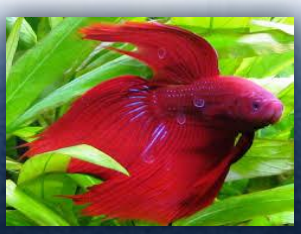
Wonder Fish

Welcome to the Amazing world of Fishes

Overview

Department of Fisheries , Himachal Pradesh cultures and conserve various ecologically and commercially important fish species. These species are useful in aquaculture, reservoir and ornamental fishery. A brief account of habits, habitat and biology of few fishes is being presented for knowledge and awareness of aquaculture enthusiasts. Information on ornamental fishes would be of great use to the people who love rearing fishes in aquariums purely for recreational purpose. So come with us in the amazing world of fishes and fisheries:

Siamese Fighter Fish (Bubble Nest Builder)



General Remark:

This fish is fairly hardy and it doesn't need a big tank. There are quite a few types of this fish. This fish got its name because it is very aggressive to other male fishes (and sometimes other fishes with elegant fins) it is usually OK to keep this fish with other fish of different kinds. If you do it there are few things to watch out. The fighting fish may get bullied by other fish. And It may not be quick for fighter fish to get the food before the other fish do.

Scientific Name: ***Betta splendens***

Common Name: **Saimese Fighter Fish**

Attainable Size: **Up to 75 mm**

Nativity/ origin: **Myanmar , Thailand , Cambodia and indeed entire South East Asia**

Compatibility: **Usually compatible & peaceful, although individuals vary & do not mix with fin nippers**

Tank setup:

Tanks may be of any size from fish bowl to 100-gallon tank. In bowls water should be changed as frequently as possible, almost daily. In larger aquaria the replacement of water should be atleast twice a week. Change of water is necessitated more often in summers than in winters. The quality of the water especially its colour, residual of feed lying at the bottom should also be taken in to consideration for change of water.

Water chemistry: **Temp: 24-29^0 C; pH 6.5-7.5**

Feeding:

Omnivorous; small live and dry food and flakes/granular- Minced and chopped earthworm/ insects; dry feed packets commonly available in the market under label of Aquarium Feed.

Breeding:

It is an egg laying fish and typical bubble nest builder. Breeding the fishes is not difficult and is very interesting to watch. The male entices and chases the female and catches her, and then embraces with claspers till eggs come out (*all inside a bubble nest).* If an egg falls off from the nest the female brings it back hurriedly. A characteristic feature is that the male would ward off the female after shedding eggs.

Sex differentiation:

Female is much duller with less elegant fins; males have elongated finnage.

Rainbow Trout

Class: Actinopterygii (Ray-finned fishes)

Order: Iso spondyli

Family: Salmonidae (Salmonids)

Sub family: Salmoninae

Species: *Oncorhynchus mykiss*

Size: Max. size: 120 cm (male/unsexed; Ref. 5504); max. recorded weight: 25.4 kg (Ref. 7251); max. reported age: 11 years.

Environment: benthopelagic; anadromous (Ref. 51243); freshwater; brackish; marine ; depth range 0 - 200 m

Climate: Temperate; 10 - 24° C; 63° N - 32° N

Importance: Suitable for commercial farming

Resilience: Medium, minimum population doubling time 1.4 - 4.4 years (K=0.38-0.46; tm=2-5; tmax=11; Fec=200)

Introduction in India:

The first successful transplantation of rainbow trout was achieved during 1912 when Mitchel hatched a consignment of trout eggs presented to him from Bristol water works, Blagdom, England. Later, the rainbow trout was distributed and spread to different states of India.

Distribution:

Rainbow trout are natives of the Sacromento river, flowing in the west coast of United States of America. They differ from rainbow trout, as the adipose fin is not tipped red.

