

spawning remove the female as quickly as possible, taking care not to disturb the nest. If she is left in the tank, the male may kill her while protecting the nest. For the next couple of days he will dedicate his life to looking after the eggs. Since they are heavier than water every so often one or more will fall out of the nest. The male will carefully catch these in his mouth and push them back into the nest.

On the third day the eggs will hatch but the fry will not become free swimming until late on the fifth or even sixth day after spawning. The fry are quite small and require newly hatched brine shrimp as their first food. Once they are free swimming, the male must be removed before he eats his offspring.

Recently several other species of *Betta* have been available to the hobbyist. Not all are suited to the community aquarium, and not all build the well-known bubble nest when breeding, but instead mouthbrood the eggs: so ensure you do your homework before you purchase them.

One of those more likely to be encountered is *Betta pugnax*, a mouthbrooder. A pair will live quite happily in a soft water community aquarium provided the other occupants are peaceable. Although relatively drab, they have an interesting method of reproduction. The female produces a batch of 10 to 20 eggs which are held in a "cup" formed by the male's anal fin. She then picks up these eggs in her mouth and spits them into the male's. The sequence is repeated until the clutch of up to 100 eggs is complete, and they are then brooded by the male. The fry are easily raised on infusoria and brine shrimp nauplii.

The Kissing Gourami

Helostoma temminckii (kissing gourami) are usually kept because of their novel way of testing each other's strength. The kissing action is not, as we might suppose, a sign of affection between male and female, but a trial of strength between two males, and forms part of the courtship ritual as they try to impress a suitable female. These creatures are very useful in the aquarium because they will pick away at algae, taking it off plant leaves without damaging them. Their preferred food is plankton but it is impossible to provide sufficient of this in the aquarium; they will accept small live foods as well as flake instead.

There are two colour forms of the kissing gourami, the green and the pink. The green fish is considered the wild form and the pink the aquarium form, the latter being the most commonly available to the aquarist. They grow quite large, some 10-15 cm (4-6 in), in captivity, so be prepared to give them space.

They are very adaptable, tolerating most water conditions, but they do like to be warm, in the 26-28°C (79-82°F) range. As they are not quarrelsome they may be kept safely with other similarly-sized fishes.

Although they can be bred in the aquarium, do this only if you have plenty of space — a pair will produce up to 10,000 eggs! In their native lands they are bred commercially as food fishes.



The wild form of *Helostoma temminckii* (green kissing gourami) (above) and the pink form shown below are plankton feeders, but fortunately for aquarists they will accept small prepared foods. They will also clean algae from plant leaves.



A courtship ritual or just a harmless trial of strength? *H. temminckii* are difficult to sex. Females are generally more round in the body and their anal fin is also rounded.

The *Giant Gourami*

Osphronemus goramy (giant gourami) is another fish that is predominantly a food fish as it grows to a large size - 40 cm (16 in) being a good-sized aquarium fish. The largest specimen recorded, however, measured 1 metre (36 in). They are long-lived and you can expect a well-cared-for aquarium specimen to be around for 10-15 years or even longer. Taking this into account, it is important to be prepared to make this sort of commitment before you purchase one of the "dear little things" in the dealer's tank. Those "little things" grow into "big things", and quickly.

If it wasn't for their size, they would make ideal fishes for beginners since they are tolerant of most water conditions, eat just about anything in the vegetable line (peas, banana, mango, cooked rice, and so on, as well as commercial foods) and don't fight. This is probably why we see them in large community tanks in public aquaria. Couple that with the fact that many

people try to give the fish away when it has outgrown its home aquarium, and you find that public aquaria are inundated with offers of these creatures. So, the message is: "think before you buy". If you won't be able to house it when it grows bigger, leave it in the dealer's tank.

Climbing Perch

Anabas testudineus is probably the best-known species of this group, but is probably the least frequently kept.

There is a legend in the East that *Anabas* climbs palm trees and drinks the sap. This was first recorded in 1787 by a Lieutenant Daldorf of the Danish East India Company based at Tranquebar. He had found a climbing perch lodged in a crack in the bark of a palm tree growing beside a pond. It took an Indian naturalist to dispel this notion. Dr Das put forward the alternative explanation that these fishes are often found in trees, having been placed there by predatory birds who had captured them while they were

migrating across land. So *Anabas* has acquired a common name which has nothing to do with how it gets up into trees!

When migrating from pond to pond, it not only uses its fins to help propel itself across the ground but also spreads each gill cover in turn so that the sharp spines on the latter anchor it to the ground while the fins push the fish forward, allowing it to move in a jerky side to side motion. This solves the problem of surviving when the pools dry up, and should the fish be unable to find another water source, it can bury itself in damp mud to survive. This remarkable creature can live for up to 48 hours out of water provided the conditions are damp. Being so hardy, they were able to withstand transportation by sailing ship and in around 1870 were put on display at the London Zoo Aquarium.

In the aquarium, they are very easy to keep, being tolerant of most water conditions. The one thing they do need is warmth, so a temperature averaging 26°C (79°F) is beneficial. Provide plenty of plant cover and some pieces of wood for shelter. This also helps create territories in the aquarium and should reduce the amount of squabbling.

Feeding the climbing perch couldn't be easier - if it's edible, they eat it. True omnivores, they consume pellets, rice, vegetable matter, live foods, flake, and so on. They are best kept with their own kind, in a fairly large aquarium, and under such conditions they will pair and may even breed. The floating eggs hatch in some 24 to 36 hours, but the fry are small, so be prepared to provide large quantities of infusoria in the first instance.



A true omnivore, *Osphronemus goramy* (giant gourami) feasts on just about anything you care to offer in the way of nourishment from peas and banana to flakes and pelleted foods.

The African Connection

The African anabantids belong to the genus *Ctenopoma* and although they are usually referred to by their generic name, they are also known as bush fishes or even climbing perch. To avoid such confusion here, we'll stick to *Ctenopoma* (bush fish).

At first glance, you might be forgiven for thinking that these chunky fishes with protrusile mouths look more like cichlids than anabantids. In their natural habitat they may be found in weedy areas of forest streams, as well as quiet stretches of rivers, ponds, lakes, swamps, and irrigation ditches. Being carnivores, they hunt for live foods and will take anything from insect larvae to other fishes as the opportunity arises. This makes a normal community tank a no-go area as far as keeping them is concerned, but some may be housed with other fishes of similar size and temperament.

Take care when handling bush fishes, they have serrated edges to their gill covers and when intimidated may flare the latter. If this takes place when the fishes are sparring with each other there are no problems, the trouble starts if you are trying to catch them, as the serrations easily entangle in the net. If this happens, do not try to pull the fish from the net; put net and fish in the aquarium and the fish will usually release itself. If it doesn't then cut the net rather than risking injury to the fish.

Most of the smaller species we come across in the hobby, such as *Ctenopoma ansorgii* (ornate *Ctenopoma*), *Ctenopoma fasciolatum* (banded *Ctenopoma*), and *Ctenopoma oxyrhynchus* (mottled *Ctenopoma*), may be kept with



***Ctenopoma acutirostre* is one of the more accommodating members of the genus. It can be kept with smaller fishes provided they are not small enough to be regarded as food. Feed meaty foods, and especially small live shrimps such as *My sis*. It prefers a quiet tank with plenty of privacy.**

or set up a new tank for the bush

other fishes too large to be eaten. They like a well-planted aquarium with soft, slightly acid water which must be warm: anything less than 24°C (75°F) is considered cold! Their method of feeding is to drift close to the prey and then lunge at it, so if you are

tised by *Ctenopoma kingsleyae*.

keeping them with other fishes, it is important to make sure they are getting a chance to feed. If they are being kept away from the food, try feeding at both ends of the aquarium at the same time so that the more voracious feeders don't know which way to turn and the bush fishes have a chance. If

the problem persists, then remove the bullies fishes.

The most common species in the trade is *Ctenopoma kingsleyae*. Some scientists now consider this to be a colour morph of *Ctenopoma petherici* so you may see it for sale under this name as well. Whatever its scientific

name it is a beautiful grey fish. Each scale on the body is clearly defined and the fins are almost clear with white edges. These fishes grow quite large (to about 20 cm/8 in) so they are not suited to the average community aquarium, which is a pity, as they are easy to keep.

If you wish to try and breed bush fishes you will need to check on the individual species' breeding strategy. Some, for example *Ctenopoma fasciolatum*, build bubble-nests while others are termed non-brooders, producing large numbers of eggs that float to the surface. This is the reproductive method practiced. The eggs of such species may be scooped out and hatched elsewhere. If hatching fry separately, use water from the main aquarium and keep the hatching aquarium clean. The fry are quite large and will take brine shrimp nauplii from day one.

Miscellaneous Freshwater Fishes

This chapter includes popular aquarium fishes that do not fit into any of the preceding fresh water groups.

Rainbowfishes

Rainbowfishes have been known in the aquarium trade for many years but until recently only a few species have been commonly available. Of these only *Telmatherina ladigesi* (Celebes rainbowfish), *Bedotia geayi* (Madagascar rainbowfish), and *Melanotaenia splendida* (eastern rainbowfish) have made any real impression. The last species is often referred to as *Melanotaenia nigrans* but the latter was probably not in the hobby until the end of the 1970s.

Recently this neglected group has aroused much more interest, with more species available in the shops and still more through the specialist societies which are springing up worldwide. The reasons for their popularity are obvious when you consider the type of fishes we are dealing with here. Most species measure

between 3-15 cm (1¼-6 in) as adults and are peaceful, lively fishes which fit in well in most communities. They also have very attractive colours and a hardy disposition, which all adds up to the perfect aquarium fish.

From the scientific point of view the group of fishes we aquarists call rainbowfishes are split into three families:- Atherinidae (silversides), Melanotaeniidae (rainbowfishes), and Pseudomugilidae (blue-eyes). They are found in all sorts of habitats, from mountain streams to lowland rivers as well as lakes, ponds, ditches, and swampy regions. We recommend that the new aquarist starts with members of the Melanotaeniidae, such as *Melanotaenia*, *Glossolepis*, and *Chilatherina*, which tend to be the easiest to maintain.

Provide them with a well-planted aquarium of 100 cm (36 in) or more in length: rainbows are very active fishes and some of these species can grow to in excess of 10 cm (4 in). They do well in soft to medium-hard



Telmatherina ladigesi (Celebes rainbowfish) need hard, alkaline water and regular partial water changes.

water (up to say 10-15° dH) but are sensitive to poor water quality and will remain near the bottom with their fins clamped to their bodies if water conditions are not to their liking. Regular partial water changes and a good filtration system will avoid this. Many like alkaline conditions: we suggest *C. bleheri* (Bleher's rainbowfish), *C. campsi* (highlands rainbow-fish), *G. wanamensis* (Lake Wanam rainbowfish), *M. boese-mani* (Boeseman's rainbowfish), *M. herbertaxelrodi* (Lake Tebera rainbowfish), and *M. trifasciata* (banded rainbowfish).

Another species worth mentioning is *Iriatherina weneri* (filament or threadfin rainbow-fish). The males are eye-catching because of their long trailing fin filaments and their flag-like dorsal fins. Females are less gaudy. These small "rainbows" grow to at most 3.5 cm (1¼ in) and the females are usually smaller at 3 cm (1¼ in). When first available in the trade only males were sold, but females are now available. They should be kept in a planted aquarium with soft, slightly acid water and a temperature of 24-28°C (75-82°F). They have been bred using either groups or pairs of fishes. The eggs are deposited in clumps of Java moss and hatch in 12 days. The fry require tiny foods such as rotifers and will even take



There are several subspecies of *Melanotaenia splendida* (eastern rainbowfish).

Bedotia geayi (Madagascar rainbowfish) requires plenty of live foods to maintain its colour and condition.

some fine commercially prepared foods or powdered egg yolk. If using powdered foods of any kind take extra care not to overfeed and pollute the water.

