Northern Territory Government
Department of Business, Industry & Resource Development

CATCH UP WITH FISHING

MARINE & FISHERIES EDUCATION MODULE - BAND THREE

BASED ON: BLUEBACK BY TIM WINTON

For further information please contact

The Fisheries Group
Department of Business, Industry and Resource Development
GPO Box 3000
Darwin NT 0801
Phone (08) 8999 2144
Fax (08) 8999 2065

Forward

The aim of the Fisheries Group of the Department of Business, Industry and Resource Development can be defined as:

"providing for the regulation, conservation and management of fisheries and fishery resources so as to maintain their sustainable utilisation, to regulate the sale and processing of fish and aquatic life, and for related purposes", as stated in the *Fisheries Act* (2001).

The Department of Business, Industry and Resource Development's Fisheries Group has developed an education and communication strategy that provides a framework for the group to deliver educational materials and messages about the marine environment and fisheries in the NT. Stage one of the strategy has been addressed through the production of an education kit for schools where our primary school students can learn how to keep Northern Territory fisheries and marine environment in good health.

A number of Northern Territory schools, including Karama Primary, Nakara Primary, Nightcliff Primary, Humpty Doo Primary and St Francis of Assisi, were involved in the construction and trial stages of the kit during 2002. The result is three education modules spanning three primary school bands (levels of development).

Fisheries Group staff, initially Damian White and more recently Rebecca Solah, have also been working closely with the education department staff to ensure the modules are appropriate and useful for Northern Territory schools. The Northern Territory Department of Education and Training (DEET) staff, Marisa Boscato, Dallas Glasby and Ellen Herden provided invaluable advice and support in the draft stages of the project.

This education kit is provided to schools free of charge and schools will be sent the complete kit on request. Teachers will also able to download the complete kit or individual activities from the Fisheries Group website http://www.dbird.nt.gov.au/

The Fisheries Group will continue to support the schools through presentations and supplementary materials as required and can be contacted by telephone on (08) 8999 2144 or facsimile on (08) 8999 2065.

RICHARD SELLERS
Fisheries Executive Director
Department of Business, Industry and Resource Development

Contents

Page

Introduction to the unit

The Northern Territory aquatic environments provide food, employment and recreational enjoyment for many Territorians and visitors.

In recognition of the importance of the NT marine environment to the life-styles of Territorians, the Department of Business, Industry and Resource Development Fisheries Group has produced an educational package focusing on the marine environment. The goal of this material is to increase the students' understanding of marine habitats and the responsibilities everyone shares in ensuring that it remains in good health.

The resources used for this Module provide an introduction to some new concepts that assist students in exploring the world of the marine environment. Each module encourages students to research the marine environment so that they can begin to realise just how rich and vast the oceans are.

The modules use three keys texts to focus its messages.

Module 1 uses the *Eagle and the Gull* Dreamtime story from the Bardi people of North Western Australia. The story illustrates the influence people can have upon natural resources when used unwisely.

Module 2 uses the book *The Treacherous Travels of Tasman Turtle* by Simon McLean. The story follows Tasman's travels through the ocean and the challenges he has to overcome along the way.

Module 3 uses the book *Blueback* by Tim Winton. The story centres around the life of the character Abel, from his childhood in a small fishing village to his life as a marine biologist.

Junior Code of Practice

The junior code of conduct has been developed from the National Code of Practice for Recreational and Sport fishing. This national Code of Practice was developed as an initiative of Recfish Australia, the peak national body for recreational and sport fishing.

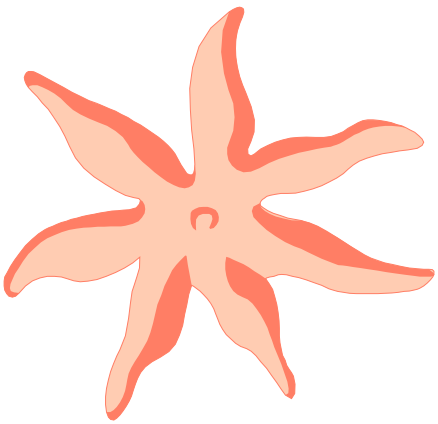
The Junior Code was developed specifically to target children of primary school age and contains the following six points:

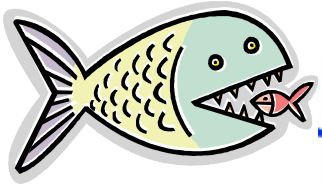
1. Take only what you need
2. Fish with friends
3. You're the solution to water pollution
4. Throw the little ones back
5. Don't leave your tackle behind
6. Quality catchments equals quality fish

The Junior Codes was used to develop the Department of Business, Industry and Resource Development, Fisheries Group:

> ***Into The Blue*;**
> ***Marine and Fisheries Education Kit* (2003).**

A reference for the code is provided in the resource list at the end of this module and is available on the Victorian Fisheries website





Methodology

These modules are written to cover approximately five weeks of a school term and apply components of the Social Literacy teaching model.

Focus Question - A question is asked or a problem is posed at the beginning of a learning sequence

Consider - A stimulus is given such as a problem situation, a moral dilemma, conflicting points of view, factual information, an historical document, a photograph or drawing.

Analysis - A series of activities critically analyzing the input, moving from analytical process to critical processes.

Main Idea - Learners review and analyse the concept generalisation.

Rationale

Key environmental messages are embedded in each module.

Module 1

• Instilling values for the sharing of marine resources.

Module 2

• Investigating and communicating ideas about interactions in marine environments

• Exploring how the quality of marine environments can be sustained for future generations.

