South Pacific Division of Seventh-day Adventists

Pathfinder Honour:
Trainer's Notes

Fishes 1

Instructions to Trainers / Instructors of this Honour

Thankyou for being involved with this Honour. These notes have been developed to assist in teaching / instructing this honour. We recognise that there is much more information available and we are grateful that you should share your expertise.

Please remember that Honours are designed to develop our Pathfinders in many ways; their interests, their knowledge and their relationship with their Saviour and Creator. Your enthusiasm and creativity will have a huge impact on those doing the honour.

To complete an Honour, the following (where applicable) must be completed satisfactorily:

- Physical and Practical Requirements.
- Honour Workbook.
- Honour Assessment Sheet. *(On SPD Honour Website but Leader's level access is required)*

Additional Reference Material

http://en.wikipedia.org/wiki/Fishes

Please see final page of these notes for additional references.

Acknowledgements

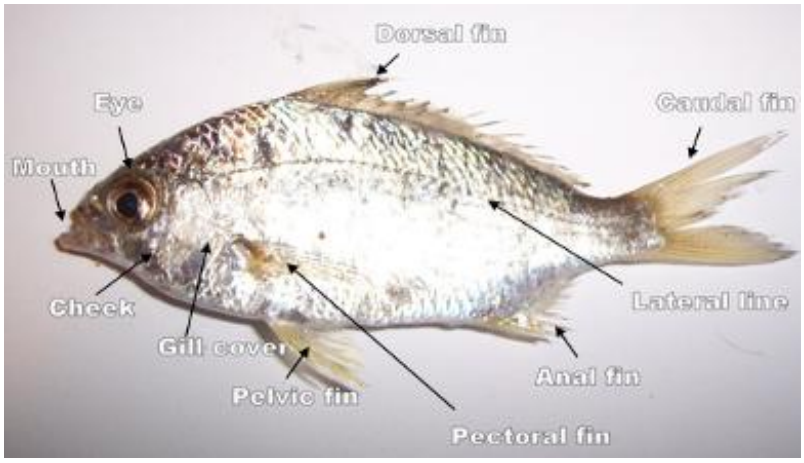
Mark Young of the Northern Australia Conference provided much useful information. Please see the following notes for other citations. Please be aware that material on Wikibooks or any other site is beyond the control of the SPD.

Fishes 1 Honour: Trainer's Notes

REQUIREMENT 1: Give five characteristics which define fishes.
The following characteristics define a fish. Please note that there are exceptions.

- They are vertebrates.
- They are cold blooded.
- They are aquatic (ie live in water).
- Most have some form of scales.
- They swim by using body motion.
- They have fins for balance and steering.
- They breathe by getting dissolved oxygen from the water by the use of gills.
- They have a fishy smell.

REQUIREMENT 2: Identify the following parts of a typical fish:



a. The **dorsal fin** is located on the back. A fish can have up to three. It is used for balance and to help turns and stops.

b. **Pectoral fins** come in pairs, either side of the body, just behind the operculum. They can be highly developed as in flying fish, or fish that 'walk'.

c. **Pelvic fins** are paired and are almost under the body. They help the fish to go up or down and to turn and stop.

d. The **Anal fin** is located behind the anus and is a balancing fin.

e. The **Caudal fin** is the tail fin and is used for propulsion.

f. The **Lateral line** runs along the side of the body and is used to detect movement from vibrations within the water.

g. The **Operculum** (ie Gill cover**)** is the hard shell-like cover that protects the gills.

h. **Barbels** are found on some fish such as catfish and are very taste sensitive. They are used to search for food.

i. **Swim bladder.** Not all fish have swim bladders. The sharks and rays do not. Swim bladders are air sacs which allow the fish to stay at a set depth without sinking. Sharks must keep swimming or sink to the bottom.

j. **Gills** are breathing organs, which extract dissolved oxygen from water. Fish are not the only creatures with gills as some molluscs, crustaceans, insects and amphibians also have gills. Most fish can move their operculums to send water over the gills. Sharks and rays cannot do this, so they have to keep swimming or rest where a current is sending water over their gills.

Fishes 1 Honour: Trainer's Notes

REQUIREMENT 3: Briefly describe the following groups of fish. Name a fish which belongs to that group.

As there are about 31,900 species, classifying fishes is very complex and beyond the expectations of this honour. We've included one simplified way of classifying fishes. It is based on: http://en.wikipedia.org/wiki/Template:Basic_fish_taxonomy

a. Jawless Fish (They do not have a jaw)

Lampreys

Lampreys are jawless fish which live in temperate waters. Adults have a toothed funnel-like sucking mouth. Some species bore into the flesh of other fish to suck their blood, but most species never feed on other fish.

Pictured: Lamprey (*Diversas_lampreas*)
http://upload.wikimedia.org/wikipedia/commons/6/6f/Diversas_lampreas.1_-_Aquarium_Finisterrae.JPG

b. Cartilaginous fish (They have cartilage skeleton instead of bones)

Sharks

There are about 440 species of sharks, ranging in size from the small Dwarf Lantern Shark, *Etmopterus perryi*, a deep sea species of only 170mm (6.7 in) in length, to the whale shark, *Rhincodon typus*, the largest fish (See Requirement 4). Well-known species are the Great White Shark, Tiger Shark, Blue shark and Hammerhead.