One member of the family Atherinidae commonly found in aquarium shops is *Bedotia geayi* (Madagascar rainbowfish). This is a hard water species which needs to be kept in a school of six or more to feel really secure. Regular partial water changes and a clean environment are a must to keep this species in tiptop condition. This is a larger species which can attain 15 cm (6 in) in the aquarium.

The other most commonly encountered member of this family is *Telmatherina ladigesii* (Celebes rainbowfish). Once again it is a schooling species which prefers to be in a group of six or more and can be sensitive to water quality. Both are hard water species, but will adapt to most water conditions provided the change is made slowly and acid conditions are avoided.



Melanotaenia boesemani (Boeseman's rainbowfish) loses some colour with each captive-bred generation.

Melanotaenia splendida fluviatilis (crimson-spotted rainbowfish) is found in clear, slow-moving streams.

The family Pseudomugilidae includes a group of smaller rainbowfishes which are only just beginning to make an impact in the aquarium trade. There are about ten species in the family but only two have been seen with any regularity in aquarium shops.

Pseudomugil signifer (Pacific blue-eye), comes from hard, slightly alkaline biotopes and is also found in brackish habitats. They adapt well to most aquarium conditions but do not like acid water. Females are rather drab, having a plain brownish body and clear fins, but males have bright yellow to orange fins with black leading edges. In some strains the anal and dorsal fins are elongated. Maximum size is about 5 cm (2 in) and they will fit in well in a community aquarium with similar-sized fishes.

The other species which can sometimes be found is one of the most beautiful of all the small rainbows, *Pseudomugil furcatus*. Females are rather plain



A truly beautiful fish, there are several colour forms of *Melanotaenia fasciata* (banded rainbowfish).

To help maintain the red colour of *Chilatherina bleheri* (Bleher's rainbowfish) it is important to vary the diet.

with just a hint of yellow in the fins, but males have the most spectacular golden yellow coloration which suffuses much of the body and fins. The base of the posterior dorsal fin and the anal fin are black, edged with yellow, and the tail has about six black central rays bounded by six yellow rays above and below. The top and bottom lobes are edged in black.

This is a peaceful hardy species which does well in the aquarium. It grows to only about 4 cm (1 1/2 in) and makes an ideal inmate for a community of small species. It likes hard alkaline water, and regular partial water changes are a must to keep it in good condition.

To get both colour and size on your rainbows you will need to feed them on plenty of live or frozen foods. They are particularly fond of mosquito larvae, *Mysis* shrimp, bloodworm, and *Daphnia*. These foods will also help to bring them into breeding condition.



Iriatherina wernerii (threadfin or filament rainbowfish) is quite easy to keep in soft, slightly acid conditions.

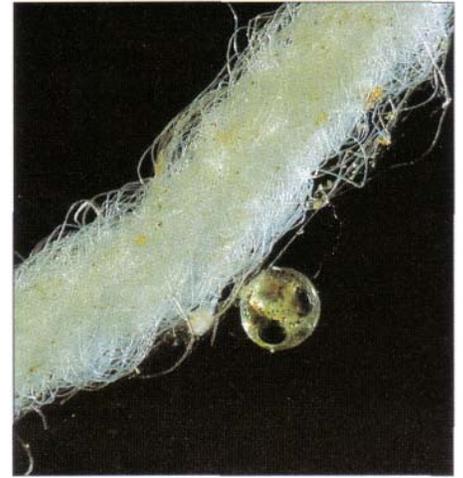
Breeding Rainbowfishes

Rainbows spawn by placing their eggs among fine-leaved plants. Most spawn over a period of several days and partial water changes, coupled with early morning sunlight falling on the aquarium, will often act as a trigger. Maybe 20 or so eggs are produced daily over a period of several days (egg numbers vary from species to species and on the size of the parents), and are hung by threads from the plants. The problem arises when the fry hatch as they do so at the same intervals as the eggs were laid, thus you find you have very tiny, newly hatched fry mixed with those that are a week old. Many hobbyists overcome this by spawning rainbows on mops such as those used for killifishes. It is then easy to pick off the eggs and raise the fry separately in batches. If you have only a community tank in which to keep your rainbows, a mop can be provided for the fishes to spawn on and removed every day or two to pick off eggs.

Raising the fry can be very hard work. In some species they are minute and require infusoria (*Paramecium* is very useful if you can get a culture going) and very fine brine shrimp nauplii, but once you have found the right foods and managed to get the

hatching times of fishes and foods to coincide, growth of the fry is steady - under no circumstances can it be termed fast. Regular small feeds four to six times a day work best, and during this time the rearing tank needs to be kept scrupulously clean. Sponge filters are very useful but it is also necessary to siphon out any dead brine shrimp before it decays. Partial water changes also help to maintain water quality.

Although many people like to mix rainbow species in the community aquarium, this is not a wise practice if you are intending to breed these fishes, as one female can look very like another and they may interbreed, producing unsaleable hybrids.



Rainbowfishes will spawn on mops in a similar manner to killifishes. Here we can see an "eyed-up" egg of *Chilatherina bleheri* (Bleher's rainbowfish). The eggs are quite tough and can be picked from the mop with your fingers and transferred to hatching trays.



A shoal of adult rainbows such as *Melanotaenia trijasciata* and *M. boesemani* is ideal for larger furnished aquaria.



Chilatherina sentaniensis (Lake Sentani rainbowfish) benefits from regular partial water changes and a varied diet which includes aquatic insect larvae.



The males of *Glossolepis incisus* (red rainbowfish) live up to their common name; females are plain silver coloured fishes.



Male *Melanotaenia lacustris* (Lake Kutubu rainbowfish) have a gold stripe down the centre of their heads when in breeding dress.

Electric Fishes

If you have read through the catfishes chapter you will already be aware of *Malapterurus electricus* (electric catfish). There are, however, several other fishes that are able to produce electricity. Some use it to find their way around and others for defence and stunning prey, and all are aided by the fact that water is a good conductor.

The electric organs are modified muscle cells; those fishes that stun their prey have large, powerful electric organs (*Electrophorus electricus* (electric eel) is a good example of this), whereas those which use electricity for navigation have much smaller and less powerful organs. Interestingly electric fishes have very small eyes and inhabit silty waters with poor visibility where electro-navigation is an asset.

A word of caution: **THESE FISHES ARE NOT FOR BEGINNERS.** Electric eels can deliver a shock of more than 500 volts and that is powerful enough to stun a horse. Even though you may fancy keeping one for its novelty value, please give the matter very careful consideration before proceeding. They are powerful creatures that require specialist handling, and if you have young children who may put their hands in the aquarium, do not even think about it.

Members of the African genus *Mormyridae* (elephant noses) use electric pulses to find their way around, communicate with each other, and passively defend territory. The electric organ is small, weak, and situated near the caudal peduncle. These fishes are so sensitive to water quality that in Germany they have been introduced into a water supply to monitor drinking water purity; if



Electrophorus electricus (electric eel) is a very large and potentially dangerous fish. Think hard before buying - it can deliver a shock that can stun a horse.

their electrical pulses increase from the normal 800 per minute this indicates a deterioration in the water purity.

In the aquarium the most commonly kept species is *Gnathonemus petersi* (Peter's elephant nose). If your aquarium has been established for a year or more, everything is going well, and it is not overstocked, you could try to keep one or two elephant noses. They are quite peaceful but if you are intending to keep more than one, make sure they are of similar size, as large specimens will sometimes bully smaller, weaker ones.

Elephant noses are nocturnal so ensure that there are caves or other suitable places for them to hide in during the day. If you are keeping more than one specimen it is important that the fishes can hide away in separate areas of the aquarium so that their electric fields are not permanently interacting with each other.

Feed them in the evening,



Gnathonemus petersi (Peter's elephant nose) requires a fine substrate so that its delicate snout is not damaged when searching for food.

offering flake, frozen, and live foods. They are particularly fond of frozen bloodworm. They use their soft "snout" to detect food in the substrate, and this organ can easily be damaged by sharp gravel, so fine sand is more suitable.

As we have already stated, they are sensitive to poor water conditions. In the aquarium regular partial water changes (with aged or conditioned water) are advantageous.

Another species of weakly electric fish, this time from South America, is *Apteronotus albifrons* (ghost knife fish) whose common name stems from tribespeople in Guyana who believe it to be inhabited by a ghost or evil spirit.

This fish grows large, up to 50 cm (20 in), much too big for a community aquarium. It is mentioned here because it too has a weak electric organ near the caudal peduncle which it uses to locate food. Should you wish to keep it, do remember they can sometimes be aggressive. They need a furnished aquarium with plenty of hiding places and will even tolerate larger peaceful companions once they have become used to aquarium life. Feeding these fishes poses little difficulty as they are omnivores, taking everything from pieces of meat to tablet foods.

Sun Bass and Darters

There are some wonderful alternatives to goldfishes for the cold-water aquarium, such as the sun bass and darters. Both groups could be kept in a garden pool in the summer months, but because of their colour and/or lifestyle you would not see them very often.

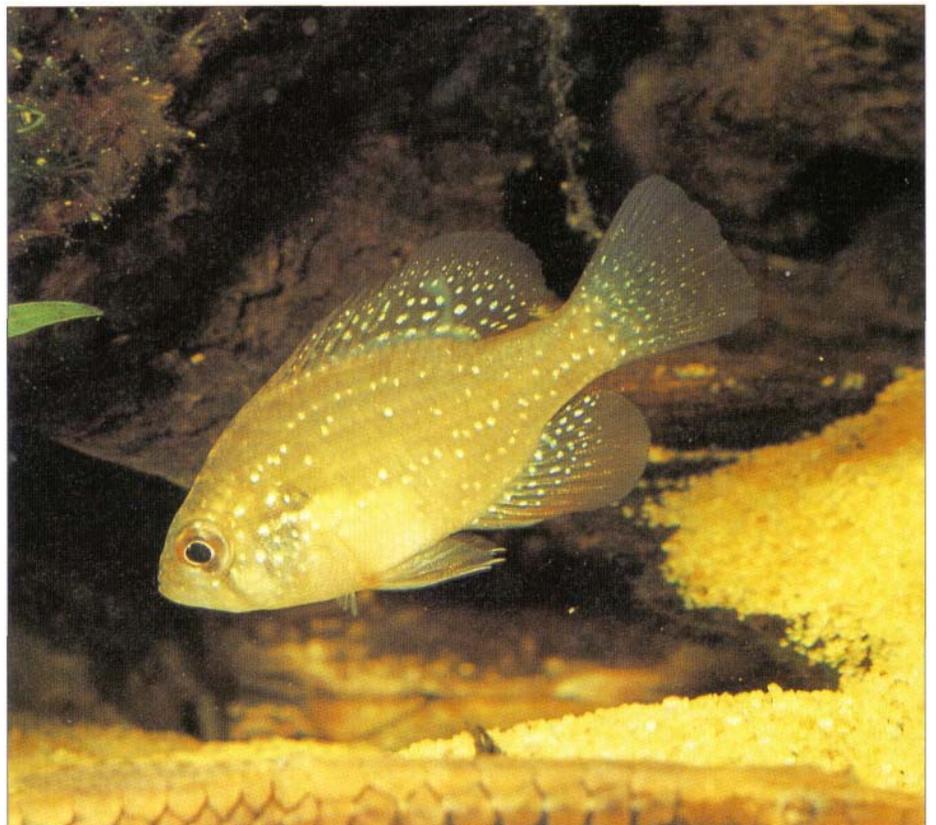
Sun bass, or sunfishes as they are sometimes called, are North American fishes of the family Centrarchidae. Some very large members of this family are held in high regard by anglers. Aquarists, however, are mostly interested in the smaller species which can easily be accommodated in an aquarium. Sunfishes are very attractive, with numerous coloured spots and spangles on their flanks, and, when seen in sunlight, it is not surprising that they are sought after for the cool water aquarium.

One of the smaller species, *Elassoma evergladei* (pygmy sunfish, Everglades pygmy sunfish, Florida pygmy sunfish), is found in the eastern USA from North Carolina to Florida. As may be expected from its distribution, this fish has a wide temperature range (10-30°C /50-86°F) and is often kept in the tropical aquarium. It is small, reaching only 3.5 cm (1½ in).