Module 3

• Exploring issues relating to the sustainable use of the marine environment

• Investigating potential negative impacts on marine environments and identifying the scientific solutions.

Addressing Curriculum needs

Each module in the education kit targets students at different stages of schooling. Teachers are encouraged to consider the developmental needs of their learners when using these modules and mapping the activities with outcomes from the NT Curriculum Framework (NTCF).

Module 1 targets early childhood learners and uses NTCF outcomes from Band 1.

Module 2 targets middle primary learners and uses NTCF outcomes from Band 2.

Module 3 targets upper primary learners and uses NTCF outcomes from Band 3.

The **EsseNTial Learnings** lay the foundation for 'connected life-long learning', and are essential in preparing students for complex future life roles. These modules work towards demonstration of Constructive Learner 4 in the EsseNTial Learnings. The Constructive Learner 4 identifies environmental and social issues within the local and global community and takes steps to promote change.

Teachers will need to select or develop indicators of learning appropriate to the learning needs of their students.

The NT Board of Studies ***Environmental Education Policy Statement*** *2nd Edition* (1997) recognises the importance of a sound and balanced environmental education. These modules provide teachers with content focus to achieve the aims of the policy.

The **Learning Areas** specifically targeted by these modules are:

• Studies of Society and Environment

• Science

Teachers are encouraged to consider cross -curricula links and the explicit literacy and numeracy components of all activities.

Assessment

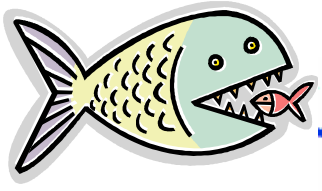
Teachers are encouraged to develop appropriate assessment and reflection tasks to meet the needs of learners.

To help you assess student progress the modules from *Into The Blue* provide the following

1. **Culminating Tasks** that have been designed back from NTCF outcomes.
2. A generic **Rubric** scoring tool for self, peer, teacher or community based assessment.
3. An **Assessment Checklist** that provides an overview of the activities used to achieve key environmental messages within each module.

Assessment Checklist

Concept	**1**			**2**			**3**			**4**			**5**			**6**		
Student Name																		

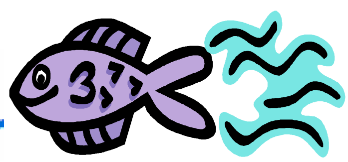


Rubric Template

(Describe here the task or performance that this rubric is designed to evaluate.)

	Beginning 1	Developing 2	Accomplished 3	Exemplary 4	Score
Stated Objective or Performance	Description of identifiable performance characteristics reflecting a beginning level of performance.	Description of identifiable performance characteristics reflecting development and movement toward mastery of performance.	Description of identifiable performance characteristics reflecting mastery of performance.	Description of identifiable performance characteristics reflecting the highest level of performance.	
Stated Objective or Performance	Description of identifiable performance characteristics reflecting a beginning level of performance.	Description of identifiable performance characteristics reflecting development and movement toward mastery of performance.	Description of identifiable performance characteristics reflecting mastery of performance.	Description of identifiable performance characteristics reflecting the highest level of performance.	
Stated Objective or Performance	Description of identifiable performance characteristics reflecting a beginning level of performance.	Description of identifiable performance characteristics reflecting development and movement toward mastery of performance.	Description of identifiable performance characteristics reflecting mastery of performance.	Description of identifiable performance characteristics reflecting the highest level of performance.	
Stated Objective or Performance	Description of identifiable performance characteristics reflecting a beginning level of performance.	Description of identifiable performance characteristics reflecting development and movement toward mastery of performance.	Description of identifiable performance characteristics reflecting mastery of performance.	Description of identifiable performance characteristics reflecting the highest level of performance.	
Stated Objective or Performance	Description of identifiable performance characteristics reflecting a beginning level of performance.	Description of identifiable performance characteristics reflecting development and movement toward	Description of identifiable performance characteristics reflecting mastery of performance.	Description of identifiable performance characteristics reflecting the highest level of performance.	

http://edweb.sdsu.edu/triton/july/rubrics/Rubric_Template.html



Activity 1. Introducing the story of Blueback

Resources required:

Blueback by Tim Winton

Focus Question:

What should you consider when studying and/ or managing the marine environment?

Consider:

Have a brainstorm session listing all the animals that live in the sea. Classify the listed animals using a semantic grid that includes:

Perceptual criteria eg size, shape, colour, parts, features.

Knowledge criteria eg location, function, habits, properties, characteristics.

Evaluative criteria eg usefulness, value, attractiveness, suitability.

Ask students to discuss their feelings about the marine environment, what they like about it, how they use it etc.

Analysis:

Read the first four chapters of the book *Blueback* by Tim Winton as a group. The book illustrates a number of issues which will inevitably arise when discussing this theme, including:

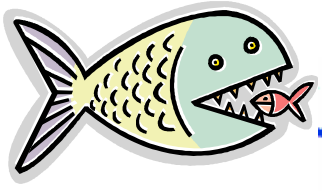
- Life in the marine environment
- Management of the marine environment
- Protection of fish breeding grounds and habitats
- Pollution, habitat destruction and land management
- Working in Marine Science

Write these ideas on the board as they are raised in the book. Ask the students to collect information on each of these issues from newspaper articles, books, the internet or from other media. Pin these articles to a classroom board for later discussion.

Main Idea:

In studying and managing the marine environment we need to consider things like what is there, who uses it, how they use it, and whether some species are more important than others.

