

**fishes** In Singapore, the majority of fishes are found in coastal waters. Only about 12 per cent are confined to freshwater. Half of the freshwater species are non-native. They were introduced for aquaculture, angling or mosquito-control, or are abandoned ornamental fishes—many of which prey voraciously on native species. With the loss of forests and streams, most native freshwater fishes are now endangered. The first comprehensive study of Singapore's freshwater fishes was published in 1966. Updated in 1996, it listed 104 species, 39 of which are presumed to be locally extinct. The two major groups of fishes found in Singapore are cartilaginous fishes and bony fishes.

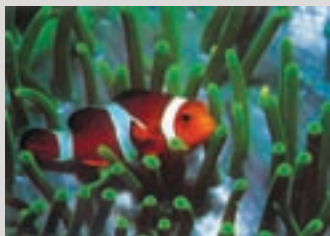
**Bony fishes**

Bony fishes are far more numerous than cartilaginous fishes in Singapore.

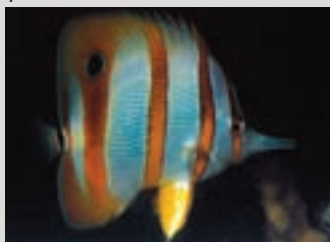
**Perciformes**

The order Perciformes is the largest and most diverse component of Singapore's fish fauna. They are generally recognizable by their two dorsal fins, one of which is supported by stiff spines, as well as their scale-covered bodies. Many members of this order are encountered in the market, such as the barramundi (*Lates calcarifer*), orange-spotted grouper (*Epinephelus coioides*), mangrove red snapper (*Lutjanus argentimaculatus*) and threadfin breams (*Nemipterus spp.*).

Damselfishes are commonly seen around coral reefs. The most famous



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example is the clown anemonefish (*Amphiprion ocellaris*) (1), which lives in symbiotic association with large sea anemones. Also found around corals is the copperband butterflyfish (*Chelmon rostratus*) (2).

In freshwater, the most conspicuous perciform is the tilapia (*Oreochromis mossambicus*). It was apparently imported from Africa for aquaculture during the JAPANESE OCCUPATION. Another popular table fish is the marbled goby or Soon Hock (*Oxyeleotris marmorata*). Also a freshwater perciform, it is the largest of over 100 species of gobies found in Singapore.

Some freshwater perciforms are able to survive for periods outside water. The climbing perch (*Anabas testudineus*) breathes atmospheric air and can crawl over land from one body of water to another, aided by its strong, serrated gill covers. Other air-breathers include mudskippers (members of the family Gobiidae) and snakeheads (*Channa spp.*).

**Clupeiformes**

This order includes sardines and herrings—some of the most abundant fishes in Singapore waters. Anchovies (*Stolephorus spp.*) are sold—fresh or dried—for food; Tamban (*Sardinella spp.*) are used for animal feed. Anchovies and Tamban occur in large schools and feed on plankton.

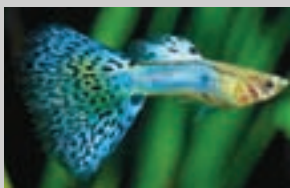
**Beloniformes**

Halfbeaks and garfishes belong to this order and have extremely long jaws. Garfishes, such as the spot-tailed

gained popularity in the 1940s due to their vibrant colours. Interest in guppies (7) waned in the 1970s, but has since been revived with the development of new strains of attractive and disease-resistant guppy.

From the early 1960s to the 1980s, schoolchildren often reared fighting fish (8) for sport. Fighting fish were relatively expensive, and children would often try to find them in drains and canals, rather than purchase them.

Many businesspeople rear fish that are believed to be auspicious. Examples are the AROWANA and the flowerhorn



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**Cartilaginous fishes**

These include rays and sharks. Sharks are found in Singapore waters, although large man-eating varieties are rare. In 1967, a locally-caught Tiger Shark (*Galeocerdo cuvier*) was found to have human remains in its stomach. Most sharks found locally are relatively small and harmless.



Rays are dorso-ventrally depressed sharks with eyes on their backs, and gill-slits and mouth located on their undersides. Some rays can generate electricity to stun prey and predators, while some look like sharks. Yet others have venomous spines on the tail.

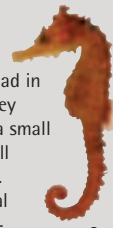
Spotted eagle ray (*Aetobatus narinari*) (left); brown-banded catshark (*Chiloscyllium punctatum*) (right).



garfish (*Strongylura strongylura*), are carnivorous. Their jaws are of about equal length, lined with numerous sharp teeth. Halfbeaks tend to be insectivorous, their lower jaw much longer than the upper. Examples are the stripe-nosed halfbeak (*Zenarchopterus buffonis*) and the forest halfbeak (*Hemirhamphodon pogonognathus*).

**Gasterosteiformes**

Belonging to this order are seahorses and pipefishes. Clad in leathery armour plating, they have tubular mouths with a small gape, and can only eat small organisms like zooplankton. They occur mainly in coastal waters where they are well-camouflaged amongst seagrass and coral. The Estuarine Seahorse (*Hippocampus kuda*) (3), Blue-speckled Pipefish (*Hippichthys cyanospilos*) and Slender Seamothe (*Pegasus volitans*) are all examples. The seahorse is a protected animal in Singapore.



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**Tetraodontiformes**

Known as puffer-fish (4), these fishes can inflate their bodies by inhaling air or water when threatened. Some relatives of puffer-fishes have box-shaped bodies with hardened rigid skin, and are unable to puff themselves up. The Short-nosed Boxfish (*Rhynostracion nasus*) (5) is a common example. Besides its body armour, it can also protect itself by exuding a poisonous mucus.



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**Scorpaeniformes**

Scorpionfishes belong to this order. They have venomous spines on their dorsal fins. A handful of species are found in Singapore's coastal waters. They tend to resemble rocks and corals. The little Longspine Scorpionfish (*Paracentropogon longispinis*) (6) is common, but it is the larger Estuarine Stonefish (*Synanceja horrida*) that is much feared. People have died from being stung by it. However, it is not poisonous to eat.



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**fish rearing as a hobby** Rearing ornamental fishes is a popular pastime in Singapore. The most popular fishes are guppies, which are hardy, cheap and easy to breed. First brought into Singapore in the early 20th century to help control the mosquito population, wild guppies from Brazil—often referred to as *longkang* (Malay for 'drain') fish, as they populated drains and canals—



(*luohan*). Indeed, there have been unsubstantiated claims of people winning lotteries after staring at flowerhorns for protracted periods. Koi are also considered lucky and are the most common ornamental species in ponds at residences and commercial buildings.

Singapore has been a major exporter of ornamental fish since the 1950s, holding a quarter of the industry's global trade. In 2004, this amounted to some \$86 million. More than 1,000 varieties of ornamental fish are bred in Singapore and

exported to some 50 countries.