



FISHERIES FACT SHEET

WEST AUSTRALIAN DHUFISH



West Australian dhufish
Glaucosoma hebraicum

Jewel in the crown

There are good reasons why the West Australian dhufish is a WA fishing icon: it grows to a great size and tastes superb. Most importantly, this fish is found nowhere else in the world.

Exclusive to WA waters

Dhufish are 'endemic' to Western Australia, which means they do not live anywhere else.

Dhufish have been found off the Recherche Archipelago near Esperance and as far north as Shark Bay. However, they are most common along WA's lower west coast between Kalbarri and Augusta.



Range of West
Australian dhufish

Dhufish, not jewfish

In the past, dhufish have also been called jewfish or 'jewies'. West Australian dhufish belong to the Glaucosomatidae family and are related to pearl perch.

Home-lovers

Adult dhufish prefer to live around rocky outcrops and ledges. They can usually be found in water 20 to 50 metres deep, however sometimes they have surprised fishers by turning up in water just three metres deep.

Tagging studies have shown that they are generally sedentary – that is, they usually do not travel far from home.

An important characteristic of dhufish is they are 'demersal', which means they live near the seabed. As with other demersal fish, dhufish can suffer 'barotrauma'. This is an important issue for managing dhufish stocks as fishers must return undersize and unwanted dhufish to the water.

Barotrauma

You have probably heard of SCUBA divers getting 'the bends' because they ascended to the surface too quickly after a deep dive. Some demersal fish experience similar problems when they are caught in deep water and pulled rapidly to the surface on a fishing line. This condition, which results from gases expanding in the fish's body, is called barotrauma.



The most obvious signs of barotrauma in a fish are a bloated stomach, bulging eyes and the stomach pushed out through the mouth or gills. A fish with these symptoms may not survive when put back and may simply float on the sea surface. However, its chances of recovering may be improved if a fisher uses a release weight.

A release weight consists of a barbless hook with a weight attached that is inserted through the fish's lip. The fish is then lowered into the water and when it reaches the depth from which it came, it can be released by a gentle tug on the line. Once back in deep water, gases in the fish swiftly recompress, saving it from further injury.



Photo: Garry Lilley

Predators and prey

'Dhufies' have big eyes and cavernous mouths, with which they prey on other fish, crustaceans and molluscs such as squid and octopus. As larvae and juveniles they may be prey to a wide range of other sea creatures.

Adult dhufish have a distinctive vertical dark line called a chevron running through their eye that fades once they die and which is also fainter on females. Juvenile dhufies have black stripes along their body.



A three-month-old juvenile dhufish measuring just over three centimetres. Photo: Julia Shand, University of WA



At the larval stage, dhufish have huge eyes relative to their head size. This makes them very well adapted to seeing in low levels of light.

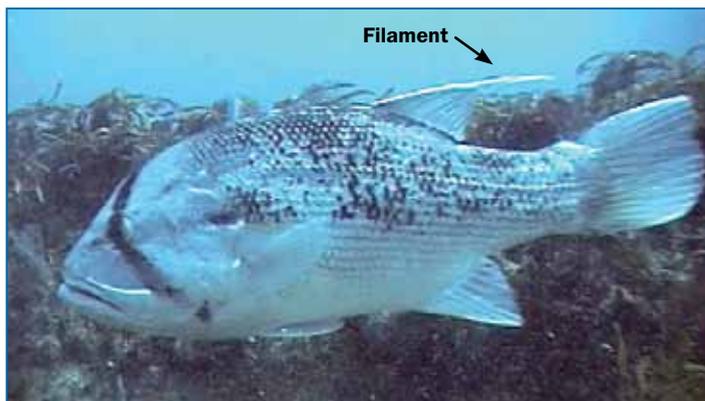
Summer spawning

During spawning, eggs and sperm are released into the water and fertilisation occurs externally. At these times, dhufish may gather in groups called 'aggregations'. This generally occurs between November and April with the peak period being between December and March, when water temperatures are elevated.

