

# Seaweed 2007 *Marine Bycatch Matters*

## Managing Bycatch in Fisheries

Senior Secondary – Year 11-12 Geography and Multi Strand Science

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## Main Idea

The study of physical systems is fundamental to all interactions within the natural environment, on a local, regional or global scale. During the course of this unit students will gain an appreciation for, and understanding of fishing and specifically, the processes that affect bycatch in fisheries, how solutions to reduce bycatch can be developed and the resulting changes that can occur through sustainable fisheries management. Students will be empowered to understand the need for sustainable management practices and the complexity of developing solutions to issues such as bycatch, and also to take actions to promote environmental best practices.

Natural resource management requires an understanding of the nature of an ecosystem or resource system and the patterns of human activities, values and decision-making processes that impact on that system. This unit will encourage students to assess the short-term and long-term implications of decisions and management approaches in fisheries for people and the environment. The unit will also provide students with opportunities to gain knowledge of, and an appreciation for, the complexities of natural resource management and empower them to propose solutions and evaluate management decisions.

## Key Understandings

*What is bycatch?*

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 and rays, marine mammals, marine reptiles, seabirds or invertebrates, such as crabs and shells. Bycatch can be caught in commercial, recreational and Indigenous fisheries

Every type of food production activity affects the environment. 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 and 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, for example 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' to

management. This is a relatively new concept and methods for putting in place 'Ecosystem-Based Fisheries Management' are still developing.

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; and
- 5) to ensure the catch of a particular species as bycatch does not adversely affect the marine ecosystem, eg through removal of predators or key prey species from a foodweb.

#### *Wildlife bycatch*

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

Some 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 adult turtles in some countries. Given the declines in populations of some 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 (the *Environment Protection and Biodiversity Conservation Act 1999*, EPBC Act) species can be listed as protected (eg all marine mammals and seabirds, sea snakes), vulnerable (eg green turtle, great white shark, Australian sea lion), endangered (eg loggerhead turtle, Tristan's albatross, southern giant petrel) or critically endangered (eg 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,

the USA implemented a trade embargo on prawns from countries which did not use Turtle Excluder Devices TEDs in their fisheries.

#### *Measures to reduce bycatch*

Australian fisheries are trying to reduce bycatch to reduce waste and keep marine resources healthy. 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.

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; and / or
- (iii) changing how fishing gear is used to avoid catching the species, or if caught minimise harm to the species.

There 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 when designing ways to reduce their bycatch. The aim is to reduce bycatch while still ensuring the target species can be caught.

It is important to keep looking for new and better ways of reducing bycatch, to benefit fishers and the marine environment. As consumers of seafood you should also be aware of how different fisheries operate, both within Australia and overseas when you choose your fish. As recreational fishers you should consider how your activities affect the marine ecosystem and how you can personally manage this.

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, so fewer are caught as bycatch.

#### *Seabirds*

The accidental bycatch of seabirds, particularly albatross and petrels, in pelagic longline fisheries is of national and global concern. In Australia it is addressed through Australia's Threat Abatement Plan – Bycatch of Seabirds. Seabirds dive on 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 New Zealand Fur Seal and Australian Sea lion, interact with boats trawling for 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 trapping 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 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. There is also concern about the potential impact of fishing on some other

sharks, mainly deepwater species as they tend to be long-lived, slow growing and appear to 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 of 20 on the number of sharks that can be retained in a fishing trip. 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.

#### *Fish and Invertebrates*

Bycatch includes unwanted fish species and also small individuals (usually juveniles) of the species being targeted. Many commercial fisheries try to reduce and avoid the catch of small individuals through modifications to the gear.

- In fisheries that use trawl gear to target fish, there is usually a minimum mesh size which enables small individuals to pass through the mesh and not be retained in the trawl.
- In hook and line fisheries, the size of the hook and bait used will determine the size of the fish caught. To avoid catching juveniles a larger hook can be used.
- In most tropical prawn trawl fisheries there tends to be a lot of bycatch, mainly fish and invertebrates (crabs, shells, sponges etc). This is because the trawl nets are relatively unselective and these species live in the same area as the prawns and so are caught by the nets. In recent years there has been a lot of effort in the development of Bycatch Reduction Devices (BRDs) which allow the fish to escape from the net, while still retaining the prawns. These include devices such as "square mesh windows", "fish-eye" and the "fish box". These all work on the fact that fish have better swimming abilities than prawns and so can actively escape if there is a device to let them out.
- In Southern Rock Lobster fisheries, which use pots (a type of baited trap) to capture the lobsters, there are escape gaps in the pots to allow undersized lobsters to crawl out.

