

Seaweed 2007 *Marine Bycatch Matters*

Bycatch Rescue

Junior Secondary - Years 8-10 SOSE and Science

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Main Idea

In this unit, students will investigate the bycatch of marine mammals, seabirds, marine reptiles and some sharks in fisheries and study ways in which individuals, communities, industry and Government can protect, manage and conserve these bycatch species.

Groups of students determine their own area of inquiry based on issues and interests.

Key Understandings

What is bycatch?

Every type of food production activity affects the environment. When fishers target particular species that they want to catch, they also catch other species by accident. These non-target species are called bycatch and can include fish, sharks, marine mammals, marine reptiles, seabirds or invertebrates, such as crabs and shells. The type of bycatch depends on the type of fishing gear used and where and when the fishing takes place. Bycatch can be caught in commercial, recreational and Indigenous fisheries, because most conventional fishing methods can lead to bycatch being caught. Most bycatch is discarded over the side of the boat.

Why are Australian fisheries trying to reduce and manage bycatch?

In recent years, bycatch has become one of the most significant issues affecting fisheries management, both nationally and globally. Previously the focus of fisheries management has been on the species targeted by the fishery, such as the prawn species targeted by a prawn trawl fishery. The drive for Ecologically Sustainable Development (ESD) has broadened the focus of fisheries management. Management of commercial fisheries now focuses on the impact of fishing on not just the target species, but also bycatch species, the marine habitats and ecosystems in which fishing occurs. This is called an 'ecosystem approach'.

The management of bycatch is necessary for several reasons:

- 1) to prevent waste: if the bycatch is not going to be used, catching it should be avoided as much as possible;
- 2) to reduce the work for fishers in sorting their catch and prevent damage to the catch from bycatch species;
- 3) to ensure the catch of a particular species as bycatch does not threaten the long-term survival of a population. This is particularly important for species which are considered vulnerable to local and even global extinction due to declining numbers;
- 4) to minimise impacts on bycatch species that are protected under Australian legislation;
- 5) to ensure the catch of a particular species as bycatch does not adversely affect the marine ecosystem, e.g. through removal of predators or key prey species from a foodweb.

Wildlife bycatch

The bycatch of marine mammals (sea lions, seals, dolphins), seabirds (albatross, petrels), marine reptiles (marine turtles, sea snakes) and some sharks (grey nurse, great white) is of particular concern. Most of these species are generally slow growing, late maturing, long-lived, give birth to few young and often have small population sizes. Some species are considered vulnerable to local and even global extinction because of their declining numbers. These declines may be due to a range of factors, for example some turtle populations are affected by bycatch in fisheries, loss of nesting beaches and predation of eggs by feral animals. Due to their biology these

species are particularly susceptible to any activities that result in increases in mortality and are slow to recover when their populations are reduced.

These species are also protected under Australian legislation, some are listed as endangered or threatened. This means fisheries are required to avoid and minimise bycatch of these species. In addition, these species are charismatic wildlife whose fate arouses public concern. While these species may be seldom caught in fisheries, they raise public concern which can have adverse social and economic impacts on fisheries.

Measures to reduce bycatch

Australian fisheries are trying to reduce bycatch of these species to minimise our impacts on their populations. By working together, fishers, researchers, conservationists and the government have introduced fishing technologies and innovations, including changes to fishing gear and practices, that have reduced bycatch. However it is not a one size fits all solution. Differences in the types of fishery and the bycatch species involved will determine the best approach.

Focus Questions

- What sort of impacts does food production have on the environment?
- What is bycatch?
- What species of bycatch are of particular concern and why?
- What are possible, probable and preferable futures for bycatch species?
- How and why are bycatch species under pressure?
- What species need support and action?
- What are fisheries in Australia or overseas doing to reduce and manage bycatch?
- What can we do and why is it important to get involved?

Key Terms

alternatives, Bag limits, Best Environmental Practices (BEP's), biodiversity, Bycatch Reduction, Device (BRD), codes of practice/conduct, commercial fishing, conflict issue, conflict resolution, conservation, continental islands, coral atoll, coral cay, coral reef, cost-benefit analysis, cultural values, day to day management (DDM), ecologically sustainable development (ESD), economic values, ecosystem, ecosystem approach to fisheries management (EAFM), ecosystem based fisheries management (EBFM), endangered, enforcement, environmental values, ethics, evaluation criteria, impacts, implementation, Indigenous peoples, integrated management, interest group, legislation, management plans, mitigation measures, multiple-use resource, natural hazards, permits, political values, protected species, rare, recovery plan, recreational fishing, resource, restrictions, Seal Exclusion Device (SED), spatial closures, stakeholder / user group, threat abatement plan, threatened, tourism, Turtle Exclusion Device (TED), Vessel Monitoring Systems (VMS), zoning.