Biology:

The natural habitat of the species is fresh water with temperature of 12° C in summer. It is unclear whether its anadromy is a truly genetic adaptation or simply an opportunistic behaviour. It seems that any stock of rainbow trout is capable of migrating, or at least adapting to seawater, if the need or opportunity arises. They require moderate to fast flowing, well-oxygenated waters for breeding, but they also live in cold lakes (Ref. 6390). Rainbow trout survive both in lakes and in streams (Ref. 26519). Ascends upstream & tributaries from September to October, spawns in spring. Generally feeds close to the bottom (Ref. 13337). Adults feed on aquatic and terrestrial insects, molluscs, crustaceans, fish eggs, minnows, and other small fishes (including other trout); young feed predominantly on zooplankton (Ref. 26523). eaten fresh, smoked, canned, and frozen; eaten steamed, fried, broiled, boiled, microwaved and baked (Ref. 9988). Rainbow trout is cultured in many countries and is often hatched and stocked into rivers and lakes especially to promote recreational fishers (Ref. 9988).

Rainbow Trout

Morphology:

Dorsal spines (total): 3-4; Dorsal soft rays (total): 10-12; Anal spines: 3-4; Anal soft rays: 8-12; Vertebrae: 60-66. Body elongate, somewhat compressed especially in larger fish. No nuptial tubercles but minor changes to head, mouth and colour occur especially in spawning males. Coloration varies with habitat, size, and sexual condition. Stream residents and spawners darker, colours more intense. Lake residents lighter, brighter, and more silvery. Caudal fin with 19 rays (Ref. 2196).

Rainbows are entirely fresh and cold water fish. The steelhead trout, a close relative to the rainbow, is the anadromous version. It lives in the Pacific ocean and migrates up into the streams of the west coast to spawn. Their migration can be a 1000 or more miles.

The rainbow trout characteristically are very colourful with an overall metallic coat. They have a bright red coloration on the gill covers with deep pink band down the lateral line. Their dorsal exterior is covered with black spots as well as the anal fin. They do not have teeth on their tongue. The body progressively darkens in colour from the ventral side to the dorsal side. A fleshy finlet posterior to the dorsal fin called an adipose fin is present in the rainbow. This is a distinguishing characteristic of the order salmoniformies.

Habitat:

Rainbow trout live mainly in cold rivers and streams at about 55 F to 60 F, but sometimes occupy small cold water lakes. Rainbows are the most flexible of the trouts in that they can occupy waters up to 80 F, but at these levels they feed little and grow slowly. The most productive streams have a gradient of .2 to .5 percent, which is about 25 to 100 feet per mile. Some mountain streams have steeper gradients, up to 15 percent, but they must have log jams or levels for trout to survive. Rainbows prefer sandy or gravel bottoms to live in, because they produce more insects and are good for spawning. Trout can tolerate a wide variety of pH levels, form 4.5 to 9.5. Rainbows can very much live in any stream, but they must remain relatively cool and with moderate flow rates year round for them to survive. There must be good shade on the streams for trout to live in it.

Habits:

Its cultivability arises from following characteristics:

a) It lends it self more easily to domestication.

b) It accepts artificial feed;

c) It with stands higher temperature better, even 24^0 c or over for short spells;

d) It with lands low dissolved oxygen content of water;

e) It is more resistant to certain diseases notably furunculous;

f) Its incubation period is shorter;

g) It shows faster growth.

Rainbow Trout

Feeding:

They feed mainly on insects on top of the water, but they sometimes snack on insects in the nymph stage drifting below the surface of streams and rivers. They also eat plankton, fish eggs, smaller fish, and even crustaceans. The trout that feed on insects grow more slowly than those that feed on fish. The trout that eat insects often expend more energy in catching than they get out of it. The trout that feeds on bait fish gets a lot more energy than it uses in catching it. Cold mountain streams that are less fertile and therefore produce less food the trout of these streams rarely exceed 1 pound. The larger rivers with marginal temperatures produce plenty of bait fish and the trout often grow to be about 15 pounds. The rainbow trout has a maximum age of 11 years.