Outcome:
Science/Working Scientifically/ Acting Responsibly
SOSE/Environments/Environmental Awareness and Care
Cross Curricula Perspectives
Literacy



Sematic grid of animals that live in the sea

Animal	Size, shape	Animal Group	Suitability to their environment
Sharks	Large, long and thin	Fish	Streamlined (long, thin) body shape allows the fish to swim fast
Barramundi			
Milkfish			
Eels			
Turtles			
Molluscs (Mussels, squid)			
Whales			
Dolphins			
Dugongs			

Activity 2. Library research

Resources required:

- Library books
- Internet

Focus Question:

What animals and plants do we need to consider, in particular, when studying and managing the marine environment in the Northern Territory.

Consider:

Discuss the definitions of endangered, vulnerable and extinct species.

Why do you think some marine species have become extinct or endangered?

What do the students already know about endangered animals?

DEFINITIONS

Probably Extinct: An animal or plant species that has not been found in the wild during the past fifty years.

Endangered: An animal or plant species that is in danger of extinction and will probably not survive if it continues to be threatened.

Vulnerable: An animal or plant species which will probably become endangered if it continues to be threatened.

Analysis:

In small groups, ask students to use

- books
- the internet
- interviews or
- videos

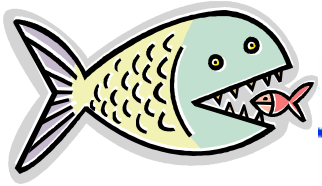
to find out what causes species to become extinct, endangered or vulnerable.

Provide students with a copy of the endangered marine species list for the NT (attached) and ask them to study these animals specifically.

Main Idea:

There are a wide variety of plants and animals which need to be considered when studying and managing the marine environment but there are some species which need particular consideration because of their status on the endangered species list.

Outcome:
Science/Working Scientifically/ Acting Responsibly
SOSE/Environments/Environmental Awareness and Care
Cross Curricula Perspectives
Literacy, Learning Technology



ENDANGERED MARINE AND AQUATIC SPECIES IN THE NT

(as at January 2000)

REPTILES

Loggerhead Turtle (scientific name *Caretta caretta*)

FISH

Speartooth Shark *(scientific name Glyphis* sp. A)

Freshwater Tongue Sole (scientific name *Cnyoglossus heterolepis*)

Northern River Shark (scientific name *Glyphis* sp. C)

VULNERABLE MARINE AND AQUATIC SPECIES IN THE NT

(as at January 2000)

REPTILES

Leatherback Turtle (*scientific name Dermochelys coriacea*)

FISH

Narrow Sawfish (scientific name *Anoxypristis cuspidata)*

Finke Goby (scientific name *Chlamydogobius japalpa*)

Lorentz's Grunter (scientific name *Pingalla lorentzi*)

Dwarf Sawfish (scientific name *Pristis clavata)*

Green Sawfish (scientific name *Pristis zijsron*)

Angalarri Grunter (scientific name *Scortum neili*)

Activity 3. Take only what you need

Resources required:

- NT Fishing Regulations book
- Otoliths (fish earbones supplied in kit)
- Basic microscopes for students

Focus Question:

What can we do to ensure we use aquatic resources sustainably?

Consider:

Once you have reached Chapter 6 of the book 'Blueback' read the chapter with the students and ask them how they felt about the abalone fisherman. Why are the actions of the abalone fisherman of concern to Abel and his mother?

Analysis:

What do you know about regulations to protect fish for the future, protected species, legal sizes etc?

Discuss the NT Fishing regulations. Why do we have these regulations? What do these regulations do to ensure that fish are sustained for the future?

Note: Fishing regulations vary from state to state and are updated regularly in each state. Speak to the local fisheries office to ensure you have the most up to date regulations.

How do we decide that 55cm is a good size limit for Barramundi? Is a 55cm fish an old fish (pin up a cardboard cut out of a 55cm fish)? Ask the students to guess how old the fish is?

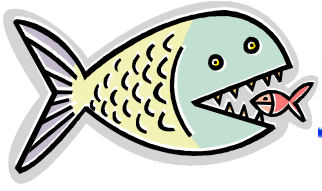
Answer - from studying the growth rings on the earbones of barramundi, scientists know that a male barramundi has usually reached maturity by the time it is 55cm in size (Male Barramundi reach sexual maturity at approximately 2 years old). Therefore it is OK to keep a Barramundi larger than 55cm because it has probably reproduced by then, creating more fish for the food chain.

Take a look at the otoliths provided in the kit and try and work out how old the fish is? (this is not an easy task even for professional scientists so students may come up with different answers but will still experience one of the roles of scientists).

Main Idea:

The utilisation of marine resources is a worldwide practice and many people rely upon these activities for employment and food. Marine resources are shared resources. The goal of fisheries researchers and managers is to maintain the balance between the need for jobs, food and recreation, and the needs of the animals on which these activities depend.

Outcome:
Science/Working Scientifically/ Acting responsibly
Science/Concepts and Contexts/Life and Living
Learning area link:
SOSE/Environments/Environmental Awareness and Care



Fishing the Territory

General Personal Possession Limit

Recreational fishers must observe a general personal fish possession limit in the Northern Territory.

A possession limit is the maximum number of fish each person may have in possession at any time, other than in their place of permanent residence.

A person may not possess more than 30 fish or the equivalent of 30 fish whether the fish are whole, trunked, filleted, diced or a combination thereof.

Included in the general personal possession limit are specific limits for managed species (see list below).