Key Learning Areas

- SOSE

- English
- Science

Key Competencies

- Collecting, analysing and organising information
- Communicating ideas and information
- Solving problems
- Using technology
- Working with others and in teams.

Outcomes

On completion of this unit, teachers should be able to make judgements about each student's level of achievement in the Key Learning Areas of Science and Studies of Society and Environment (SOSE).

From Place and Space:

4.1 Students make justifiable links between ecological and economic factors and the production and consumption of a familiar resource.

4.2 Students predict the impact of changes on environments by comparing evidence.

4.3 Students participate in a field study to recommend the most effective ways to care for a place.

4.8 Students develop an action plan to contribute to a positive outcome for an issue of personal concern.

5.2 Students design strategies for evaluating environmental impacts, highlighting relationships within and between natural systems.

5.3 Students participate in geographical inquiries to evaluate impacts on ecosystems in different geographical locations.

5.4 Students use maps, diagrams and statistics placing value on environments in Australia and the Asia-pacific region.

5.6 Students apply ideas concerning sustainability to suggest how natural, social and built environments should interact in a preferred future

6.1 Students use criteria and geographical skills to develop conclusions about the management of a place.

6.2 Students create proposals to resolve environmental issues in the Asia Pacific region.

6.3 Students initiate and undertake an environmental action research project based on fieldwork.

6.4 Students use maps, tables and statistical data to express predictions about the impact of change on environments.

6.5 Students make clear links between their values, sustainability and their preferred vision of a place.

Theme Overview

What is bycatch?

All types of fishing activities – commercial, recreational and Indigenous – can affect the environment and all stakeholders can play an important role to ensure our aquatic resources remain healthy for future generations to enjoy.

When fishers target particular species that they want to catch, they also catch other species accidentally. For example if a recreational fisher is trying to catch a bream, they may catch a toadfish they don't want, or when a commercial fisher is targeting tuna they may catch a shark. These non-target species are called bycatch and can include fish, sharks, marine mammals (sea lions, seals, dolphins), marine reptiles (marine turtles, sea snakes), seabirds (albatross, petrels, pelicans) or invertebrates (crabs, shells etc.). The type of bycatch depends on the type of fishing gear used, where and when the fishing takes place and what species are around at the time. Bycatch can be caught in commercial, recreational and Indigenous fisheries, because most conventional fishing methods can lead to bycatch being caught. Most bycatch is returned to the ocean, depending on the species and fishery it may be returned alive or dead.

Why are Australian fisheries trying to reduce and manage bycatch?

Historically fisheries management has focused on making sure that fishing for the target species is sustainable. This focus has changed with increasing awareness and emphasis on ensuring our aquatic resources remain healthy for future generations, Ecologically Sustainable Development (ESD). In Australia, fisheries management has broadened to include reducing impacts on bycatch species or habitats and take into account the way different species interact together and with their habitats. This is called an 'ecosystem approach'. This is a relatively new concept and so methods for putting in place 'Ecosystem-Based Fisheries Management' are still developing.

Wildlife bycatch

In recent years, the bycatch of marine mammals, seabirds, marine reptiles and some sharks by fisheries has been of increasing concern both globally and nationally. Most of these species are generally slow growing, late maturing, long-lived, have few offspring and often have small population sizes. For example, the leatherback turtle, grows to about 1.8m in length, weighing about 500 kg, they don't start breeding until they are 13-14 years old and then only breed every 2 – 3 years, on particular beaches.

Some of these species are considered vulnerable to local and even global extinction because of declining numbers. Depending on the species, these declines can be due to a range of impacts, including human activities and environmental changes. The leatherback turtle is found in all oceans of the world and the populations in the Pacific are regarded as endangered. The population declines are thought to be due to bycatch in fisheries throughout the Pacific, disturbance to nesting beaches, gathering and eating of eggs in some countries, predation of eggs by feral animals, pollution (causing disease), rubbish, boat strike and hunting adults in

some countries. Given the declines in populations of some of these species, even though they may seldom be caught in most fisheries, Australian fisheries are trying to reduce their bycatch to assist in the recovery of the populations.

These species are also protected under Australian legislation. Under Commonwealth environmental legislation species can be listed as protected (e.g. all marine mammals and seabirds, sea snakes), vulnerable (e.g. green turtle, great white shark, Australian sea lion), endangered (e.g. loggerhead turtle, Tristan's albatross, southern giant petrel) or critically endangered (e.g. grey nurse shark on the east coast). This means fisheries are required to avoid and minimise bycatch of these species.

In addition, these species are charismatic wildlife whose fate arouses public concern. While these species may be seldom caught in fisheries, any bycatch may raise public concern which can have adverse social and economic impacts on fisheries. For example, previously the USA implemented a trade embargo on prawns from countries which did not use TEDs in their fisheries.