Spawning :

Rainbow trout spawn in the spring in small tributaries streams at about 50 F to 60 F. Trout prefer a clean gravel bottom for spawning in the tail of a pool where the current sweeps the bottom free of silt. The female digs several nests called redds while the largest dominant defends the territory against other fish. The male courts the female by nudging and shaking. The male and female lie next to each other with their mouths open and they release eggs and sperm. Afterwards the female digs the upstream side of the redd and the sediment covers the eggs. Sometimes other males in the area also deposit sperm in the redd. Trout do not attempt to care for their young after they hatch.

Threats :

A big problem that trout are facing today is the destruction of habitat hurdles in their breeding migration and reduction in the water flow in streams. Many trout streams are being overwhelmed with excess silt. Silt is the result from poor farming practices, overgrazing of stream banks road construction and coming up of number of HEP projects. The excess silt clogs the spaces between the gravel. This destroys insect habitat and suffocates trout eggs.

Rainbow trout farming in Himachal Pradesh:

The commercial farming of this fish in the state, which was a distant dream till 1980, has become reality with the transfer of technology from Norway under a bilateral project. Objectives of the project i.e.

· Establishment of a modern hatchery with a production capacity of fingerlings normally required to produce 10 tonnes of fish and demonstrate commercial farming in village raceways;

· Developing economically feasible feed;

· Production of economically viable fingerlings to enable local farmers to take up farming;

· Training to farmers & project staff.

were achieved within the fixed time schedule and Himachal became the first state in the Union of India which introduced commercial trout farming in private sector during 1997. At present over 50 units are engaged in trout production in the state. The fish produced in the state has high demand in the market and the venture is fast expanding in private sector. The state is in a position to act as consultant for the initiation of Rainbow trout farming in other hill states of the country.

Red List Status: Not in IUCN Red List (Ref. 36508)

Brown Trout (Salmo trutta) sp. Salmo trutta fario

General Description: **The brown trout is a member of the salmon family of fishes and has the following characteristics:**

- **An elongate, laterally compressed body and a long head;**
- **A rounded snout and a pronounced hook which develops on the lower jaw in mature males;**
- **In stream populations, the back, upper sides and the top of the head are brown becoming silvery on the sides with pronounced black spots and rusty-red spots on the sides;**
- **In large lakes or the sea, the overall body colour appearance is silvery and most of the spots are concealed; and**
- **The fins, except for the adipose fin, which is an orange colour, are smokey, opaque and sometimes yellowish with some spots on the dorsal, adipose and caudal fins.**

Distribution:

The brown trout is native to Europe and western Asia. It was first introduced into Canadian waters in Quebec in 1890. Since then, successful introductions of the brown trout have been made in all provinces, except Prince Edward Island, Manitoba and the Northwest Territories.

Habitat and Life History: The brown trout is a cold-water species that was introduced mainly into stream or river habitats in Canada, although there are now a number of lake or sea-run populations. The habitat of brown trout is clear, cool, well-oxygenated streams and lakes. Brown trout spawn in late fall to early winter, from mid-October to January depending on location. The usual spawning site is in shallow, gravelly headwaters of streams or gravelly shallows of lakes. The female makes a shallow depression (redd) in the gravel into which the eggs are deposited during spawning. When spawning is completed, the female covers the redd with gravel. The time of hatching and growth rate varies greatly with region and habitat. Brown trout habitat and spawning requirements are similar to the native brook trout, with which it is usually in competition.

Food Habits:

Brown trout are carnivorous and feed on a variety of organisms, which includes aquatic and terrestrial insects, molluscs, crustaceans (especially crayfish), salamanders, frogs, rodents, and fishes.

Economic Importance:

The brown trout has become increasingly popular as a game fish since it was introduced into Canadian waters in 1890. The brown trout can withstand less favourable environmental conditions, lives longer and grows bigger than the native brook trout.

Brown trout is the European relative of the Atlantic salmon.