#### *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 Rescue 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.

## Legislation

The Australian Fishing Zone (AFZ) is the third largest in the world, covering nearly nine million square kilometres. It extends to 200 nautical miles from the Australian coastline and also includes the waters surrounding our external territories, such as Christmas Island in the Indian Ocean and Heard and McDonald Islands in the Antarctic.

The Australian Fisheries Management Authority (AFMA) manages Commonwealth commercial fisheries. In general, these extend from 3 nautical miles out to the extent of the AFZ. The States and the Northern Territory are responsible for the majority of recreational and commercial coastal and inland fishing and inland and coastal aquaculture operations.

Because fish don't recognise lines in the sea, AFMA shares responsibility for managing some fisheries with the States and Northern Territory. However, a general rule of thumb is that States and the Northern Territory manage inshore species, such as rock lobster and abalone, whereas AFMA generally manages deeper water finfish and tuna species.

In most jurisdictions both fisheries and environmental legislation guide fisheries management. Here we provide some key points from the Commonwealth legislation that relates to bycatch in fisheries.

### ***Fisheries Management Act 1991***

The Act's objectives include achieving a balance between economic efficiency and ensuring the health of marine resources. In regard to bycatch, the Act includes an objective aimed towards ensuring that the exploitation of fisheries resources is conducted in a manner consistent with the principles of ecologically sustainable development and the exercise of the 'precautionary principle', in particular the need to have regard to the impact of fishing activities on non-target species and the long term sustainability of the marine environment. Fisheries management is also expected to have regard to ensuring, through proper conservation and management measures, that the living resources of the AFZ are not endangered by over-exploitation.

There are provisions under the Act (s 14) regarding regulations to conserve the marine environment, including specific actions to prevent or minimise wildlife bycatch.

### ***Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)***

#### **(a) Marine listed protected species established under section 248 of the EPBC Act (s 254).**

Seabirds, marine mammals, marine turtles and sea snakes are all listed as protected marine species, some of which are also listed as threatened (which includes the categories: conservation dependent, vulnerable, endangered or critically endangered). There are some species of shark (eg great white shark and grey nurse shark) and fish (eg sygnathids – pipefishes and seahorses) that are also listed as threatened. Under s 254 of the EPBC Act, these species are protected to help ensure their long-term survival. It is an offence to kill, injure, take, trade, keep or move a member of a listed threatened species, listed migratory species or listed marine species in a Commonwealth area unless the action is covered by a permit issued by the Minister for the Environment and Heritage. Under the EPBC Act, fishers must adopt tools and practices to reduce wildlife mortalities/injuries.

Once species are listed as threatened a Recovery Plan is developed to document how the range of threats will be addressed. If capture of the species as bycatch in fisheries is a threat the Recovery Plan should identify actions to address this. There are currently Recovery Plans for albatrosses and giant-petrels, marine turtles, grey nurse sharks, great white sharks. Activities can also be listed as Key Threatening Processes for species under the EPBC Act. The bycatch of seabirds in longlining has been listed as a Key Threatening Process and so a Threat Abatement Plan has been developed to reduce the bycatch.

#### **(b) Environmental assessment process (s 147 and s 303FN (10A)).**

Once a fishery is identified as requiring a strategic environmental impact assessment (all Commonwealth managed fisheries and State/Territory fisheries with an export component), the responsible management agency (either the Australian Fisheries Management Authority or the State fisheries agency) assesses the fishery against the *Guidelines for the Ecologically Sustainable Management of Fisheries* developed by Australian Government. Principle 2 states '*Fishing operations should be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem*':

Two objectives of this Principle, supporting this study, are:

- '*The fishery is to be conducted in a manner that does not threaten bycatch species*'
- '*The fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species and avoids or minimises impacts on threatened ecological communities*'.



The assessment of fisheries under the EPBC Act has resulted in increased focus on the management of bycatch issues.