Measures to reduce bycatch

There has been a lot of research done in Australia and overseas focused on ways to reduce bycatch. In Australia, by working together, fishers, researchers, conservationists and the government have introduced technologies and innovations, including changes to fishing gear and practices that have reduced bycatch. There have been a number of success stories, such as the use of Turtle Excluder Devices (TEDs) in tropical prawn trawl fisheries. These have dramatically reduced turtle bycatch in these fisheries.

Approaches to reducing bycatch can involve:

- (i) changing the fishing gear to allow species to escape, avoid catching them or minimise harm to the species if caught;
- (ii) fishing in different places or times where the bycatch species do not occur or are less common;
- (iii) changing how fishing gear is used to avoid catching the species, or if caught minimise harm to the species.

It is not a one size fits all solution to bycatch. Developing the right approach depends on the fishery, the type of fishing gear and the bycatch species involved. The bycatch species vary in terms of their size, shape and behaviour, all of which need to be taken into account in designing ways to reduce their bycatch. The aim is to reduce bycatch will still ensuring the target species can be caught.

It is important to keep looking for new and better ways of reducing bycatch, to benefit the fishers and the marine environment. As consumers of seafood you should also be aware of how the fisheries operate when you choose your fish.

Sharing information on bycatch solutions is an important step toward reducing bycatch on a global scale.

Some examples of what is being done to help reduce bycatch?

Turtles

In Australia, all boats that use trawl nets to target prawns in tropical waters must have Turtle Excluder Devices (TEDs) fitted to their nets. Turtles are occasionally caught as bycatch by prawn trawlers as they occur in the same areas where the fishing occurs. The TEDs are a grid within the net. If a turtle enters the net this grid guides it to an opening at the top of the net so that it can escape. The prawns pass through the grid to the end of the net and are caught. The use of TEDs has dramatically reduced the bycatch of turtles in Australian tropical prawn trawl fisheries. At the same time safe handling procedures for turtles have been developed for fishers, in case a turtle is still caught. These show how to ensure the turtle is safely returned to the water. The TEDs have also benefited larger sharks and stingrays, as they are also able to escape through this device and so fewer are caught as bycatch.

Seabirds

The accidental bycatch of seabirds, particularly albatross and petrels, in pelagic longline fisheries is of global and national concern. In Australia it is addressed through Australia's Threat Abatement Plan – Bycatch of Seabirds. Seabirds dive on the baited hooks when the hooks are near the surface during setting or hauling of the longline and can get hooked or entangled. A range of measures have been introduced in fisheries to reduce bycatch of seabirds, these include:

- Setting the longlines at night, as most seabirds are less active at night.
- Using tori-lines, or bird-scaring lines. These are lines attached to a pole at the back of the boat, they extend out above where the hooks are being set or hauled. The tori-lines have streamers on them which stop the birds from trying to get the baits.
- Using weighted swivels on the hooks. These are weights that make the hooks sink faster, so that the birds cannot get them.
- Other things that are being researched include: dyeing the baits so it is harder for the birds to see them and underwater setting chutes so the birds can't get the baits.

Seals and Sea Lions

Seals, mainly the Australian Fur Seal and occasionally the NZ Fur Seal and Australian Sea lion, interact with boats using trawls to catch fish in southern Australian waters and may be accidentally caught. The interactions occur because the seals occur in the same areas as the fisheries, they are inquisitive and their diet includes the fish targeted by the trawlers. Seals can also learn to associate trawlers with food and so may be attracted to fishing boats. These fisheries have been looking at whether Seal Excluder Devices (SEDs), which are very similar to TEDs, are effective at reducing seal bycatch. The Commonwealth-managed South East Scalefish and Shark Trawl Fishery also has a Code of Practice which describes fishing practices aimed at reducing interactions and bycatch of seals. These include:

- Not deploying trawl gear when seals are near the stern of the vessel.
- Rapidly deploying gear to reduce the time the gear is in shallow water where the seals are most likely to be.
- Not turning during trawling if the net mouth is near the surface, to avoid potential trapping of seals in the net.

Fishers, researchers and managers are also working together to collect more information on seal interactions in this fishery to understand the bycatch issue.

A small population of Australian sea lions lives along the mid-west coast of Western Australia. This population overlaps with the western rock lobster fishing grounds, which is both a commercial and recreational fishery. While a rare occurrence, small sea lion pups can become trapped in the rock lobster pots and drown. The industry, researchers and government have

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worked together to develop Sea Lion Excluder Devices (SLEDs) which are simple, relatively cheap devices, basically an upright bolt fitted to the base of the pot which rises towards the pot opening. It stops the sea lion pups entering the pots but does not affect the catch of lobsters. All rock lobster pots, both commercial and recreational, used in the waters near the sea lion population must have SLEDs.