Brown Trout (Salmo trutta) sp. Salmo trutta fario

Efforts for population conservation in Himachal Pradesh waters:

Brown trout has populated itself in the headwaters of rivers like Beas, Satluj, Ravi and their tributaries due to the sternness efforts made by the department of fisheries. The fish has become a source of attraction for the tourist anglers. In order to protect this fish from the side effects of Hydro-power projects Govt. of Himachal Pradesh has specifically declared Tirthan river which is a tributary of Beas as an Angling reserve and has taken a Historic decision not to allow any power project on it as well as it's rivulet, besides making release of 15% water downstream dams/weirs as mandatory for all hydropower projects envisaged in the state. A seed production farm at the cost of Rs. 3.5 crore to be setup on the bank of Tirthan river for regular seed ranching of Brown trout has been sanctioned.

Almost each & every angler has gone satisfied so far after fishing in 20 km stretch upstream Largi.

Fishing Facts: Brown trout can be hybridized with brook trout to produce a "tiger trout".

Guppy

Scientific name: ***Lebistes reticulates***

Origin: **Central America**

Temperament: :

The Guppy is a peaceful fish and it is therefore popular in community aquariums. If you are a beginner aquarist, a community aquarium with Guppy and other peaceful and adaptable fishes is a very good start.

Diet:

Feed your Guppy a varied diet to prevent malnutrition. Live foods and Tubifex worms are two good choices.

Care:

Taking care of a Guppy is not very difficult. You can add some salt to the water to combat some of the common aquarium diseases. This does *not* mean that your Guppy should be kept in a brackish aquarium.

Water conditions:

The Guppy is a tropical fish and will do best when the water temperature is 25 – 28 degrees C (77 – 82 degrees F). The pH should be in the 7.0-7.5 range.

Gender:

Distinguishing between male and female Guppies is not very difficult, since the male has a gonopodium. The gonopodium is an anal fin that has transformed into a reproductive organ. A male Guppy is also very colourful, while the female is not (sometimes with the exception of her tail). A female Guppy will grow larger than a male Guppy.

Breeding:

Guppies are livebearers and the female will give birth to free swimming fry. If you want any fry to survive, you should make sure that the aquarium contains plenty of hiding spaces where they fry can avoid being eaten by the adults. Hiding spaces can for instance be created using plants. You can also place the fry in their own tank and reintroduce them to the main aquarium when they are large enough to avoid being eaten. Breeding Guppy is not hard, so if your first batch gets eaten you can just wait for the next one.

Additional comments:

If you have other fishes, you can breed Guppy and use as food. Guppy fry can be served as food for small fish, while adult Guppy is suitable for medium sized species.

Department of Fisheries Himachal Pradesh has initiated the breeding programme of this fish at it's Deoli farm (Bilaspur, HP) after the construction of nurseries at an estimated cost of Rs. 2.62 lakh. The results have been very encouraging. Each adult female produces approximately 60-80 young ones during a breeding season. After raising the brood stock now there are plans to undertake large scale seed production and then open the sale of fish for public.

Molly Fish

General Remarks: **Owing to varied body colouration like black, blue, purple etc and easy to breed, it occupies an important place among the fresh water aquarium fish.**

Scientific Name: ***Mollienisia lapipinna, M. vetifeara and M. sphenops.***

Common Name: **Sailfin, Molly and the liberty fish respectively**

Attainable Size: **3-1/4 in char, 5 inches and 3 inches respectively**

Nativity /origin: **Mexico, Yucatan and Gulf coast respectively**

Compatibility:

As mollies require plenty of space and react badly to over crowding, hence Mollies do better in the aquarium containing their own kind, than in a community one.

Tank Setup:

Water tank/ aquarium should be so placed as to receive the maximum sunlight, this being essential in the growth of the algae which forms the staple diet. It should be large, well lighted and thickly planted.

Temperature: **The water temperature required is on the range of 70-80^0 F.**

Feeding:

Although molly prefer vegetarian food however it exhibit omnivorous feeding habit. It appreciates a slight greening of the water, a occasional nibble at the plants but welcome additional green food in the form of chopped lettuce or spinach. The fine filamentous algae is their favourite food. Dried packet foods containing vegetable matter should be used when the algae die down in the autumn.