### **Relevant national policies**

There is an array of national policies stating that wildlife bycatch needs to be addressed in all Australian fisheries:

- National Policy on Fisheries Bycatch (1999)
- Commonwealth Policy on Fisheries Bycatch (2000)
- National Strategy for the Conservation of Australia's Biological Diversity (1996)
- National Strategy for Ecologically Sustainable Development (1992)
- Australia's Oceans Policy (1998)

### **International conventions**

There are numerous international conventions/agreements that relate to bycatch management in fisheries. The main international fisheries agreements are the *United Nations Convention on the Law of the Sea, 1982 (UNCLOS)* and the *Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UN Fish Stocks Agreement)* both of which include responsible management of bycatch. The United Nations Food and Agriculture Organisation (FAO) Code of Conduct for Responsible Fishing (1995) was produced to help countries implement the UNCLOS and UN Fish Stocks Agreement, and includes management of bycatch.

"The right to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources."

Under the FAO Code of Conduct for Responsible Fishing, two international plans of action have been produced that relate to bycatch management:

- International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries
- International Plan of Action for the Conservation and Management of Sharks

In line with these, Australia has developed a National Plan of Action for the Conservation and Management of Sharks and a draft National Plan of Action for Seabirds.

Other relevant conventions/agreements include:

- Convention on Migratory Species (CMS):
  - MoU on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia
  - MoU concerning Conservation Measures for Marine Turtles of the Atlantic Coast of Africa
  - Agreement on the Conservation of Albatrosses and Petrels
- International Union for the Conservation of Nature and Natural Resources (IUCN)
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

### **Australian Government commitment**

The Australian Government emphasises that Australians have a responsibility to help protect their unique threatened marine species from human threats and environmental impacts such as over-fishing and marine pollution. It is strongly committed to the ecologically sustainable development of Australia's fisheries in terms of the impact of human activity on target species, bycatch species and the marine ecosystem generally.

## Focus Questions

### What and where are the issues or patterns being studied?

- What sort of impacts does food production have on the environment?
- What is bycatch?
- What is a resource?
- What is a multiple-use resource?
- What is the pattern and distribution of selected bycatch species within Australian marine ecosystems? World Heritage Area?
- What are the elements of ecologically sustainable development of Australia's fisheries?
- What legislation is associated with the ecologically sustainable development of Australia's fisheries?
- What are the differences between bycatch in commercial, recreational and Indigenous fisheries?

### How and why are they there?

- What processes are associated with patterns within the ecologically sustainable development of Australia's fisheries?
- What processes cause change within the ecologically sustainable development of Australia's fisheries?
- Why do some resource issues develop into conflict?
- Should recreational fishing be part of ecologically sustainable development?

### What are their impacts or consequences?

- What are some social, economic, political and physical impacts of change within the ecologically sustainable development of Australia's fisheries?
- What are the social, economic, political and physical impacts of current and possible future uses of the ecologically sustainable development of Australia's fisheries?
- What consequences might arise as a result of these changes?

### What is being done and could be done?

- What is being done and could be done by individuals, groups, fishers, conservationists and governments regarding the sustainable management of Australia's fisheries and its resources?

## Managing Bycatch in Fisheries

- What technologies and practises have been implemented in Australian fisheries or overseas to reduce bycatch?
- How are solutions to bycatch developed?
- How is awareness of bycatch developed?

## Key Terms:

Alternatives, bag limits, Best Environmental Practices (BEPs), biodiversity, biological magnification, Bycatch Reduction Device (BRD), codes of practice/conduct, commercial fishing, conflict, conflict issue, conflict resolution, conflict study, conservation, 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 Impact Assessment (EIA), Environmental Impact Statement (EIS), environmental values, ethics, evaluation criteria, impacts, implementation, Indigenous peoples, integrated management, interest group, legislation, management plans, mitigation measures, multiple-use resource, 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, Turtle Exclusion Device (TED), Vessel Monitoring System (VMS), zoning.

## Key Learning Areas

- Studies of Society and Environment;
- English;
- Science; and
- Technology.

## Essential Learning

- Critical Thinking;
- Group Discussion;
- Analysis/Data Manipulation;
- Evaluation via criteria;
- Decision-making;
- Research and Communication; and
- Goal Setting.

## Key Competencies

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

## Outcomes

This unit focuses on the following core learning outcomes from the Senior Geography and Multi-Strand Science Syllabuses.