Sharks

Some sharks are protected species in Australia, such as the grey nurse shark and great white shark. Some other sharks, mainly deepwater species are of concern as they tend to be long-lived, slow growing and can be susceptible to overfishing. Fisheries around Australia have taken steps to reduce shark bycatch:

- In Australia's tuna longline fisheries, the Eastern Tuna and Billfish Fishery and the Western Tuna and Billfish Fishery, sharks are a bycatch that is sometimes retained and sold (by-product). However, this does not include any protected shark species which can not be kept. To manage and reduce shark bycatch these fisheries have a limit on the number of sharks that can be retained in a fishing trip, no more than 20 shark. These fisheries have also banned the use of wire trace. Wire trace is a length of wire used to attach the hook to the fishing line. Without wire trace the sharks have a greater chance of biting through the fishing line and so not being caught.
- In the South East Scalefish and Shark Fishery areas have been closed to reduce the bycatch of school shark and deepwater shark species.
- In the Northern Prawn Fishery the introduction of TEDs has also reduced the bycatch of large sharks and rays.

Recreational Fishing

Recreational fishers also catch bycatch. The bycatch of recreational fishing includes catching fish species that they don't want to keep, and the accidental catch of seabirds, marine mammals or marine reptiles, that might try and take the bait from hooks or lobster pots, get tangled in the fishing line or nets.

Volunteer organisations such as Australian Seabird Rescue and Wildlife Rescue groups work to save and rehabilitate injured seabirds, many with fishing-related injuries. Australian Seabird Resuce has found that most seabird fishing tackle injuries happen during fishing, not due to lost equipment. They have developed guidelines for sensible angling to reduce bird injuries, including:

- Being on the lookout for diving birds such as terns, gulls and pelicans which may take a bait when a line is cast;
- Avoid using unattended set lines;
- Do not cut the line if a bird is hooked but try to reel in the trapped bird gently, cover their head and remove the hook. If the hook can't be removed without causing further injury, seek assistance from the local wildlife group.

Fishers often catch finfish, sharks or stingrays they don't want to keep. This can be because it is a species they didn't want to catch, or because of bag limits and legal sizes. Catch and release fishing has also become an increasingly popular practice among many anglers. It is quite common for fishers to release fish they could legally keep, and while this isn't bycatch, similar principles apply in terms of ensuring these fish survive. The Gently does it initiative, is part of the National Strategy for the Survival of Released Line Caught Fish (<http://www.info-fish.net/releasefish>) is an initiative of the Fisheries Research and Development Corporation (FRDC) in conjunction with the Australian National Sportfishing Association (ANSA) and Recfish Australia. The strategy aims to improve the understanding of and increase the survival rates of released line caught fish.

To help these animals survive fishers can:

- Always throw back undersized, unwanted or inedible animals alive;
- Remove mouth hooks, if possible, or cut the line if the hook has been swallowed;

- Try to release the fish as fast as possible and avoid handling them too much;
- Hold the fish upright, where possible, until it has recovered sufficiently to swim away.

Sample Unit Sequence and Activity Ideas

Tuning in

An overview of bycatch species

Ask students to develop a concept map describing the issue of bycatch –what it comprises, the biodiversity of species affected, their values (social, emotional, environmental, cultural), consequences of bycatch and the potential solutions. Share with students some facts about the bycatch, what it includes and its environmental, social and economic impacts and potential solutions.

Refer to atlases, reference books and websites for support material. See also:

<http://www.reefed.edu/explorer> for information and images about the bycatch species, to support students' learning.

Understanding terms

As a class identify and define terms or key words about which students are uncertain. Once defined, ask the students to explain the meanings of the terms to others. Using the image collection available on the GBRMPA Web-site:

http://www.gbrmpa.gov.au/isg/library/image_service.html, have students locate photographs that illustrate the relevant term.

Preparing to find out

Setting the task

The group task for the class is to prepare either a multi-media presentation, a report or a brochure which conveys detailed information about the:

- Bycatch of marine mammals, seabirds, reptiles and some sharks
- Their characteristics;
- Distribution;
- Current values;
- Threats, risks and issues affecting bycatch species (including fishing, other human activities, environmental issues);
- Futures – possible, probable and preferable;
- Management of the bycatch;
- Impact that human activities are having on bycatch species
- Tools and practices used to reduce wildlife mortalities and injuries;
- Ways to reduce wildlife bycatch;
- What people can do when fishing recreationally to reduce bycatch; and
- Ecologically sustainable management.