Sex differentiation:

The female is much less spectacular, her colouring is subdued and the dorsal fin is of normal size. In mature male, develops a intermittent organ called gonopodium. Both the sexes should be separated before the fish are two months old.

Breeding:

Fish is vivpasous one, giving birth to young ones. The female is fertilized by the merest touch of the gonopodium on her vent, and one fertilization will last for several broods.

When female in the community tank shows by the dark and swollen appearance of the under side, signs of being gravid, it is used to remove it to separate quarters. This is not because it might consume its young but because the other fish will. The sooner a gravid fish is moved the better, the commotion caused by netting or other appliances may result in fatal injury to the fish or in misshapen or even dead off springs. If one intends to breed with really good mollies it is best to have the parents in their own private tank at the outset. The temperature can then be raised to breeding heat i.e. 78^{o}F. As mentioned earlier, tank used should be large, well lighted and thickly planted and in these conditions young should thrive. The fry eat screened daphnia from the first.

Success has been achieved in breeding experiments of molly fish at departmental fish farm Deoli Dist. Bilaspur. Now it has been proposed to breed the fish to meet commercial commitments. In this direction 4 new ponds/ Cisterns are being constructed at the said fish farm.

Carassius auratus (Fan tail)

Synonyms : ***Carassius auratus auratus, Carassius carassius auratus.***

Common Names: **Gold fish, Fan tail**

Original Distribution : **Eastern Europe, East Asia, Siberia**

Native range: **Central Asia and China, Japan**

Habitat: **Freshwater, bottom dweller, demersal, rivers, lakes, ponds and ditches with stagnate or flowing water. They live better in cold water. It has resulted as Asian sub specious as a result of selective breeding of gold fish by Japan & China**

Identifying Characters:

Hard scale less, broadly triangular, snout longer than eye diameter. Metallic red- orange body with matching fins. The dorsal fin is high and the anal and caudal fins are doubled and free flowing. Young fish are initially green-grey in colour and only acquire their mature colour after about three months. Wild-caught specimens, olive brown, slaty olive, olive green, with a bronze sheen, silvery, greyish yellowish, grey-silver, through gold (often with black blotches) to creamy white, yellowish white or white below. Cultured forms vary through scarlet, red-pink, silver, brown, white, black and combinations of these colors, mouth terminal.

Average and maximum size: **15-20 cm (Av.)59 cm (Max)**

Environmental requirements: **Temp. 17-28^0 C, pH 7.5-8.5 dH 5.0-19.**

Food and feeding habit:

Omnivorous, accept dry food, likes to eat small insects, and also likes vegetable food. Feed on a wide range of food including plants, small crustaceans and detritus.

Breeding Habit:

Goldfish breeds most easily in large garden ponds- also breeds easily in a spacious aquarium with plenty of oxygen and feathery- leafed vegetation. A substrate spawner is necessary as the parent fish eat their own eggs. For the same reason the parent fish are removed after spawning. Fry are very sensitive to changes in temperature, now days, the spawn and milt are removed by hand and mixed together, so that as many eggs as possible are fertilized.

Sticky eggs, open water/ substratum egg scatterers. Non-guarders, Oviparous, with pelagic larvae. They last long in captivity. Fertilization external, spawning frequency is one clear seasonal peak per year. Cold water necessary for proper ova development.

Remarks:

Escapes and deliberate releases have resulted natural population in over 20 countries. For instance the species is a firmly established element in the fauna of Central Europe, Southern Scandinavia and Spain; The environmental effects of the species end to be some what neutral although in some areas it is regarded as a nuisance due to its capacity to produce stunted populations; Peaceful nature; Hybridize readily with carp.

Himachal Fisheries has initiated breeding programme of this fish at it's carp farm at Deoli (Ghagus) Bilaspur.