LIMITS FOR MANAGED SPECIES

Barramundi *(Lates calcarifer)*

55cm minimum size limit

5 possession limit per person

2 possession limit per person in the Mary River Management Zone

Black Jewfish *(Protonibea diacanthus)*

5 possession limit per person

Narrow-barred Spanish Mackerel

(Scomberomorus cammerson)

5 possession limit per person

Golden Snapper *(Lutjanus johnii)*

5 possession limit per person

Mud Crab *(Scylla serrata)*

13cm minimum size limit for male mud crabs

14cm minimum size limit for female mud crabs

10 possession limit per person

30 possession limit per boat

(with 3 or more people on board)

Tropical Rock Lobster *(Panulinus sp.)*

10 possession limit per person

30 possession limit per boat

(with 3 or more people on board)

Molluscs

A person may not have in possession a volume of molluscs greater than 10 litres with shells intact.

Further information on Fishing the Territory can be found in the 'Northern Territory Recreational Fishing Controls' booklet provided with the kit

Activity 4. Fishy activity ‘A fishing we will go!’

Resources required:

• 170 cutout fish (30 large, 50 medium and 90 small). Include a wide assortment of fish from your own local area.

• Each fish to have a paperclip attached to it and on the back a species name and measurement.

• Fishing rods made from thick bamboo (or whatever else you think will suffice) about 60cms in length with a piece of string tied to one end. On the other end of the string attach a small magnet.

• Large blue pieces of material, some rocks / branches, plastic /silk aquatic plants, other relevant habitat elements. Timer. Whiteboard.

Focus Question:

What do we understand about threats to fish stocks and what practical ways are there to enjoy fishing while ensuring the survival of fish for future generations?

Consider:

1. Discuss the different environments that fish inhabit, such as an inland river, lake or rock-platform.

2. Construct a retrieval chart that directs the students to note take of key features of these environments, such as a substrate, logs, rocks and plants.

Share retrieval charts as a whole class.

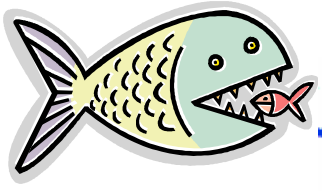
Analysis:

Play the game ‘A Fishing we will go” to illustrate what happens in a marine environment when fishing is unregulated.

Main Idea:

Fishing can be a fun activity with minimal impact on the natural environment but to ensure the impact is minimal fisheries officers and managers enforce restrictions such as bag limits and size requirements.

Outcome:
Science/Working Scientifically/ WS3.4
Learning area link:
SOSE/Environments/Env3.2
Cross Curricula Perspectives
[Lit]



PREPARATION:

1. Create a chosen relevant scene, such as an inland river, lake, or rock-platform, and use blue sheets folded into a narrow stream to represent a river or a blue sheet spread out flat to represent a larger area.

2. Add features explored by the students that you would find in that habitat. Let the students place the fish around those features, using prepared cut out fish of varying sizes (small, medium, and large).

3. The whole group is then to sit around the edge of the habitat.

4. Every second member of the group receives a fishing rod. No instructions are given other than they are to go fishing.

RULES

1. Using a five-minute timer, fishers catch fish. Before they can cast their line after catching something they must pretend to bait their hook.

2. When the five minutes have passed, fishing ceases. Then tally individual 'catches' (a good opportunity to practice tallying skills).

3. Look in the habitat and discuss whether there are many or just a few fish left.

4. Ask some group members questions such as:

" How many fish are in your bag?"

" Did you keep all that you caught?"

5. Ask the whole fisher group:

" Did you leave any fish for the next time you fish? Why or why not?

6. Ask students their thoughts on what they think may happen to the river/lake/ocean next time when the other students go to fish.

"Would there be any fish left?"

"What could they have done differently to ensure that there were fish left for next time?"

Activity 5. Don’t leave your tackle behind

Resources required:

World Wide Fund for Nature marine debris fact sheet.

Focus Question:

What kind of marine debri is the most common and why is this debri of concern to marine fish and other marine animals? What can we do to help?

Consider:

Once you have reached Chapter 8 of the book ‘Blueback’ read the chapter together as a class and ask the students how they felt about the shark caught around the fishing buoy?

How could this have been avoided?

Analysis:

Can we relate this situation to our own lives? Is there anything we leave behind when on the water, which may affect the fish or other marine life?

Ask the students to come up with some ideas for what we take with up when we go fishing and happens to these things when we leave them behind. Write these ideas down in your books. A few ideas are provided.

Main Idea:

Marine debri damages the environment in a number of ways. We can avoid these environmental disasters by leaving the environment just as we found it when we arrive, leaving nothing behind.

WHY IS TACKLE A PROBLEM FOR FISH?

Discarded lines: Discarded fishing line and netting is impossible for many native fish, aquatic mammals and birdlife to see in drifting currents of the water. It can easily become entangled around their bodies causing an inability to swim, hunt or feed.

Hooks: Discarded hooks buried in the sand may soon be uncovered by the movement of water, the next tide, or rain, proving hazardous both to humans and aquatic life.

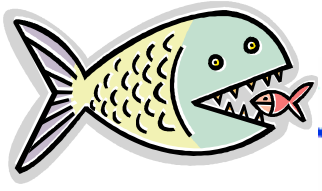
Nets: Lost and discarded nets can lead to 'ghost fishing', which may deplete fish stocks.

Bait bags: Many species of fish and marine mammals feed on jellyfish, which many plastic bags resemble in the water. It is known that "turtles find plastic bags indistinguishable from food and can ingest large quantities of them".

Plastics: Ingestion of plastics can cause problems to a range of animals. "Starvation is the main cause of death for animals that ingest plastic, as the animal does not eat sufficient food, and the plastic prevents proper digestion or elimination of food".

Six pack rings: These can become harmful 'neck collars' on fish and other aquatic life.

