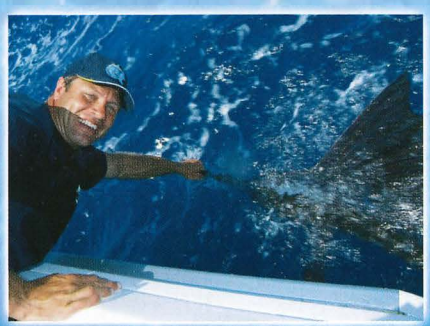
Gently Does It!

A Guide for Releasing Fish to Survive

A message from ET



Take care in handling your fish...

Use fish friendly gear.....

Gently does it when you release your fish.....

FISHERIES RESEARCH & DEVELOPMENT CORPORATION

Released Fish SURVIVAL

A National Strategy for the survival of released line caught fish

There is a growing trend among recreational anglers to release fish. This is done for a variety of reasons. However there is very little data in Australia on the survival rate of these fish and the impact of this on fish stocks.

In 2001 the Fisheries Research and Development Corporation (FRDC) launched a National Strategy for the Survival of Released Line Caught Fish with an initial emphasis on recreational fishing. This strategy involves the funding of a number of projects that will address the key issues over the next few years.

Projects have already been funded by FRDC to collate existing knowledge; identify the key species and prime causes of mortality; examine the survival of some deep water reef species in Western Australia; look at stress from catch and release in barramundi; and, promote best practices for releasing fish by recreational fishers.

Future projects will measure the survival rate of important recreational species and examine gear and method changes that may improve the survival rate of released fish.

Trout anglers started the trend to catch and release

Code of Practice for releasing fish

In 2002 the Australian National Sportfishing Association (ANSA) became the first recreational fishing organisation to adopt a code of practice for releasing fish. This is being used as the benchmark for current best practices. Fishing organisations are being encouraged to develop their own code or adopt the ANSA code. Individual fishers are encouraged to adopt the practices outlined in the code.

The ANSA code of practice can be obtained from the website www.info-fish.net/releasefish.

By using the code, fishers will ensure that the fish they release will be returned to the water in as healthy a condition as possible to maximise the chance of survival.

Why are fish released?

Recreational fishing is becoming more regulated around Australia. All States now limit the fish that can be kept and require fish outside those limits to be released. These regulations are often in the form of bag and/or size limits but can include area and seasonal closures.

Increasingly recreational anglers are voluntarily releasing fish they can legally keep.

Studies around Australia show that over 50% of all fish caught recreationally are released.

More whiting are released than any other species (Peter Griffiths photo)

A national study was undertaken in late 2002 to understand why anglers release fish, and to assess current release practices.

Of the anglers surveyed 88% stated they had released fish in the past 12 months to 2 years. Respondents who had released fish were asked whether they agreed or disagreed with a series of statements on releasing fish. 88% of these respondents agreed there were benefits to themselves in releasing fish; 72% indicated that they knew the proper techniques to release fish. Of these anglers, 66% were aware that there are practices when releasing fish that increase survival rates.

Another series of questions focused on handling fish and the gear used. 94% of respondents believed that keeping fish out of the water for several minutes decreases their survival rate. A total of 79% of respondents agreed that using barbless hooks increased survival rates, however only 5% indicated they used barbless hooks (single or treble) on their most recent fishing trip.

48% of respondents agreed they would use new fishing gear that improves fish survival even if it makes no difference to their catch rates while 25% indicated they would use new gear even if it reduced their catch rate.

Complete details of the survey are available from the website www.info-fish.net/releasefish.

Increasing numbers of large flathead are being released
(Neil Carstens photo)

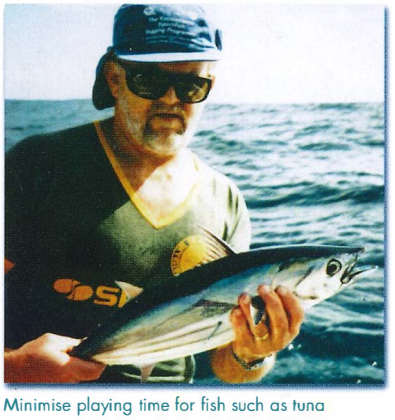
Causes of fish mortality

To improve the way fish are handled it is important to understand the causes of mortality when fish are released.

Responses to being caught vary between species, individual fish and different sizes of fish of the same species. Not all effects are lethal; these can vary from immediate and obvious to those that are delayed and not obvious.

Immediate mortality can result from fatal hook damage, poor handling, barotrauma, self inflicted damage from flapping around and predation on release.

Long playing times exhaust fish and increase stress levels, especially in fast swimming pelagic fish, and can result in death.



Minimise playing time for fish such as tuna

Delayed mortality can result from overstress, unseen damage to internal organs and backbone, poisoning or infection from hooks left in the fish and infection from loss of scales or protective slime.

Not all effects are lethal and can include such things as changes in behaviour, reduced reproductive ability, non fatal infection or less resistance to disease and reduced growth rate.

Mortality may be higher under conditions when the fish is already under stress before being caught. This can occur when water temperatures are outside the comfort range for a particular species or where dissolved oxygen levels are low.

Barotrauma, is the fish equivalent of the "bends" suffered by divers. The condition is obvious in most cases as the expanded swim bladder pushes the stomach of the fish out through the mouth. Fish suffering from barotrauma may not be able to return to the bottom and are vulnerable to predation by sharks or other species.

Jewfish showing the effects of barotrauma (Dave Woodburn photo)

Take care in handling your fish

If you intend to release fish then you should plan ahead so that everything you need is close at hand. You need to work quickly, but carefully to ensure the fish is out of the water for the minimum time.

Handling fish

Always use wet hands or a wet cloth when handling fish. Place the fish on a wet surface such as carpet or cloth for hook removal. Avoid hot dry surfaces.

Some species of fish, such as bass, will be fairly docile when laid down while others, such as flathead, will continually writhe and thrash about. Smaller fish that are active are best held while the hook is removed. Larger fish may need to be carefully, but gently, restrained on a wet surface. Use a wet cloth to help hold the fish. A fish grip may be used to help immobilise the fish provided the body of the fish is supported at all times.

Care for fish eyes

Direct sunlight into the eyes of a fish can damage its vision so ensure they are shaded when out of the water. Where possible use your shadow to shade the fish or place a wet cloth over the eyes. This will also help subdue some species such as tuna.

Avoid contact with the eyes of fish and keep fingers out of eye sockets of fish to be released.

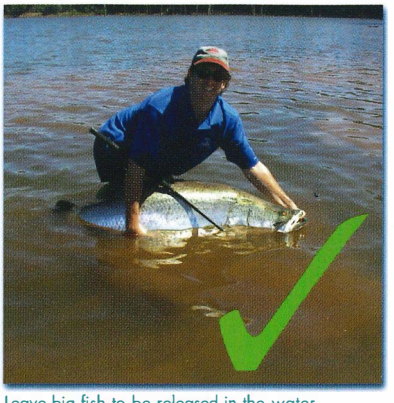
Keep fingers away from eyes

Handling fish when landing

Avoid using the line or rod to lift other than small fish from the water, especially if the hook cannot be seen, as the weight of the fish may embed the hook further. For larger fish use a landing net, rather than a gaff or jaw grips to land the fish.

Fully support the body of large fish at all times to avoid damage to internal organs that may result if the fish is held up vertically by the jaw. Place a hand under the stomach while still in the water, then take the weight off the hook. Very large fish should be left in the water for removal of the hook.

Do not put fingers in gills or hold large fish vertically



Leave big fish to be released in the water (Alf Hogan photo)

Removing hook

If the hook is lodged in the jaw or inside the mouth but not out of sight it should be removed carefully with a dehooker or long nosed pliers. Any hooks that are lodged near the gills need extra care in removal.

Hooks in the jaw are easier to remove

If the hook is swallowed it is best not to try to remove it as this will cause additional damage to internal organs. Leave the hook where it is and cut the line. While the recommended practice has been to cut the line as close to the hook as possible research in the USA has shown survival is improved if the line is cut 20-30cm from the hook. This reduces the chances of the hook impeding the fish's feeding. For more details see the fact sheet.

Measuring fish

To keep a record of the size of fish that are to be released it is preferable that the length be measured rather than the fish weighed.

Measure rather than weigh fish that are to be released

Weighing fish

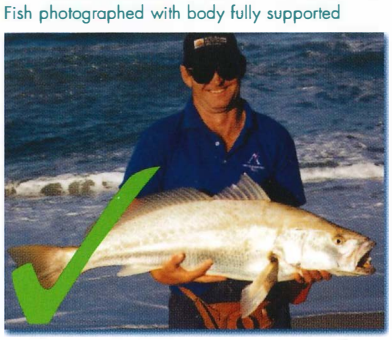
Avoid weighing fish to be released as this keep the fish out of the water longer. If large fish are to be weighed then keep them in the landing net or use a sling. Weigh the landing net or sling separately and you will be able to calculate the weight of the fish.

Avoid weighing large fish that are to be released

Photographing fish

When photographing fish make sure the fish is supported and that large fish are held horizontally with their body fully supported. Make sure your camera is close at hand and ready as taking a photograph means the fish will be out of the water a little longer.

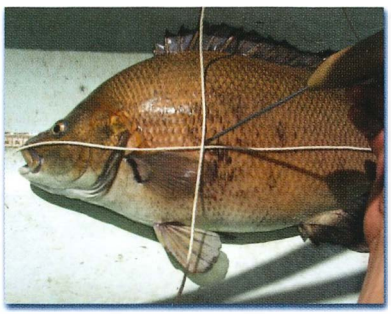
Fish photographed with body fully supported



Deep water fish

Fish brought to the surface from depths of 20 metres or more are likely to suffer from barotrauma. The susceptibility to this condition and response to treatment varies between species. Jewfish species, in particular, suffer badly from barotrauma.

There are two methods currently promoted for dealing with fish that are suffering from barotrauma (although opinions among researchers and experienced fishers differ as to the best method for dealing with this condition).



Releasing air from the swim bladder (Alf Hogan Photo)

Venting

Venting, or puncturing the swim bladder with a fine hollow needle can be used to allow the expanded air in the swim bladder to escape. Venting methods can vary with species however in most cases the needle is inserted in line with the top of the pectoral fin and below the 4th dorsal spine.

Releasing fish using weighted line (Gary Lilley photo)

Weighted line

An alternative, less intrusive method, is to use a weighted line to return the fish to the bottom. The fish is hooked in the jaw with a barbless hook, attached to a weight and lowered to the bottom on a cord. When the cord is pulled back the hook comes out of the fish.

Water temperature

The survival of released fish decreases when water temperatures are near the upper tolerance levels of fish. This is a problem during hot weather, especially in shallow water. Under these conditions fish must be kept out of the water for the minimum time possible. If conditions are extreme it may be better to keep fish or to cease fishing.

Use fish friendly gear

Every piece of fish friendly gear you use will help improve the chances of the fish surviving after release.

Correct tackle

Use tackle specific to the fish you are targeting so that fish can be landed quickly to minimise exhaustion. Tackle could range from a fully rollered game rod for catching marlin or game species from a gamefishing boat to a light spinning rod for trout in a small stream or tommy ruff from a jetty. The fishing equipment and line strength used should ensure that the fish can be landed quickly and not played out until it is exhausted.

Use gear suited to the fish you are targeting

Hook selection

For many fish species the most important factor that contributes to fish survival is the hook and where it is lodged in the fish.

Use barbless hooks on lures

Fish caught on artificial lures are more likely to survive than fish caught on bait. This is because there is less likelihood of fish being gut hooked when using lures, especially hard bodied lures. Using artificial lures with barbless hooks is even better. Barbless hooks are easier and quicker to remove and result in less damage when removing hooks.

Despite the views of some fishers that using barbless hooks results in less fish being landed research suggests that there is little or no change in catch rates.

To improve survival when bait fishing use a hook size larger than normal to reduce the chance of it being swallowed by smaller fish or use a pattern of hook (such as a circle hook) that maximises the chance of the hook being lodged in the jaw. Mortality rates are higher for fish that are gut hooked so minimising the chance of this occourring will improve survival.

Use circle hooks for bait fishing

Hook removal

A hookout or long nosed pliers are another handy piece of equipment that will make removal of hooks much easier, especially if they are barbless.

Long nose pliers make removing hooks easier

Landing nets

Use a knotless landing net to land your fish as this type of net minimises the damage to fish scales and slime. Another benefit, especially if using barbless hooks is the reduction in tangling of hooks in the net mesh. With knotted landing nets this can cause considerable delays in removing hooks, especially barbed, from the net and reduces fishing time. This can be important during short periods when the fish are avidly biting.

Use knotless landing nets

Fish grips

A fish grip device can be used to assist in handling and immobilising a fish however the body of the fish should be supported at all times. Avoid grips with inbuilt scales and don't be tempted to weigh the fish by hanging it off the grip.

Avoid holding fish vertically with grips

Fish grips used correctly can help (Joel Fox photo)

Measuring ruler

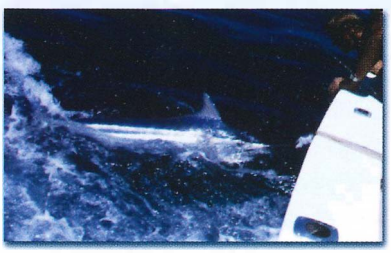
While a ruler will not improve survival of released fish it is an essential piece of equipment. Measuring fish is necessary to determine if the fish exceeds the legal length. Use a ruler that has a "butt" at one end as this makes it easier to get an accurate measurement.

Measure your catch

"Gently does it" when you release your fish

Fish should be released by placing them carefully back into the water. It may be necessary to swim fish around to promote water flow over the gills to ensure revival. Fish should not be just thrown back into the water. Some pelagic species such as tuna and mackerel can be "speared" head first into the water to promote water flow through the gills.

Very large fish over 20kg, especially gamefish such as marlin or sailfish, should not be removed from the water and are best released beside the boat.



Leave large fish for release in the water (Julian Pepperell photo)

Gently does it....