Display these materials as an on-going reference for students to use. Use brainstorming to guide the investigation and suggestions as to where relevant information might be found. Students should work in groups to prepare for their investigation.

Identifying and exploring the issues

Help students find information using one or more of the following activities:

- Develop a futures wheel and/or concept map to unearth topics and threats associated with bycatch;
- Brainstorm threats to bycatch species and potential solutions;
- Determine sources of information for students;
- Express ideas, with a teacher playing the role of “devil’s advocate”;
- Take class polls on problems and threats to expose a range of views and possible starting points, such as incidental capture, increased fishing, threatened species, experience with bycatch while recreationally fishing, wildlife mortalities and injuries;
- Search the local papers and media for information about threats and issues affecting bycatch species. Find out how these issues are being handled currently and how they might be managed better; and
- Use *Edward De-Bono’s six-hat thinking* techniques to examine the issues, risks and threats from a range of perspectives. (See Resource 1.1)

Framing questions and actions

Encourage the students to refine their questions and clarify how their investigations will be conducted. For example:

- Individually or in groups, formulate possible lines of inquiry into threats and issues affecting bycatch species and possible solutions. Test these against the reaction of other class members;
- List the threats and/or issues and categorise them as either human or non-human; and
- Prepare a table to collate information relating to the project. Include the names of those responsible for the project and detail where they will seek the information and how it will be gathered.

Finding out

Collecting information

Valuable information can be gathered by many means and students could be encouraged to:

- Identify and interview people known to be involved in developing solutions to reduce bycatch;
- Undertake surveys within their school to see how many students go fishing with their families and whether they have caught bycatch, which species and how often. How do they deal with bycatch?;

- Compare issues and threats facing bycatch species with those affecting other marine mammals, seabirds, reptiles and sharks, both nationally and globally (eg rain forests);
- Cultivate contacts in the broader community for relevant information about risks, threats, solutions and/or issues affecting bycatch species;
- Write or fax letters to groups involved with bycatch solutions and the management of fisheries. They may be industry groups, government agencies, research institutions and/or organisations concerned about the conservation of marine species;
- Plan a visit to the education team at your local Marine Discovery Centre and/or public aquaria;
- Find out what needs to be taken into account when developing approaches to managing bycatch, what are the different perspectives involved, how do you decide what is the most appropriate approach; and
- Find out about threats and issues affecting bycatch species and how they are being managed.

Sorting out

Interpreting the information

Encourage students to:

- Graph or tabulate the findings from their investigations;
- Consider the motives of the author(s) of the information;
- Apply *De Bono's six-hat thinking* to determine the orientation of statements found;
- Check one person's interpretation against another;
- Search for inconsistencies;
- Evaluate information which presents contrasting opinions;
- Make judgements about how to deal with conflicting information;
- Rearrange the information to reflect new patterns;
- Determine the features needed in any technology, tools or practices that might be used to help reduce bycatch;
- Examine the appropriateness of current management practices for bycatch such as legislation, national policies and international conventions
- Identify the key functional, aesthetic, political and environmental features of recreational and commercial practices currently undertaken; and
- Investigate how user activities, management practices and/or technology impact on the bycatch species and explain their significance, if any, at a local and/or global level.

Making connections

Making conclusions from the information

Once the investigations have been completed, and any additional information has been evaluated, students could:

- Write a series of generalisations about bycatch solutions, based on the information analysed;

- Initiate a question and answer session to discuss conclusions with other classes;
- Investigate the economic, environmental and social costs and benefits of various threats, issues and solutions proposed;
- Consider the consequences of different responses to the conclusions arrived at; and/or
- Present the worst and best case scenarios in a persuasive argument.

Taking action

Acting on the information

Once the information has been collated and discussed, students might undertake the following activities:

- Develop an action plan using flowcharts, consequence charts, timelines and visual tools to support understanding of how to protect bycatch species;
- Generate detailed reports, multi-media presentations or brochures outlining findings regarding the threats, issues, solutions and management practices
- Mount a display inviting others' viewpoints and ideas;
- Consider their recreational fishing activities and those of their family and friends, what could they do to reduce bycatch or wildlife injuries?;
- Consider taking economic action by purchasing certain goods or services that have the least impact on bycatch species; and
- Write letters to editors of newspapers expressing views on the threats facing the bycatch of marine mammals, seabirds, reptiles and some sharks and supporting the development of solutions.

Reflection on outcomes

Encourage students to:

- Check to see if they answered their original investigation questions;
- Discuss the main obstacles to, and opportunities for, obtaining information about the threats, risks, issues, solutions and management practices affecting bycatch in fisheries;
- Write an account of the investigation or develop a flowchart identifying strengths and weaknesses, opportunities and threats of the strategies used by Government to protect and manage wildlife bycatch; and
- Reflect on whether the investigation has changed students' individual attitudes to bycatch species and the pressure they face.