## Knowledge

- Ability to recall learned factual material in text and spatial forms. For example facts, concepts, key ideas, theories and explanations.

### **Analytical processes**

- Ability to break material into its component parts, thus identifying trends, similarities, differences and patterns;
- Understand the meaning of information by transforming, interpreting or extrapolating;
- Establishing the validity and reliability of information;
- Identifying relationships of differing complexity;
- Suggest causes for some of those relationships; and
- Identify anomalies in the information.

### **Decision-making processes**

- Evaluating alternative proposals, strategies, solutions or plans;
- Applying appropriate criteria for evaluation;
- Making judgements/decisions about alternatives; and
- Justifying the decision with reasoned and logical arguments.

### **Research and communication skills**

- Design a research plan relevant to the purpose;
- Gather and record information from a variety of sources and settings;
- Organise information prior to analysis and decision making;
- Reference and acknowledge sources;
- Use appropriate formats when presenting the results of learning experiences;
- Use clear, concise expression and language conventions relating to grammar, spelling and punctuation; and
- Integrate, where appropriate, the use of maps, diagrams, statistics and referencing adhering to set conventions.

### **Planning Considerations**

Some tips to help the unit run smoothly:

- Read through the unit and mark the activities that you think are most relevant for your students;
- Consider the learning outcomes that are most likely to be “worked towards” by students and the outcomes outlined in your curriculum documentation;
- Gather together key learning resources used in the unit; and

## Activity Ideas

### Tuning In: Sample Activities

#### Prior knowledge investigation

Provide students with time to respond to each of the following questions:

- What is bycatch?
- How large is the issue of bycatch in your local area, nationally and globally?
- Which bycatch species are of specific concern?
- What resources do the fisheries sectors (commercial, recreational and Indigenous) provide?
- List the different specific groups of people that fish and catch bycatch species;
- What are the benefits that come from the sustainable use and management of Australia's marine resources?
- Outline the negative and positive impacts that can and have occurred from using Australia's marine resources;
- Why are bycatch species important? and
- Why are some bycatch species "under pressure"?
- What solutions are there to bycatch (bycatch mitigation practises)?
- What is currently being done by fisheries to reduce bycatch (in Australia, other countries or on the high seas)?

#### Setting the task

Explain to the class that their task is to prepare either a multi-media presentation, a report or a brochure which conveys detailed information about:

- Australia's marine resources;
- Current uses of Australia's marine resources;
- Distribution of Australia's marine resources;
- Biodiversity of Australia's marine resources;
- Bycatch as an issue affecting Australia's marine resources; and
- Management of Australia's marine resources.

Display these details 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 work in groups for their investigation.

#### Where to from here?

Ask students what they think are the most important things we need to know if we are going to ensure we have sustainable fisheries. Consider issues affecting Australia's marine resources and find information about the need for user groups to use these resources in a sustainable way.

## Viewing and reading area

Set up an area where students can browse through resources such as atlases, zoning maps, information and books or articles about bycatch and sustainable fisheries. Some titles include:

- The Workboot Series: the story of seafood in Australia (C. Nicholls).
- Commercial Fishing: the wider ecological impacts (edited by G. Moore and S. Jennings)
- Marine matters national: Atlas of Australian Marine Fishing and Coastal Communities (J. Larcombe, C. Charalambou, E. Herreria, A. M. Casey and P. Hobsbawn), Online mapping system at <http://adl.brs.gov.au/mapserv/fishcoast/>, or download pdf at <http://www.affashop.gov.au/product.asp?prodid=13535>)
- Technologies to reduce seal-fishery interactions and mortalities (C. Stewardson & M. Cawthorn, download pdf at <http://www.daff.gov.au/content/publications.cfm?ObjectID=62357C03-0B55-4A0E-8D90C8F5B4436E60>)
- Monitoring the catch of turtles in the Northern Prawn Fishery (C. Robins, A. Goodspeed, I. Poiner and B. Harch, download pdf at <http://www.daff.gov.au/content/publications.cfm?Category=Fisheries%20and%20Marine%20Sciences&ObjectID=26A9E754-A7F8-4368-8861A9BA4D5F5663>)

Use texts to gain information about the processes used in fisheries management and issues affecting bycatch species.