Increasing awareness

During 2003 and 2004 a national community awareness campaign will be run on Channel 9 and WIN Television to increase awareness among anglers on how to release fish correctly. The television commercials feature Andrew Ettingshausen of "Escape with ET" fame.

Keep up to date

You can keep up to date with what is happening in the national strategy and the latest information on releasing fish by subscribing to the Released Fish Survival email news bulletin. Just send your email address to infofish@zbcom.net with "subscribe to released fish survival news" as the subject.

More information

Visit www.info-fish.net/releasefish for fact sheets on releasing fish and access to the latest research information.

Fact sheets contain more details on releasing fish including how to handle different species. The website also provides easy access to research material on all aspects of releasing fish.

Visit your local AFTA tackle store

Staff at your local Australian Fishing Tackle Association tackle store will be able to help you with the latest information on releasing fish. A best practices video will also be available later in 2003.

Visit your Fisheries website

For information on fishing regulations in each State and Territory.

Department of Primary Industries
Queensland Fisheries Service
www.dpi.qld.gov.au/fishweb

New South Wales Fisheries
www.fisheries.nsw.gov.au

Department of Primary Industries
- Victoria
www.nre.vic.gov.au/fishing

Department of Primary Industries,
Water and Environment - Tasmania
www.dpiwe.tas.gov.au

Inland Fisheries Service - Tasmania
www.ifs.tas.gov.au

Primary Industries and Resources
- South Australia
www.pir.sa.gov.au

Fisheries Western Australia
www.fish.wa.gov.au

Department of Primary Industries and
Fisheries Northern Territory
www.nt.gov.au/dbird/dpif/fisheries

FISHERIES RESEARCH & DEVELOPMENT CORPORATION

The National Strategy for the Survival of Released Line Caught Fish is an initiative of the Fisheries Research and Development Corporation.

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The promotion of best practices in releasing fish is being undertaken by Infofish Services in conjunction with the Australian National Sportfishing Association and Pepperell Research and Consulting Pty Ltd.

infofish

This project is supported by the Australian Fishing Tackle Association, Recfish Australia, Channel 9 and WIN Television.

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Other information products

The Released Fish Survival website is at **www.info-fish.net/releasefish** and contains a range of useful fact sheets and information products.

Technical reports outlining the results of the individual research projects can be downloaded from the website.

Some other information products that are available include posters promoting fish friendly tackle, results of the Barramundi research, Flathead survival poster and NSW fish survival poster. These posters are suitable for distribution through fishing clubs, tackle and boating shows, Fishcare volunteers and to schools with marine or fish studies.

Fisheries and related websites

Fisheries Research and Development Corporation
www.frdc.com.au

Queensland Department of Primary Industries and Fisheries
www.dpi.qld.gov.au/fishweb

New South Wales Department of Primary Industries
www.fisheries.nsw.gov.au/recreational

Department of Primary Industries - Victoria
www.dpi.vic.gov.au/dpi/

Department of Primary Industries and Water - Tasmania
www.dpiw.tas.gov.au

Inland Fisheries Service - Tasmania
www.ifs.tas.gov.au

Primary Industries and Resources - South Australia
www.pir.sa.gov.au

Department of Fisheries - Western Australia
www.fish.wa.gov.au/sec/rec/

Department of Primary Industries, Fisheries and Mines - Northern Territory
www.nt.gov.au/dbird/dpif/fisheries

Recfish Australia
www.recfish.com.au

Australian National Sportfishing Association
www.ansa.com.au

Australian Fishing Tackle Association
www.afta.net.au

Infofish Services
www.info-fish.net

Acknowledgements

The following organisations have contributed significantly to the National Stategy

Ross Winstanley and Released Fish Survival Steering Committee

NSW DEPARTMENT OF PRIMARY INDUSTRIES

Recreational Fishing Trusts

RECFISH AUSTRALIA

Victoria The Place To Be

Australian Government
Fisheries Research and Development Corporation

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AUSTRALIAN NATIONAL SPORTFISHING ASSOCIATION ANSA

Gently Does It

Releasing Snapper and Bream

A number of Bream species are the mainstay of estuary fishing around much of the country while Snapper is one of the most important species for reef fishers in temperate waters.

Bag and size limits in most States limit the number of these species that can be kept. A national survey in 2000 indicated that 62.9% of Bream caught were released while 33.7% of Snapper caught were released.

Bream and Snapper Caught

SPECIES	Bream	Snapper
HARVEST	4.8 million	1.7 million
RELEASED	8.2 million	0.8 million
TOTAL CATCH	13.0 million	2.6 million
% REL	62.9%	33.7%

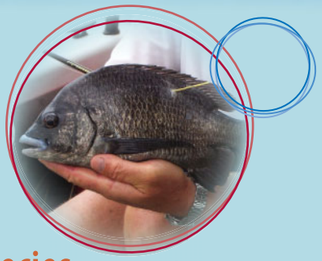
Over the past six years, under the National Strategy for the Survival of Released Line Caught Fish, a number of studies have examined the survival of released Bream and Snapper. Bream were studied in Victoria and NSW while Snapper were studied in Victoria, NSW and WA.

The main cause of mortality of Bream is deep hooking while for Snapper the main causes of mortality are deep hooking and barotrauma. Deep hooking is when the hook is lodged in the gills, throat or swallowed and in the stomach.

Barotrauma results from the expansion of gases in the swim bladder, and its effects are related to the depth from which the fish is brought to the surface. For many species the symptoms begin to appear in fish caught in about 10m of water. Mild symptoms are a hardening of the fish's stomach. More severe symptoms include bulging eyes and the stomach pushed out of the mouth. Fish from very deep water may show no signs of barotrauma because the swim bladder has burst.

Bream

With deep hooking being the main cause of mortality in Bream it is important to know how many fish are deep hooked. The following provides a guide to deep hooking rates in a number of Bream species using a range of popular gear types.



Pikey Bream

Deep hooking rates in Bream species

STATE	SPECIES	SHALLOW HOOKED	DEEP HOOKED
Vic	Black Bream	72%	28%
NSW	Yellowfin Bream	85-97%	3-15%
Qld	Yellowfin Bream	89%	11%
Qld	Pikey Bream	89%	11%

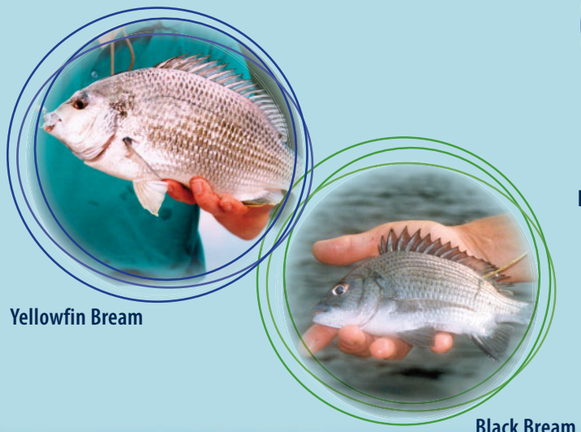
The incidence of deep hooking can be reduced by actively fishing with a tight line when bait fishing, rather than leaving the fish to hook itself. If the fish has swallowed the hook do not try to remove it. Cut the line outside the mouth and release the fish because fish can often disgorge the hook.

Research in Victoria and NSW showed the following survival rates for shallow and deep hooked Bream showing the lower survival rates for deep hooked fish.

Bream fishing

Survival rates of shallow and deep hooked Bream

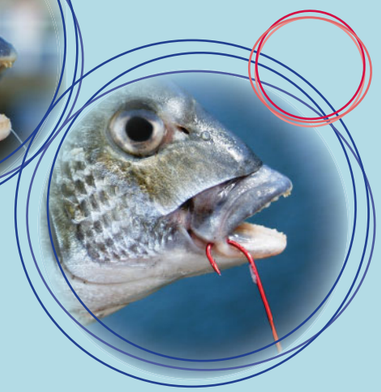
STATE	SPECIES	OVERALL	SHALLOW HOOKED	DEEP HOOKED
Vic	Black Bream	93%	95%	74%
NSW	Yellowfin Bream	96%	97%	72%
NSW	Yellowfin Bream	85-100%		



Yellowfin Bream

Black Bream

Deep hooked Bream



Shallow hooked Bream

Snapper

As with Bream, deep hooking of Snapper is a key cause of mortality. However, with Snapper, mortality is also dependent on the depth of water fish are caught in and the effects of barotrauma. The following provides a guide to deep hooking rates of Snapper from shallow water using a range of popular gear types.

Snapper fishing

Deep hooking rates of Snapper in shallow water

STATE	SPECIES	SHALLOW HOOKED	DEEP HOOKED
Vic	Snapper	92%	8%
Qld	Snapper	91%	9%

Research in Victoria and NSW showed the following survival rates for shallow and deep hooked fish showing the lower survival rates for deep hooked fish.

Survival rates of shallow and deep hooked Snapper

STATE	SPECIES	OVERALL	SHALLOW HOOKED	DEEP HOOKED
Vic	Snapper	97%	97%	48%
NSW	Snapper	67%		
WA	Snapper	70%		

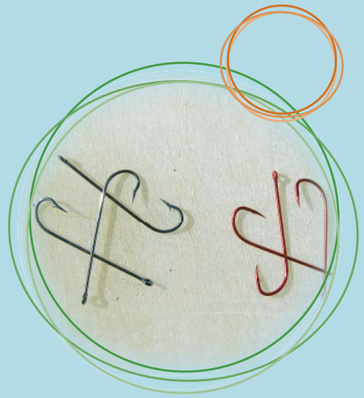
Testing Hooks

The research in Victoria tested for deep hooking rates using a variety of fish sizes and hook sizes. Hook patterns tested were those that were popular in the Victorian fishery. In the Black Bream fishery in the Gippsland Lakes the most common rig used is a size 4 long shank or baitholder hook with a soft bait such as sandworm.

Undersized Snapper in Port Phillip Bay are often caught as a bycatch in the King George Whiting fishery. A size 6 long shank is often used with a soft bait in that fishery.

The research found that deep hooking of fish was the most important factor in determining survival. Deep hooking rates for under-sized fish were shown to be dependent on fish length and hook size for Black Bream but not for Snapper.

In the NSW study the deep hooking rate for Snapper was 10% when using circle hooks compared with 16% using conventional J hooks.

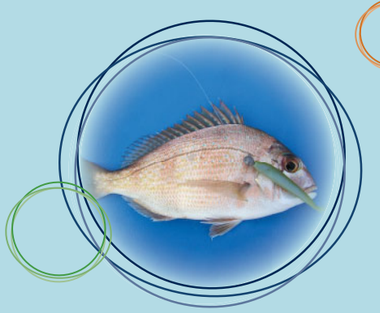


Hooks used in research

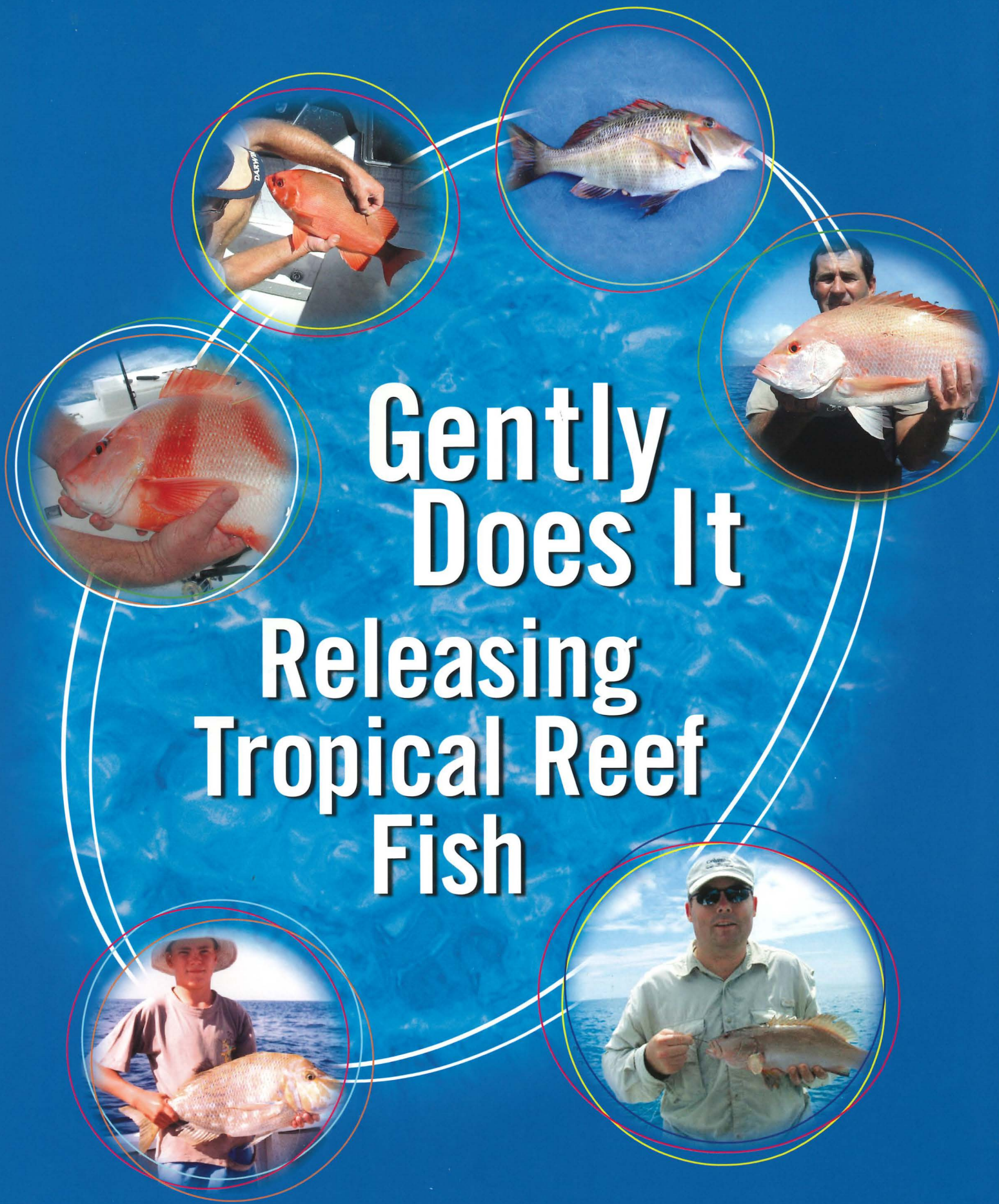
Best Practices In Releasing Bream And Snapper

- For bait fishing use larger J hooks or circle hooks to reduce gut hooking
- Use a hookout or long-nosed pliers to remove hooks from mouth hooked fish
- Cut the line outside the mouth for deep hooked fish and do not try to remove the hook
- Fishing with a tight line will reduce gut hooking
- Use barbless hooks to minimise damage when removing hooks
- Use a knotless landing net to land fish
- Use wet hands or wet cloth when handling fish
- When photographing fish that are to be released hold horizontally and support the body of the fish
- Minimise handling time and return the fish to the water quickly
- Snapper caught in depths greater than 20m may need to be treated for barotrauma by venting or use of a release weight

Deep hooked Snapper



Shallow hooked Snapper



Gently Does It

Releasing Tropical Reef Fish

Bag and size limits now result in an increased number of reef fish being released with between 20% and 90% of targeted reef fish released in Queensland, depending on species. Research has been undertaken on six key reef species to determine short and long-term survival, testing of different release techniques and the effects of using different hook types.