While there is much about dhufish behaviour that is yet to be fully understood, it appears that this species displays complex social behaviour during spawning with larger individuals dominating and achieving greater spawning success. Males and females probably spawn in pairs.

Gender difference

Adult male dhufish are often bigger than female dhufish. Another easy way to tell the difference between male and female dhufish is the presence of an elongated filament on the dorsal fins of males.



An adult male dhufish. Note the long filament on its dorsal fin.

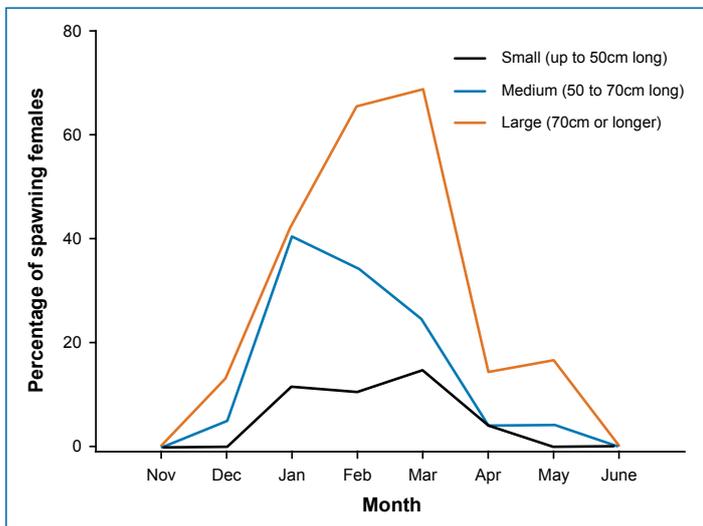
The importance of big dhufies

Dhufish can live for more than 40 years, reach more than a metre in length and weigh more than 25 kilos. As with many bottom-dwelling fish, they are relatively slow-growing.

They also grow most quickly when they are young. Their growth slows down considerably after about 12 years, and they reach close to their maximum size at about 20 years. Like all animals, individual dhufish may be larger or smaller than their peers at the same age.

Previous research showed that dhufish start to reach sexual maturity at three to four years old, or when they were 30 to 35 centimetres long. Recent research indicates that even though dhufish are reproductive at this time, females produce few eggs and do not spawn every month of the spawning season. It appears that dhufish only reach their full reproductive potential as they become larger and thus older.

Older and larger female dhufish spawn more eggs, more often and for a longer period – and therefore produce more eggs per spawning season – than younger females. This means big female dhufish are very important for the overall health of a dhufish population.



During each month of the spawning season, fewer small female dhufish spawn than medium and large-sized females.

Boom years

'Recruitment' is a term used by researchers to describe the natural addition of fish to a population, either by reproduction or migration. While it sometimes refers simply to young fish joining a population, in some contexts it may instead refer to fish of legal size entering a fishery.



A 33-day-old larval dhufish measuring less than one centimetre long. Photo: Julia Shand, University of WA

Researchers believe that dhufish larvae are dispersed by currents and this may explain a high level of variation in dhufish recruitment to different parts of the west coast. Water temperature and the availability of food are also thought to affect spawning and survival of dhufish eggs, larvae and juveniles.

In some years with very favourable conditions, dhufish recruitment is very successful ('boom' years) while in others, recruitment is lower. Researchers have found that in the last 20 years, there have only been a few boom years.

The variation in dhufish recruitment between years is an important consideration when managing their stocks. When a lot of dhufish, resulting from a boom year, reach legal size, it can give the impression that fish stocks are fine. However, if these fish – which include much of the breeding stock – are fished down, the population may struggle to recover if recruitment following this 'year class' of fish is low.