## Preparing to find out: Sample Activities

### Media Investigation

Ask students to collect reference material about bycatch that is part of the commercial or recreational fishing catch not targeted by fishers and answer the following key questions with respect to each article:

- Who are the people involved?
- What impacts (environmental, economical, social/cultural and political) have resulted?
- Where are these impacts occurring?
- Why are these humans causing these impacts?
- How will these affect Australia's marine resources?
- What benefits have resulted from the fishing activities?
- Are there solutions in place? and
- What are other potential solutions?

Encourage students to review local and national newspapers newspapers for information. Press Com ([www.presscom.com.au](http://www.presscom.com.au)) is a helpful Internet site for articles. Collate all the articles into a media folio.

## Cause and Effect Wheels

Create cause and effect wheels outlining how the impacts of bycatch will, in the long term, have effects on Australia's marine resources. Students select a bycatch related issue they consider is affecting marine resources and identify first, second and third order effects of the issue. Encourage students to exchange information about the issues and their effects.

A cause and effect wheel is a diagram, which will prove helpful when organising your ideas in preparation for writing reports. It will help you see the consequences that result from particular actions, thus enabling you to analyse effectively the data you have collected.

The steps in creating a cause and effect wheel are given below:

### Step 1

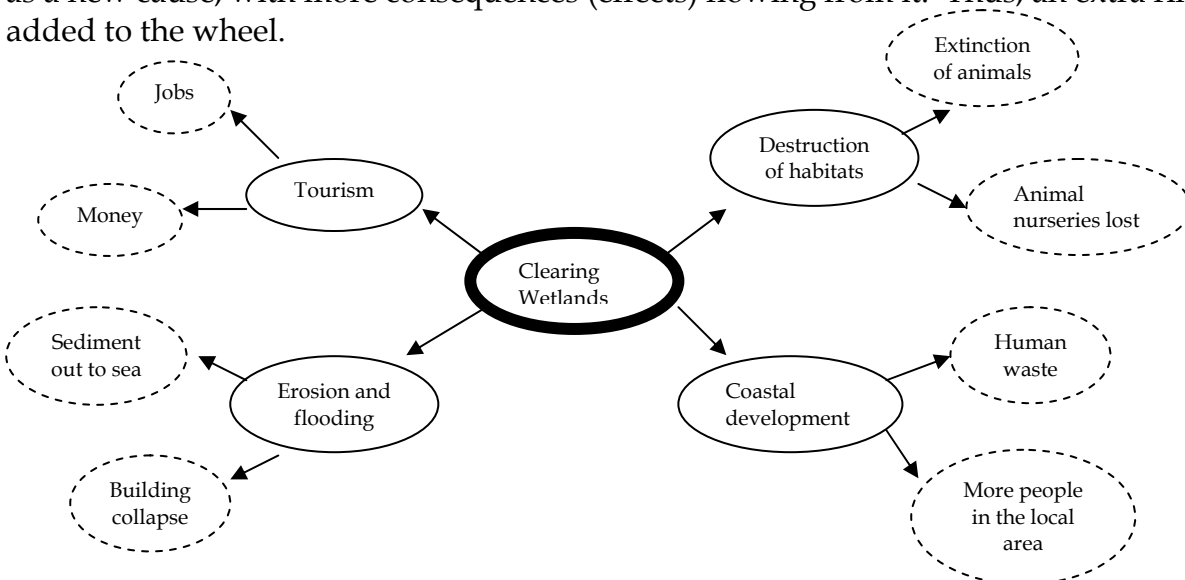
A key concept (problem or issue) is placed in the centre of the diagram – as the hub of a wheel. This is called the **cause**.

### Step 2

A number of possible consequences or implications, arising from the cause given on the hub, form a ring (as in a wheel) around the initial cause. These consequences or implications (real or potential) are called **effects**.

### Step 3

The wheel created in **Step 2** can be further extended, because each effect can be looked on as a new cause, with more consequences (effects) flowing from it. Thus, an extra ring is added to the wheel.





## Finding Out: Sample Activities

### Search the Bureau of Rural Sciences Wildlife Bycatch Mitigation Database Bycatch

(Note: this is still in development and will be accessible in late February)

Discuss with students what they think they are going to encounter on the BRS database. Explain to students that the database will give them an opportunity to look at the research into bycatch solutions that has been undertaken in Australia for different bycatch groups. The information is categorised by fishery, area and species group. The database also links to the relevant policy and legislation relating to bycatch management.