The three species of *Enneacanthus* are slightly larger fishes ranging from 8-10 cm (3¼-4 in) in length and are not recommended for inclusion in the tropical tank: they like the water temperature to rise to about 22°C (71-72°F) in the summer and cool to 10°C (50°F) or so during the winter months. *Enneacanthus chaetodon* (the black-banded sunfish) is found in the states of New York, New Jersey, and Maryland; *E. gloriosus*



Enneacanthus chaetodon (black-banded sunfish) is often overlooked in dealer's tanks. Although suitable for garden pools provided their companions are of a similar size and disposition, they are best kept in a cool water aquarium.



Enneacanthus gloriosus (blue-spotted sunfish) can be kept and bred in an aquarium, but pay special attention to their temperature requirements if you are attempting to breed them.

(the blue-spotted sunfish) is more wide-ranging, occurring from New York State down the eastern seaboard to Florida; and *E. obesus* (diamond sunfish, little sunfish) from New England to Florida.

All prefer a planted aquarium with a sand or fine gravel substrate, and all are sensitive to poor water conditions and rapid, frequent temperature fluctuations. Care is needed when making water changes to ensure that the pH is not raised - *E. obesus* in particular will suffer - and even healthy fishes will become susceptible to fungal infections if, for example, they are suddenly switched from slightly acid water to anything more than slightly alkaline conditions (above 7.5 is likely to prove harmful). At worst the fishes will die.

Feeding is simple as they readily take frozen foods such as bloodworm and mosquito larvae. Live foods are preferred, but they will accept flake. To condition them for breeding it is essential to give them as varied a diet as possible.

Breeding Sunfishes

Sunfishes are more likely to breed if they have been kept in cooler water during the winter. We have found that keeping *E. chaetodon* in an unheated greenhouse in a 50-70 litre (10-15 gallon) vat with external power filtration, sand substrate, a few plants, and a diet of frozen and live foods (much of which fell in

A stream fish, *Etheostoma caeruleum* (rainbow darter) adapts well to the aquarium provided it has cool conditions and well-oxygenated, clear water, as rising temperatures in spring and summer are a natural "trigger" for breeding.

naturally) provided ideal conditions for the fishes to breed.

In *Enneacanthus* it is hard to differentiate the sexes: females are heavier-bodied and their colours may be slightly more intense. One way to tell takes a little practice; observation of their behaviour. The males stake out territories and defend them; this is more obvious when they are about to breed but can also be detected at other times. Spawning is preceded by courtship and nest building. The male digs a pit in a sheltered area of the tank and defends it vigorously. He courts his chosen female and eventually the sticky eggs are deposited in the nest. After spawning the female can be removed, leaving the male to guard the nest and fry. Once these are free swimming, the male can also be removed. The fry are raised on small live foods.

Recently, one of the North American darters, *Etheostoma caeruleum* (rainbow darter), a native of central North America but with some population pockets in New York State, has been made available to hobbyists. A small bottom-dwelling fish, it needs cool conditions (4-18°C/ 39-64°F), and suffers considerably if the temperature rises above this. Some aquarists even use cooling systems to keep the water temperature down during the summer months. It inhabits fast-flowing streams with very clean, highly oxygenated water and something approaching these conditions should be aimed for in the aquarium. It is very sensitive to silty and polluted conditions. Reaching 7.5 cm (3 in), it is an ideal aquarium fish and may breed. In the wild it spawns in gravel beds during spring and early summer.



Gobies

Many gobies are brackish water fishes but there are some that are at home in fresh water. Most are bottom-dwellers, lurking among stones and roots, and scuttling from place to place in search of food. They are carnivores and require live foods and/or dead meaty foods (frozen bloodworm for small species and pieces of fish or meat for larger ones). Aquarists use the term "goby" to cover two families of fishes, the Gobiidae, or true gobies, and the Eleotridae, or sleeper gobies. The Eleotridae have long slender bodies and their ventral fins are separate whereas the Gobiidae have a similar body shape but the ventral fins are fused to form a sucker that helps the fish to maintain position in fast-flowing waters. Members of both families adapt well to aquarium life, but do check to see how big they grow before putting them into a community aquarium. *Oxyeleotris marmoratus*, for example, can grow to 50 cm (20 in) and has a voracious



Hypseleotris cyprinoides is quite at home in a community aquarium. It will eat flake, but prefers live foods such as *Daphnia*, failing which use frozen foods.

appetite, consuming the equivalent of its own body weight in a day - your neons wouldn't stand a chance.

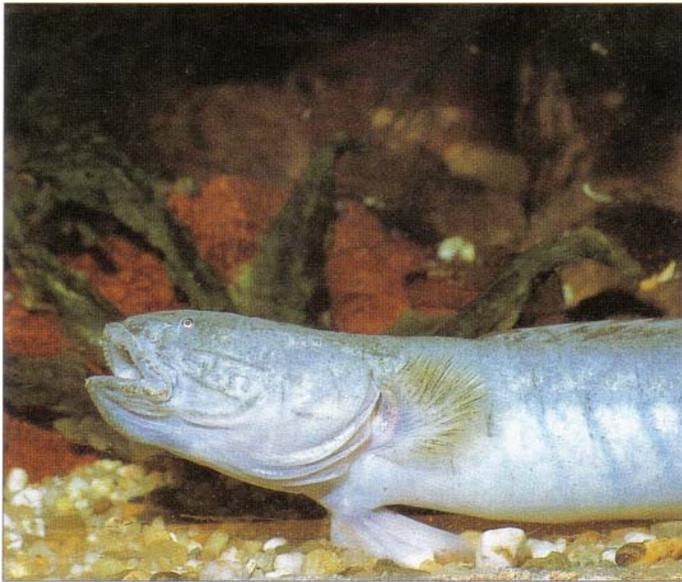
Of the sleeper gobies, *Hypseleotris cyprinoides* is a peaceful addition to the general community aquarium, where it will coexist with other fishes without any problems. Far more colourful is *Tateurndina ocellicauda* (peacock or eye-spot sleeper)

native to New Guinea, where it is found in lowland rivers and pools. Their colour alone makes them an instant success among aquarists, and that you can breed them is a bonus.

Peacock gobies need a well-furnished, softwater aquarium. If kept with other fishes, these should be equally peaceful otherwise you will not see an awful lot of your gobies — they will retire to the quieter, darker regions. Males, although slightly larger, are slimmer than females. The females have more yellow on the belly region and brighter yellow on the outer edges of the dorsal and anal fins. These small fishes, 7.5 cm (3 in) at most, breed in small cracks and crevices or caves. Half a coconut shell makes an acceptable spawning site. The male courts the female by shaking and shimmering his body and fins in front of her. The pair then retire to the spawning site where the eggs are deposited on a flat surface; the female is then chased away by the male, who remains on guard to tend the eggs and brood. The fry are easy to raise because they will



A native of New Guinea, *Tateurndina ocellicauda* (peacock or eye-spot goby) has been bred in captivity. Fortunately the new generation retains the wonderful coloration of the parents.



***Gobiodes broussonnetii* (dragon or eel goby) is a predator and definitely not for the community aquarium!**

accept brine shrimp nauplii as a first food.

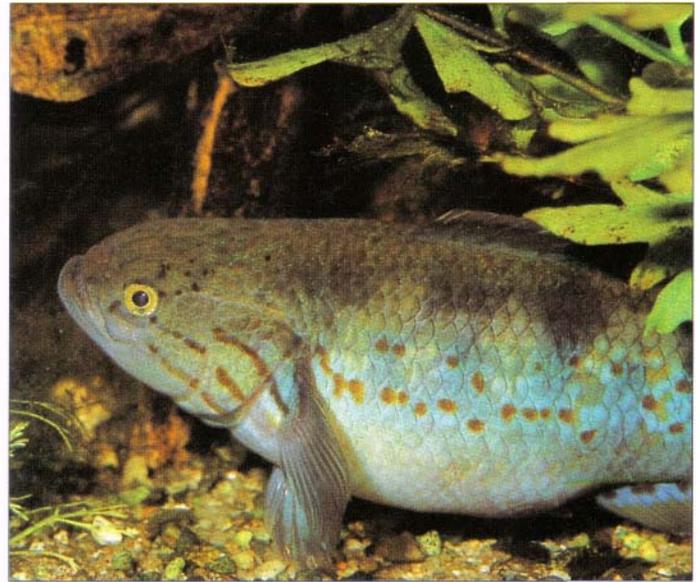
Of the true gobies, *Stigmatogobius sadanundio* is a very popular, if infrequently imported, goby. In complete contrast to the peacock goby, this fish requires hard alkaline water and under no circumstances should you try to acclimatize it to acid conditions. Although these little gobies are territorial bottom-dwellers, they do not bother mid-water fishes, so they may safely be kept with swordtails or sailfin mollies in a planted aquarium that has rocks and caves to provide seclusion and help territorial boundaries to be defined.

These fishes benefit from a fluctuation in water temperature over each 24-hour period (with a lower temperature at night). They will tolerate temperatures between 20-26°C (68-79°F). You can also add 1-2 level teaspoons of aquarium salt per 11 litres (2.5 gallons) - if your plants and other fishes will tolerate it - but this is not essential.

If, however, you wish to try and breed them, a species tank is

best. At this time the water temperature needs to be at the upper end of their range (about 24-28°C/75-82°F), and the addition of salt as detailed above certainly helps to induce spawning. A sand or fine gravel substrate with rocks and caves is required. Flowerpots laid on their sides, or completely inverted with a small triangular piece cut out as an entrance, are ideal. The gobies lay their eggs on the ceilings of caves so an inverted pot makes a good substitute. A pair may produce 1000 or so eggs each of which is attached to the cave ceiling by a fine thread. Both parents tend the brood and the fry are relatively easily reared on newly hatched brine shrimp.

One of the most beautiful of all the gobies, which turns up from time to time in retail outlets, is *Chlamydogobius eremius* (desert goby). It is very a small species which will grow to about 6 cm (2V4 in) in the aquarium, although the female tends to remain a little smaller. She is a rather plain silvery-grey fish with a black spot in the second dorsal



***Mogurnda mogurnda* is attractive when young, but grows to 17cm (7 in) and likes eating fish!**

fin. The male, however, is a lovely lemon-yellow colour on the body, which contrasts spectacularly with the blue fins edged in yellow or white.

This is another hardwater species which prefers a pH above 7.5 and a hardness in excess of 12 dH. The temperature should be maintained at 24-26°C (75-79°F). The tank should have a white (or other pale colour) sand substrate and plenty of rocks and caves. The males are very quarrelsome towards each other but peaceful towards other species.

It is supposedly a cave spawner which lays its eggs on the ceiling of a cave, but it will also spawn in the open on a rock. Whichever method is used, the male will guard the eggs and young until they are free swimming. Up to 50 eggs are laid in a clutch. These take up to seven days to hatch and the fry will require newly hatched brine shrimp as their first food. The fry grow quickly and are sexable after only three months, and are sexually mature at about six months of age.

Spiny Eels

At some time or other you may wish to try your hand at keeping spiny eels, members of the family Mastacembelidae. Despite their common name they are not related to the true eels, but just have a similar long thin shape. They are found in brackish and fresh waters in Africa and south-east Asia. These long, sinuous fishes are excellent burrowers and will undermine rocks and plants in the aquarium. They have long, prehensile noses which they use to sift through mud and sand in search of worms and other buried food. As these fishes grow they become more predatory. Captive specimens are not very fond of flake and tablet foods, so be prepared to feed them on frozen foods with the occasional meal of aquatic invertebrates such as *Tubifex* for small specimens. Larger fishes are particularly fond of earthworms.

Mastacembelus erythrotaenia (fire eel) is an aquarium favourite, probably because they look so sweet in dealers' tanks. Young specimens bury themselves beneath wood or rocks with only their heads sticking out. Large numbers are available in the trade and many people buy them



Mastacembelus erythrotaenia (fire eel) requires a diet of meaty foods such as worms, shrimps, and chopped mussels.

without realizing just how big they can grow: 50 cm (20 in) is not unusual in captivity and their potential is 1 metre (36 in). At these sizes they are predatory and will eat small fishes when they come out to feed at night.