Platies

Scientific Name: ***Platypoecilus maculates***

Origin: **South Mexico**

Size: **Male $1^{1/2}$ inches, Females 2 inches**

Temperature: **70^0-90^0 F is favourable**

Common Name : **Platy 'Moon Fish"**

General Remarks:

This is very like the mollie except for the smaller dorsal fin. By selective line breeding there are six distinct colour varities, viz. the Blue, the Variegated, the Golden or Yellow, the Red- it is almost like a gold fish- the Black- this is really black and green- and the Berlin which is red with a heavy black smear along the sides. It is really a colourful fish. The breeding habits are same as described for the live bearers generally. By mating with sword tails the various colour types can be evolved.

Breeding:

It is a live bearer fish and gives birth to young-ones. The female is fertilized by the merest touch of the gonopedium on her vent and one fertilization lasts for several broods. Usually there is a month's interval between broods and as the time approaches the under part of the female will be noticeably darker and swollen. She should be removed to a well planted tank and be well fed. Even additional food, however, does not prevent the parents from devouring her offspring; but with dense vegetation, the minute fry are afforded a fair protection. The fry will eat screened daphnia from the first. Once again it is the males which show the brilliant colours while those of the females are much more subdued although equally pleasing the female usually show only blue and green, but the males can be a blaze of reds, blues and yellows of various tones. Those males which appear with bright yellow bodies and scarlet tails add to the beauty of any aquarium. It is a great mistake to dispose of males when they are young, as it is rare for full colouring to appear until the fish is about ten months old.

This fish has successfully been bred at Departmental Carp Breeding Centre Deoli near Ghagus of District Bilaspur. It holds a good promise to the private entrepreneurs to accept the challenge and adopt the profession/ hobby of 'Fish keeping' in Aquaria as a means of self employment.

Koi Carp

Common Name : ***Koi Carp, Mirinda carp, Manila carp***

Zoological Name : ***Cyprinus carpio*** **'koi'**

Native range : **Japan, Thailand**

Habitat : **Freshwater to brackish water, benthopelagic.**

Environmental requirements : **Temp. 22^0 c-32^0c, pH 7-8**

Average size : **50 cm with maximum size of 120 cms.**

Food & Feeding habits:

Omnivorous, Feed on submerged plants & benthic organisms; enjoy al types of live food; can be given a special dry food made for koi carp (sera koi plus) as basic staple, supplemented with vegetable food like blanched lettuce leavers or soft aquatic plants.

Breeding Habit:

Egg layers, substratum egg scatters, non guarders, reproduce without any problem in large ponds, given the right conditions; In modern koi farms, the eggs are artificially milked and fertilized; breeding temperature 15-20^0 c. a female of 47 cms can lay as many as 3,00,000 eggs.

Availability:

Easily available in India.

Disease known:

Koi carp herpes viral disease. Hence its import needs a certification of pathogen free consignment.

Remarks:

Peaceful, need 1-2 meter large tanks for rearing; in ponds they dig the pond bottom and make the water muddy. Various strains are available and scalation of koi varies according to the strain. The recognized colour varities have Japanese name. The ' Kohaku' (red with white) is the best known and popular one. The 'shusui' and 'Asagi'are mainly blue coloured fish with deep orange on their flakes. There is also a gold coloured fish called 'ogon'.

Koi has successfully been bred at Departmental Carp Breeding Centre Deoli near Ghagus of District Bilaspur. The results have been very encouraging. After raising the brood stock now there are plans to undertake large scale seed production and then open the sale of fish for public.

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Mirror Carp

Scientific Name: ***Cyprinus carpio***

Facts:

Kingdom	**Animalia**
Phylum	**Chordata**
Class	**Actinopterygii**
Order	**Cypriniformes**
Family	**Cyprinidae**
Genus	***Cyprinus***

Size:

Maximum recorded weight: 37.3 kg

Maximum length: 120 cm

Status:

Domestic carp: common and widespread: not threatened. Wild carp: classified as Data Deficient (DD) on the IUCN Red List 2003

Description :

Domestic carp have a much faster growth rate and a relatively short body with a high back and deep belly. The body is greyish to bronze in colour and two fleshy barbels project downwards at either side of the mouth. The number of scales varies greatly, with some individuals (known as leather carp) completely lacking scales . The usual form found in Britain is called the king carp, another form, the mirror carp has a single row of large scales along the sides.