Ask students to prepare a list of questions to seek information about.

In groups, students discuss and record why they think it is important to find out about the issue of bycatch, species involved, effect on marine resources and innovative tools and practices that improve fisheries management to help reduce wildlife bycatch. Ask these questions:

- Why do you think using the BRS database could help you in this unit of work?
- What patterns can you uncover when you look at how the issue of bycatch is dealt with now as opposed to in the past?
- Do you think marine resources will be used sustainably in the future? and
- What types of resources do you think the database will and won't be able to provide?

Introduce the concept of 'sustainable management'. Students consider the following questions:

- How can we find a balance between meeting our present needs for resources from the ocean, and conserve and protect its natural resources for the benefit of future generations? Why is finding this balance so important?

Groups report back and record their findings. Students compare ideas, identifying similarities and differences and discuss differing opinions.

## Sorting Out: Sample Activities

### Multiple-use resource

Review the major user groups who use our seas and oceans. Source information to complete the table below.

<i>User Group</i>	<i>Area Affected</i>	<i>Nature of effects</i>	<i>Time of year</i>	<i>Spatial distribution</i>	<i>Degree of impact</i>
Scientists	Small	Collecting animals and plants, use of chemicals and	All year	All areas and habitats	Usually slight but could be large if working

		interaction with animals			with endangered animals.
Commercial Fishers					
Recreational Fishers					
Other extractive users (eg bioprospecting, seaweek harvesting etc)					
Aquaculture					
Tourism					
Indigenous Groups					
Energy production					
Shipping					

**Who manages fisheries and what legislation exists to protect and ensure the long term survival of marine species?**

Talk with students about who makes fisheries management decisions and encourage students to find out how fisheries are managed and how decisions are made. Ask students to construct a flow chart showing how decisions are made. Encourage students to explore the meaning of “multiple-use management” and “ecosystem-based management” and the range of uses and values that are managed within fisheries.

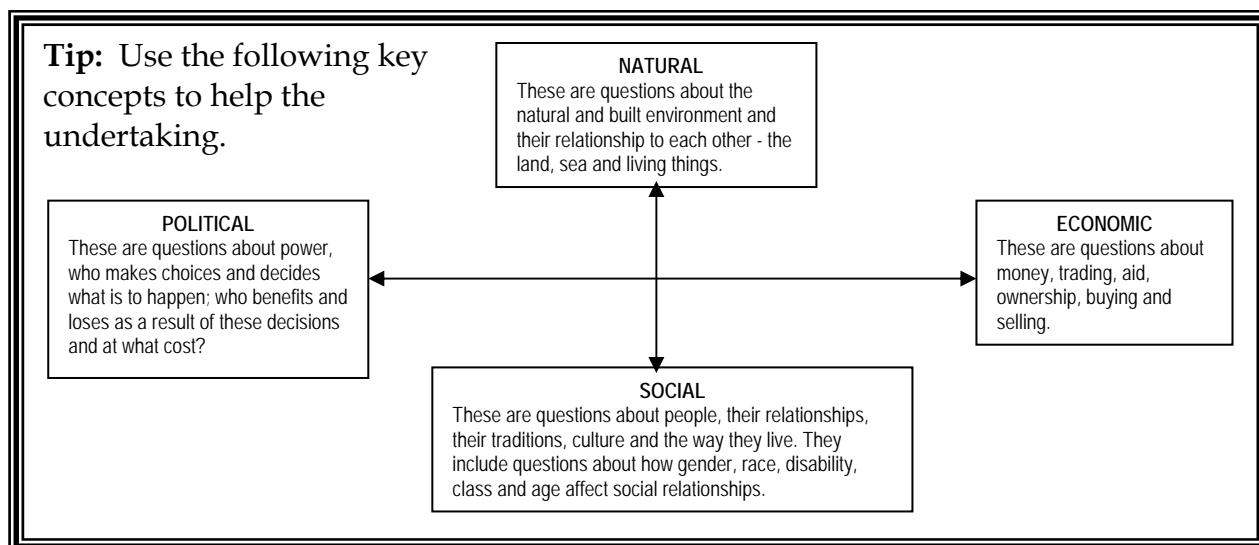
**The contribution fisheries management makes to biological diversity and Australia’s economy, society and environment.**

Talk with students about biodiversity being the variety of species, populations, habitats and ecosystems. Encourage them to find out about the biodiversity within our seas and oceans. Similarly discuss Australia’s economy and explore how fisheries (commercial, recreational and Indigenous) contribute to it. Find out about how fisheries are of value to Australia’s society and to traditional and cultural values.