The key causes of mortality of reef fish that are released are the effects of barotrauma (over expanded swim bladder), deep hooking, handling and predation on release.

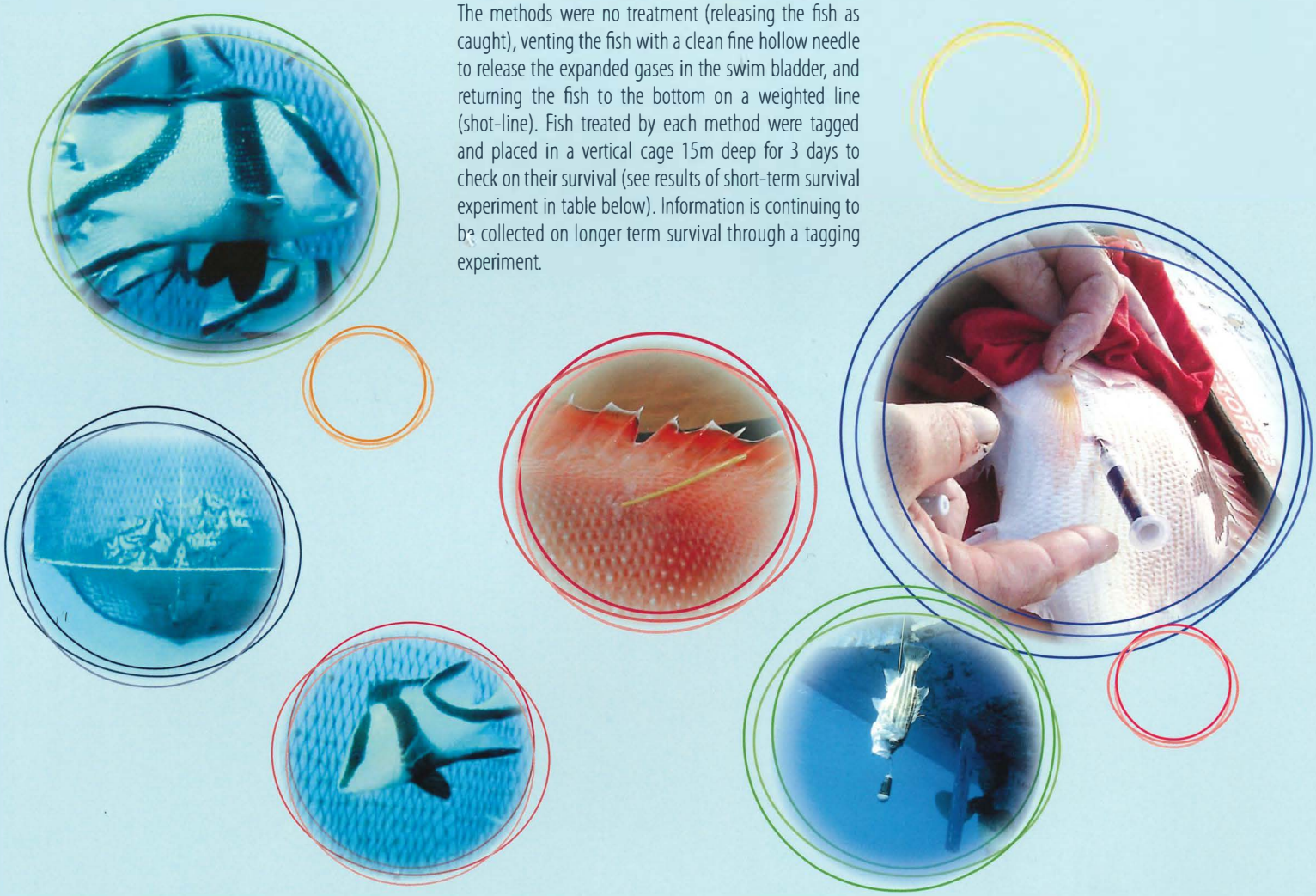
Barotrauma

Barotrauma results from the expansion of gases in the swim bladder and its effects are related to the depth from which the fish is brought to the surface. For many species the symptoms begin to appear in fish caught in about 10m of water. Mild symptoms are a hardening of the fish's stomach. More severe symptoms include bulging eyes and the stomach pushed out of the mouth. Fish from very deep water may show no signs of barotrauma because the swim bladder has burst, releasing all the gas.

The research tested three methods of release to see if they could affect the survival rates of released fish. The methods were no treatment (releasing the fish as caught), venting the fish with a clean fine hollow needle to release the expanded gases in the swim bladder, and returning the fish to the bottom on a weighted line (shot-line). Fish treated by each method were tagged and placed in a vertical cage 15m deep for 3 days to check on their survival (see results of short-term survival experiment in table below). Information is continuing to be collected on longer term survival through a tagging experiment.

Treating Fish Suffering From Barotrauma

Fish showing signs of barotrauma should be vented if they are floating to help them get back down to the bottom. Venting resulted in an increase in the survival of Saddletail Snapper, but based on the short-term experiments results there seems to be little to be gained from treating Red Emperor.



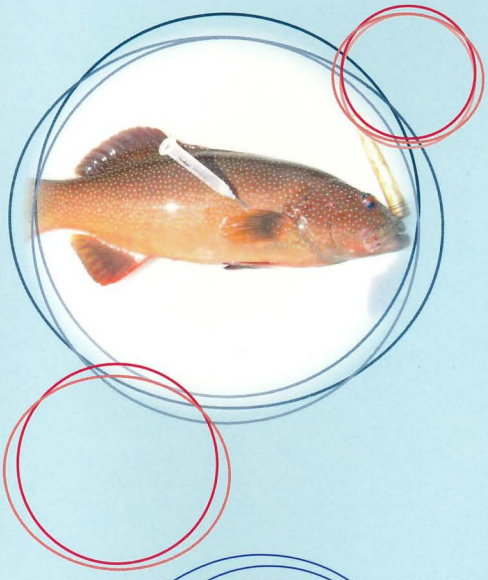
Short-term (3-day) survival rates of released coral reef species, by treatment

	SHORT-TERM SURVIVAL RATE				
TREATMENT	CORAL TROUT	REDTHROAT EMPEROR	RED EMPEROR	CRIMSON SNAPPER	SADDLETAIL SNAPPER
No treatment	78.5 %	90.7 %	100.0 %	82.6 %	44.4 %
Shot-lined	78.1 %	79.6 %	94.8 %	80.5 %	47.4 %
Vented	84.8 %	85.6 %	100.0 %	84.3 %	60.2 %

Vent or Shotline

Venting involves using a clean fine hollow needle to release the gases that have expanded in the swim bladder. Venting methods can vary with species however in most cases the needle is inserted in line with the top of the pectoral fin and below the 4th dorsal spine.

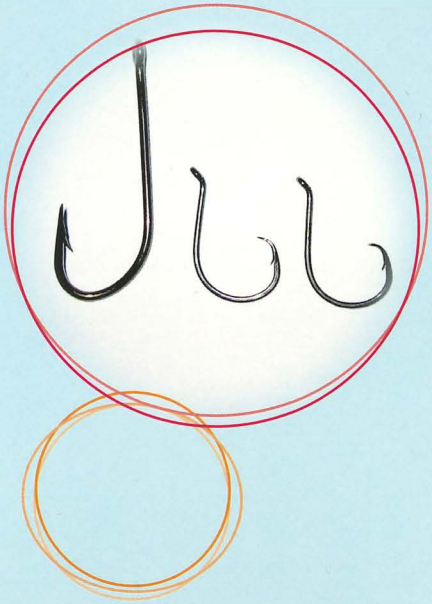
Shotlining involves using a weighted line to return the fish to the bottom. The fish is attached to the weight by a barbless hook through the jaw. The fish is lowered to the bottom on a cord. When the fish reaches the bottom a small tug on the line is all that is required to release the fish. This procedure is recommended for large Rockcod and other species that may be difficult to vent successfully. A brochure on the Release Weight is available from the Released Fish Survival website.



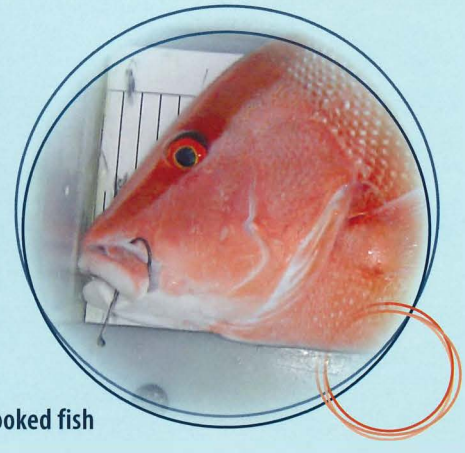
Hooking

Hook design does not appear to have a significant effect on the rate of deep hooking of the reef species examined. It is recommended that fishers use smaller hooks (size 4/0) rather than large hooks (size 8/0) to reduce the amount of damage caused to target and non-target species during capture. Use of non-offset circle hooks cause fewer injuries. However the effects of hooking will vary with the species.

For fish hooked in the mouth a hookout or long nosed pliers can be used to help remove the hook. For deep hooked (throat or gut) fish cut the line outside the mouth.

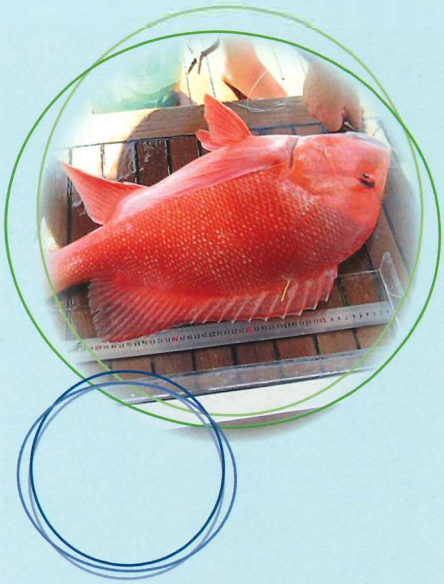


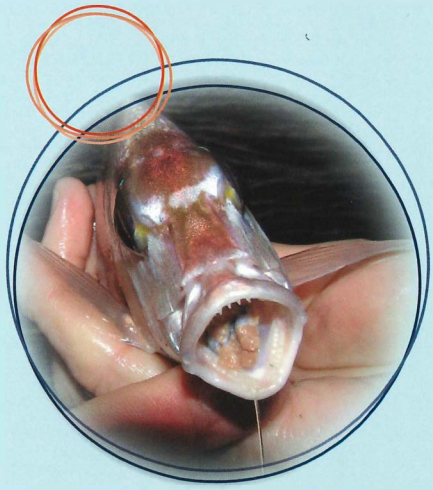
Shallow hooked fish



Handling

Use wet hands or a wet cloth when handling fish for release and minimise handling time as much as possible. Place fish on a cool wet surface and avoid hot decks when handling fish, removing hooks or measuring.





Deep hooked fish

Other information products

The Released Fish Survival website is at **www.info-fish.net/releasefish** and contains a range of useful fact sheets and information products.

Technical reports outlining the results of the individual research projects can be downloaded from the website.

Some other information products that are available include posters promoting fish friendly tackle, results of the Barramundi research, Flathead survival poster and NSW fish survival poster. These posters are suitable for distribution through fishing clubs, tackle and boating shows, Fishcare volunteers and to schools with marine or fish studies.