Range :

The carp has global distribution and paved the way for aquaculture in cold waters of the state. It has the capability to withstand wide range of temperature due to which it can be cultured in all parts of the state. This fish was introduced in Himachal Pradesh on 18th April 1955 by His Excellency Lt. Governor Sh. Bajrang Bhadur Singh by getting 210 fingerlings from Bhawali hatcheries in Kumaon hills and stocking then in Pucca tank at Nahan (Sirmour Distt.) After its breeding here the seed was supplied to different states like Punjab, Jammu & Kashmir, Madhya Pradesh, Rajasthan, Delhi, Bihar, Manipur & Sikkim.

Habitat :

This hardy fish is able to tolerate a broad range of conditions, but fares best in large bodies of fresh water with slow-flowing or still water, with soft muddy sediments.

Mirror Carp

Biology:

This species is omnivorous, feeding on aquatic crustaceans, insects, worms, aquatic plants, algae and seeds . Its feeding technique, of grubbing around in the sediment and straining food from the mud, has caused problems in areas where the carp has been introduced. As well as uprooting submerged vegetation, it also increases the cloudiness of the water, which can have detrimental effects on native wildlife.

In temperate waters, spawning take place during the summer in patches of weeds. A number of males pursue spawning females in the race to fertilise the eggs as they are shed into the water. The sticky yellowish coloured eggs attach to vegetation, and are not guarded by the parents (2). A typical female can lay over a million eggs in one breeding season (2).

By gulping air at the surface, the carp is able to tolerate periods when oxygen levels in the water fall (2). In winter, individuals go into deeper waters which tends to be somewhat warmer than shallow water (2).

Threats

This species is not threatened.

Glossary

Barbels: **Fleshy projections near the mouth of some fish.**

Crustacea: **Diverse group of arthropods (a phylum of animals with jointed limbs and a hard chitinous exoskeleton) characterised by the possession of two pairs of antennae, one pair of mandibles (parts of the mouthparts used for handling and processing food) and two pairs of maxillae (appendages used in eating, which are located behind the mandibles). Includes crabs, lobsters, shrimps, slaters, woodlice and barnacles.**

Omnivorous: **The term used to describe an organism that feeds on both plants and animals.**

Are fish the greatest athletes on the planet?

The scientists discovered that fish are far more effective at delivering oxygen throughout their body than almost any other animal, giving them the athletic edge over other species.

"Fish exploit a mechanism that is up to 50 times more effective in releasing oxygen to their tissues than that found in humans," said study lead author Jodie Rummer from the Australian Research Council's Centre of Excellence for Coral Reef Studies at James Cook University. "This is because their haemoglobin, the protein in blood that transports oxygen, is more sensitive to changes in pH than ours and more than the haemoglobins in other animals,".

This is especially important for fish during times of stress, to escape from predators, or when they are living in water that is low in oxygen. They can double or even triple oxygen delivery to their tissues during these critical times.

For the past decade researchers have been using rainbow trout to investigate oxygen delivery in fish.

They first discovered and tested this mechanism by monitoring muscle oxygen levels in real-time in trout.

Now they have determined just how powerful that system can be and have compared the results with medical studies on humans. "This information tells us how fish have adapted this very important process of getting oxygen and delivering it to where it needs to be so that they can live in all kinds of conditions, warm or cold water, and water with high or low oxygen levels," This trait may be particularly central to performance in athletic species, such as long distance swimming salmon or fast swimming tuna. "For fish, enhanced oxygen delivery may be one of the most important adaptations of their 400 million year evolutionary history,“

Positive attitude and an open mind are true characteristics of all good fishermen.

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