Although youngsters are gregarious, as they grow they become intolerant of their own kind but may be kept with other large, mid-water fishes or some of the larger armoured catfishes. Water with a hardness of up to 15 degrees and a pH on the acid side of neutral seems to suit these fishes. Ensure that the substrate is soft and has no sharp pieces of sand or gravel that may cut the fishes as they burrow.

The fire eel is one of the most delicate species of the genus and very particular attention should be paid to maintaining the water quality. They are also excellent jumpers and escape artists, which will wriggle through the smallest of openings, so ensure you cover the tank tightly.

Two other species that are sometimes available are *M. circumcinctus*, a small fish growing to only 16 cm (6^XA in) and *M. armatus* (spiny eel) which grows to 75 cm (30 in). Both require very similar conditions to the fire eel.

Bichirs and Reedfishes

In the tropical waters of Africa we find a very interesting family of fishes, the Polypteridae (bichirs, reedfishes, or lobe-finned pike). They have elongated, snake-like bodies which are covered with enamelled, diamond-shaped (ganoid) scales. Their swim-bladder is modified to allow them to breath from the atmosphere and thus survive in oxygen-deficient waters. In the aquarium they will surface at regular intervals to take in gulps of air, regardless of whether the water is well oxygenated or not. If they are prevented from reaching the surface they will die.

They are carnivores and prey on anything that will fit into their mouths, from fishes to worms, insect larvae, and frogs. In the aquarium they will take dead foods such as pieces of fish or meat. Shrimps or prawns can be broken up and fed with some of the shell on.

There are two genera: *Erpetoichthys* (reedfishes or snakefishes), which has a single species *E. calabaricus*, and *Polypterus* (bichirs) with several species. Both may be kept with other fishes provided their companions are large enough not to be considered prey. They are excellent escape artists, especially the reedfish, which will wriggle out of the smallest gaps, even those where external filter pipes enter the tank. They can be deterred by trapping a piece of net curtain between the cover glass and the tank so that it covers this small gap and the pipe. If necessary, tape the net to the outside of the aquarium to hold it in place. Should your fish be found on the carpet in a semi-desiccated condition, do not give up hope. One of us found her

reedfish covered with dog hairs and rather stiff on the floor one morning. With nothing to lose she returned it to the aquarium. Four hours later the fish was swimming about - still covered in dog hairs and its finnage looking somewhat ragged - but it was alive. What's more important, it recovered completely from its little outing.

Erpetoichthys calabaricus (reedfish) is a peaceful fish, even with its own kind, but it should not be kept with anything small enough to be considered food. It grows quite long and slim, reaching a maximum of 40 cm (16 in). These fishes prefer their water to be soft and slightly acid and a normal community aquarium of appropriate-sized fishes is ideal for them.

The bichirs can be quarrelsome when kept together, especially if there are not enough hiding places in the aquarium, but their aggression is not usually directed towards other species. They are tolerant of most water conditions provided extremes of pH and hardness are avoided. Some species seen regularly in the hobby are *Polypterus ornatipinnis* (ornate bichir) which can grow to 45 cm (18 in), *P. delhezi* (armoured



Polypterus senegalensis (Senegal or Cuvier's bichir), like the other species, are great escape artists. Be sure to cover the aquarium tightly.



When *Polypterus palmas* (marbled bichir) breed, the eggs are left to fall to the bottom of the aquarium.

bichir) 35 cm (14 in), and *P. senegalensis* (Senegal or Cuvier's bichir) and *P. palmas* (marbled bichir) both 30 cm (12 in).

Some species have been bred in captivity. During spawning the male spreads out his anal fin so that it is slightly cupped and places it beneath the vent of the female. The eggs and sperm are

expelled into the cupped fin. Some species, for example *P. ornatipinnis*, lay their eggs among plants, while others, such as *P. palmas*, let them fall to the bottom. Hatching takes four to five days but the fry are not free swimming until a few days later. They will take newly hatched brine shrimp.



This contrasts with the breeding strategy of *Polypterus ornatipinnis* (ornate bichir) which deposits its eggs amongst plants.

The Butterfly Fishes

For anyone looking for something a little out of the ordinary, nothing could be better than the butterfly fish. Known scientifically as *Pantodon buchholzi*, it is a surface-dwelling predator. The mouth is like a drawbridge and they will take any insect or even fish that fits into it. Apart from this, they make excellent companions for medium-sized (over 8 cm (3 in)) mid- or bottom-dwelling peaceful fishes.

The aquarium need not be deep, 15-20 cm (6-8 in) is acceptable, but you can, of course, house them in deeper aquaria when they are kept with other fishes. For preference the water should be soft, acid, and well filtered. Any deterioration in water quality may lead to fin degeneration and loss of appetite.

They like to lurk beneath rafts of floating plants; cork bark floating on the surface provides a natural looking alternative and a place to put a dish of maggots to hatch into flies for the fishes to eat. "Butterflies" love to jump for flies - butterflies love to jump, period! The floating cork/plant layer helps to discourage this, but, better safe than sorry, make sure the aquarium is tightly covered. Other foods relished are any surface-dwelling insects, be they larvae or adults; meal worms, spiders, woodlice, maggots (buy uncoloured maggots from a fishing tackle shop and store them in a plastic box, with ventilation holes, in a cool place), large flakes, and sometimes floating pellets. Frozen foods are eaten as they fall through the water but anything that reaches the bottom is usually ignored.

There has been some success breeding these creatures. Males have a convex anal fin with the central rays forming a tube, while that of females is straight. Correct feeding is crucial to bring them into spawning condition: they need a varied diet including plenty of live food.

The fishes spawn over a long period each day, and the eggs, which are lighter than water, float to the surface. They can be easily scooped out to be hatched in another tank using water from the parents' aquarium. The eggs are transparent at first but over the next nine hours or so turn dark brown, almost black; they hatch in about 36 hours. Raising the fry is exceedingly difficult. Try *Artemia nauplii* as a first food and make regular, small, partial water changes, and you may have some success.



***Pantodon LiucMiolzi* (butterfly fish) will jump to catch insects - keep the aquarium tightly covered.**

Glass/ishes

As suggested by the common name, the Chandidae (glassfishes) have transparent bodies which allow you to see the skeleton and many of their internal organs. Two species crop up every now and again in the trade:

Chanda ranga (Indian glassfish) and *Chanda wolffii*. The larger of the two is *C. wolffii* at 20 cm (8 in) although it is most unusual for them to reach this size in captivity even if they are fed correctly.

Although a great talking point in public aquaria, glassfishes are shrouded in mystery when it comes to keeping them in the aquarium. They are regarded as "difficult" and to a degree this is true. Although they are peaceful enough, they do not benefit from being kept in the teeming metropolis of the average community, preferring the quiet of a species aquarium.

Use a 75 cm (30 in) aquarium with a dark substrate of lava chips or very dark gravel; not peat, as this will acidify the water; glassfishes like medium-hard and slightly alkaline water. Before they are introduced the system needs to be mature with the plants growing well; use those that will tolerate salt in the water as these fishes benefit from 1-2 level teaspoons of aquarium salt per 11 litres (2.5 gallons) of water. Being somewhat timid, when first introduced they may hide, but once they feel secure you will see them more and more often. They are territorial and take a little time to sort out their own space, but once they have established this there are no further problems.

Both species will accept flake foods, but flake alone is not enough for the fishes to survive.

The diet needs to include small invertebrates as well as frozen foods. Sometimes it can be difficult to find the right dietary combination to succeed with these creatures. One of us based her feeding regime on live *Daphnia* and bloodworm every day, with frozen and flake foods used to supplement this, and achieved reasonable success in keeping these fishes.

Indian glassfishes spawn quite readily provided they have been well conditioned on a wide variety of foods. Rather than using a single pair, use several pairs in the same aquarium. Spawning can be triggered by sunlight falling on the aquarium, raising the temperature slightly, the addition of some fresh water and, if all this fails, separate the males and females for a few days. The former have a blue edge to the dorsal and anal fins. The female is more yellowish and, if we look closely at their (conveniently visible) internal organs, the front of her swim-bladder is rounded (pointed in the male).

Each spawning pass produces about half a dozen sticky eggs that adhere to the plants (Java moss is very good for this purpose); spawning continues until the pair have laid 200 or so eggs. Although the parents ignore both eggs and fry, it is wise to remove them just in case they feel peckish. The eggs hatch in 24 hours and the larvae are tiny.

The larvae festoon the plants until they become free swimming some three days later. Now the problems really start. Although they will take brine shrimp nauplii, they do not actively hunt for it but merely snap at it as it passes by. The addition of an air-operated sponge filter, which will keep the food moving



Chanda ranga (Indian glassfish) is difficult to feed because it requires live foods and will not survive on flake foods alone.



Although larger than *C. ranga*, *Chanda wolffii* is a shy fish, which benefits from being kept in a species aquarium rather than the hurly-burly of the community tank.

about, helps, but feeding them on a single food is not adequate; just as the adults need variety, so do the fry. It is a case of try anything small enough, feed little and often, and then just hope you have got it right.

A word of warning. Glassfishes have been imported with arcs of fluorescent colour in their bodies, and sold to unsuspecting hobbyists as "disco fishes". These fishes have been injected with a coloured dye. This action causes distress and damage to the fishes and is a potential cause of infection. This practice is frowned upon by most hobbyists and reputable traders and should be discouraged by not buying such specimens. Not only species of *Chanda* have been treated this way, but the glass catfish, *Kryptopterus bicirrhus*, has also suffered.

Leaf Fishes

If you are looking for something a little out of the ordinary you may like to consider the leaf fishes.

These members of the family Nandidae occur in South America, Africa, and Asia. *Monocirrhus polyacanthus* (South American leaf fish) and *Polycentrus schomburgki* (South American leaf fish or Schomburgk's leaf fish) are found in north-eastern South America; *Polycentropsis abbreviata* (African leaf fish) occurs in west Africa; and *Nandus nandus* (nan-dus) in Asia, from India to Thailand. Breeding strategies vary: *M. polyacanthus* lays its eggs on a leaf, *P.*

schomburgki spawns in a cave, *P. abbreviata* uses a bubbler, and virtually nothing is known about what *Nandus nandus* does. All are rarely seen in the trade but we have chosen one to illustrate some of their needs.

Monocirrhus polyacanthus inhabits still and slow-moving waters in the Peruvian Amazon. We include it here so that you don't inadvertently buy one and place it in your community aquarium with disastrous results. These fishes are out-and-out predators and will not accept



You must be prepared to feed live fish to *M. polyacanthus*; otherwise do not attempt to keep them. Remember they will regard small tankmates as snacks.



As can be seen here, *Monocirrhus polyacanthus* (South American leaf fish) can vary greatly in colour. A single specimen can be brown but half an hour later have changed to cream.

dead foods at all, so if you are contemplating keeping them, think hard before buying.

Primarily brown in colour, they look just like dead leaves. They can vary their body colour: one day they may be dark brown, another golden, and a third "cloudy". At night they take on what can only be described as a cloud pattern -brown patches on a lighter beige/brown background.

Monocirrhus polyacanthus needs to be kept in a species aquarium. The tank should include bogwood, be well planted with large *Echinodorus* sp. (Amazon sword plants), and have very gentle filtration so there is little water movement. The fishes are timid and difficult to acclimatize, so once they have settled in do not add any other fishes. The set-up needs to be mature with slightly acid soft water. If the water is not right -perhaps too high in nitrates -the fishes will stop feeding and rest with their fins clamped.

For much of the day they will float motionless, head down in the water, looking to all intents and purposes like floating leaves. To make the illusion complete, they have a small fleshy barbel on the tip of the lower lip which looks just like a leaf stalk. Put some live food (fishes) in and the leaves come to life, fluttering their fins so that they drift towards the prey; when close enough, the jaws open and the prey is engulfed. They should be kept only if a continuous supply of small live fishes can be provided as their food.