**Cost Benefit Analysis**

Undertake a cost-benefit analysis to identify all the costs and benefits of fisheries (commercial, recreational and Indigenous) in our society, environment or economy. If the benefits exceed the costs, the cost-benefit analysis is said to indicate an overall gain to society, or vice versa.

Choose an issue related to fisheries and the issue of bycatch and complete a cost-benefit analysis on it. Present your findings to the class for discussion.



## Going Further: Sample Activities

### Class Debate

Students debate topics such as:

- Oceans are for everybody. People should be able to take as much as they want from the ocean.
- Bycatch is part of fishing. Bycatch species are seldom caught in most fisheries .
- Fishing makes money. More fishing should be allowed.

### Environmental Impact Assessments & Management Plans

Using one of the debate topics or a current issue relating to the issue of bycatch and sustainable fishing, complete an **Environment Impact Assessment**. Once you have completed your Environment Impact Assessment, follow up and design a **Management Plan** for the activity. An Environment Impact Assessment sheet for students is attached to the end of this document.

For the Management Plan, students need to:

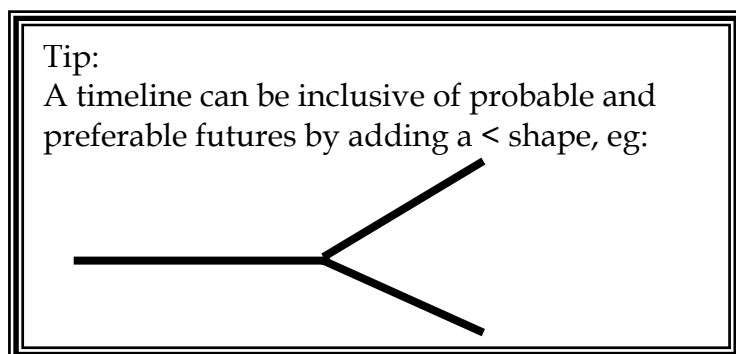
- **Develop** a set of criteria, which could be used to evaluate a management plan;
- **Formulate** a management plan, that is, decide how and by whom the issue should be managed; and
- **Justify** your management plan using the criteria you initially developed.

## Making Connections: Sample Activities

What are possible, probable and preferable futures for bycatch species?

Working in small groups students plot the significant events for bycatch species on a timeline. Students distinguish between those they think local societies have some control over and those over which they have little control.

Teachers demonstrate the continuation of the futures timeline, encouraging students to consider the probable and preferable futures of bycatch species. In groups, students discuss the types of decisions needed if these preferable futures are to eventuate.



Students plot probable futures along the upper axis and preferable futures along the lower axis. Probable futures refer to how students expect the future to be, both in their own lives and in the wider world. Preferable futures refer to how students would like the future to be, both in their own lives and in the wider world. Suggested issues for consideration are global climate change and endangered or threatened species.

## Taking Action: Sample Activities

### Act on the information

Encourage students to start acting for the future now by doing things to manage their marine resources, ensuring a sustainable future for our seas and oceans.

Some appropriate forms of action could include:

- Communicating the conclusions of the investigations to other classes, community members, members of relevant organisations or politicians.
- Mounting displays in prominent community settings.
- Taking economic action by not purchasing certain goods and services.

### Get Involved

Contact your Local Fisheries Department's Environmental Section and find out what stakeholders are active in your local community (Coastwatch, Seagrass Watch etc). Make contact with these organisations and find out what types of activities they undertake and how your class could become actively involved.

There are also national and international organisations that your class could become involved in, such as G.L.O.B.E (Global Learning and Observations to Benefit the Environment).

Surf the following sites to find out more:

- [www.deh.gov.au](http://www.deh.gov.au)
- [www.marinewatch.com](http://www.marinewatch.com)
- [www.deh.gov.au/education/globe/](http://www.deh.gov.au/education/globe/)

## References

Corrigan, C, Dyer, J, et al, *Resources and People VCE Geography Units 3 & 4*. Milton: Jacaranda Wiley Ltd. 1994.

