

FRESHWATER FISHES

THE SCARCITY OF FRESHWATER BODIES IN THE UAE limits both the number and variety of fish that can be found in these habitats. Only three native species occur, all in wadis in the Hajar Mountains. These are: *Garra barreimiae*, a small, dark, catfish-like bottom feeder that is the UAE's most common wadi fish; *Cyprinion microphthalmum*, a larger, minnow-like species found in only two UAE wadi systems; and *Aphanius dispar* (the Arabian killifish), a small, pale fish common in shallows in coastal lagoons as well as mountain wadis and today introduced into many man-made water bodies. The first two species are members of the carp family (Cyprinidae), whereas the third belongs to a large family commonly known as egg-laying toothcarps (Cyprinodontidae).

No mountain wadis in the UAE flow continuously at the surface throughout the year, but fish can nevertheless be found in most of them (Feulner 1998a). Unlike some specialised fish species elsewhere, the local wadi fish cannot aestivate in order to survive the prolonged desiccation of their environment, nor do they produce drought resistant eggs. Instead, they must be able to survive for extended periods in small, isolated pools, then propagate and disperse rapidly when the wadis flow again after rain.

Two non-native varieties of freshwater fish also occur in the UAE. One, the tilapia *Oreochromis* spp., has been actively introduced in recent times and is now established in a few larger wadis and a number of man-made environments. The other, the molly *Poecilia* spp., is known only from irrigation channels at a single agricultural plantation outside Dubai.

An additional species, the freshwater goby *Awaous aeneofuscus*, occurs in a few wadis in northern Oman, adjacent to the UAE

border near Hatta. This fish lives as an adult in pools in larger streams, but typically breeds downstream and disperses via the sea.

The observed distribution of wadi fish in the Hajar Mountains was accomplished at least thousands of years ago, during periods of wetter climates, when the wadis flowed more regularly. It is an important biogeographic observation that the UAE's native freshwater fish have their closest evolutionary relationships to species in Iran and that there is no evidence for the exchange of freshwater fish species between the mountain regions of eastern and western Arabia.

Known predators of wadi fish include the wadi racer *Coluber rhodorhachis*, a long thin snake, and (in shallow pools) occasional migrant or wintering herons, little bitterns and kingfishers. Toads have been reported to prey on fish stranded in drying pools, and it is possible that the Burton's saw-scaled viper *Echis omanensis* (formerly *E. coloratus*) may do the same.

NATIVE SPECIES

Garra barreimiae, named after the Buraimi oasis, is by far the most common native species. In many wadis *G. barreimiae* is the only fish present. They are small (adults are generally ca. 4.5–7 centimetres) and mottled brown in colour, typically dark but varying somewhat with the surroundings. Larger adults sometimes show more colourful red, white or blue markings, probably related to breeding status. They feed on detritus and algae and have a specialised mouth plate that functions as a suction device. They resemble aquarium catfish as they nuzzle their way over gravel and rock surfaces, but they dart about frantically when approached in shallow pools where they are vulnerable to terrestrial and avian predators.

G. barreimiae is endemic to the UAE and northern Oman. Separate subspecies have been recognised on the east and west flanks of the Hajar Mountains, respectively, but these cannot be distinguished by field observation alone. The genus *Garra* is known from East Africa to South Asia and several other *Garra* species are endemic to the mountains of south-western Arabia, but the closest relative of *G. barreimiae* is thought to be *G. persica*, which is widespread in southern Iran.

G. barreimiae has a behavioural tendency to explore upstream,

which probably facilitates dispersal when the wadis flow. Smaller adults have been observed to climb several metres up waterfalls, using the wet surface of the splash zone adjacent to the main flow of water, sometimes wriggling, sometimes jetting forward, resting periodically with pectoral fins spread, the mouth plate engaged for suction, and the tail twisted and pressed flat against the rock.

Little is known about the life history of *G. barreimiae* in the wild. Several anecdotal reports exist of the release of eggs and sperm during transport of specimens, provoking speculation that spawning may be triggered by turbulence, mimicking that of a wadi in spate. *G. barreimiae* will cannibalise its own eggs if conditions permit. Experiments have shown that *G. barreimiae* can tolerate water temperatures up to ca. 40°C (104°F) and salinity up to one-third that of sea water (Haas 1982).

G. barreimiae is caught and eaten by human residents of the mountains, even today. The normal technique employs a V-shaped stone dam to channel the fish onto a portable sieve-like platform made from palm ribs, wire mesh or nylon netting. This can be very effective, eliminating all but the very smallest fish in the area, but only *G. barreimiae* is taken for food, even when other species are present.

The Arabian killifish *Aphanius dispar*, is found in many UAE mountain wadis, but its primary environment is coastal lagoons (*khors*), where it may be the most common fish. For this reason it is known to experts as a 'secondary' freshwater fish. It is able to tolerate a wide range of salinities, from freshwater to hypersaline. It is also able to survive at water temperatures as high as 46°C (114°F) (Haas 1982). Such extreme temperatures can be encountered in tidal lagoons as well as in shallow mountain pools.