They breed in a similar manner to some of the cichlids. The pair clean a leaf and the female deposits the eggs thereon. These and the resulting fry are guarded by the male. Rearing the fry is easy if, and only if, you can provide enough live foods. The fry will consume their own body weight in food each day, and when you have 300 hungry mouths to feed, this is an awful lot of live food.

The Halfbeaks

The halfbeaks occur in southeast Asia and are found in both fresh and brackish environments. Most of those available in aquatic outlets have been acclimatized to freshwater conditions (with maybe a level teaspoonful of salt per 4.5 litres/1 gallon), so you should have no problems with them. They are shoaling fishes which live at the water surface, and if you look at the position of the dorsal fin you will see that it is set well back on the body so that it does not break-up the dorsal profile and stick out of the water, betraying the presence of the fish to any predator.

The lower jaw of these fishes is extended and fixed, and as they cruise just beneath the surface this allows them to feed on surface-dwelling insects or any that fall onto it. In captivity these insectivores require live foods: they will take *Tubifex* (from a feeder), fruit flies, indeed, any small flies will be avidly consumed. The problem for the aquarist is to get enough of the right foods. In summer the garden provides plenty of insects such as aphids - but don't use any that have been sprayed with insecticide; mosquito larvae, pupae, and adults are also relished. Alternatively you can use a hand net (for example an aquarium net) to sweep long grass and you will be amazed at the number of bugs that you catch. To feed the fishes, first of all ensure that you have a tight-fitting cover glass or all your insects will escape. (This also helps to keep the fishes in the aquarium as they are very good jumpers.) Release the bugs into the space between the water and the cover glass. If using some creepy-crawlies such as

small spiders, float a small piece of cork bark on the water and set the bugs adrift on this "raft". As they near the edge, the fishes see them and leap to catch them. Alternatively, use floating plants.

Being surface dwellers, they can be accommodated in a shallow aquarium. The water should be hard with a little salt added if the tap water in your area is soft. If necessary use buffers to maintain the pH at about 7.0.

Three genera are regularly imported via the trade: *Dermogenys*, *Nomorhamphus*, and *Hemirhamphodon*. All three produce live young.

The halfbeaks most often imported nowadays are members of the *Nomorhamphus* genus. They tend to have much thicker bodies than the other genera and the lower jaw is shorter, barely protruding beyond the upper. Often the lower lip is black-pigmented. Any one of several different

species may be offered for sale under the name of Celebes half-beak; all grow to about 10 cm (4 in) and will eat anything small enough to fit into their mouths, even a small neon tetra, so make sure you keep them only with fishes of a similar size.

The males of this genus have the front rays of the anal fin shortened to form the copulatory organ. Mating usually takes place just after sunrise when the male will be seen courting the female. About six weeks later up to 20 young will be born. Although these are very large at birth (up to 2 cm (³A in)), the parents will still eat them if given the chance, so remove them to another aquarium for rearing. They will eat newly hatched brine shrimp as their first food, but grow quickly and soon require the same foods as their parents.

Members of the *Dermogenys* genus turn up from time to time.



Dermogenys pusillus sumatranus (wrestling halfbeak) is the easiest of the halfbeaks to breed. They produce a brood about once a month. As with other halfbeaks, the lower jaw is vulnerable to damage during shipment, so check carefully before buying.



Hemirhamphodon pogonognathus (thread-jawed or long-snout halfbeak) is very difficult to maintain in captivity. Firstly you must ensure that the fishes have suffered no damage to their snouts in transit, and secondly you must provide an almost constant supply of live foods.

These are often called "wrestling halfbeaks", the common name is derived from the males' habit of wrestling with each other to determine which is strongest and establish a pecking order. The most commonly available species is *Dermogenys pusillus*. They have a much longer beak than the Celebes halfbeak and this is vulnerable to damage during shipment. Such damage is often followed by infection and death, so make sure you purchase only specimens with a complete lower jaw. These are the easiest of the group to breed in captivity, with broods of up to 30 being born every month or so.

The other genus of halfbeaks to regularly appear in retail outlets is *Hemirhamphodon*. *H. pogonognathus* (thread-jawed or long-snout halfbeak) is somewhat different from the other members of this group in having

the front part of the anal fin extended instead of shortened. Again this fin is used as a copulatory organ during mating.

This species is by far and away the most difficult of the group to establish in captivity. They have a very long and thin lower jaw which is often broken when the fish is being shipped, and such an injury will almost always lead to death.

They are also more choosy about their diet. All halfbeaks are insectivores but most can be weaned on to floating flake foods. While this will not be enough to keep them in tip-top shape, it will tide them over lean times when live foods are unavailable. The thread-jawed halfbeak, however, is very reluctant to take this alternative regardless of how hungry it is, so do not buy one unless you are confident of maintaining a year

round supply of live foods. It will take live foods such as *Daphnia* and bloodworms from the upper part of the aquarium but, unlike the other halfbeaks, will not follow these foods down to the lower strata.

The fry are produced over a period of several weeks with a couple being born every day. Eventually a brood will number 30 to 40. If well fed the adults should not eat them but it is wise to remove them for rearing in another aquarium, just to be on the safe side. The fry will eat all small live foods offered provided these are near or on the surface of the water. Newly hatched brine shrimp can be offered, but position a strong light above the aquarium to draw the shrimps to the surface where the halfbeaks will eat them. Any dead shrimps must be siphoned out before they decay.

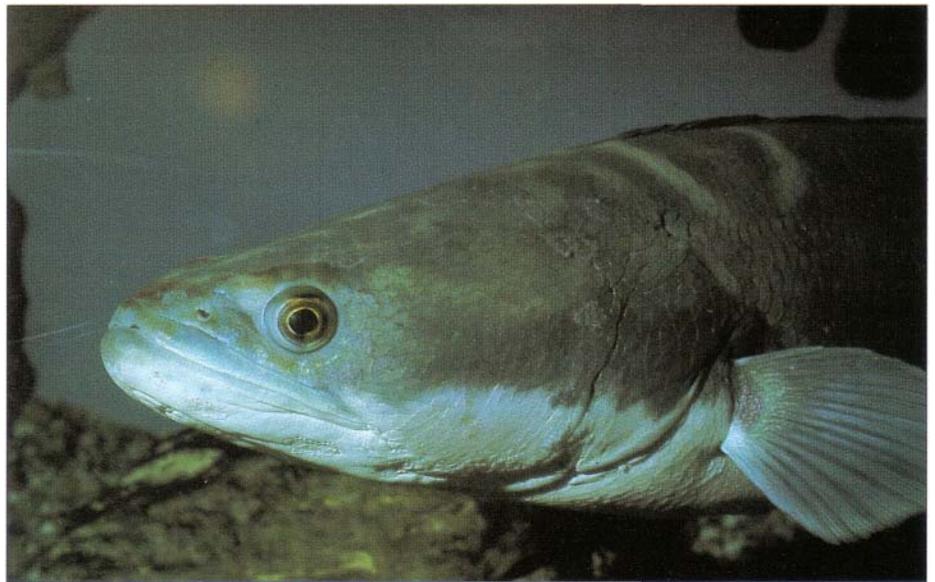
Snakeheads

If you like large predators then these are the fishes for you.

Depending on species they range in size from about 15 cm (6 in) to well over 1 metre (36 in) when full grown. All are predators which feed on live fishes and other live foods, but in the aquarium they can be weaned on to dead fishes such as whitebait, and pieces of fish and meat as well as large earthworms. As with all large predators, feed them only when they are hungry. In young fishes this tends to be almost every day but in adults it may be only once a week - when they will gorge themselves.

Snakeheads have an accessory breathing organ which allows them to live in water with a low oxygen content, and, like some of the labyrinths, they often go "walkabout" in the wild, moving from pond to pond in search of food. Obviously a tight-fitting cover glass is important, held in place by a heavy weight if your fish is big.

In general snakeheads are tolerant of poor water conditions, but this does not mean you can neglect the filtration. They are large predators which produce high protein waste, necessitating a filtration system capable of preventing any build-up of toxins such as ammonia, and regular water changes to minimize nitrates. Snakeheads make long-lived hardy pets which will feed from your fingers once they become accustomed to you. The only limiting factor is size, but this is not as much of a problem as you might think. If well fed, they tend to sit around doing nothing, so a large aquarium is wasted on them. Provided the tank is at least twice the length of the adult snakehead and the



Channa micropeltes (red snakehead) is bought from unscrupulous dealers by unsuspecting aquarists, not realizing just how big these fishes grow.

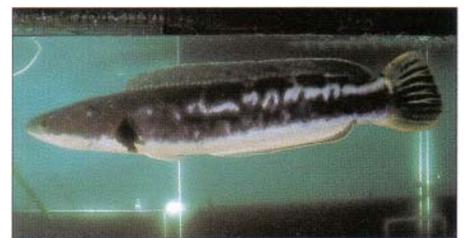
width at least equal to its adult length, then it will be happy.

They are not fussy when it comes to decor, and although bogwood and plants can be included to create a more natural effect, they adapt well to a bare tank with a gravel substrate. Filtration can be by internal power filter, and while not light-sensitive they do seem to prefer subdued lighting. Temperature can be anywhere between 22-26°C (72-79°F).

Of those species generally available, the one most often offered for sale is also one of the most unsuitable. *Channa micropeltes* has the common name of red snakehead because of its coloration when young. Babies (and we do mean *babies*!) of about 15 cm (6 in) body length have two black stripes running the full length of their reddish body. The red is strongest below the first stripe and is very striking. Unfortunately it fades as the fish grows — as do the black stripes - until you are left with a not particularly attractive, metre-long (36 in), grey and black mottled fish. A much

better species to try is *Channa orientalis*, which grows to only 30 cm (12 in) and, while a drab fish as a youngster, develops a lovely blue sheen to the body and fins as it matures. The fins are edged with bands of black and yellow.

Snakeheads tend to be loners and are usually maintained one to an aquarium. If you have the space you might like to try breeding them. In all species the male cares for the eggs, but some are mouthbrooders, while others guard the eggs which float at the surface under thick plant cover. In the larger species the eggs may number up to 3000, but in the smaller mouthbrooders only about 40 are produced.



C. micropeltes is no small fish; at 1m (40 in) it has lost not only its charm but also its colour. This will make finding it a new home difficult if you can no longer cope.

Sticklebacks

Remarkably few European native fishes are kept by aquarists and yet some meet all the criteria of a good aquarium fish, that is, small size, pretty colours, and interesting behaviour. The sticklebacks meet all these criteria in full and yet are very rarely even thought of when choosing aquarium fishes.

The sticklebacks are a small family of fishes which live in fresh, brackish, and marine waters of the northern temperate zones. Two species make good inhabitants of the cool water aquarium. These are *Pungitius pungitius* (ten-spined stickleback) and *Gasterosteus aculeatus* (three-spined stickleback). In general it is best to house these species separately from each other in a single species aquarium about 60 cm (24 in) in length. Although they are schooling species, males become territorial during the breeding season and will fight and badly injure each other if the aquarium is too small. It is wise, therefore, to keep only one male and a group of females.

The tank should have a fine gravel substrate, plenty of plants, and lots of caves and pots to provide hiding places. The water will need to be soft unless you can find a wild population which is living in hard water conditions. Aeration is needed to maintain the oxygen level during warm weather, and ideally the aquarium should be sited where the temperature will fall as low as possible (without freezing) during winter. This helps stimulate the fishes to spawn in the spring.

Once settled in they will spend much of their time out in the open looking for food. For fishes caught in the wild this will



When in breeding condition the male *Gasterosteus aculeatus* (three-spined stickleback) develops a vibrant red coloration. At this time he is ready to entice a willing female into his nest.



G. aculeatus is often overlooked as an aquarium fish by hobbyists but is a firm favourite with school children, who like to catch them.

need to be live foods such as bloodworms, *Daphnia*, and whiteworms. It is a rare wild fish which can be weaned on to flake foods, but most will eventually accept frozen foods and small pieces of fish or meat.