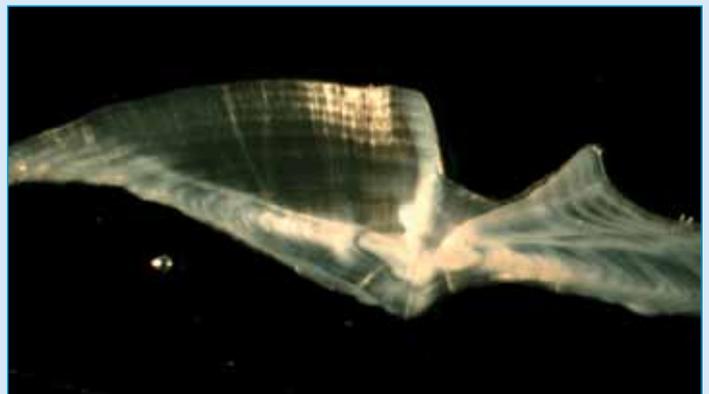
Heavy fishing of dhufish combined with low recruitment is likely to put the future of a population of dhufish in jeopardy.

How old is this dhufish?

Working out the age of sampled dhufish helps researchers understand the 'age structure' of a dhufish population, in other words, how many fish there are of different ages. This in turn tells them whether fishing is reliant on a particularly successful year class of fish – that is, fish spawned during a certain year – or whether recruitment has also been good in other years.

The ear bones of fish, called otoliths, contain a detailed record of their age. Each year, as a fish grows, tiny bands of calcified material are laid down in the bone, similar to growth rings in a tree. When growth is faster, translucent or clear bands are laid down. When growth is slower, the bands are milky or opaque.

Researchers extract the otoliths and cut thin sections from them using a high-precision saw. Under magnification, the alternating white and translucent bands can be seen and counted. This is done to thousands of fish otoliths in Department of Fisheries' research laboratories each year.



Section of a dhufish otolith.

Researchers can also find out about the environmental conditions in which a fish lived by chemically analysing otoliths. Stable isotopes of oxygen and carbon are deposited in otoliths from the water in which the fish lived. This 'isotope signature' often varies between locations.

Fishy science

Along with WA's human population, the number of recreational boats and the level of fishing activity in nearshore waters off WA have grown. Fishing effort today is more widely distributed, with boats travelling further to fish, than it was in the past.

In addition, fishing technology has improved and become more widely owned, including high quality colour echo sounders and global positioning systems (GPS). These technologies have increased the ability of both recreational and commercial fishers to accurately locate, record and return to reefs and other prime fishing grounds.

To manage fishing activity so that stocks are protected into the future, the Department of Fisheries analyses two types of data. The first type includes the species' biology, life cycle and evidence about the age structure of the population being fished.

The other type of data includes catch, effort and 'catch rates' – in other words, information about how many fish are being caught compared to the past. This is considered in relation to the amount of time that people are spending fishing.

For a slow-growing species such as dhufish that has few natural predators once fully grown, important signals that populations are being overfished may include a decrease in the maximum age of fish sampled and a decrease in the proportion of older fish.



Photo: Henrique Kwong



The oldest dhufish to be caught and officially aged by scientists was 41 years of age (Hesp *et al* 2002). This occurred in the late 1990s. These days, due to fishing pressure, it would be very hard to find a dhufish that old.

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Glossary

Age structure

The number of fish of different ages within a population

Aggregation

A gathering of fish in one area, usually during spawning

Barotrauma

Expansion of gases in the fish's body due to a decrease in pressure, similar to 'the bends' in humans

Catch rate

The amount of fish caught in relation to fishing effort

Demersal

Bottom-dwelling, or living near the seabed

Effort

The amount of time spent fishing by a given group of fishers

Endemic

Restricted to, or only found in, one place

Isotope signature

The ratio of stable or unstable isotopes (chemical forms) of particular elements

Legal size

Size (usually a minimum length) at which it is legal to catch and keep a fish.

Maturity

Stage at which a fish can reproduce or breed

Otolith

Fish ear bone

Recruitment

Addition of fish to a stock or population as a result of reproduction, migration or growth to legal size

Release weight

A weighted barbless hook connected to a fishing rig that is attached to a fish to be released

Sedentary

Non-migratory, or tending to stay in one location

Year class

(also called age class)
Fish within a stock or population that were spawned in the same season

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FURTHER INFORMATION

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