The Arabian killifish is somewhat smaller (adults *ca.* 3.5–5.5 centimetres) and paler than most *G. barreimiae*. It also swims higher in the water column and often 'hovers' characteristically with the tail curved slightly to one side. Adults show marked sexual dimorphism. Females are mottled golden-brown with numerous dark, vertical, zebra-like stripes; males are pale and faintly white-stippled but the tail fin bears two to three dark vertical bands. In breeding colour the lips and fins of the male are vivid blue-white and, when displaying, the tail is fluttered like a matador's cape.

The Arabian killifish is a surface feeder by design, but in the wadi environment it is highly opportunistic. It can subsist on algae, but it takes live food when available and also feeds on debris on the wadi bed. It is also an efficient predator of mosquito larvae. One study reported an average consumption of 96 larvae per fish per day, in the presence of abundant alternative foods (Haas 1982). For this reason *A. dispar* has been introduced for mosquito control into various man-made bodies of water in the UAE, including cisterns, agricultural runoff channels, bulldozed ponds and water tanks. It is able to reproduce successfully in all of these environments.

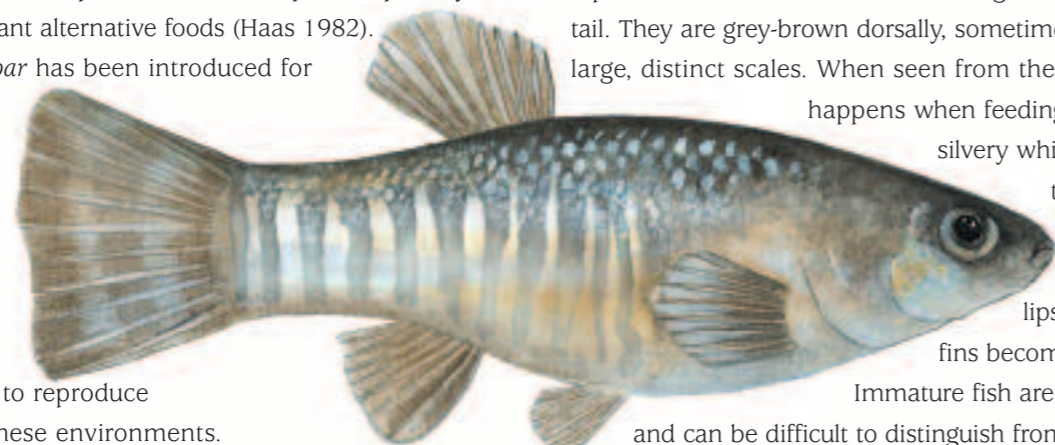


LEFT: *Garra barreimiae*
BELOW: Arabian killifish *Aphanius dispar* (female)

The Arabian killifish is found around the entire Arabian Peninsula and its dispersal from one wadi system to another is undoubtedly facilitated by its ability to migrate along the seacoast. At least in some UAE wadis, however, it seems likely that it has been artificially introduced. Observations in the 1990s identified three wadis in which *A. dispar* was, anomalously, the only fish present (Feulner 1998a). Two of these were subsequently found to dry up entirely during prolonged drought, eliminating all fish.

Cyprinion micropthalmum is the largest but least common of the UAE's native species. Within the UAE, it is found only at Hatta and Hadf, and only in larger pools, but it is present throughout the mountains of northern Oman, and in Iran, Pakistan and Afghanistan.

C. micropthalmum is a streamlined mid-water swimmer. Its mouth and lips are specialised for scraping algae from rock surfaces, but it will also take live food such as mosquito larvae and small crustaceans, when available. Adults are recognisable by their size (up to *ca.* 12 centimetres) and their large, transparent, deeply forked tail. They are grey-brown dorsally, sometimes slightly mottled, with large, distinct scales. When seen from the side, as sometimes happens when feeding, they are a striking silvery white that can reflect like the flash of a knife blade. In breeding colour they darken and the lips, gill areas and pectoral fins become a vivid pale blue. Immature fish are mottled golden-brown and can be difficult to distinguish from juvenile *G. barreimiae*.



INTRODUCED SPECIES

Tilapia are a sub-group of the very large and highly diversified Cichlid family of fish (Cichlidae). The name tilapia refers to several similar species in the related genera *Oreochromis* and *Tilapia*. Tilapia are omnivores and they have been introduced throughout Arabia in recent years to freshwater bodies of all kinds for algae, weed and mosquito control. Some are now bred locally.