During spring and summer the male will come into breeding condition and it is then that you see the real beauty of these species. Ten-spined stickleback males turn a velvety black and have bright orange pectoral fins. Three-spined stickleback males develop the most beautiful red coloration over much of the body, particularly on the throat.

The male will select a suitable site and build a nest. This will be



Pungitius pungitius (ten-spined stickleback) is similarly overlooked, yet both are very interesting and breedable aquarium fishes.

on the bottom of the aquarium in the case of the three-spined stickleback and a few inches above the bottom in the other species. It is made of pieces of plants stuck together with a "glue" produced by the male. Once it is complete the male will entice a ripe female into the nest and spawning will take place. As other females become ready to spawn they too will be invited into the nest to spawn. In between the male will look after the eggs and later guard the fry. The fry will eat newly hatched brine shrimp, and as soon as they are large enough to handle should be removed to another aquarium for rearing.



In this chapter we have introduced you to some of the more unusual fishes available in the hobby but it doesn't end there. On this page we will give you just a taste of what else in the way of "oddballs" is out there if you are prepared to look. Some of these unusual species have bizarre habits and very specific environmental and dietary requirements, so don't forget: NEVER purchase them on impulse, but always check on their size, behaviour, and needs first.

Above: *Gastromyzon punctulatus* inhabits fast-flowing streams. Cool, well-oxygenated water is essential, so do not keep this fish in an over-populated community aquarium as the oxygen levels will be too low for it to survive.

Right: *Xenomystus nigri* (African knife-fish) grows to 30 cm (12 in). It can be quarrelsome. Do not keep with small fishes as it has a large mouth and will eat anything that fits in it! It prefers calm water, and, because it is nocturnal in the wild, muted lighting, or at least shady areas to which to retire.



There are two subspecies of this fish: *Badis badis badis* and *Badis badis burmanicus*. The former is blue and the latter predominantly red. Both are small, carnivorous fishes that look rather like some South American dwarf cichlids. Sometimes known as chameleonfishes, they come from still waters in India, and are more peaceful than other members of the Nandiae.



Scleropages formosus (Asian arowana, dragonfish) is a protected species, but it is now being bred on fish farms in the Far East and limited numbers of youngsters are being made available to the hobby. The maintenance of these large mouthbrooding fishes should not be undertaken lightly.

Brackish Water Fishes

Retail outlets tend to stock only a few brackish water fishes because people usually want either marines because of their flamboyant colours or freshwater as they are easiest. The main brackish water fishes available are scats, monos, archers, Arius catfishes, mudskippers, *Anableps*, and *Brachyogobius*, plus, if you want to see them at their best, sailfin mollies (*Poecilia* sp.). This last group has been dealt with in the Cyprinodonts chapter.

Just because these fishes all come from slightly saline waters doesn't mean that they can be kept in the same aquarium, so we will look at each type separately and, where appropriate, make some suggestions as to which may be kept together.

Four-eyed Fishes

There are three species of *Anableps* (four-eyed fish) found in fresh and brackish waters of Central and South America. On the Pacific coast of Mexico, Guatemala, El Salvador, and Costa Rica *Anableps dowi* (the Pacific four-eyes) can be found. This species is only rarely imported, which is a pity since it is the most attractive member of the genus. It has a greenish brown body with a bright yellow stripe running along its full length. It is usually found in brackish water but one population in Mexico lives in fresh water.

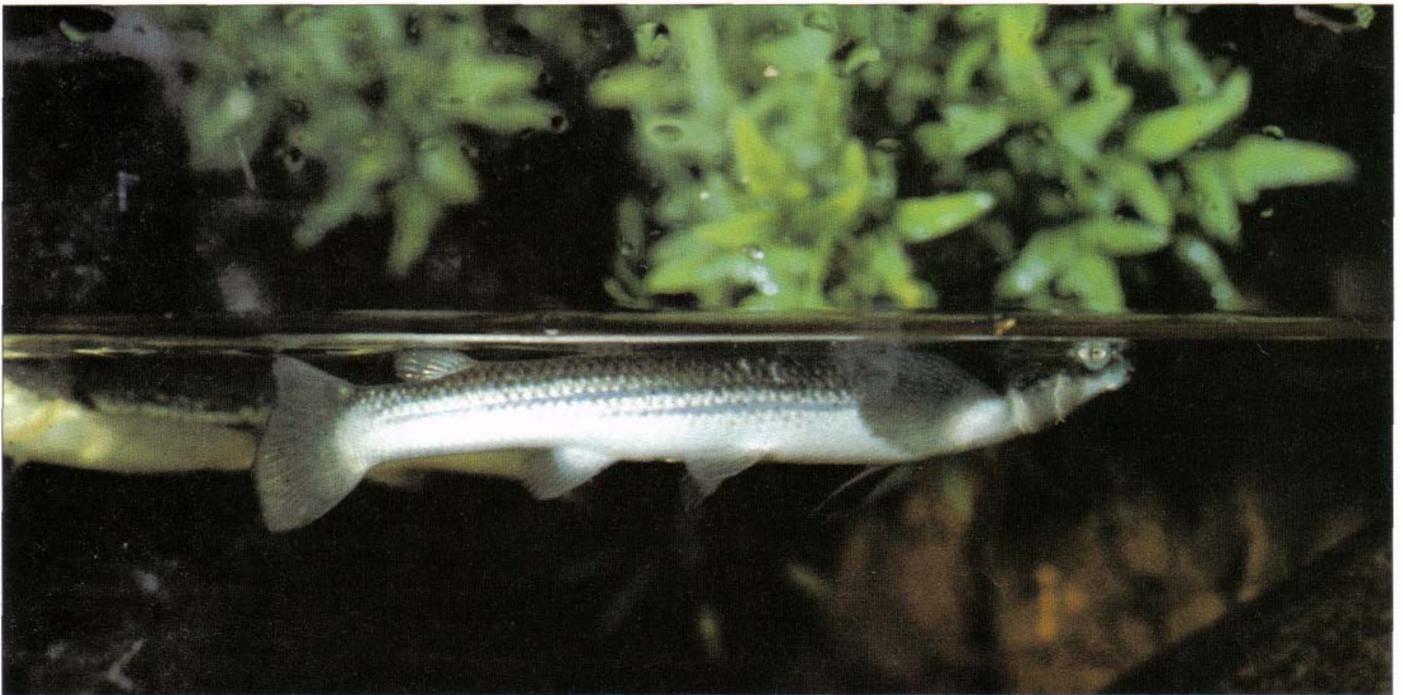
Anableps microlepis (fine-scale four-eyes) occurs on the Atlantic shoreline of South America from the Orinoco to the Amazon. This



The eye of *Anableps anableps* is divided to allow the fish to see both above and below water.

fish is usually found in marine habitats and only rarely enters brackish water. It has two or three rather poorly defined brown stripes along the sides.

Anableps anableps (striped four-eyes) has the same range as the fine-scale four-eyes but lives primarily in brackish water and rarely enters fresh or marine habitats. It has five horizontal stripes along the body which can be more or less distinct depending upon the fish's mood. This is the species most commonly imported by the trade, but some consignments contain a few fine-scale four-eyes as well.



Anableps anableps (striped four-eyes) is a real oddity. A predator, it will take insects from the surface as well as small fishes that stray into its vicinity. Make sure you do not use any sharp-edged decor on which this fish could damage its eyes. This warning applies equally to equipment, such as filter pipes.

All four-eyes are large (25 cm (10 in)), surface-dwelling live-bearers which get their common name from their eyes, which are divided into two segments, enabling them to see both above and below the water's surface at the same time. This is a very useful ability which helps them to spot food or danger as they cruise around the shallow lagoons and river mouths which are their usual habitats.

Anableps have very specific requirements. The aquarium should have shallow, warm (25-28°C (77-82°F)), brackish water and the air space above it should be kept very humid. This can be achieved by a tight-fitting cover glass which also serves to keep the fishes in the aquarium - they are excellent jumpers and frequently leap when catching flies. A sand or gravel "beach" is also welcome, and the fishes will come partly out of the water to rest on this.

A good filtration system is essential. *Anableps* are large fishes which feed on high protein foods so the system must be able to cope with their waste products. External power filters are ideal, and their return pipes can be positioned so that they *create a* feature in the aquarium, for example a waterfall over rocks on a beach.

Avoid any sharp objects in the tank, to prevent damage to the fishes' eyes. If you want rocks, use rounded pebbles, and if using wood, again select rounded pieces (or do it yourself with sandpaper). Salt-tolerant plants may be used to decorate the aquarium, but ensure that there is plenty of open swimming space at the surface.

Although they are principally insectivores in the wild, feeding

in captivity is relatively simple, as they will take frozen bloodworm as well as small pieces of mussel, shrimp, meat, and fish. If they turn up their noses at one of these, try something else, but do vary the diet, and if you can offer live foods, do so. Most specimens will also feed on flake and sometimes tablet foods.

Breeding Four-eyed Fishes

Breeding these fishes is problematical from the outset in that more females than males occur in the trade, and it is often just luck that you find a male among the females in a dealer's tank. But this is only half the problem: the copulatory organ (modified anal fin) of the male is left- or right-handed, that is, it curves either to the left or the right, and the genital opening in females is also biased to the left or right. This means that a right-handed male can mate only with a left-handed female and vice versa. To overcome this, it is necessary to keep groups of four-eyed fishes and let them pair themselves. Indeed, these fishes seem far happier if kept as a small shoal of six to eight individuals.

Four-eyed fishes are by no means prolific. Under good conditions they produce four broods a year, and each time the female gives birth to only about eight fry. These are large, up to 5 cm (2 in) but more usually 2.5 cm (1 in) and this gives them a better chance of survival than smaller fry. From the outset they can take insect larvae, and growth is steady provided they are well fed and regular partial water changes are carried out. It is a good idea to raise the fry apart from the parents so that you can make sure they are getting sufficient food.

Mudskippers

Mudskippers are notoriously difficult to maintain in captivity because of the demands they place on the aquarist. Species imported include *Periophthalmus barbarus*, *P. catonensis*, and *P. kaelreukeri*, but these names are often confused and identification is uncertain. All have similar habits and can be found along the east African coast from the Red Sea to Madagascar and on into southeast Asia and Australia. In nature they are found in estuarine conditions such as those in mangrove swamps, a favourite habitat. Here, in the tidal zone, they dart about on the mud and clamber up onto the mangrove roots using the pectoral fins as "legs" and sinuous movements of the rear part of the body to push themselves forward. They often go undetected until they begin flicking their colourful dorsal fins up and down to signal to each other. If danger threatens, each fish will leap from its basking site back to the safety of the water with one flick of its tail end. As the waters recede the fishes dig pits in the mud. Bearing all this in mind, we have to try and create something similar to a mangrove swamp in the aquarium if we are going to stand even a remote chance of keeping these creatures alive and healthy for any length of time.



Periophthalmus papilio (mudskipper) requires rocks and roots so it can climb out of the water.

Public aquaria have managed this quite well, using large enclosures and employing wave machines so that water gently laps the shore. Tree roots are bedded into a soft sand substrate that slopes down into and continues below the water. A few pebbles scattered around help to give everything a natural appearance. Some salt-tolerant plants may be grown in the substrate, and mosses and Java fern attached to the tree roots. Or they may even cheat and use plastic plants, both terrestrial and aquatic. For most of us wave machines occur only in our dreams. So we will ignore this little luxury and see what else we can do.

The aquarium needs to be wide, and long, because it is easier to create a long shallow slope along the length of the tank rather than from front to back (this can be achieved but your substrate will have a much steeper gradient). The sand can be held in place by a series of terraces made from rounded pebbles. If you don't use these, the sand will just even itself out and defeat the object. Add some vine roots sited below the water but projecting out of it so you can attach terrestrial plants and the fishes can clamber out. Some people like to float a small piece of cork bark on the water so the fishes can clamber out onto this as well. If there are no places for them to crawl out of the water, they will, in desperation, stick on to the glass.