Dodd, B. and Dodd, J, *SECTRUM Geographical Perspectives of People and their Environment*. Milton: The Jacaranda Press. 1994.

Tyler Miller, G, *Living in the Environment*. USA: International Thomson Publishing. 1994.

VAEE. Preuss, P, Duke, G, and Rogers, J, *A Sustainable Earth*. Melbourne: Cambridge University Press. 1998.

## 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](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](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](http://www.afma.gov.au/information/publications/education/pdfs/fs07_bycatch.pdf)

[www.afma.gov.au/information/students/methods/brd.htm](http://www.afma.gov.au/information/students/methods/brd.htm)

[www.afma.gov.au/information/students/methods/docs/brd.pdf](http://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/13_code1.pdf)

[http://www.pir.sa.gov.au/byteserve/fisheries/get\\_hooked/pdf/code/16\\_code4.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](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)

## Managing Bycatch in Fisheries

[www.fisheries.nsw.gov.au/recreational/general/get\\_hooked](http://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/ATT22AI9/intro.pdf](http://www.dpi.vic.gov.au/dpi/nrenfaq.nsf/646e9b4bba1afb2bca256c420053b5ce/178183686128f34bca256eb4001b6f76/$FILE/ATT22AI9/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

[http://bookshop.frdc.com.au/miva/merchant.mv?Screen=PROD&Product\\_Code=PUB-001&Category\\_Code=pubcat&Store\\_Code=B](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/](http://www.epa.qld.gov.au/nature_conservation/cyberrangers/)

**ProjectNet for Schools** (AIMS)

[www.aims.gov.au/pages/research/project-net/apnet-alpha.html](http://www.aims.gov.au/pages/research/project-net/apnet-alpha.html)

**ReefED** (GBRMPA - middle years)

[www.reefed.edu.au/teaching/middle\\_schooling/index.html](http://www.reefed.edu.au/teaching/middle_schooling/index.html)

**Schools for wildlife** - WWF (video)

[www.wwf.ca/satellite/wwfkids/S4W/0512.asp](http://www.wwf.ca/satellite/wwfkids/S4W/0512.asp)

**Teach Engineering resources for K-12**

[www.teachengineering.org/index.php](http://www.teachengineering.org/index.php)

**Fish and Kids (British)**

[http://www.fishandkids.org/staff\\_resources.php](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](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>

**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**

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](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](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](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](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](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](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](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/](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/](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](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](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)**

## Managing Bycatch in Fisheries

<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**

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 Whales - Grey nurse sharks**

[http://www.fisheries.nsw.gov.au/threatened\\_species/general/species/?a=698](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](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](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](http://www.fisheries.nsw.gov.au/__data/assets/pdf_file/4834/Responsible-fishing-to-reduce-wildlife-injuries.pdf)

Catch and release fishing

## Managing Bycatch in Fisheries

[http://www.fisheries.nsw.gov.au/recreational/saltwater/saltwater/catch-and-release\\_fishing](http://www.fisheries.nsw.gov.au/recreational/saltwater/saltwater/catch-and-release_fishing)

## Environmental Impact Assessment

1. **Title:** Your activity needs a title so people will recognise the area you are assessing.
2. **Description of activity:** Briefly outline the activity and when the activity will take place. (Include diagrams of facilities/structures and their location).
3. **Need:** Why is the activity necessary?
4. **Impacts:** What are the likely impacts on the flora, fauna and ecological processes?  
What will be the impacts on water, air or surface quality?  
What are the likely impacts on the heritage, wilderness and/or aesthetic value of the area?  
What wastes will be generated, how will they be handled and what are the impacts of handling them this way?  
What cumulative impacts could arise from this activity given other existing or planned activities?  
What is likely to be the most significant negative impact of this activity?  
Are there any impacts not addressed above and/or are there any other comments you wish to make?
5. **Mitigation measures:** What action, if any, will be taken to mitigate the impacts of the activity?
6. **Alternatives:** What alternatives to the activity would involve less environmental impact?
7. **Conformity with management plan:** How does the activity accord with any management plan prescriptions applicable to the location?
8. **Possible public concerns:** What public concerns could be expressed about this activity?
9. The Environment Impact Assessment must then be signed and dated.
10. The Assessment will receive a negative or positive recommendation.
11. Finally, the Assessment will receive a Determination stating whether or not the activity will be allowed.