Outcome:
Science/Working Scientifically/ WS3.4
Learning area link:
SOSE/Environments/Env3.2



MARINE DEBRIS FACT SHEET

OCEANS & COASTS

Marine debris, or human-generated floating litter in the marine environment, is classified as one of the five major pollutants of the oceans.

Around 7 billion tons of marine debris is thought to enter our seas annually. The main components of marine debris are plastics, glass, metal and rubber and include items such as plastic bottles and containers, fishing nets and thongs.

Globally plastics comprise the highest percentage of items recorded, and plastic bags, containers and fishing gear are now thought to comprise between 48 - 99% of marine debris worldwide.

Marine debris enters our marine environment from several sources such as land-based activities, fishing operations and marine vessels.

MARINE DEBRIS IN NORTHERN AUSTRALIA

The Arafura Sea is a shallow part of the ocean separating Australia from New Guinea and Indonesia. Much of the region is remote, sparsely populated and often inaccessible and many coastal areas remain largely untouched by development.

Despite this, vast stretches of coastline in the Arafura Sea region are being increasingly swamped by marine debris because of ocean and weather circulation patterns and its proximity to intensive fishing efforts. The region includes some of the world's last remaining strongholds for threatened species such as turtles and dugongs.

The northern Australian coastline of this region is being swamped by tonnes of marine debris – plastic containers, oil and fuel drums, fishing gear and nets. Indigenous people own extensive areas of this coastline and, along with many other groups and individuals, are becoming increasingly concerned about the amounts and impacts of debris washing ashore.

Of greatest concern are large numbers of derelict fishing nets that present a navigational danger, smother coastal habitats, and entangle threatened species such as turtles and dugongs.

WWF-Peter Eve

Activity 6. 'Designing an environmentally friendly bait box'

Resources required:

• Recycled materials such as cardboard, plywood, paper, straw, twine, string, cotton wool, wool, material scraps, cardboard fruit juice containers, etc.

• Fisheries *Dedicated to* Environment Friendlier Fishing Methods (Julie-Anne trawl) poster (copy is provided opposite but the original poster is available by loan from the fisheries office by calling 8999 2144).

Focus Question:

What kind of marine debris is the most common and why is this debris of concern to marine fish and other marine animals? What can we do to help?

Consider:

Scientists are always looking at new ways to reduce the negative impacts of the varying uses of the marine environment . Discuss the poster opposite and brainstorm other ideas for reducing the negative impacts on the marine environment from its use. For example, if plastics are one of the biggest rubbish problems in the marine environment what can we do to reduce the amount of plastic used?

Analysis:

One example of reducing the amount of plastics used in the marine environment is designing an environmentally friendly bait box.

If possible, let the students come up with the characteristics themselves.

Some suggestions may be;

• Must be made of a substance that is biodegradable or reusable.

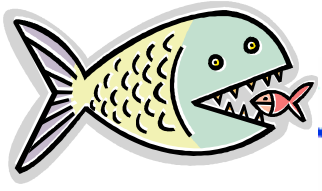
• Must not have anything on it that will endanger aquatic life.

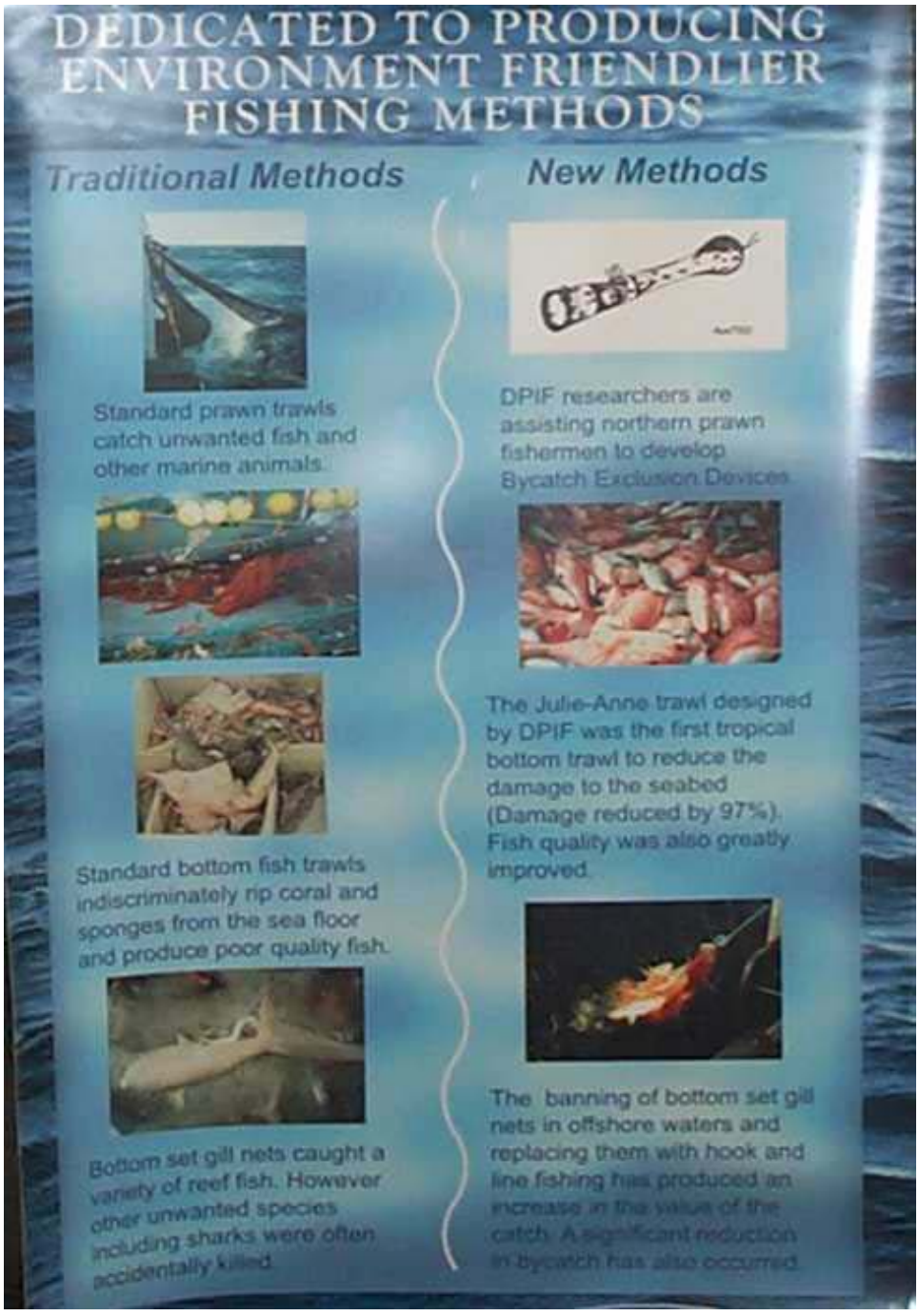
• Must be lightweight.