After reflection, stimulate group discussions to identify and deal with unresolved questions, and to initiate future investigations.

References

- Corrigan, C. & J. Dyer *et al.* (1994), *Resources and People VCE Geography Units 3 & 4*, Jacaranda Wiley Ltd, Milton.
- Dodd, B. & J. Dodd (1994), *Geographical Perspectives of People and their Environment*, SECTRUM, The Jacaranda Press, Milton.
- Tyler Miller, G. (1994), *Living in the Environment*, International Thomson Publishing, USA.
- Preuss, P., G. Duke & J. Rogers (1998), *A Sustainable Earth*, VAAE, Cambridge University Press, Melbourne.

Websites

The websites have been organised as:

- Key websites
- Teaching resources and school kits related to fisheries and marine environment
- Fisheries - Fishing gear, management and research
- Bycatch and environmental management in fisheries
- Protected Marine Species, General
- Turtles
- Seabirds
- Seals and Sea Lions
- Bycatch Reduction Devices (BRDs) for fish
- Recreational fishing and bycatch

Key websites

MESA - Seaweek 2007

Department of Agriculture Fisheries & Forestry - Fisheries

<http://www.daffa.gov.au/fisheries>

Bureau of Rural Sciences - Fisheries and Marine Sciences

http://www.daff.gov.au/fisheries_marine

Department of the Environment and Heritage - Coasts and Oceans

<http://www.deh.gov.au/coasts/index.html>

CSIRO Marine and Atmospheric Research

<http://www.cmar.csiro.au/>

Oceanwatch - SeaNet

<http://www.oceanwatch.org.au/>

Fisheries Research and Development Corporation

<http://www.frdc.org.au/>

Great Barrier Reef Marine Park Authority

<http://www.gbrmpa.gov.au/>

Australian Fisheries Management Authority

<http://www.afma.gov.au>

Department of Primary Industries, New South Wales – Fishing and aquaculture

<http://www.dpi.nsw.gov.au/fisheries>

Department of Primary Industries and Fisheries, Queensland - Fisheries

http://www.dpi.qld.gov.au/cps/rde/xchg/dpi/hs.xsl/28_ENA_HTML.htm

Department of Primary Industries, Victoria – Fishing and aquaculture

<http://www.dpi.vic.gov.au/dpi/nrenfaq.nsf>

Primary Industries and Resources, South Australia – Fisheries

<http://www.pir.sa.gov.au/sector7.shtml>

Department of Primary Industries and Water, Tasmania – Sea Fishing and aquaculture

<http://www.dpiw.tas.gov.au/inter.nsf/>

Department of Fisheries, West Australia

<http://www.fish.wa.gov.au/index.php>

Department of Primary Industries, Fisheries and Mines, Northern Territory - Fisheries

<http://www.nt.gov.au/dpifm/Fisheries/>

Teaching resources and school kits related to fisheries and marine environment

Australian Fisheries Management Authority (AFMA) - Resources for teachers and students:

www.afma.gov.au/information/publications/education/pdfs/fs07_bycatch.pdf

www.afma.gov.au/information/students/methods/brd.htm

www.afma.gov.au/information/students/methods/docs/brd.pdf

Oceanwatch – links to fisheries related resources for kids

<http://www.oceanwatch.org.au/kids.htm>

Fisheries Western Australia - Kids resources, including games and activities:

<http://www.fish.wa.gov.au/fishtales/index.php>

Get hooked: it's fun to fish (Primary Industries and Resources, SA):

<http://www.pir.sa.gov.au/dhtml/ss/section.php?sectID=1998&tempID=16>

includes:

- Activities around throwing small fish back and how to return them to the water

http://www.pir.sa.gov.au/byteserve/fisheries/get_hooked/pdf/code/13_code1.pdf

http://www.pir.sa.gov.au/byteserve/fisheries/get_hooked/pdf/code/16_code4.pdf

- Not leaving fishing gear unattended

http://www.pir.sa.gov.au/byteserve/fisheries/get_hooked/pdf/code/17_code5.pdf

Get hooked: it's fun to fish (NSW DPI Fisheries)

www.fisheries.nsw.gov.au/recreational/general/get_hooked

Get hooked: it's fun to fish: national junior fishing codes education kit (Fisheries Victoria)

[www.dpi.vic.gov.au/dpi/nrenfaq.nsf/646e9b4bba1afb2bca256c420053b5ce/178183686128f34bca256eb4001b6f76/\\$FILE/ATT22A19/intro.pdf](http://www.dpi.vic.gov.au/dpi/nrenfaq.nsf/646e9b4bba1afb2bca256c420053b5ce/178183686128f34bca256eb4001b6f76/$FILE/ATT22A19/intro.pdf)