Tilapia are notoriously voracious, hardy and prolific species native to African rivers that vary seasonally, predisposing the fish to be able to tolerate considerable fluctuations in temperature, salinity,

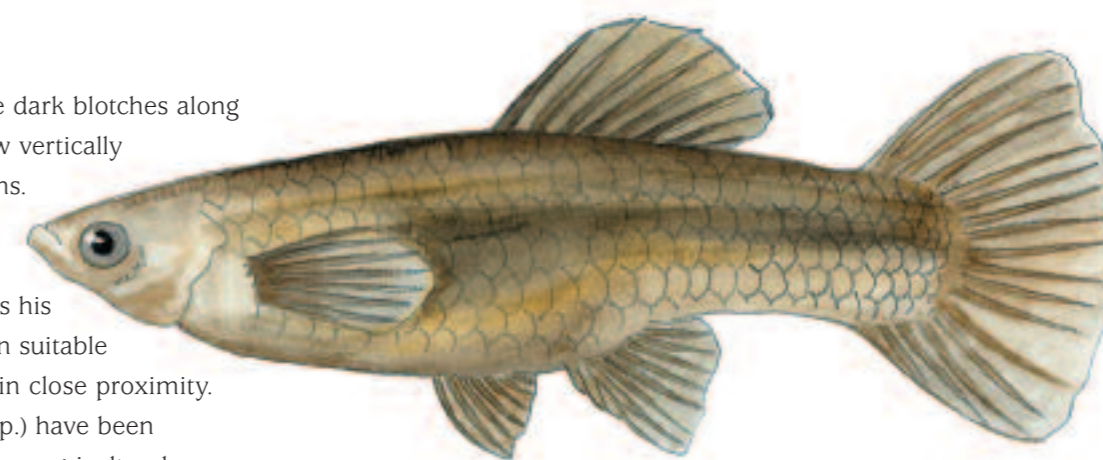
water quality and food resources. Tilapia are also much larger than the UAE's native wadi fish (potentially exceeding 20 centimetres), making them not only formidable competitors but also potential predators. As a result, there is reason for concern that the introduction of tilapia will adversely affect native fish populations.

Field identification of individual tilapia species is difficult. The species present in the UAE have not been confirmed, but probably include *Oreochromis niloticus* and *O. mossambicus*. The variety most commonly seen in wadi environments is a pale beige colour,

usually marked with a row of several diffuse dark blotches along the side of the body. Larger individuals show vertically striped and variably tinted dorsal and tail fins.

At breeding time, the tilapia male excavates a characteristic shallow bowl in a sandy bottom area, which he then patrols as his territory and defends against other males. In suitable areas, many territories may be established in close proximity.

Mollies *Poecilia* spp. (formerly *Mollinesia* spp.) have been observed in irrigation ditches at Ruwayyah, an agricultural area outside Dubai, and may occur in similar circumstances elsewhere. They are thought to have originated from private aquaria. Mollies are native to tropical and subtropical America, but the black molly, a selectively bred variety, is a popular aquarium fish available worldwide. At Ruwayyah, mollies occur in



Molly *Poecilia* spp. (female)

three colour varieties: black (the commercial variety), pale beige (considered to be the original wild colour) and mottled black-and-beige. This phenomenon represents a reversion of the aquarium stock to the original wild colour due to indiscriminate breeding.

OTHER SPECIES POSSIBLY PRESENT

The freshwater goby *Awaous aeneofuscus*, has been found in northern Oman in wadis adjacent to the UAE border near Hatta (Feulner and Cunningham 2000). Most gobies are sedentary marine fish inhabiting shallow-water environments and sheltering in burrows or crevices. Some, however, live primarily in freshwater rivers and streams. *Awaous aeneofuscus* is one of the latter and is found in Indian Ocean tributaries from South Africa to Pakistan, in a variety of habitats. *A. aeneofuscus* could possibly be found from time to time in the larger East Coast wadis of the UAE, such as Wadi Wurayyah or Wadi Zikt, although the recent construction of major dams in those wadis diminishes that possibility.

A. aeneofuscus is a sedentary, omnivorous bottom-dweller that can exceed 20 centimetres in length. The elongated body is mottled grey-brown with diffuse, yellow-buff transverse bands across the back. In open sand or gravel, it can take cover by rapidly burying itself. Reproduction by *A. aeneofuscus* has never been observed, but is thought to be similar to other large species of *Awaous*, in which adults move downstream to estuaries to breed, the eggs becoming part of the oceanic plankton community for an unknown period of time. Fry return to streams during

spring tides and after heavy seasonal rains. The goby population near Hatta nevertheless seems to have maintained itself *in situ* for a number of years without access to the sea.

It is probably inevitable that additional introduced fish species will be found from time to time at discrete permanent freshwater sites, particularly in agricultural ponds and dammed lakes. Aquarium fish, such as guppies *Poecilia reticulata* and platies *Xiphophorus maculatus*, in addition to the mollies mentioned above, have been released into spring-fed drainage systems in eastern Saudi Arabia and have apparently persisted (Ross 1985). All of the foregoing species are members of the live-bearing toothcarp family (Poeciliidae) and are prolific in captivity. Another member of the same family is *Gambusia affinis*, a New World species that has been widely introduced elsewhere to control mosquitoes, but often to the severe detriment of the native fish fauna, as in Iran. Fortunately, the high summer temperatures of freshwater bodies in the Hajar Mountains, and the extreme irregularity of their hydrologic regimes, may protect against the successful introduction of *G. affinis* in the wild in the UAE.

Gary Feulner

Freshwater goby *Awaous aeneofuscus*