Main Idea:

There are different ways we can reduce the amount of rubbish in the marine environment. One idea is to encourage fishers to reduce their waste by using recyclable bait bags or encouraging the use of bait bags that break down faster than plastic in the water (biodegradable).

Outcome:
Science/Working Scientifically/ WS3.4
Learning area link:
SOSE/Environments/Env3.2
Cross Curricula Perspectives
Learning Technology




DEDICATED TO PRODUCING ENVIRONMENT FRIENDLIER FISHING METHODS
Traditional Methods
New Methods
Standard prawn trawls catch unwanted fish and other marine animals.
DPIF researchers are assisting northern prawn fishermen to develop Bycatch Exclusion Devices.
The Julie-Anne trawl designed by DPIF was the first tropical bottom trawl to reduce the damage to the seabed (Damage reduced by 97%). Fish quality was also greatly improved.
Standard bottom fish trawls indiscriminately rip coral and sponges from the sea floor and produce poor quality fish.
Bottom set gill nets caught a variety of reef fish. However other unwanted species including sharks were often accidentally killed.
The banning of bottom set gill nets in offshore waters and replacing them with hook and line fishing has produced an increase in the value of the catch. A significant reduction in bycatch has also occurred.

Activity 7. Helping Your Catchment

Resources required:
None

Focus Question:

What can you do to ensure the environment around your home or school is healthy?

Consider:

When you reach Chapter 10 of the book 'Blueback' read the chapter with the class and discuss what is happening to Longboat bay. Discuss ideas such as:

- "Why are Abel and his mother concerned about the environment"
- "What rivers, creeks and other aquatic environments are around your school or home". Are they healthy?"
- "How can we ensure that the environment around our homes is healthy?"

A catchment is an area of land from which water drains to a low point (a river, creek or the sea).

Analysis:

1. Investigate if there are any local groups of people who are making an effort to make your river, creek or other aquatic environment part of a quality catchment. Are there any Bushcare, Coastcare, Waterwatch groups in your local area?

2. Find out what they do by looking at their websites, looking in local papers or on local noticeboards to see what is happening in your area. The local councils may be able to assist.

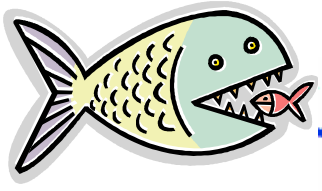
3. As a class, write a letter to one of the groups and nominate any future sites that you think need attention by one of these groups. Ask them what your school can do to help?

Main Idea:

We all live in and use the natural and man made environments in a catchment.

The environment we live in is our responsibility. We can all work together to ensure it is healthy.

Outcome:
Science/Working Scientifically/ WS3.4
Learning area link:
SOSE/Environments/Env3.2
Cross Curricula Perspectives
Learning Technology



Landcare, Waterwatch and Coastcare

The Darwin Urban Landcare, Waterwatch and Coastcare groups all work together to protect and rehabilitate bushland areas and waterways. Examples of some of the work of Landcare Groups in the Darwin urban area includes:

• Casuarina Coastal Reserve Landcare Group

This group has been working for the last couple of years on a weed control and revegetation project in the reserve. The main project has been rehabilitating and extending the riparian vegetation along a tributary of Sandy Creek.

• Ludmilla Creek Landcare Group

The Ludmilla Creek catchment supports woodland, monsoon forest and mangrove communities. This group was formed to promote community involvement in the management of the catchment. They have carried out extensive revegetation work using direct seeding and tree planting.

• Mitchell Creek Landcare Group

This group was formed out of interest in protecting Mitchell Creek and the vegetation communities it supports. The developing Palmerston urban area is rapidly moving towards the creek corridor. Without protection and appropriate management the creek ecosystem will become degraded and lose many of its valuable qualities. The group has been involved in weed mapping and control activities and Waterwatch and AusRivAs monitoring.

• Nightcliff Coastcare Group

Issues this group would like to pursue include education workshops, litter around the coast and erosion. The area of coast covered by the group is Progress Drive to the bridge at the mouth of Rapid Creek. Their main objective is to be a voice within the community and to work alongside other community groups and organisations.