Fisheries and related websites

Fisheries Research and Development Corporation
www.frdc.com.au

Queensland Department of Primary Industries and Fisheries
www.dpi.qld.gov.au/fishweb

New South Wales Department of Primary Industries
www.fisheries.nsw.gov.au/recreational

Department of Primary Industries - Victoria
www.dpi.vic.gov.au/dpi/

Department of Primary Industries and Water - Tasmania
www.dpiw.tas.gov.au

Inland Fisheries Service - Tasmania
www.ifs.tas.gov.au

Primary Industries and Resources - South Australia
www.pir.sa.gov.au

Department of Fisheries - Western Australia
www.fish.wa.gov.au/sec/rec/

Department of Primary Industries, Fisheries and Mines - Northern Territory
www.nt.gov.au/dbird/dpif/fisheries

Recfish Australia
www.recfish.com.au

Australian National Sportfishing Association
www.ansa.com.au

Australian Fishing Tackle Association
www.afta.net.au

Infofish Services
www.info-fish.net

Acknowledgements

Ross Winstanley and Released Fish Survival Steering Committee

The following organisations have contributed significantly to the National Strategy

Queensland Government
Department of Primary Industries and Fisheries

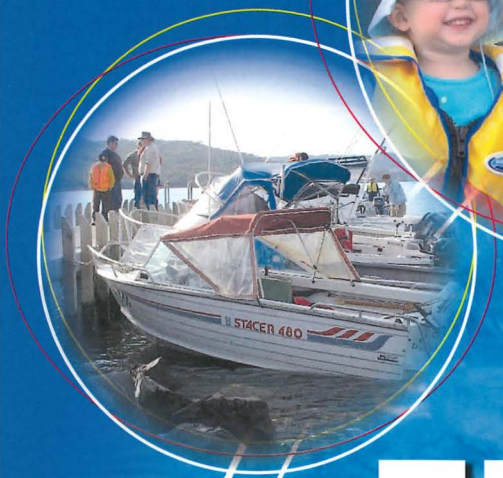
RECFISH AUSTRALIA

CRC Reef Research Centre

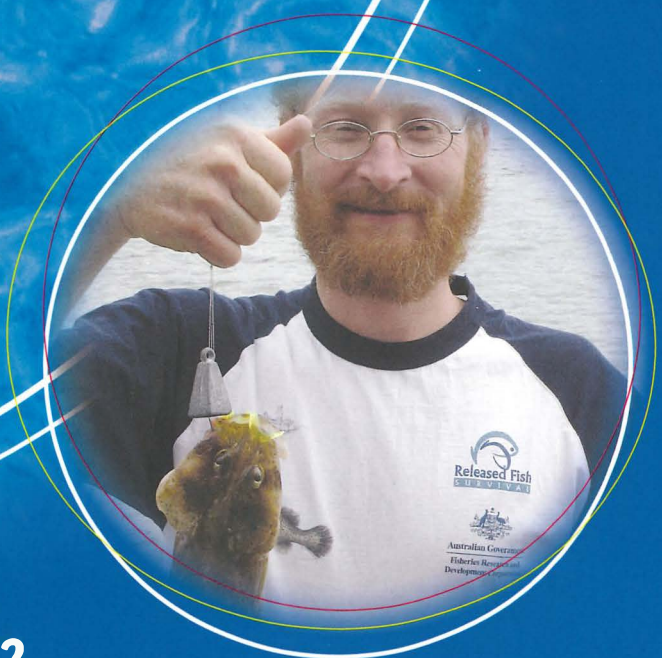
Australian Government
Fisheries Research and Development Corporation

infofish

Australian National Sportfishing Association ANSA



Flathead Survival



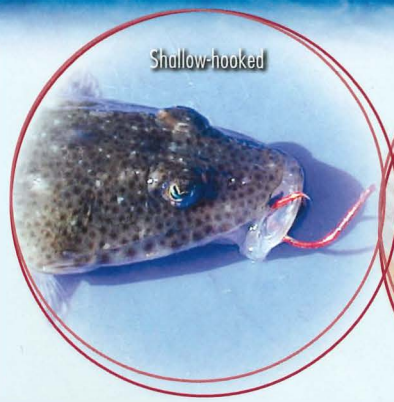
Do released flathead survive?

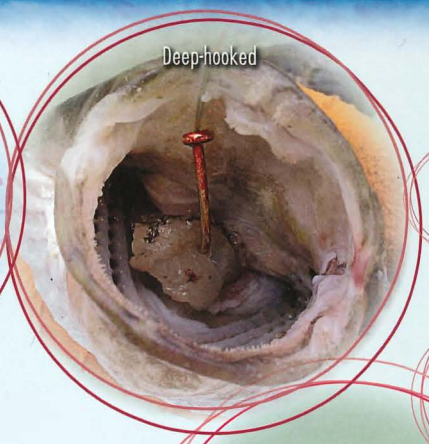
Due to size and bag limits many flathead are released by recreational anglers, but until recently little was known about how many of these fish survive.

The Tasmanian Aquaculture and Fisheries Institute investigated factors influencing survival of flathead caught by baited hooks. In collaboration with volunteer angler organisations this has led to the development of approaches that will maximise the survival of released flathead.

Research findings

Hooking damage is the most significant factor relating to whether flathead survive – survival is lowest for fish hooked in the gills or gut (deep-hooked). Additionally, fish that are bleeding stand a reduced chance of survival. Overall, however, flathead are robust and, if hooked in the lip or mouth (shallow-hooked), have a very good chance of survival if released.





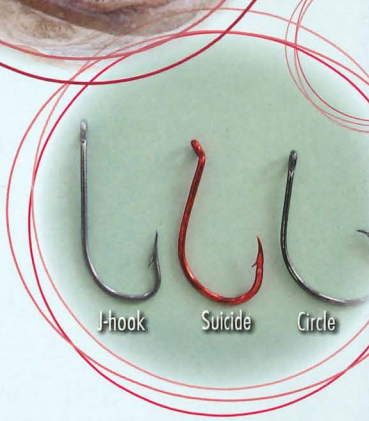
Bait fishing for flathead

A range of hook types and sizes, including "J" and "Suicide" hooks are commonly used when bait fishing for flathead. Circle hooks represent an alternative to traditional hook types, and are gaining popularity in Australia for a range of species.

Circle hooks

Our research shows that circle hooks are just as likely to catch flathead as the more commonly used hook types but, importantly, are far less likely to deep-hook fish.

Circle hooks are designed in such a way that fish hook themselves and are less prone to being swallowed than more commonly used hook types. Using circle hooks does require an adjustment to fishing practices in that you do not need to strike on the bite.



What can you do to increase survival of released fish?

Switching to circle hooks can increase the likelihood of the fish you release surviving since deep-hooking rates are extremely low, thus contributing to the health and sustainability of the flathead fishery.

For traditional hook types try to keep the line tight as this makes it less likely that fish will swallow the hook.

Deep-hooked fish

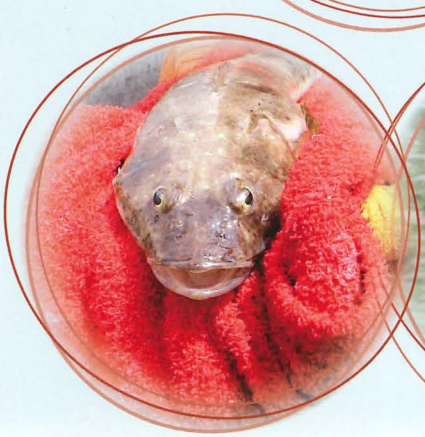
If the flathead is gut-hooked, cut the line and leave the hook in place. Attempts to remove the hook may cause considerable damage to the fish. Our research shows that the likelihood that a fish will survive increases if the hook is not removed, with some fish able to expel hooks within a short period.

Handling fish

Use a damp towel, cloth and/or gloves when handling fish as this helps protect the mucous layer on the fishes skin, and reduces the chance of injuring yourself on the spines.

Use a de-hooker, pliers or fishgrip when removing hooks.

Release fish as soon as possible after capture.



Released Fish SURVIVAL

RECFISH AUSTRALIA

Australian Government
Fisheries Research and Development Corporation

Tasmanian Aquaculture & Fisheries Institute
University of Tasmania

barramundi

What happens to the barramundi you release?

A study was conducted by the Fisheries Group of the Northern Territory Department of Business, Industry and Resource Development to investigate the post-release survival and stress response of barramundi caught and released by anglers.

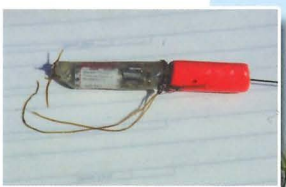
To assess the physiological stress and recovery times of angler caught barramundi, blood samples were taken from over 100 landed fish and analysed for changes in the blood chemistry.

To determine the post-release survival rate, angler caught barramundi were tagged with radio transmitters and tracked for up to 7 days.

The study found that the post-release survival rate of barramundi in a freshwater environment is about 90%. It also found that barramundi caught in the build-up were more stressed by the experience than those caught in the dry season, and consequently, the post-release survival rate in summer was lower.

Drawing blood for analysis

One that didn't survive - a post-release mortality



Recovered radio transmitter

Northern Territory Government
Department of Business, Industry and Resource Development

FISHERIES RESEARCH & DEVELOPMENT CORPORATION

Contact Fisheries Group 8999 2144

Visit our website at: www.fisheries.nt.gov.au

barramundi

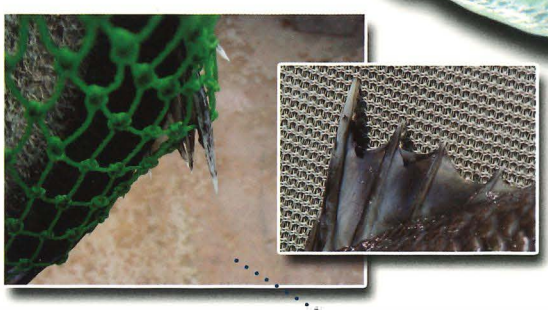
Handling of barramundi

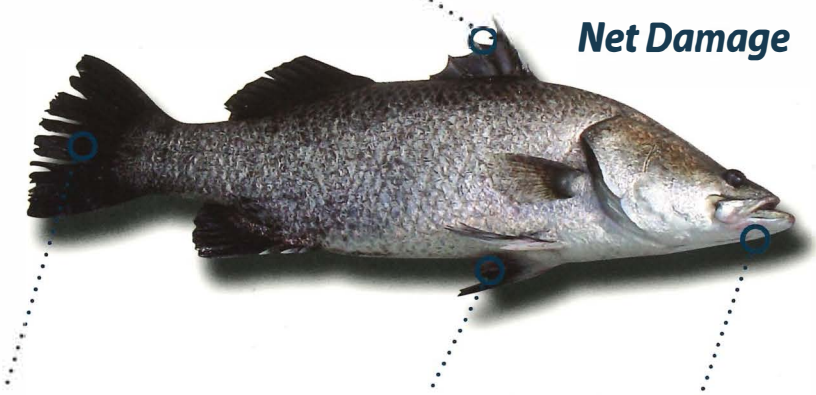
The effects of two types of landing nets on injuries to large fish were experimentally assessed at the aquarium facilities of the Territory Wildlife Park, Northern Territory. The two types of net, the knotted and knotless landing net, represented two commonly available nets in the NT.

Barramundi were caught and held in the landing nets for 60 seconds and then released into a glass aquarium where injuries to the body and fins were visually scored.

All of the barramundi examined showed some skin abrasions and fin damage after being held in the landing nets but the extent of damage was much greater for those fish held in the knotted net.

Therefore the use of knotless nets is highly recommended for catch and release fishing.





Northern Territory Government
Department of Business, Industry and Resource Development

FISHERIES RESEARCH & DEVELOPMENT CORPORATION

Contact Fisheries Group 8999 2144

Visit our website at: www.fisheries.nt.gov.au

Fish Friendly Tackle

To improve the chances of survival when releasing fish, use fish friendly tackle that minimises stress and damage to the fish.

Tackle

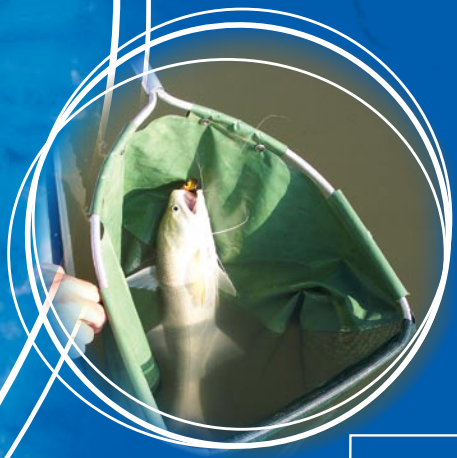
Use tackle that will land fish quickly.

Hooks

Use hook patterns such as circle hooks to reduce gut hooking.

Barotrauma

Learn how to deal with barotrauma. Relieve barotrauma by venting or using a release weight.



Landing Nets

Use knotless landing nets.

Measuring Fish

Measure fish rather than weighing them.

Fish Grips

When using fish grips support the fish at all times.

For more information visit the released fish website
www.info-fish.net/releasefish

AFTA – Protecting Fishing's Future – Australian Fishing Tackle Association

Released Fish Survival

RECFISH AUSTRALIA

Australian Government
Fisheries Research and Development Corporation

Fish Friendly Tackle

Tackle

USE TACKLE THAT WILL LAND FISH QUICKLY

Hooks

USE HOOK PATTERNS SUCH AS CIRCLE HOOKS TO REDUCE GUT HOOKING

Removing Hooks

USE A "HOOKOUT" OR PLIERS AND MINIMISE DAMAGE

Landing Nets

USE KNOTLESS LANDING NETS

Measuring Fish

MEASURE FISH RATHER THAN WEIGHING THEM

Australian Government
Fisheries Research and Development Corporation

RECFISH AUSTRALIA

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Released Fish SURVIVAL

For more information visit the released fish website
www.info-fish.net/releasefish

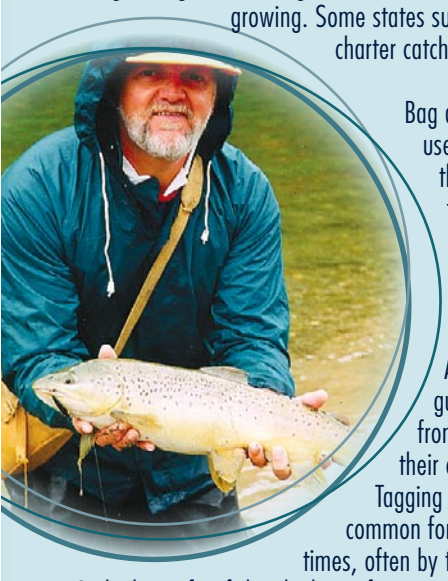
Released Fish Survival is Your Business

Released Fish Survival Is Your Business

Looking after fish is as important to your business as looking after your clients. Without fish there will be no clients. This kit outlines the latest information available on survival of released fish to help improve your business.

In 2000 the National Recreational and Indigenous Fishing Survey estimated the recreational finfish catch in Australia at 107.7 million fish caught of which 47.3 million (43.9%) were released.

While there are no national statistics on the numbers of the fish caught using fishing charters or guides the number is significant and it is likely to be growing. Some states such as Qld, WA and SA collect data on charter catches.