Partially fill the aquarium with brackish water to a depth of about 15 cm (6 in) and use an external power filter to help maintain good quality water. As with the aquarium for *Anableps*, the filter return pipe can be used



Periophthalmus papilio (mudskipper) is a predator with a fearsome set of teeth. The eyes, set well on top of the head, give it excellent vision when hunting. They can sometimes be seen resting in shallow water with just their eyes above the surface.



The colourful dorsal fin of *Periophthalmus* species is used for signalling. When basking on mud flats or defending territories they flick the fin up and down in order to communicate with each other.



If there is no other resting place out of the water, *Periophthalmus* species will try to attach themselves to the aquarium glass.

to create a feature in the above-water part of the tank, for example water cascading over roots or rocks.

One of the most important points when keeping mudskip-pers is to maintain humidity and warmth in the section of the aquarium above the water. The

air temperature here should equal the water temperature 25-30°C (77-86°F) otherwise the fishes may become chilled, so the cover glass must fit very well. The one drawback with this is that if the room is cold, condensation tends to form on the glass and it becomes difficult to view the interior of the tank.

When buying your mudskip-pers take the time to find good, healthy stock and make sure that they are feeding. As these fishes are territorial, they sometimes quarrel in the dealer's tanks, so check your purchases for damage. The stress of being caught, transported, and perhaps chilled slightly is enough for them to have to cope with, without the possible infections that may occur on nipped fins. Because of their territoriality, it is better to keep just three or four well rather than a lot that are constantly fighting. Also bear in mind that the little juveniles of 5-6 cm (2-2 V4 in)'grow into large adults of 12.5-15 cm (5-6 in).

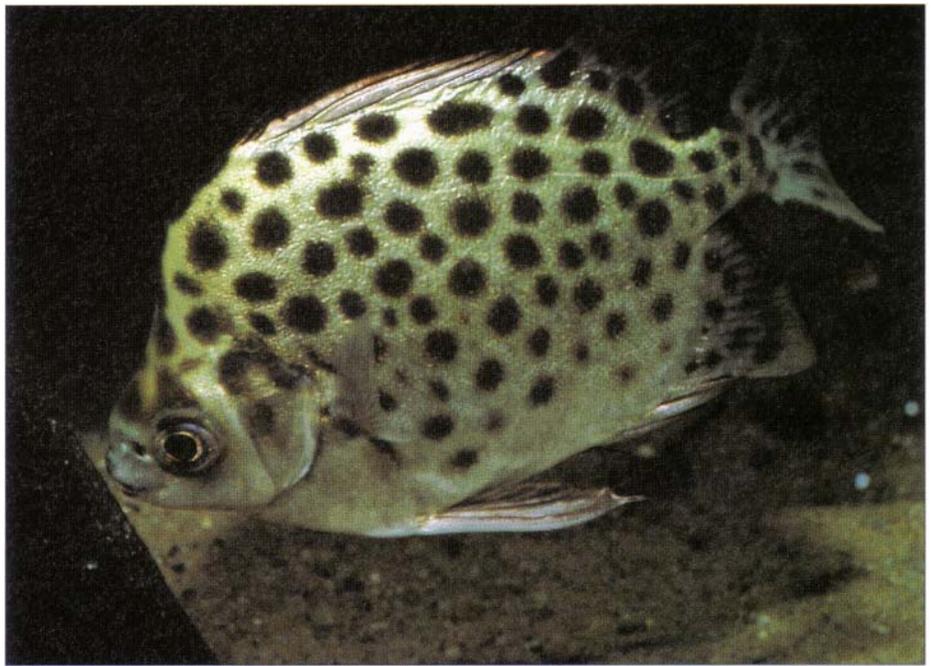
These fishes can become very tame and will even feed from your hand - but beware of the teeth. It is better, if you value your fingers, to use a pair tweezers if you wish to "hand" feed. They will take just about anything meaty, but, especially when first imported, prefer live foods. Worms of all kinds are preferred, and crickets make mealtimes fun because you can watch the fishes stalk them. Flake and frozen foods can also be given. Take care not to overfeed as decaying flake and frozen foods can quickly pollute the substrate, especially in the above-water section. Likewise, do not overdo live worms or you may find yourself with a worm colony in the aquarium.

Monos and Scats

Monodactylus argenteus (monos) and *Scatophagus argus* (scats) have been grouped together as they are both shoaling fishes which will live in harmony in a large brackish-water aquarium. Although they are usually sold as small specimens, the potential for *Scatophagus argus* is 30 cm (12 in) and for *Monodactylus argenteus* 25 cm (10 in). Both fishes have been recorded from fresh, brackish, and marine waters, so it is important to see what conditions your stock are being kept in at the time of purchase. Monos are found along the African coast and into Indonesia. Scats are found along the coasts of the Indian and Pacific Oceans, with Tahiti the easternmost limit of their range.

In captivity, these fishes need to be kept in groups and do very well in brackish aquaria provided they are given plenty of space. They love to swim so do not try to keep them in cramped conditions. Water quality is very important so ensure that your filtration system is working efficiently and, to supplement it, add a protein skimmer. It is important to keep nitrate levels to a minimum otherwise the scats in particular will suffer. Regular water changes, not just topping up to compensate for evaporation, are essential.

Scats love to eat plants, which rules out real greenery. Tank decor may consist of wood and rocks with some artificial plants for added colour. Bear in mind their love of plants when feeding the fishes. Monos are not as fond of plants but do benefit from some vegetable matter in their diet. Both species are omnivorous so provide a varied diet that includes items such as live



Young *Scatophagus argus* (scats) are attractively marked. We suggest plastic plants and/or wood for decor as these omnivores have a great liking for plants. Remember to include vegetable matter in their diet.



Adult *S. argus* have different markings on the body. To grow your fishes to adulthood ensure that you maintain good quality water and avoid any build up of nitrate.

foods, flake, lettuce, peas, oatmeal, frozen shrimps, bloodworm, and so on. The more varied the diet, the better the colour of the fishes. A word of caution here: in his book *Aquarium Fishes* (Volume 1), Hans Baensch notes that scats feeding on Java fern (often used for herbivores to feed on) died after eating it, whereas fishes that did not survived.

Young fishes are quite highly coloured. Monos show a lot of yellow in the dorsal, and distinct



Monodactylus argenteus (monos) are large shoaling fishes that may be kept with scats. Feed a varied diet to ensure good coloration, although this will fade as they grow.

black bars on the silvery body, but unfortunately this intense * colouring fades as the fishes mature and they become a rather dull greyish/silver with only a few traces of the yellow and black. Scats also vary in coloration from juvenile to adult. The juveniles have a yellow background colour with distinct black spots. As they mature, the body becomes silvery-bronze, still with some black spots, and traces of red appear along the dorsal surface.

Archer Fishes

No one can fail to be intrigued by a fish that shoots down its prey, and in public aquaria there is almost always a small crowd of people around the archer fish tank, all hoping that the fishes will perform.

The "archer" usually offered for sale is *Toxotes jaculator*, a widespread species found from the Gulf of Aden, all around the Indian coast, into southeast Asia and even in northern Australia. It is yet another fish that will tolerate fresh, brackish, and marine conditions. The one thing they won't tolerate is cold: they like a water temperature of 25-28°C (77-82°F), and many captive specimens are lost because they are kept too cool.

Archers are ideally suited to a paludarium (an aquarium that has both underwater life and above-water plants). The tank should be large enough to accommodate four to six fishes (they can reach 20 cm/8 in or so) and can be planted with *Sagittaria* and Java fern and decorated with wood, which can extend above the water's surface. Out of the water, above and to the back of the tank, grow some terrestrial plants which overhang the water, because it is on their foliage that insects will land and from which the fishes will attempt to shoot them down.

Keep fishes of approximately the same size together as it is quite common for larger specimens to intimidate smaller ones, preventing them from feeding or nipping at their fins. Injured fishes are vulnerable to fungal or bacterial infections and this situation needs to be avoided. Some people like to keep young scats and monos with their archers, but the problems start when the

scats and monos grow too large and become too active for the archers' liking.



In order to observe the feeding habits of *Toxotes jaculator* (archer fish) it is necessary to house them in a paludarium so that terrestrial plants may be grown overhanging the water, and to provide insects as prey.

Feeding Archer Fishes

Feeding archers is simple. They like to take their food from the surface and will consume flake as well as live insects. Once acclimatized to aquarium life they will also accept frozen bloodworm and the like. However, the purpose of keeping these fishes is usually to observe their novel method of catching their prey. First you need a supply of prey items. Small crickets can be purchased at shops that deal in reptiles. Alternatively, you can use flies: purchase some uncoloured maggots from your local fishing tackle shop and



In such an environment it is possible to witness *T. jaculator* "shooting" down prey items such as flies or spiders with jets of water, or leaping to snatch them from the plant leaves.

place a few in a small straight-sided dish (use a jar lid or similar) and place it among the plants. The maggots will pupate and subsequently hatch into flies, ready for your archer fishes to shoot down. (Store maggots in a bait box in the fridge to keep them for any length of time.) Add more maggots to the dish as the old ones hatch, to maintain a good supply of flies. The trouble is that the archer's aim is not that good, so it can take several attempts before it gets its fly. Remember to ensure that your paludarium is properly covered otherwise you will have a house full of bluebottles!

The furthest an archer can spit is about 150 cm (60 in), which means that the fishes can easily hit a fly anywhere in the paludarium. It also means that they could just as easily hit the lights - cold water on hot lights can mean that the lights "blow", so ensure that you protect them behind a sheet of glass.

There is another species of archer fish sometimes seen in the trade, *Toxotes chatareus*. It requires similar conditions and foods to *T.jaculator*, but doesn't spit at its prey, instead taking it from the water surface. It differs too in body depth and colour: *T.jaculator* is silvery-white with dark blotches and the body is fairly deep, whereas *T.chatareus* is more coppery-coloured with black bars and a black blotch, and has a slimmer body.

The fishes shown here are *Arms seemam* (shark catfish), a juvenile (above) and a semi-adult (below). Small specimens grow rapidly but fortunately they do not fight so it is possible to keep more than one in the aquarium. They are likewise peaceful towards other fishes - unless they are small enough to eat!

Shark Catfishes

Most people regard catfishes as purely freshwater fishes but there are marine and brackish water species as well. Imported under the names *Arms seemani* and *Ariusjordani*, they are collectively known in the trade as the shark catfishes, and have been a regular, if somewhat seasonal, import over the last twelve years or so. Their common name probably derives from their vague resemblance to sharks when they are swimming.

When they originally appeared on the market it was believed that they, like all the other catfishes in the trade -with exception of *Plotosus lineatus* (marine catfish) - were freshwater fishes. Many were lost, but it was noted that those kept in harder water showed a better

survival rate. Then research by aquarists revealed that they were probably brackish, if not marine, and that they were also migratory. They proved to be no trouble when kept in brackish water other than that their growth rate was rapid and they required large aquaria.

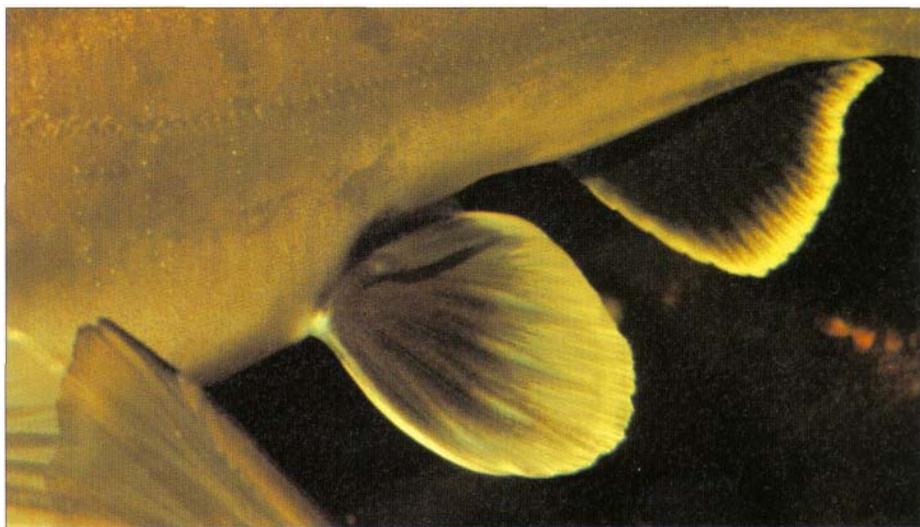
Shark "cats" are found along the western seaboard of the Americas, from California down to Colombia. Young specimens are imported at about 5-10 cm (2-4 in) in length, and these will live for a while in fresh water, but as they grow they require more saline conditions so in this respect they are ideal for a brackish aquarium. They are gregarious and very active. Don't be tempted to keep young shark catfishes in your community aquarium, even on a temporary



basis, while you prepare a suitable tank for them. Although they will love it, you will find that your other fish stocks become seriously depleted and the shark "cats" will have a smile from whisker to whisker.