• Rapid Creek Landcare Group

Rapid Creek supports a range of vegetation communities including mangroves, monsoon forests, swamps and woodland. The group was formed to coordinate community input into the management of the area. Their latest project involves revegetating the creek corridor between McMillans and Trower roads with Greening Australia.

For more information contact the;

Landcare Manager

Tel: 8999-4464

Fax: 8999-4445

OR THE

Northern Territory National Landcare

Program Coordinator

Tel: 8999-3493

Fax: 8999-4445

Activity 8. 'Murky water'

Resources required:

- Transparent bucket.
- Containers of pollutants (dirt, detergent, rubbish).
- Resin mold or polyfill if you want to make your own catchment.

Focus Question:

What are the different kinds of pollutants caused by human activities in a catchment?

Consider:

This is a tale of a boy or girl, just like yourselves who lived not far from a river that flowed down to the sea. Sam was his/her name. He/she used to go fishing with friends and sometimes with his/her parents in the dingy. They always had a fantastic time, whether they caught anything or not.

One day they decided to explore further down the river. As they travelled down the river they entered a wide muddy patch of water. Sam turned to his/her friends who all screwed up their noses in distaste. 'Phew…what's up with the water' they asked each other questioningly. 'Look' said Sam and pointed to the bank.

What did Sam see?"

Analysis:

This lesson can either be extended over a couple of days by making a model of a catchment as a class or by just using a clear bucket to illustrate the story. If you make the catchment put a creek or river flowing down the middle, by moulding a material such as polyfiller (from a hardware store). Use sand, dirt, grass or twigs as model trees to make the sides of the bank in the model.

At the base of the river place a large transparent bucket or bowl to represent the local water catchment.

Start the catchment story (opposite page) and comment on the changes that are taking place as the rain pours down the 'catchment'. As you read the story pour in some pollutants, as appropriate (the cups full of sand, rubbish, detergent etc).

At the end of the story ask questions such as;

How would you feel about drinking or swimming in this water?

Why did the water look so different at the end of the story?

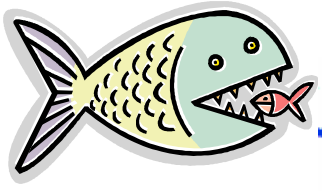
Do participants think that this activity was an accurate reflection of how water pollution occurs in the community?

What other kinds of measures could be used to prevent or reduce water pollution?

Main Idea:

While there are certain activities in the environment which are important to our life-style, such as farming, there are ways we can reduce the negative impacts these activities have on the environment. This might include planting trees along river banks near farms, or being more careful with our gear when we go fishing.

Outcome:
Science/Working Scientifically/ WS3.4
Learning area link:
SOSE/Environments/Env3.2
Cross Curricula Perspectives
Learning Technology



A Catchment Story

Source: Adapted from Who Polluted the Potomac?, Alice Ferguson Foundation, Hard Bargain Farm, Accokeek, MD, USA.

This is the story of the travels of a very special river through its catchment. It begins in the higher parts of the catchment where the rain runs off the slopes and begins its long journey to the sea. The water gathers momentum as it descends the slopes. In the valley below there is farming country which recently fertilised its crops. Afterwards the crops were watered and the run-off into the river has brought with it some of the fertiliser (pour a container full of fertiliser or bicarb soda to demonstrate fertiliser pollution into the bucket).

On the other side of the river are grazing lands. A grazing herd of cattle feed on the vegetation on the banks. When heavy rain arrives the banks collapse into the river. Some of the cattle cross over the river carrying soil with them (pour a container of dirty water into the bucket).

Slowly the river starts to wind its way through the outskirts of a major town. There are a number of people making use of the river around the bend. Someone is fishing on the banks. Unfortunately their line gets caught around a rock and is left in the water. Another group of people is enjoying a picnic at a park overlooking the river. A gust of wind blows some of their rubbish off the table and down into the water. The park litter covers the surface of the water (pour rubbish into the bucket).

The river now starts to meander through the suburban part of the town. A new development is underway. Many of the trees have been removed and when it rains, the top layer of soil is eroded and contributes to the silting of the river (pour another container of dirty water into the bucket).

There is still some industry along the river here. It uses industrial detergents to keep its production equipment clean. But, sometimes, the dirty water is hosed out of the factory into the gutter where it disappears into a storm water drain. Once again, however, this water flows straight into the river. If there were phosphates in the detergent then it will cause excess algae growth in the river, and an algal bloom will result. When this algae dies and begins to rot, it uses up oxygen which animals in the water rely on. They may suffocate as a result. (pour detergent into the bucket)

With one final bend the river finally arrives at its mouth and flows into the sea. But look at what flows out with it!

What can we do with our river? A heavy rainstorm would help. The fresh supply of river water from rain can help flush out many pollutants. Indeed, rivers can be a major way of flushing and cleaning ecosystems. However this only moves the problem to a coastal area where other ecosystems will be affected.

We must reduce the amount of pollution that is entering the river.

Activity 9. Washed away - 'Algal Blooms'

Resources required:

- Notepad as a daily diary
- 3 jars of distilled water, label them 1,2,3.
- Eyedroppers
- Liquid fertilizer and detergent
- Local algae (use gloves to collect algae)

Focus Questions:

Can pollution start around our home or school? Where does it end up and what does it do?

Consider:

During a period of heavy rain, trace the path of the water from your home or school yard. If there is no rainwater to follow just discuss this idea with the students by drawing a diagram on the board.

- What sorts of both natural and manufactured waste did you see flowing to the stormwater drain after heavy rain?
- How would these items end up in the gutter?
- Could any of this rubbish or pollution have come from your home or school?
- Brainstorm practical ways you can change the amount of waste entering the gutter.
- Locally can you trace where the rubbish from your school yard ends up?