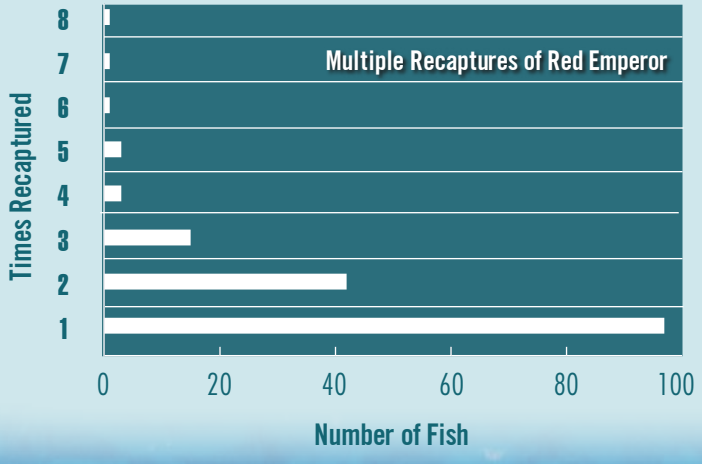


Bag and size limits are the common tools used by Fisheries Managers to manage the recreational catch and many fishers voluntarily release fish for a whole range of reasons. Regardless of the reason there are more and more fish being released.

As a charter operator or fishing guide your business will benefit from the careful release of fish so that their chances of survival are maximised. Tagging studies have shown it is quite common for many species to be caught multiple times, often by the same person, in the same place. So looking after fish is looking after your business.

While the practice of high grading (throwing back smaller fish when a larger fish is caught to remain within bag limits) occurs sometimes, charter operators and fishing guides are encouraged to take steps to reduce the incidence of this practice in their business.

The graph shows the capture of tagged red emperor multiple times by a single charter boat providing evidence that fish can survive when handled correctly. One fish has been recaptured 8 times from the one boat.



Hooks, Hooking and Removing Hooks

One of the most significant causes of fish mortality is deep hooking, that is when the hook is swallowed and lodged in the throat or gut. Studies on many species show high survival rates for fish hooked in the jaw and mouth while for those same species hooked in the gills, throat or which have swallowed the hook into the stomach, the survival rates are much lower.

Fish survival will improve if the incidence of deep hooking is reduced. There are some simple things that can be done to reduce deep hooking.

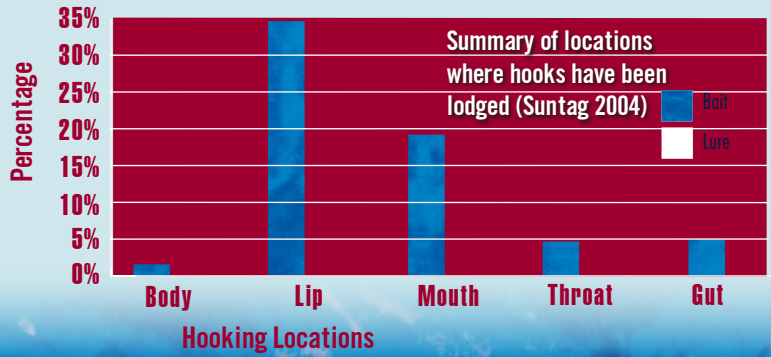
- Use hook patterns such as circle hooks that are known to reduce deep hooking in targeted species.
- Use a larger size hook than normal.
- Use lures in preference to bait.

Even when using these techniques there will still be fish that are deep hooked. It is recommended if deep hooked fish are legal that they should be kept rather than released, if survival is doubtful.The graph below shows that overall around 10% of fish caught are deep hooked.

If a deep hooked fish is to be released it is recommended that the hook be left in place without attempting to remove it. Trying to remove it is likely to cause more damage. Cut the line and release the fish. Some work overseas recommends cutting the line outside the mouth of the fish to limit the hook from rotating and blocking the throat.

Another way of improving fish survival from hooking is to use barbless hooks. Contrary to popular belief there is little evidence that this reduces catch rates, especially when using lures with barbless trebles. Barbless hooks are easier to remove and do less additional damage to the fish when being removed. They are also easier to remove should they get accidentally lodged in the fisher, saving a trip to the hospital.

Use long-nosed pliers or a hookout to help remove hooks, especially for fish with sharp teeth, abrasive lips or cutting edges around the head.



Dealing With Barotrauma

Barotrauma is the term now being used to describe the condition that results from the expansion of gases in a fish swim bladder as it is hauled from the bottom to the surface. This condition is similar to that experienced by divers suffering from the "bends".

The visible symptoms of barotrauma that fishers can look for are:

- Swollen stomach that is hard when touched.
- Stomach that has been pushed out through the mouth or gill cover.
- Eyes that are bulging out of their sockets.

The symptoms of barotrauma may not be evident in fish brought up from very deep water where the swim bladder has burst during ascent.

The susceptibility to barotrauma varies depending on the species. The effects of barotrauma are generally noticeable when fish are brought up from water greater than 10m and become more pronounced as the depth increases. The following table is provides as an approximate guide on species susceptibility to barotrauma.

Coral trout being 'vented' to release expanded gases from its swim bladder

Common species taken from deep water

Resilient	Moderately affected	Badly affected
Snapper	Sweetlip	Tuskfish
Red Emperor	Coral Trout	Parrotfish and Wrasse
Leatherjacket	Redthroat Emperor	Rockcod and Groper
Flathead	Nannygai (Sea Perch)	Jewfish and Teraglin
Striped Trumpeter	Morwong	Blue-eye Trevalla
King George Whiting	Bass (freshwater)	WA Dhufish and Pearl Perch
Samsonfish		Mackerel

Resilient species can often be released without treatment. Moderately affected species should be released by using a release weight or by venting. Badly affected species should be released using a release weight.

Research is underway to test release methods on a range of key species to determine which may be the best for each species.

If symptoms are mild then fish can be released without treatment and they will generally be able to return to the bottom. When the swim bladder is over inflated fish may not be able to swim below the surface and may float away. This makes them vulnerable to predators and survival is less likely.

One method of release is by use of a release weight. A barbless hook attached to a weight is inserted in the top jaw and the fish is lowered to the bottom on a line. When it reaches the bottom a tug on the line will release the fish.

WA Dhufish being released using the release weight

Release weights are now being made commercially and are becoming available from tackle outlets. Trade enquiries for the release weight can be directed to Hills Mako Tackle at Welshpool WA on 08-9274-5255 or Demon Jigs & Deep Water Lures on (07) 3217-3120

The other method is to 'vent' fish to release the gases by piercing the swim bladder with a fine hollow needle. The needle is inserted in line with the top of the pectoral fin and in line with the 4th dorsal spine (this is valid for a range of species). When the spot is located push the needle gently through the skin and then the swim bladder. The gases will be heard escaping through the tube if it has been done correctly. When the fish is released it will be able to swim down to the bottom.

Venting tools are not readily available from tackle outlets however a 16 guage syringe with the piston removed makes an effective tool.

Gently releasing a fish

Handling Fish For Release

Handling fish correctly from catching to releasing plays an important role in the survival of released fish.

These are some practices to use to improve fish survival from handling:

- Avoid long playing times that exhaust fish.
- Small fish can be removed from the water by lifting the fish on the line.
- Larger fish intended for release should be landed using a knotless net.
- Place fish on a cool wet surface and avoid hot dry surfaces.
- Keep the fish out of the water for the minimum time possible.
- Hold fish horizontally and support their body when releasing and gently place in the water.
- Fish grips can be used to help in handling and restraining fish however fish should not be held up vertically with grips.

A study on barramundi in the NT showed the incidence of scale loss, slime removal and fin splitting was significantly reduced by the use of a knotless landing net compared with a standard knotted net.

For estuary and freshwater charters water temperature can be an important factor in survival. When water temperatures are very high in summer it is best to avoid catching and releasing large fish as survival rates under these conditions are much lower. The NT study into barramundi showed 100% survival rates when released in winter but this dropped to 80% in summer.

On offshore charter boats it may not be practical to release fish by gently placing them in the water. This could also be dangerous if predatory fish, especially sharks, are around. In this case fish should be dropped head first into the water.

Recording A Memorable Catch

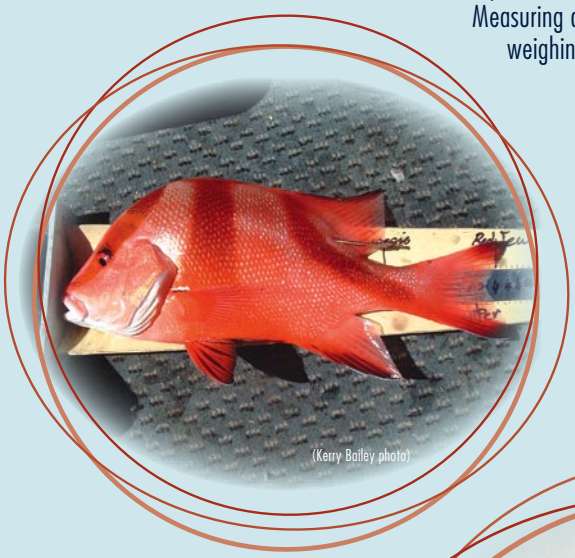
Many clients of charter fishers or fishing guides want to record a memorable catch. That generally involves photographs, measuring or weighing a fish or all three. For charter fishers targeting reef species this is generally not a problem as most of the larger legal fish are kept.

More and more estuary charter fishers are deciding to release larger fish however require evidence of their catch. That is generally decided before the trip so the appropriate arrangements can be made to ensure the catch is recorded.

While recording the catch is important so is its survival after release. It is becoming more commonplace to hear of large fish, especially barramundi, being found dead after a fishing trip where fish have been released. While this may not be from charter fishers it can still influence public views.

When photographing a client with a fish make sure that the fish is out of the water for the minimum time possible. Ensure that the fish is held horizontally with its body supported at all times.

If using a fish grip with inbuilt scales avoid using the grips to hold the fish vertically by the jaw to record its weight. While this may be convenient it may cause internal damage to the fish's organs and in extreme cases the backbone has been known to snap from the weight of the fish. If weighing a fish the best way is to weigh it in the landing net or use a cradle. Measuring a fish is recommended in preference to weighing.



Red Emperor being measured before release

When photographing large fish that are to be released, such as this tagged Largemouth Nannygai, hold them horizontally and support their body

Using a knotless landing net to land a fish

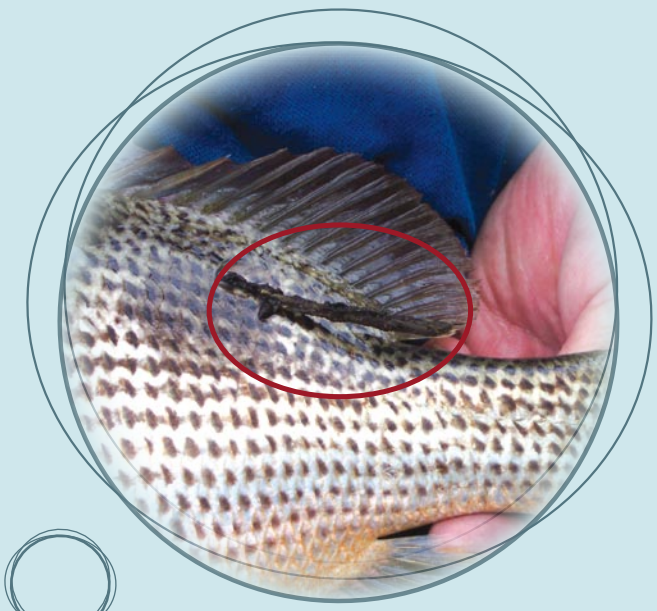
Tagged Fish

There are a number of programs around Australia where fish are being tagged and it is not unusual for charter fishers to catch tagged fish. It is important that the details of tagged fish are accurately recorded and reported back to the relevant tagging program. Most tags have an 1800 toll free number on them or contact information.

Tags may not be apparent when a fish is landed as often the tag is covered in algae and may just appear as something hanging from a fish. Wiping the algae off carefully will reveal the presence of a tag.

The information that is normally required on tagged fish includes:

- Tag number
- Date fish caught
- Species
- Length of fish
- Location where caught (GPS coordinates are the best for offshore locations)



A tag in fish is often covered with algae and is difficult to recognize.

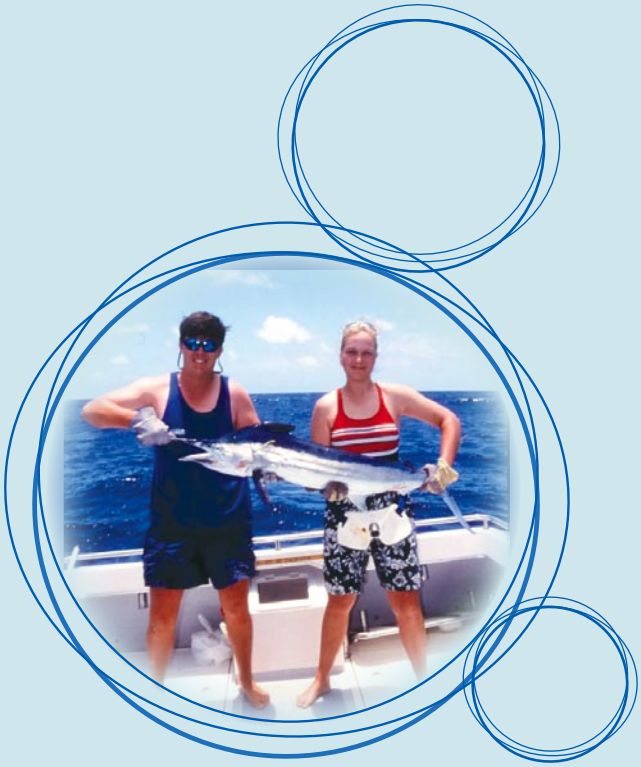
Billfish and Pelagic Species

Some charter operators specialise in billfish and pelagic species such as tuna and practise a high level of catch and release or tag and release. These fish are often large and require special treatment if they are to be released unharmed.