They can be kept with other fishes such as *Scatophagus argus* (scats) and *Monodactylus argenteus* (monos), but we have found that it is best to keep them from the outset as a group of four to six in brackish conditions in a species aquarium. The colour on the fishes becomes more intense if they are in a group and they are more active. Indeed, they are one of the few catfishes that are not nocturnal. Provide a sandy substrate and some rounded pieces of bogwood to decorate the aquarium, rather than rocks on which these "naked" catfishes (they have thick skin and no scales) may damage themselves. They are active and sometimes take fright, so they might dash themselves against sharp rocks and any scratches or grazes would show up clearly on their bodies. Lighting can be quite dim as plants are unnecessary in this aquarium. The fishes like to spend some time resting in the shelter of the wood or cruising just above the substrate. Provide external power filtration to create not only good quality water, but also a good current against which the fishes can swim. They become very listless if water quality deteriorates or water flow diminishes, and, if conditions become too bad, their barbels will start to degenerate as will their fin membranes. Regular partial water changes and maintenance of the filtration system will prevent this.

Feeding is not a problem. They like a varied diet and will



Female *Arms seemani* (shark catfish) develop fleshy pads on the ventral fins when they come into breeding condition. Unfortunately few home aquaria are large enough for a pair of breeding-sized specimens.

consume large quantities of pelleted foods, flake (for small specimens), pieces of meat, fish, and prawn, in fact just about anything. The temptation is to overfeed them and you must resist this. Feed on alternate days and only then if the fish does not still have a bloated appearance after gorging itself on its previous meal.

As the fishes grow, the colour changes slightly. Youngsters are silvery with velvety black fins, but as they begin to mature they become silvery grey, and if well maintained, develop a delightful coppery sheen. The black in the finnage diminishes until only a trace remains at the base.

A word of warning: shark cats grow very large. In the aquarium they quickly reach 30 cm (12 in), but at this size they are only one-third grown. The likelihood of breeding them in captivity in home aquaria is remote. From field observations and captured specimens we know that they practice oral incubation, with the male brooding both the eggs and fry. We also know that in some species the female grows a fleshy pad on her ventral fins, and it

has been suggested that the eggs are held by this pad so that the male can then take them into his mouth. This pad has also been observed on aquarium specimens but, so far, that's as far as captive breeding has got.

Take care when handling these fishes. They have stout spines on the dorsal and pectoral fins and these spines can easily become entangled in nets. The sharp points of the spines can also inflict a nasty wound to the hand of the unwary aquarist who is cleaning out an aquarium, and although at first it doesn't hurt, it usually swells and becomes rather painful. Bathing in hot water has been found to relieve the pain.

As a total aside, ariids are also known as crucifix fishes. This came about because native fishermen found that they could decorate the catfish's skull. The underside is usually painted with a scene of Christ on the cross while the dorsal surface (top) is decorated so that it looks like a monk in flowing robes. These artefacts are then sold to tourists - a great way to earn a living from old fish skulls.

Bumblebee Gobies

Now for something a lot smaller. *Brachygobius* (bumblebee gobies) are suitable for those of you who cannot keep a large brackish water aquarium, because they will be quite happy in a 60 x 30 x 30 cm (24 x 12 x 12 in) tank. Although these fishes are small, we do not recommend using anything smaller than this because it is more difficult to maintain good water conditions in a small body of water.

There are two species available, *Brachygobius xanthozona* (bumblebee goby) and *Brachygobius nunus* (golden-banded goby), but because they look very similar, both are usually labelled "bumblebee gobies" in dealers' tanks. Both are small, 4-4.5 cm (IVz-PA in) in length at most, and both have broad yellow and black vertical bands on the body, but in *B. xanthozona* these bands are more clearly defined. Both are found in fresh and brackish waters in Asia, but *B. xanthozona* has the more restricted range.

Like all gobies, these fishes spend much of their time darting about among rocks and pebbles, or resting on wood or leaves in the mid to lower regions of the aquarium, so design your decor with this in mind. Fine gravel makes a good base for a scattering of pebbles and rocks together with a piece of bogwood. Attach some Java fern to the wood, and plant other salt-tolerant plants in thickets to the rear and sides of the aquarium. If possible

People often fail to keep *Brachygobius xanthozona* (bumblebee goby) because they do not realize that these fishes require a diet of predominantly live foods. Although they can be weaned onto frozen substitutes it is rare for them to accept flake.

provide a cave or two, which can be half flowerpots either left just as they are or camouflaged with stones - the choice is yours, but make sure there are plenty of other hiding places because bumblebees are territorial, so it is important to have sufficient rocks, wood, and so on, so that each fish can stake a claim to its own patch. Then, provided you don't add more gobies or move the rocks around, there will be no real battles, just the fishes shaping up to each other if one inadvertently enters the territory of another.

Feeding bumblebees can be quite a problem, as only rarely will they accept flake foods. If you are lucky, they will take frozen bloodworm and *Daphnia*, if not, then you must be prepared to provide live foods of all kinds. They are particularly fond of whiteworm and *Tubifex*, and will also take most other aquatic invertebrates. If you have limited supplies of these available, it is suggested that you also culture brine shrimps and let these grow on a little before feeding them to your fishes.

Although they will live in hard (above 15° dH) fresh water, they really seem to prefer warm, brackish conditions. Make sure that you have an efficient filtration system as any deterioration in water conditions can cause stress and they may suffer from bacterial or fungal infections. This doesn't mean that there has to be a torrent of water flowing through the tank - flow rate does not equate with efficiency - just a gentle turnover of the water is fine; the fishes won't enjoy being washed away.

Breeding Bumblebee Gobies

A water change with fresh water (that is, a reduction in salinity) will often provide the trigger for the fishes to spawn. Males are more colourful than females but at spawning time the females are easy to spot because they are much fuller in the body and, about 48 hours prior to spawning, will show an ovipositor. The pair will spawn either beneath a rock or in a cave, laying up to 200 eggs. At about 28°C (82°F), the eggs will hatch in four days and the male guards the fry. At



this time he will defend his brood against all comers, including the female, so she must have a hideaway to retreat to. For the first few days after the fry become free swimming, the shoal moves about the lower levels of the aquarium, but it isn't long before they, like their parents, adopt a bottom-dwelling lifestyle. One of the problems is providing sufficient live foods. It is critical that the timing of brine shrimp hatching coincides with the fry needing it.

Growth is steady provided you can supply enough live foods and plenty of space, so you will probably need to set up another tank in which to grow on the fry. Most losses seem to occur because the fry starve.

Keeping these little gobies in a species aquarium is all very well and good, but it does seem an awful waste of the top layers of the aquarium. A pair of sailfin mollies (*Poecilia* sp.) make excellent companions for the gobies and in brackish waters they really show their true colours and tend not to suffer from the bacterial or fungal infections that sometimes break out on those kept in fresh water. Being opportunists, they will take the live foods put in for the gobies, but you will soon learn how much will keep both species happy.

A word of warning here: don't let the aquarium become overpopulated with young mollies or they may overload the filtration and the resulting deterioration in water quality will lead to the demise of your gobies. It will be far better to grow the young mollies on in another tank.

Non-breeding *Etroplus maculatus* (orange chromides) are difficult to sex, so grow on half a dozen youngsters and allow them to pair naturally.

The Asian Chromides

Two species of cichlid are found almost exclusively in brackish water: *Etroplus suratensis* (green chromide, 45 cm (18 in)) and *E. maculatus* (orange chromide, 10 cm (4 in)). Both occur in coastal regions of southern India and Sri Lanka, chiefly in brackish estuaries and lagoons. The salinity of both types of habitat is variable, depending on the state of the tide and the fresh water input, which varies with the seasons.

Both species are found in close association with each other and with beds of *Halophila* (sea-grass), which provides them with shelter and spawning sites. *E. maculatus* lays its eggs on the narrow leaves of the plants, no easy task when the latter are waving to and fro in the current, so to ensure accuracy it uses its pelvic fins as guides, one each side of the leaf. The larger *E. suratensis* prefers to dig pits, exposing the roots of the sea-grass and sometimes using them as a spawning substrate.

The green chromide is a peaceful herbivore which breeds

seasonally; the orange, on the other hand, is an opportunistic feeder, eating, *inter alia*, parasites and necrotic skin which it cleans from its larger relative, and the latter's spawn! The relationship is, nevertheless, symbiotic as both benefit from it. *E. maculatus* will also cannibalize the eggs and fry of its own kind, but only those of other pairs - they are excellent parents, guarding their fry for weeks, even months. The orange chromide will breed continuously if its food supply is adequate. In nature it lives colonially; it requires a territory of at least 180 cm² (24 sq in) per pair if this is to be tried in captivity.

E. suratensis must have highly oxygenated brackish water and be housed in a large aquarium (120 x 45 x 45 cm (48 x 18 x 18 in) is the minimum for a pair). Far too many of these lovely fishes die in captivity as a result of ignorance of these basic requirements, and the reason this species is rarely bred is probably because few individuals survive to adult size. Plastic plants are ideal shelter - real





Etroplus maculatus (orange chromides) are excellent parents, protecting their fry for some time. The fry feed initially on the parents' body mucus.

ones are likely to be eaten, and few of those available will withstand the salinity necessary for the fishes.

E. maculatus can be kept in similar conditions, but will also thrive in hard alkaline fresh water; do remember that individuals that have been accustomed to brackish water must be acclimated slowly to different conditions. Like many cichlids they will utilize flowerpots for shelter, but plants (real or plastic), ideally those with long, straight narrow leaves (such as *Vallisneria*), should be provided as spawning substrates. A temperature of 27-28°C (80-82°F) will suit both species.

The green chromide must be offered predominantly vegetable foods, such as scalded lettuce and spinach, as well as vegetarian flake and pellets. Like most nominally vegetarian cichlids, it also enjoys live fare such as pond foods and earthworms.

E. maculatus is, by contrast, an out-and-out carnivore, and should be given suitably sized live foods, cod roe, chopped shrimp/prawn, and suitable dried foods.

Although adult female *E. maculatus* develop white markings on the upper and lower edges of the tail when breeding (or thinking about it), juveniles and unpaired adults exhibit no visible sexual dimorphism. No reliable way of sexing green chromides is known. It is thus best to purchase half a dozen juveniles, growing them on together and letting them pair naturally.

Orange chromides are easy to breed, either in a species aquarium or in a community of small to medium hard or brackish water fishes. Although "scrappy" among themselves, and territorial towards other similarly-sized cichlids, they will not normally harass non-competitors such as

mollies, though it must be said that livebearer fry are relished as snacks! If the aquarium is sufficiently spacious, both chromides can be kept together, and the green can be housed with other brackish species such as scats and monos, but preferably in a deep (60 cm (24 in)) aquarium so as to allow vertical habitat segregation. Personally, however, we would prefer to "coddle" the greens a little, and allow them the privacy of their own tank. A "seasonal" increase in temperature and salinity may trigger breeding, as they spawn in the dry season in nature.

As in some South American cichlids (*Sympkysodon* sp. and *Uaru* sp.), the fry of both species feed on parental body mucus as well as micro-organisms. Failure of the first few broods in young adults may be due to failure to synchronize mucus production with hatching.

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