Analysis:

Experiment with pollution using your algae jars.

1. Stir an eyedropper of liquid fertilizer into Jar 1. Label: 'Garden or farming fertilizer'.

2. Stir an eyedropper of washing detergent into Jar 2. Label: 'Household detergents'.

3. Stir Jar 3. with an empty teaspoon. Label: 'Normal water'.

Add a small beaker of algae from a local pond to each of the jars.

Keep a daily record of how often your home washes the dishes or clothes with a detergent. Each time a detergent was used in your home add a drop of detergent to Jar 2.

Over a period of two weeks, keep a plant diary (design yourself in discussion with students) and compare each of the jars for algal growth.

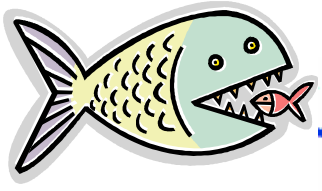
At the end of two weeks look at the jars and discuss which jar shows the greatest amount of algal growth? Can you explain what has occurred here?

- If algae completely covers the surface of the water, what problems will this cause for animals and plants below the water surface?
- Could this type of situation with detergents, fertilizers and chemicals constantly entering our waterways occur in real life (refer back to the catchment story)?
- Discover some ways you can minimize the amount of chemicals entering our waterways. (Ideas: riparian vegetation that acts as a natural filter, consider the types and amounts of liquid detergents you are using).

Main Idea:

Nutrients from the home such as detergent can cause algal blooms by adding algae food to the water. Algae can suffocate the water by inhibiting sunlight and using up oxygen.

Outcome:
Science/Working Scientifically/ WS3.4
Science/Concepts and Contexts/CC3.2
Learning area link:
SOSE/Environments/Env3.2



Activity 10. Concluding class discussion - what can we do to ensure we use aquatic resources in a sustainable manner?

Focus Question:

What have you learned about studying and managing the marine environment over the last few weeks? Have any of your values changed in regards to the marine environment?

Consider:

Discuss the book 'Blueback' by Tim Winton by asking the students questions such as:

- Can you relate to Abel and his life in any way?
- Does the book change the way you look at or think about the marine environment?
- Have your values toward the marine and aquatic environment changed during the past few weeks?

Analysis:

Describe how and why people value resources differently (history, cultural values etc).

Write these ideas down in your books and draw a picture which illustrates your thoughts? Students may prefer to illustrate their favourite scene from the book. Let their thoughts come out with their own drawing.

Main Idea:

There are different ways people value resources and some of the ways people manage resources may be better than others. We are always learning.

Outcome:
Science/Concepts and Contexts/CC3.2
Learning area link:
SOSE/Environments/Env3.2
Cross Curricula Perspectives
[Lit]

RESOURCE LIST

Books

All listed books and videos can be ordered from the Education and Training Library at Winnelie and you can check on availability on their website www.ntlib.nt.gov.au/glis/educ

1. Winton, Tim (1997) *Blueback*, Pan MacMillan Australia Pty Ltd.

2. Fisheries Victoria (2000) *Get Hooked It's Fun to Fish; National Junior Fishing Codes Education Kit.*

3. World Wide Fund for Nature *Marine debris Fact Sheet*.

4. Bolten, F. and Cullen, E. (1987). *Animal Shelters*, Martin Educational.

5. Dunbier, S. (2000). *Sea Turtles*, Thomas C. Lothian Pty Ltd.

6. Morris, R. (1983). *Mysteries and Marvels of Ocean Life*, Usborne Publishing Ltd.

7. Perkins, L. (1980). *Shells of Northern Australia*, Northern Territory Department of Education.

Videos

1. Fish, shellfish and other underwater life [videorecording] / produced and directed by Leonard Bendell ; screenwriter, Rima Firrone ; Penguin Productions.

2. Where the fish are friendly [videorecording]. Publisher BBC, [London] : c1980.

3. Coral reef community [videorecording] Publisher South Melbourne, Vic. : Educational Media Australia, assisted by the Victorian Film Corporation, [1988?]

4. Animal adaptations [slide] : coral reef community / by Tom Collis. Publisher Winnellie, N.T. : Dept. of Education, 1981.

Websites

Northern Territory Department of Business, Industry and Resource Development, Fisheries Group, **www.dbird.nt.gov.au**

Enchanted Learning, **http://www.enchantedlearning.com/Home.html**

Oceans Alive, **http://www.abc.net.au/oceans/alive.htm**

Sea World, **http://seaworld.org/**

Gulf of Marine Aquarium-all about turtles, **http://octopus.gma.org/turtles/index.html**

The Great White Shark, **http://www.ucmp.berkeley.edu/vertebrates/Doug/shark.html**

Ocean Oasis Field Guide, **http://www.oceanoasis.org/fieldguide/hipp-ing.html**

Kingdom of the Seahorse, **http://www.pbs.org/wgbh/nova/seahorse/basics.html**

National Aquarium in Baltimore's Department of Education, **http://www.aqua.org/animals/species/preel.html**

Animation Factory, **http://www.animfactory.com/index.html**

Junior Code of Practice

Commonwealth of Australia (2000) *Get Hooked It's fun to fish; National Junior Fishing Codes Education Kit.*

Available at the Victorian Department of Primary Industries and the Department of Sustainability & Environment website at **http://www.nre.vic.gov.au**

or for a direct link to the education kit go to;

http://www.nre.vic.gov.au/web/root/domino/cm_da/nrenfaq.nsf/frameset/NRE+Fishing+and+Aquaculture?OpenDocument