While long playing times should be avoided sometimes this is difficult because of the size of the fish. Small billfish and other pelagic species up to around 25kg can be removed from the water for removal of hooks and released, however larger fish are best released while still in the water. Fish should be brought alongside the boat and the hooks removed with pliers or, if that is not possible or dangerous, the trace can be cut. Billfish may be handled by holding the fish by the bill with a gloved hand but only if the fish is docile. Some charter fishers use a 'snooter', a PVC pipe and rope that is used to cover the bill to protect fishers while handling larger fish.

Fish that have been played for some time may need to be revived. This can be done by slowly motoring forward with the fish being held beside the boat until it recovers.

Sharks are often in the same area as pelagic species and can often kill fish intended for release. Care should be taken in handling and releasing fish if there are sharks or other predators in the vicinity.



Small billfish intended for release can be boated to remove the hooks

National Strategy On Released Fish Survival

In 2001 the Fisheries Research and Development Corporation launched the National Strategy for the Survival of Released Line Caught Fish. The strategy is primarily focused on recreational fishers.

The strategy has promoted best practices in releasing fish as well as overseeing research in many elements of fish survival. Currently there are 12 projects that have been completed or are in progress into survival of key reef species, bream and flathead. Initial work on barramundi survival has been completed.

As information becomes available from the research it is being provided to industry through a variety of products. This Information Kit is just one of a range of products that have been produced.

The National Strategy is supported by:

Australian Government
Fisheries Research and Development Corporation

RECFISH AUSTRALIA

AFTA

ANSA

The following have supported and assisted in the production of this Information Kit.

Charter Boat groups
Charter Boat groups
Charter Boat groups
Charter Boat groups
Individual charter operators
Individual charter operators
Individual charter operators
Individual charter operators

For more information visit the website www.info-fish.net/releasefish

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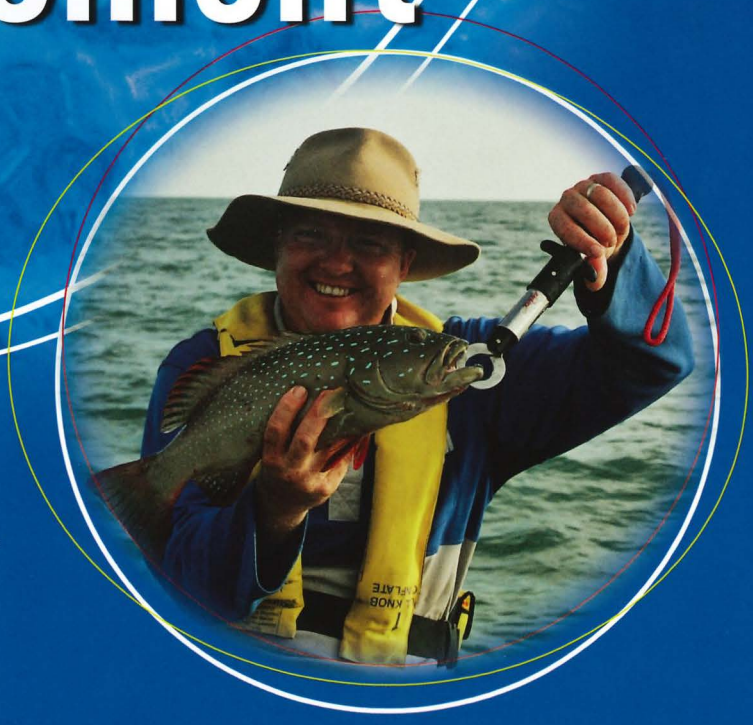
Released Fish Survival For Fisheries Management



Released Fish Survival Kit for Fisheries Management

Those responsible for managing recreational fisheries need tools to help raise awareness of a range of factors related to fish that are released by recreational fishers. Data on these factors are important in stock assessments and understanding the impacts of management decisions. The National Strategy for the Survival of Released Fish, an initiative of the Fisheries Research and Development Corporation, has been promoting research into post release survival of fish, and collection of other pertinent data for the past few years. There are currently 15 projects with a total investment of $6.5m under the National Strategy and further projects are proposed.

This kit provides Fisheries Managers with the most recent available data on survival of the key recreational species caught around Australia and factors that need to be considered when making management decisions. The data have been collected from research projects that have been/are being undertaken, past research or from overseas studies relevant to Australia. It provides an overview of the current status of knowledge on released fish and their survival with reference to the underlying work on which it is based.

What Data are Required on Released Fish to Manage Recreational Fisheries?

To make informed decisions about the management of recreational fisheries the following basic data are required.

- The number of fish caught by recreational anglers, including both the harvested (retained) and released components.
- The survival rate of released fish must be added to the total fish harvested to obtain total mortality figures for all key species or species groups.
- The causes and the levels of mortality from different factors need to be known to understand the effect of management decisions and what action may need to be taken to mitigate their effects.
- Fisher behaviour needs to be understood to ensure that management decisions achieve their desired goals and do not result in unintended consequences eg fishers handling and removing hooks roughly from fish that are undersized or unwanted.

This kit provides an overview of the current status of knowledge in relation to these important areas.

Numbers of Fish Released by Recreational Fishers

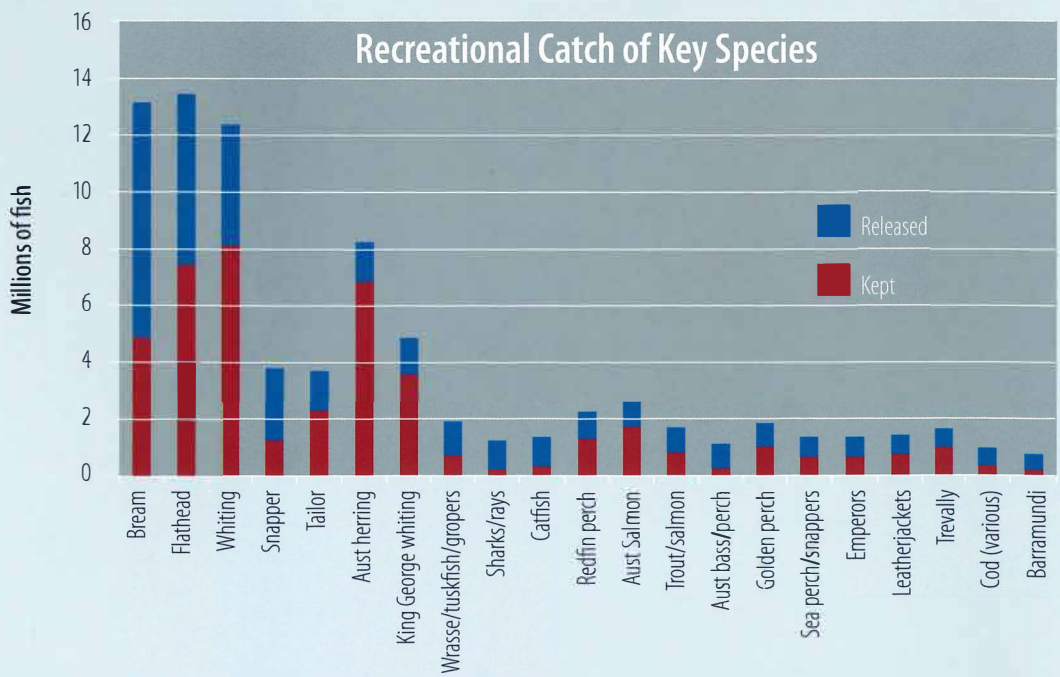
There has only been one survey that has provided national statistics on the recreational catch. The National Recreational and Indigenous Fishing Survey was conducted in 2000 and provided a national perspective on the total catch of fish by recreational anglers, and importantly, on the proportion of the catch which is released.

Data from the National Survey shows that recreational fishers caught a total of 107.7 million finfish. Of these 47.3 million (43.9%) were released. The total numbers of fish caught and released by anglers in 2000 is contained in the report available at http://www.dpi.nsw.gov.au/fisheries.

These data are simplified in the following figure, indicating the numbers of **key** species/species groups of fish caught and released.

Some states conduct statewide, regional or local surveys and these data should also be used when assessing the recreational catch.

These data are important for input into stock assessments for key recreationally important species. For example, the numbers of some species released, such as bream, flathead, whiting and snapper, represent of the order of hundreds of tonnes of each species. Determining the mortality among this component of the catch is important, as is a concerted effort to reduce or minimise that mortality.



Key Species and Species Groups

The following table provides some statistics and survival characteristics for key Australian species and species groups.

Species/Species Group	Total Catch	Percent Released	Percent Survival*	Rate of Deep Hooking	Susceptibility to Barotrauma	Susceptibility to Handling
Bream	13,144,000	63%	83-96%	11%- 17%	na	Good
Flathead	13,462,000	45%	95-100%	4%-6%	Low	Good
Whiting	12,380,000	35%	93%		na	Good
Snapper	3,824,000	66%	67-93%	7%-16%	Moderate	Good
Tailor	3,719,000	38%	97%	5%-16%	na	Fair
Aust herring	8,244,000	17%			na	Fair
King George whiting	4,899,000	26%	97%		Low	Good
Wrasse/tuskfish/gropers	1,910,000	62%		6%	High	Good-Poor
Sharks/rays	1,253,000	82%			na	Good
Catfish	1,371,000	75%			na	Good
Redfin perch	2,253,000	43%			na	Good
Aust Salmon	2,600,000	34%			na	Fair
Trout/salmon	1,693,000	51%			na	Fair
Aust bass/perch	1,135,000	76%			Moderate	Good
Golden perch	1,858,000	44%			na	Good
Sea perch/snappers	1,374,000	52%		8%	Moderate	Good
Emperors	1,336,000	51%		4%	Low	Good
Leatherjackets	1,414,000	46%			Low	Good
Trevally	1,628,000	39%	83%		Low	Good
Cod (various)	978,000	62%			Variable	Good
Barramundi	762,000	72%	90%	4%	na	Good
Red emperor	716,000	68%		8%	Low	Good
Murray cod	483,000	78%			na	Fair
Garfish	2,778,000	12%			na	Poor
Luderick	996,000	33%			na	Good
Mulloway/jewfish	600,000	46%	74%		High	Fair
Mackerels	742,000	37%			High	Poor
European carp	2,354,000	11%	ILLEGAL TO RELEASE IN SOME STATES			
Coral Trout	493,000	35%		4%	Moderate	Good
Yellowtail kingfish	251,000	55%			Low	Good
Tuna/bonitos	353,000	34%			Low	Fair
Morwong	355,000	21%			Moderate	Fair
Dhufish	160,000	36%			High	Fair
Billfish (Marlin/Sailfish)**	3,200	95%			Moderate	Good

* NOTE: Survival rates vary depending on size of fish, fishing methods, location and environmental conditions. These figures, derived from relatively few studies, should be used with some caution.

** Data from NSW DPI Gamefish Tagging Program

Black Bream, Snapper – Vic: S Conron, D Grixti and S Morison (2004): Assessment of mortality of under-size snapper and black bream caught and released by recreational anglers: Primary Industries Research Victoria, Queenscliff

Dusky Flathead, Yellowfin Bream, Sand Whiting, Silver Trevally – NSW: Broadhurst et al (2005): Mortality of key fish species released by recreational anglers in an Australian estuary: Journal of Experimental Marine Biology and Ecology

Dusky Flathead, Sand Flathead – Qld/Tas: Preliminary data from national strategy for the survival of released line caught fish: maximizing post-release survival of line caught flathead taken in sheltered coastal waters

Sand Whiting – NSW: P Butcher, MK Broadhurst and CP Brand (in press): Mortality of sand whiting (Sillago ciliata) released by recreational anglers in an Australian estuary: ICES Journal of Marine Science 63

Snapper, Mulloway – NSW: Broadhurst et al (2005): Mortality of key fish species released by recreational anglers in an Australian estuary: Journal of Experimental Marine Biology and Ecology

Tailor – WA: SG Ayvazian, BS Wise, and GC Young (2002): Short-term hooking mortality of tailor (*Pomatomus saltatrix*) in Western Australia and the impact on yield per recruit

King George Whiting – SA: T M Kumar, R Hill and D Partington (1995) The Impact of Commercial Hauling Nets and Recreational Line Fishing on the Survival of Undersize King George Whiting (*Sillaginodes punctata*): South Australian Research and Development Institute report

Barramundi – NT: P de Lestang, RK Griffin and QA Allsop (2004): Assessment of post-release survival and stress physiology of barramundi: FRDC 2002/039 final report available at www.infofish.net/releasefish

Deep Hooking Rates – Unpublished data (2005): Data from the Austag databases of the Australian National Sportfishing Association: Preliminary data from national strategy for the survival of released line caught fish: maximizing post-release survival of line caught flathead taken in sheltered coastal waters: Simon Conron, Daniel Grixti and Sandy Morison (2004): Assessment of mortality of under-size snapper and black bream caught and released by recreational anglers

Key Influences on Fish Survival

Key factors that influence the survival of fish that are released are species specific and therefore data needs to be ideally obtained on individual species, or at the least,species groups. Research, particularly in the USA, identifies as key influences on survival of released fish such factors as the rate of deep hooking, susceptibility to barotrauma (for fish caught in deep water) and the susceptibility to handling.

Research and data collection under the National Strategy has focused on collecting data on deep hooking and barotrauma for a number of key species with some work on handling. However data on the susceptibility to handling is based on subjective assessment by experienced fishers.

Hooks, Hooking and Removing Hooks

One of the most significant causes of fish mortality is deep hooking, that is when the hook is swallowed and lodged in the throat or gut. Studies on many species show high survival rates for fish hooked in the jaw and mouth but much lower survival rates if hooked in the gills, throat or stomach. A number of the current research projects are assessing the effects of deep hooking.

Fish survival will improve if the incidence of deep hooking is reduced. There are some simple things that can be done to reduce deep hooking.

- Use hook patterns such as circle hooks that reduce deep hooking.
- Use a larger size hook than normal.
- Use hard bait (eg crabs) in preference to soft bait (eg worms)
- Use lures in preference to bait.

Barotrauma

Barotrauma is the term used to describe the condition that results from the expansion of gases in a fish swim bladder as it is hauled from the bottom to the surface. Barotrauma can cause internal injury to fish (although this is not always the case) and may prevent a released fish from returning to the bottom, thereby increasing its susceptibility to predation by birds, fish and marine mammals. Research is being undertaken into key reef species affected by barotrauma in Western Australia and Queensland including WA Dhufish, Snapper, Coral Trout and tropical Snappers.