Fisheries Research and Development Corporation – Educational products

One in a Thousand the miraculous life of the sea turtle, Education kit:

<http://www.frdc.com.au/research/online%5Fresources/turtle.php>

The Workboot Series: The story of seafood in Australia

Bycatch Rescue

http://bookshop.frdc.com.au/miva/merchant.mv?Screen=PROD&Product_Code=PUB-001&Category_Code=pubcat&Store_Code=B

Environment Protection Agency, Queensland - CyberRangers

http://www.epa.qld.gov.au/nature_conservation/cyberrangers/

ProjectNet for Schools (AIMS)

www.aims.gov.au/pages/research/project-net/apnet-alpha.html

ReefED (GBRMPA - middle years)

www.reefed.edu.au/teaching/middle_schooling/index.html

Schools for wildlife – WWF (video)

www.wwf.ca/satellite/wwfkids/S4W/0512.asp

Teach Engineering resources for K-12

www.teachengineering.org/index.php

Fish and Kids (British)

http://www.fishandkids.org/staff_resources.php

*various web pages on bycatch

Fisheries - Fishing gear, management and research

Department of Agriculture Fisheries & Forestry - Fisheries

<http://www.daffa.gov.au/fisheries>

Bureau of Rural Sciences

Fisheries and Marine Sciences

http://www.daff.gov.au/fisheries_marine

Marine Matters National: Atlas of Australian Marine Fishing and Coastal Communities – online mapping tool

<http://adl.brs.gov.au/mapserv/fishcoast/index.html>

Australian Fisheries Management Authority (AFMA)

Descriptions and pictures of the different fishing methods and devices used

<http://www.afma.gov.au/information/students/methods/default.htm>

Fishery maps

<http://www.afma.gov.au/information/maps/default.htm>

Fisheries Research and Development Corporation – Information on species, where caught, gear used etc –

<http://www.frdc.com.au/species.php>

Department of Primary Industries, Victoria: Fishing gear types:

<http://www.dpi.vic.gov.au/dpi/nreninf.nsf/childdocs/-B1F754E6F182011F4A2568B30006520E-CE8BD18640C97753CA256BC80006E3AA-433E45DA0FDD5EF44A256DEA0029043D-E2641142B408F7ECCA256BED000A0711?open>

Department of Primary Industries and Fisheries, Queensland: Fishing methods and target species

<http://www2.dpi.qld.gov.au/fishweb/12540.html>

Fisheries Research and Development Corporation (FRDC)

<http://www.frdc.com.au>

Bycatch and environmental management in fisheries

Australian Fisheries Management Authority

Bycatch Rescue

Managing bycatch:

<http://www.afma.gov.au/environment/bycatch/default.htm>

Ecosystem Based Fisheries Management:

http://www.afma.gov.au/environment/eco_based/default.htm

Reducing bycatch (fact sheet):

http://www.afma.gov.au/information/publications/education/pdfs/fs07_bycatch.pdf

Bycatch action plans:

<http://www.afma.gov.au/information/publications/fishery/baps/default.htm>

Ecologically Sustainable Development in Commonwealth fisheries:

<http://www.afma.gov.au/environment/esd/default.htm>

Department of the Environment and Heritage

Fisheries and the Environment

<http://www.deh.gov.au/coasts/fisheries/index.html>

50 ways to care for our coast

<http://www.nht.gov.au/nht1/programs/coastcare/50-ways.html>

Oceanwatch

Bycatch mitigation extension and research

<http://www.oceanwatch.org.au/>

Department of Fisheries, Western Australia

Bycatch management: <http://www.fish.wa.gov.au/docs/pub/CommercialBycatch/index.php?0605>

Primary Industries and Resources, South Australia

Fisheries plans and bycatch policy:

<http://www.pir.sa.gov.au/dhtml/ss/section.php?sectID=502&tempID=10>

Department of Primary Industries, New South Wales

Bycatch and its reduction

http://www.fisheries.nsw.gov.au/commercial/commercial2/bycatch_and_its_reduction

Protected Marine Species, General

Australian Fisheries Management Authority - Protected species interactions with Commonwealth fisheries:

http://www.afma.gov.au/environment/eco_based/protected.htm

Department of the Environment and Heritage - Protected and threatened species

<http://www.deh.gov.au/biodiversity/threatened/index.html>

Primary Industries and Resources, South Australia - Protected species interactions with fisheries

http://www.pir.sa.gov.au/pages/fisheries/environmental/protected_species.htm:sectID=1983&tempID=1

Department of Primary Industries, New South Wales

Threatened species interactions with fisheries

http://www.fisheries.nsw.gov.au/threatened_species

Threatened species guide for fishers

http://www.fisheries.nsw.gov.au/__data/assets/pdf_file/24275/Threatened_species_guide_for_fishers.pdf