The symptoms of barotrauma may include:

- Swollen stomach that is hard when touched.
- Stomach that has been pushed out through the mouth or gill cover.
- Eyes that are bulging out of their sockets.

A number of methods for reducing the effects of barotrauma have been/are being assessed and the effectiveness of these vary depending on the species.

The treatments that have been/are being assessed are:

- No treatment.
- Venting by puncturing the swim bladder to release the expanded gases.
- Returning the fish to the bottom on a barbless weighted hook to equalize pressure.

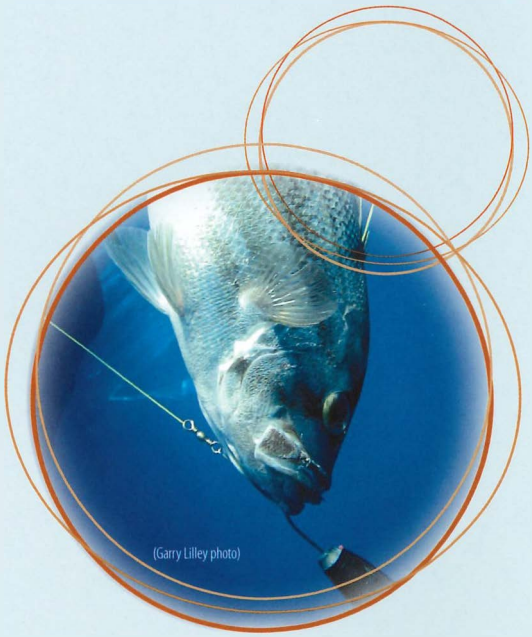
Handling Fish

Handling fish covers a range of activities that can influence the survival of released fish. Some research is looking at handling issues however the assessment presented here is subjective, being based on the observations of experienced fishers.

Handling issues that affect survival include:

- Time taken to land a fish and the level of stress imposed.
- Time that the fish is out of the water.
- How active the fish is when landed and amount of self damage caused.
- Environmental conditions such as water and air temperature.
- How fish are released back into the water.

Coral trout being 'vented' to release expanded gases from its swim bladder



WA Dhufish being released using the release weight

Understanding Fisher Behaviour in Releasing Fish

In making decisions to manage the recreational catch it is important for Fisheries Managers to have data on fisher behaviour. This is required to understand the likely responses to management rules and to avoid unintended consequences.

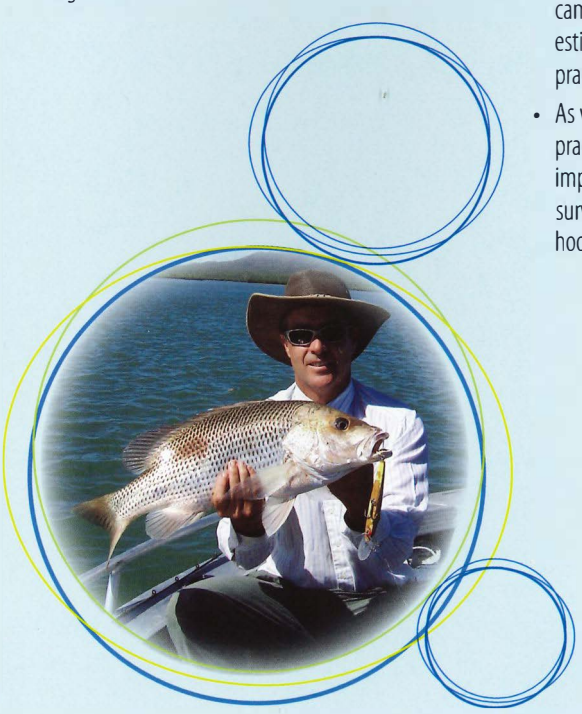
As an example the imposition of a high minimum size limit and a low bag limit on a reef species with a high susceptibility to barotrauma may result in many more fish being killed and thrown back due to fishers trying to obtain their bag limit of legal sized fish.

The National Strategy has as one of its foundations the promotion of best practices in releasing fish. A nationwide television campaign promoting best practices (hosted by Andrew Ettinghaussen) was conducted in 2003. Since then the National Strategy has produced a series of products promoting best practices and the full range of products is included with this Kit.

Reasons for Releasing Fish

There are a number of reasons why recreational fisher release fish:

- To conform to legal requirements (releasing undersized fish or fish over and above the legal bag limit or releasing fish because of area or temporal closures)
- Because the fish are not deemed edible (many examples such as puffer fish, and in particular, sharks and rays)
- Because the angler voluntarily chooses to release fish which might otherwise be kept. This would include tag and release.



Angler Perceptions and Behaviour

Prior to the national campaign promoting best practices a national survey of recreational fishers was commissioned to determine, among other things:

- Equipment currently used for fishing
- Attitudes to catching, eating, releasing, and cleaning fish
- Species both caught and released
- Views of fishers on the benefits to fish stocks of the practice of releasing fish

Some key findings were:

- 88% of fishers at least occasionally released fish voluntarily
- 83% of fishers felt that they had the equipment to properly release fish
- 95% of fishers believed that released fish benefit the fish stock
- 66% of fishers were aware that there are practices which should be used when releasing fish
- 87% of fishers do not believe that most released fish die
- 48% of fishers stated that they would use new fishing gear that improves fish survival

After the completion of the national campaign, a follow up survey was conducted to determine what changes in perceptions, attitudes and behaviour (if any) may have occurred. Key results of this survey indicated that:

- More than half (59%) of respondents were aware of the campaign with 36% recalling seeing the campaign television advertisements. It was estimated that 35% of all fishers had changed their practices as a result of the campaign.
- As well as improvements in particular fishing practices, awareness of some fish-friendly gear had improved significantly. For example, in the 2002 survey 62% of fishers did not know what a circle hook was but in 2004 this had dropped to 43%.

Fish Friendly Fishing Tackle

To support understanding of fishers a survey of the fishing tackle industry was also undertaken to determine the uptake of fish friendly tackle (tackle that assists in promoting fish survival). Key results were:

- 65% of retailers and wholesalers of fishing tackle recalled at least one element of the Released Fish Survival campaign.
- 'Fish-friendly' gear including circle hooks, knotless landing nets, hook-outs, and fish grips were all stocked by over 60% of retailers and wholesalers while barbless treble hooks were stocked by 27% of suppliers.
- Between 40% and 50% of surveyed suppliers stated that their sales of al least one of these items had increased in 2003.

The detailed reports of these surveys are available from www.info-fish.net/releasefish.

Using a knotless landing net to land a fish

Useful References

S Cooke and C Suski (2005): Are circle hooks an effective tool for conserving marine and freshwater recreational catch-and-release fisheries?: Aquatic Conservation - Marine and Freshwater Ecosystems: Available at www.interscience.wiley.com

P Reiss, M. Reiss, J Reiss (2003): Catch and Release Fishing Effectiveness and Mortality: Available at www.acuteangling.com

L McLeay (2002): National Strategy for the Survival of Released line caught fish: A review of research and fishery information: Available at www.info-fish.net/releasefish

W Sawynok and J Pepperell (2004): National Strategy for the Survival of Released line caught fish: planning, project management and communications: Available at www.info-fish.net/releasefish

S Conron, D Gritxi and A Morison (2004): To obtain a preliminary measure of survival rates resulting from anglers releasing undersized snapper and black bream: Primary Industries Victoria report: Available at www.info-fish.net/releasefish

R Roennfeldt, PF Jones and S Conron (2003): Preliminary investigation of hook retention by black bream Acanthopagrus butcheri (Munro, 1949) in the Hopkins River estuary, Victoria. School of Ecology & Environment. Research Project. Deakin University, Warrnambool, Victoria. Report available from PIRVic

R Roennfeldt (2005): Hook retention by black bream Acanthopagrus butcheri from the Glenelg River, Victoria. Honors project Deakin University, Victoria. In press

Olivier Bittar (2005): Swim Bladder properties and implications for barotrauma: Honors project Queensland University: In press

For More Information

There is a great deal of information on survival of fish released by recreational anglers available on the dedicated website www.info-fish.net/releasefish. Those responsible for fisheries management are encouraged to refer to and become familiar with this website and to download and use the many tools and products which have been developed. In particular, Managers should find the National Strategy on Released Fish Survival, which is also included in this kit, a particularly useful resource. The National Strategy document is continually being updated and is currently in edition 8.

The Key Species and Species Groups will also be maintained on the website and new information will be added as it becomes available.

Information from the National Strategy continues to be made available on an ongoing basis. An electronic News Bulletin to keep those interested up to date is available. To subscribe send an email to infofish@zbcom.net with subscribe to Released Fish News.

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Australian Government
Fisheries Research and Development Corporation

RECFISH AUSTRALIA

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Released Fish SURVIVAL

Gently Does It
Best Practices in Releasing Fish

National strategy for the survival of released line caught fish

In 2001, the Fisheries and Research Development Corporation (FRDC) established the National Strategy for the Survival of Released Line Caught Fish. With around 50% of recreationally caught fish released, understanding and improving the survival rate of released fish was the reason for the strategy.

Since then, as part of that strategy, there has been an investment of over **$7.2 million and 17 projects** to determine the survival rates of important recreational fishing species and to promote and improve the best practices used by fishers to release fish.

In 2003, a national television advertising campaign featuring Andrew Ettingshausen was undertaken to promote best practices as they were then known. At the same time a national survey was undertaken to understand fisher attitudes and practices towards releasing fish. This was then used to assist in the development of information products based on the research that followed.

Projects to determine survival rates of important recreational species have been undertaken over the past few years and will continue into the future. Species on which survival information is now available include Barramundi, Flathead, Snapper, Bream, Whiting, Mulloway and a number of reef fish species. Other issues that have been researched include: the effects of barotrauma on deep water species, the effects of hooking location and hook type, and the effects of different type of landing nets. That research has led to some refinement of best practices.

The Released Fish Survival website **www.info-fish.net/releasefish** contains a range of fact sheets and pointers on best practices and how to access other information that summarises research results.

Recfishing Research is a new program that will deal with research into a broader range of recreational fishing issues including fish survival. The website will be revamped into a Recfishing Research website and extended to cover the broader research priorities providing better access to the latest information. It will continue to provide the full range of information on best practices in releasing fish.

Why are fish released?

Fish are released by recreational fishers to meet the requirements of fishing regulations or by personal choice. Regulations are the responsibility of State and Commonwealth fisheries agencies and links to the relevant websites are provided under **Fisheries and related websites**.

The primary regulations that require fish to be released are size limits, bag limits and protected species.

There are a wide range of reasons why fishers release fish by choice. These include:

- Selecting a limited number of fish to keep, based on personal preference for size, species and edibility.
- Practicing catch and release to limit the number of fish kept and reducing their impact on fish stocks.
- Enjoying the sport of fishing but not eating fish.
- Tagging fish to improve scientific knowledge of fish species.

How many fish are released?

The National Recreational and Indigenous Fishing survey, undertaken in 2000, estimated the recreational finfish catch in Australia at 107.7 million fish caught of which 47.3 million (43.9%) were released. No other figures are available at the national level however a number of State Fisheries agencies have also undertaken surveys which indicate up to 50% of the fish caught are released.

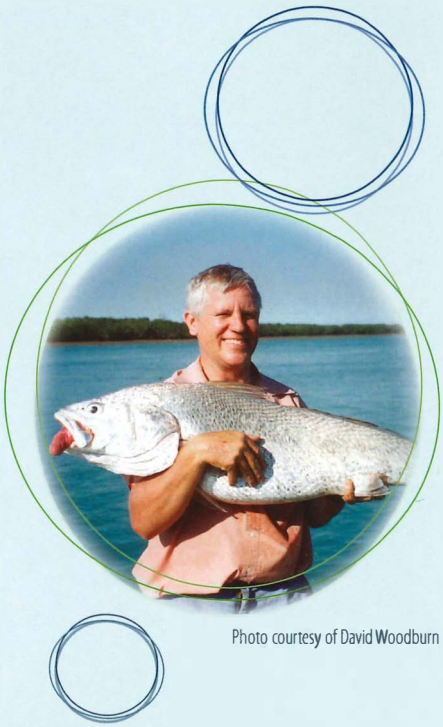


Photo courtesy of David Woodburn

Factors affecting fish survival

To improve the way fish are handled it is important to understand the causes of mortality when fish are released. Responses to being caught vary between species, individual fish and different sizes of fish of the same species. Not all effects are lethal, these can vary from immediate and obvious to those that are delayed and not obvious.

Immediate mortality can result from:

- Stress and over exhaustion caused by long fight times
- Direct physical damage to internal organs caused by deep hooking, barotrauma and poor handling
- Over exposure to air
- Predation while fighting or on release

Hook damage, particularly that caused by deep hooking (where the fish has swallowed the hook) is a prime cause of mortality.

Barotrauma, which is an expansion of gases in the swim bladder of the fish, is a problem in fish caught from deep water and brought to the surface. The condition is obvious in most cases as the expanded swim bladder pushes the stomach of the fish out through the mouth or the eyes are bulging out of their sockets.

While barotrauma is generally associated with reef fish it can occur in any fish caught in deep water including freshwater lakes.

Delayed mortality can result from:

- Stress and exhaustion
- Less obvious physical damage such as burns, tears and loss of scales and protecting mucus
- General internal injuries causing a decline in fish health
- Poisoning or infection from hooks left in the fish

Mortality may be greater under conditions when the fish is already under stress before being caught. This can occur when water temperatures are outside the preferred range for a particular species, or where dissolved oxygen levels are low.

Non lethal effects can include such things as change in behaviour, change in reproductive ability, non fatal infection or decreased resistance to disease and reduced growth rate.

Reducing deep hooking

Survival has been found to be generally good for fish hooked in the mouth. However, studies have indicated that deep hooking (where the fish swallows the hook and it is lodged in the throat or gut) is a prime cause of mortality, particularly if the hooks are removed.

A number of projects under the national strategy have looked at the effects of hooking and how to reduce the incidence of deep hooking.

The overall survival rate of Sand Flathead in Tasmania was 96% with 99.7% survival for shallow hooked fish and 64% for deep hooked fish.

The survival rate of shallow hooked Black Bream in Victoria was 94% while for deep hooked fish it was 74%. In a number of NSW studies the survival rate of shallow hooked Yellowfin Bream was 97% while for deep hooked fish it ranged from 72-85%. Overall survival rates in the NSW studies ranged from 85-100%.

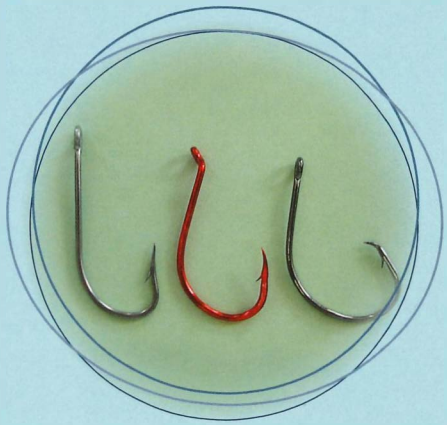
For Sand Flathead in Tasmania it was found that the catch rate using circle hooks was equal to that for J hooks while for Coral Trout the hooking rate was lower.

Some studies examined the use of conventional J and circle hook types to determine the rates of deep hooking. For the majority of species it was found that the rate of deep hooking was reduced through the use of circle hooks but in several it made only a slight improvement.

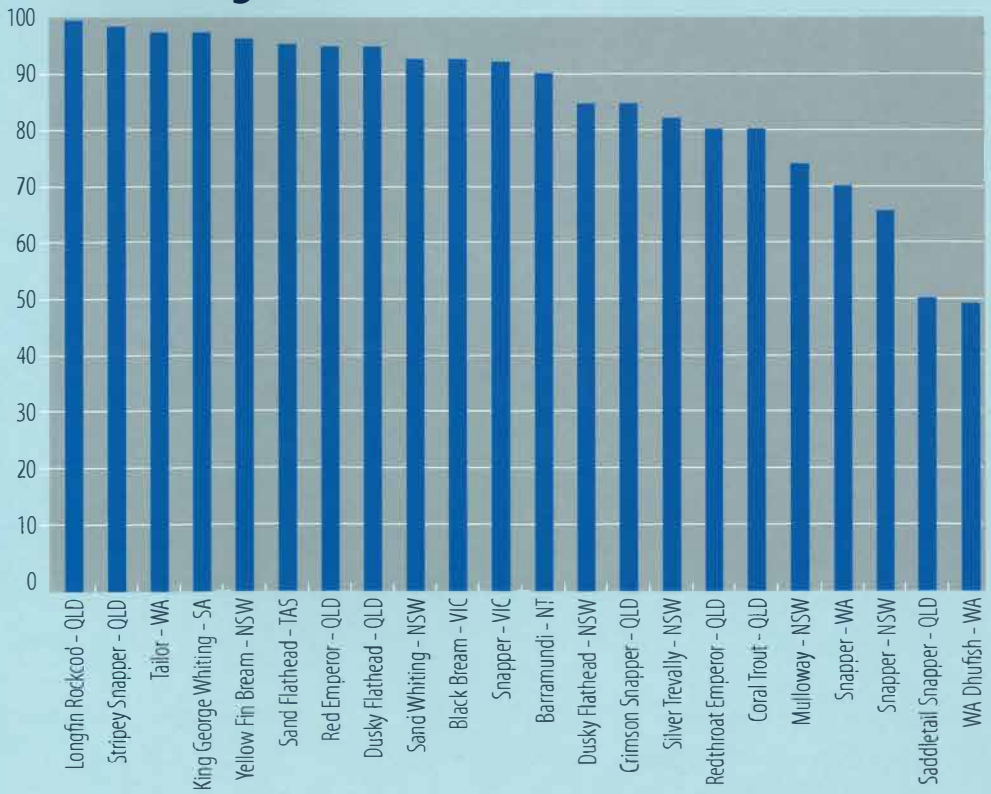
Using large hooks also reduced the incidence of deep hooking in some tropical reef species however using these hooks increased the incidence of injuries including eye injuries.

While there is no clear cut evidence on any single practice that would reduce deep hooking it is considered that there are a number of species where deep hooking is reduced by the use of circle hooks without a noticeable change in hooking rates.

A subtle change to fishing techniques is required when using circle hooks as the hook is set by steadily increasing pressure rather than striking the fish. The point of the hook should remain exposed rather than buried in the bait. Circle hook patterns that are non-offset (the hook point is in direct line with the shank) have been found to minimise deep hooking the best.



Percentage Survival Rates



Reducing mortality caused by deep hooking

If the fish is hooked deeply, it is best to cut the line as close as possible to the fish's mouth and release the fish rather than attempting to remove the hook.

Studies carried out in NSW have shown that compared to removing swallowed hooks from Yellowfin Bream and Mulloway, simply cutting the line increased their short term survival from 12% to more than 85%. Up to 76% of the released line-cut, gut hooked bream then shed their hooks within around 3 weeks.

Long term recaptures rates from a tagging study in Queensland showed that the recapture rate of deep hooked Barramundi that had the line cut was the same as for shallow hooked fish.

Photo courtesy of Garry Lilley

Reef fish and Barotrauma

Many reef species caught in deep water have much lower survival rates than those caught in shallow water.

The effects of barotrauma generally become evident in fish caught at depths of 20m or more. In mild cases this is a swollen and hardened stomach. As the symptoms become more serious the stomach may be pushed out through the mouth and the eyes bulge out of their sockets. Fish caught from much deeper water may not show any of the symptoms because the swim bladder has already burst by the time the fish reaches the surface. The effect of barotrauma varies greatly depending on the species.

Species such as WA Dhufish and Saddletail Snapper were shown to have only about a 50% survival rate when caught in depths greater than 20m. However other species like Red Emperor have survival rates of around 95%.

Projects in Queensland and WA examined a number of treatments for barotrauma in tropical reef species to determine if those treatments affected the survival of those species. Species included Coral Trout, Red Emperor, Saddletail Snapper, Crimson Snapper and Redthroat Emperor in Queensland and Dhufish and Snapper in WA. The treatments tested were "no treatment", venting and shotlining.

"No treatment" involved releasing the fish as caught. Venting involved using a hollow needle to release the expanded gases from the swim bladder and shotlining involved using a weighted hook and line to return the fish to the bottom.

Based on recaptures of tagged fish it was found that there was four times the recapture rate for WA Dhufish released by shotline compared with fish that were vented. However for tropical reef species there was little benefit demonstrated by the use of this method.

The survival rate of vented tropical reef species was only marginally better than fish that received no treatment however for Saddletail Snapper there appears to have been some benefit.

Researchers held fish in a floating cylindrical 15m deep cage affectionately referred to as a "sock" to check on the short term survival of fish with the different release treatments.

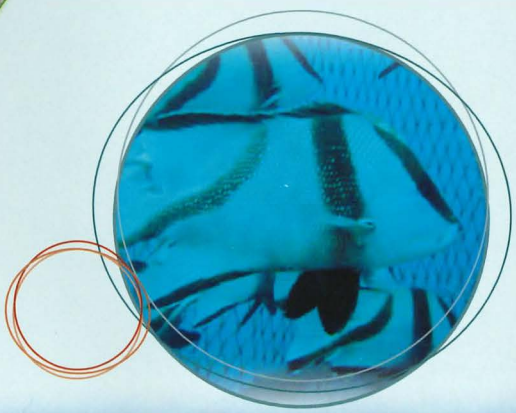


Photo courtesy of Dept. Primary Industries and Fisheries

Handling large iconic fish

There is a growing trend to release large fish of certain species. In some States species such as Barramundi, Flathead and Rockcod have a maximum size limit requiring large fish to be released. Also many fishers release large iconic fish by personal choice and release rates can be as high as 80% for these fish. Species such as Barramundi and Murray Cod are considered to be iconic and Mulloway and Samsonfish are gradually moving towards that status.

While survival rates for Barramundi have been determined this was based on average size fish and not those considered iconic (over 1m in length). In recent years the number of reports of large fish found dead shortly after release has grown indicating that this problem is increasing.

Work undertaken in Queensland showed that holding large fish up by the jaw can damage internal organs as well as stretch and even snap vertebrae.

Fishers that release large iconic fish often take a photograph as a record of their catch and need to be aware that such fish should be held horizontally with their body supported. Ideally the fish should not be taken out of the water. Care should be taken to revive exhausted fish.

Large pelagic fish such as Samsonfish can be "speared" back into the water to get them moving through the water.

Photo courtesy of Kevin Chateris

Photo courtesy of Noel Kuhl

Photo courtesy of Andrew Rowland

Fish friendly tackle

Fish friendly tackle refers to tackle that reduces damage to fish that are to be released.

Tackle that lands fish quickly reduces fish fatigue however landing fish too quickly may result in the fish thrashing around and causing itself additional damage.

Hook damage is a prime cause of injury and mortality and the information presented on hooking needs to be noted. For lure fishing, barbless trebles should be used as these cause less additional damage when being removed. They also have the added benefit of being easy to remove if a fisher gets accidentally hooked. When bait fishing use hook patterns such as circle hooks to reduce gut hooking.

Long nosed pliers or a hookout can be used to help remove hooks from mouth hooked fish, however care needs to be taken to avoid additional damage.

Fish grips can be used to help handle fish while removing hooks and releasing fish, particularly fish with sharp teeth. When using fish grips avoid the temptation to hold the fish up by the jaw to measure its weight.

When landing fish, use a knotless landing net as this causes less scale loss and splitting of fins compared with knotted net.

Other things to be aware of

When photographing fish, make sure the body is horizontal and that it is fully supported. For larger fish, use both hands to support the fish. Use wet hands or wet gloves to minimise skin damage and loss of protective mucus from the fish.

Measure fish with a ruler rather that weighing the fish as measuring is much less stressful on the fish. When measuring fish ensure that the ruler is wet and placed on a wet surface.

The survival of released fish decreases when water temperatures are near the species upper tolerance levels. This is a problem during hot weather, especially in shallow water. Under these conditions fish must be kept out of the water for the minimum time possible. If conditions are extreme it may be best to cease fishing.

Fish should be released by placing them carefully back into the water. For fish that are fatigued, it may be necessary to swim them around to promote water flow over the gills to revive them. If there is a flow of water, hold the fish facing the direction of the current until they show signs of recovery. Fish should not be just thrown back into the water.

Pelagic species may be "speared" back into the water to promote water flow over the gills.

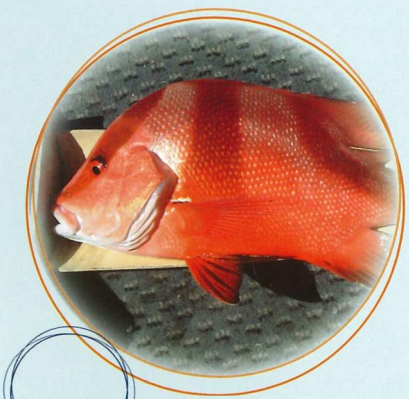


Photo courtesy of Kerry Bailey

Recreational fishers involvement

Recreational fishers have been involved in most of the research that has been undertaken as part of the national strategy. This has allowed fishers to contribute to the knowledge gained and in the extension of that knowledge to other fishers.

Fishers have assisted the research through collecting data on locations when fish were hooked, tagging of fish to check on longer term survival, testing different research techniques and providing fish for examination by researchers.

This collaboration has developed strong links between researchers and fishers and a greater understanding of the value of research.

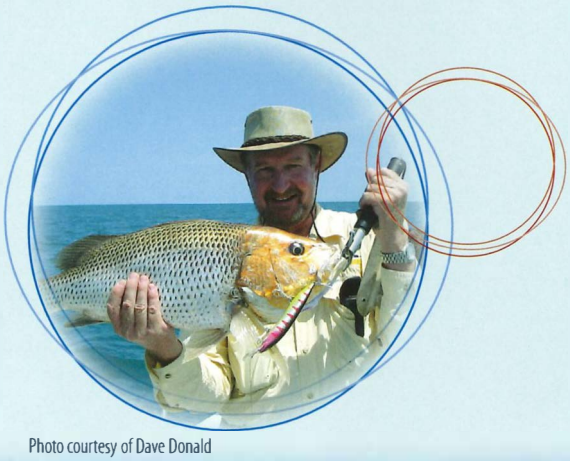


Photo courtesy of Dave Donald

Other information products

The Released Fish Survival website is at **www.info-fish.net/releasefish** and contains a range of useful fact sheets and information products.

Technical reports outlining the results of the individual research projects can be downloaded from the website.

Some other information products that are available include posters promoting fish friendly tackle, results of the Barramundi research, Flathead survival poster and NSW fish survival poster. These posters are suitable for distribution through fishing clubs, tackle and boating shows, Fishcare volunteers and to schools with marine or fish studies.

Fisheries and related websites

Fisheries Research and Development Corporation
www.frdc.com.au

Queensland Department of Primary Industries and Fisheries
www.dpi.qld.gov.au/fishweb

New South Wales Department of Primary Industries
www.fisheries.nsw.gov.au/recreational

Department of Primary Industries - Victoria
www.dpi.vic.gov.au/dpi/

Department of Primary Industries and Water - Tasmania
www.dpiw.tas.gov.au

Inland Fisheries Service - Tasmania
www.ifs.tas.gov.au

Primary Industries and Resources - South Australia
www.pir.sa.gov.au

Department of Fisheries - Western Australia
www.fish.wa.gov.au/sec/rec/

Department of Primary Industries, Fisheries and Mines - Northern Territory
www.nt.gov.au/dbird/dpif/fisheries

Recfish Australia
www.recfish.com.au

Australian National Sportfishing Association
www.ansa.com.au

Australian Fishing Tackle Association
www.afta.net.au

Infofish Services
www.info-fish.net

Acknowledgements

The following organisations have contributed significantly to the National Stategy

Ross Winstanley and Released Fish Survival Steering Committee