Department of Primary Industries and Fisheries, Queensland - Protected marine species

<http://www2.dpi.qld.gov.au/fishweb/2772.html>

Turtles

Australian Fisheries Management Authority - Turtle excluder devices (TEDs)

<http://www.afma.gov.au/information/students/methods/ted.htm>

Department of the Environment and Heritage

Marine turtles

<http://www.deh.gov.au/coasts/species/turtles/index.html>

How to help with marine turtle conservation and management

<http://www.deh.gov.au/coasts/species/turtles/conservation.html>

Department of Primary Industries and Fisheries, Queensland: Turtle excluder devices (TEDs), information, descriptions and pictures:

<http://www2.dpi.qld.gov.au/fishweb/10559.html>

Environmental Protection Agency, Queensland: turtle information

http://www.epa.qld.gov.au/nature_conservation/wildlife/watching_wildlife/turtles/

Footage of turtles

http://www.epa.qld.gov.au/nature_conservation/wildlife/watching_wildlife/turtles/turtle_tracking/

Turtle research featured on Catalyst

<http://www.abc.net.au/catalyst/stories/s1408913.htm>

IOSEA Year of the turtle

<http://www.ioseaturtles.org/yot2006/index.php>

Seabirds

Department of the Environment and Heritage

Seabirds

<http://www.deh.gov.au/coasts/species/seabirds/index.html>

Threat abatement plan - Seabird Bycatch

<http://www.aad.gov.au/default.asp?casid=20587>

Save our Shorebirds, Save our Seabirds

<http://www.nht.gov.au/nht1/programs/coastcare/shorebirds/index.html>

Agreement on the Conservation of Albatross and Petrels

http://www.cms.int/species/acap/acap_bkrd.htm

International Plan of Action for reducing incidental catch of seabirds in longline fisheries

http://www.fao.org/figis/servlet/static?dom=org&xml=ipoa_seabirds.xml

Seals and Sea Lions

Australian Fisheries Management Authority - Seal exclusion devices (SEDs)

<http://www.afma.gov.au/information/students/methods/sed.htm>

Department of Fisheries, WA - Sea Lion Exclusion Devices

<http://www.fish.wa.gov.au/docs/pub/SeaLoinExclusionDevices/index.php?0200>

Department of the Environment and Heritage

Seals

<http://www.deh.gov.au/coasts/species/seals/index.html>

Sharks

Department of the Environment and Heritage

Bycatch Rescue

Sharks

<http://www.deh.gov.au/coasts/species/sharks/index.html>

Grey nurse sharks

<http://www.deh.gov.au/biodiversity/threatened/publications/grey-nurse.html#download>

Department of Fisheries, Western Australia - Sharks

<http://www.fish.wa.gov.au/docs/pub/SharkFactSheet/index.php?0000>

Department of Primary Industries, New South Wales - Grey nurse sharks

http://www.fisheries.nsw.gov.au/threatened_species/general/species/?a=698

Department of Primary Industries and Fisheries, Queensland - Grey nurse sharks

<http://www2.dpi.qld.gov.au/fishweb/13789.html>

Bycatch Reduction Devices (BRDs) for fish

Department of Primary Industries and Fisheries, Queensland - BRDs:

<http://www2.dpi.qld.gov.au/fishweb/18560.html>

<http://www2.dpi.qld.gov.au/fishweb/12545.html#12>

Department of Primary Industries, NSW

Estuary prawn trawl and BRDs

http://www.fisheries.nsw.gov.au/commercial/commercial2/estuary_prawn_trawl_fishery

Reducing bycatch in fish traps

http://www.fisheries.nsw.gov.au/__data/assets/pdf_file/4816/by-catch.pdf

Recreational fishing and bycatch

Gently does it: Release fish survival, Fisheries Research and Development Corporation

<http://www.info-fish.net/releasefish/>

Department of Primary Industries, Victoria: Recreational fishing

<http://www.dpi.vic.gov.au/dpi/nreninf.nsf/childdocs/-B1F754E6F182011F4A2568B30006520E-9ED2C7F8E7207ABFCA256BC80006E51C-625CB431B01891D34A256DEA00291665-ED91740895D57DAACA256C400009D380?open>

Australian Seabird Rescue

<http://www.seabirdrescue.org/>

Department of Primary Industries, Fisheries:

Responsible fishing to reduce wildlife injuries

http://www.fisheries.nsw.gov.au/__data/assets/pdf_file/4834/Responsible-fishing-to-reduce-wildlife-injuries.pdf

Catch and release fishing

http://www.fisheries.nsw.gov.au/recreational/saltwater/saltwater/catch-and-release_fishing