Rays (*Batoidea)*

Batoids, like their close relations sharks, are a cartilaginous marine fish, having a boneless skeleton made of a tough, elastic substance. Rays have flattened bodies, enlarged pectoral fins and gill slits that are placed on their ventral surfaces. See the Mantra Ray in Requirement 4 for an example.

c. Bony fish (They have a bone skeleton)

Ray Finned Fish (*Actinopterygii*)

Ray-finned fishes are a type of bony fish which have 'fin rays'. That is their fins are comprised of webs of skin supported by bony or horny spines (ie 'rays').

Ray finned fish comprise over 90% of all species of fish. They are found in fresh water, in the deep seas and in the highest mountain streams. They range in size from *Paedocypris* at 8 millimetres (0.31 in), to the massive Ocean Sunfish at 2,300 kilograms (5,100 lb) and the long-bodied Oarfish of about 11 metres (36 ft).

Pictured: Black Bream –
Acanthopagrus butcheri
http://www.dpi.nsw.gov.au/fisheries/recreational/saltwater/sw-species/black-bream

Carp, perch, mullet, catfish, eels, tetras, barbs, loaches, swordtails, rainbow fishes, clown fish, bream, flathead are just a few ray-finned fishes.

Fishes 1 Honour: Trainer's Notes

REQUIREMENT 4:

a. Name and describe the smallest and largest fishes in the world. Discuss their sizes, habitats, how they feed and what they eat.

Length and weight (or both) may be used to define 'smallest' and 'largest'.

World's smallest fish

In January 2006, a new fish was discovered in acid swamps in Sumatra (Indonesia) - *Paedocypris progenetica*.

It is considered by some experts as the world's smallest fish and vertebrate animal. It is only 7.9mm (0.3 inches) long when fully grown and has very little skull to protect its brain. It is a member of the carp family.

It feeds on plankton near the bottom of water pools.

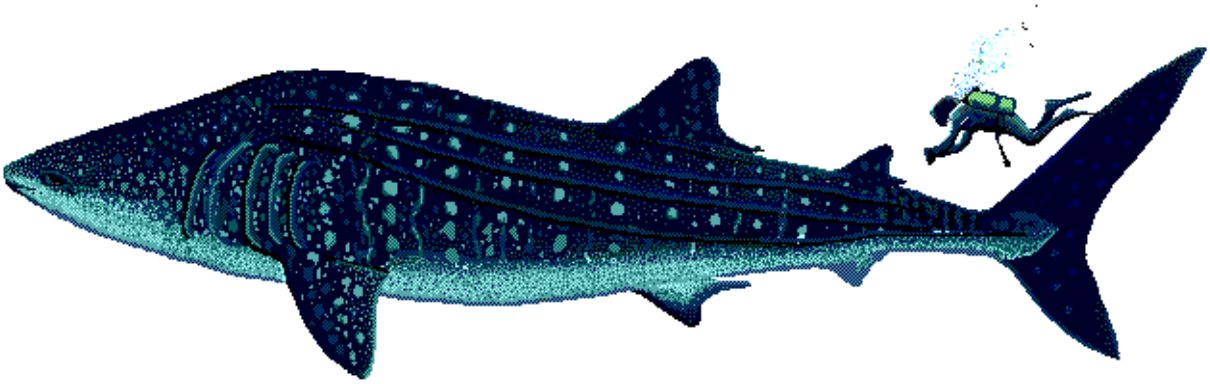
Picture: http://fishindex.blogspot.com/2008/08/paedocypris-progenetica-worlds-smallest.html

Some scientists don't accept this as the smallest fish. A deep sea angler-fish has mature males less than 7mm long. They attach themselves to the much larger female and are dependent on her for nutrition. Check this out on our *Fishes_Fascinating Facts*.

World's largest fish

The world's largest fish is the Whale Shark. It is a fish of the open ocean. This fish is a slow moving filter-feeder which feeds mainly on plankton, but may feed on shoals of small fish. It feeds by opening its giant mouth and swimming while filtering the food from the water.

The largest recorded Whale Shark was 12.65 metres (41.5ft) and the largest ever weighed went more than 36 tonnes.



Picture: http://upload.wikimedia.org/wikipedia/commons/1/11/Rhtyp_u0_white_bg.gif

b. Name two creatures that are called fish but are not fish.

Starfish, jellyfish, cuttlefish and silverfish (that insect pest that devours paper etc!).

Fishes 1 Honour: Trainer's Notes

c. Briefly describe two creatures which do not look like a typical fish but are classed as a fish.

Seahorses, Sea Dragons, Moray Eels, Rays (Sting Rays, Mantra Rays) Mud Skippers, Lung Fishes are some. We've listed just three examples.

Sea Horse genus *Hippocampus*

Hippocampus comes from the Greek *hippos* meaning 'horse' and *kampos* meaning 'sea monster'.

Seahorses are bony fish. They do not have scales, but have a thin skin stretched over a series of bony plates arranged in rings throughout their body. Their eyes can move independently of each other, much like a chameleon. They have long snouts, which they use to suck up food.

Seahorses swim upright and are poor swimmers. They are often found resting with their prehensile tails wound around a stationary object.

They eat small shrimp, tiny fish, crustaceans and plankton.

Picture: White's seahorse, also called Sydney seahorse (*Hippocampus whitei)*
http://en.wikipedia.org/wiki/File:Hippocampus_whitei_1.jpg

Leafy Sea Dragon (*Phycodurus eques*)

The lobes of skin on the leafy sea dragon grow and make it look like seaweed especially when swimming. It can also change colour to blend in, but this ability depends on its diet, age, location, and stress level.

The Leafy Sea Dragon grows to about 200–240 mm (8–10 in) and has a long, pipe-like snout that it uses to feed.

They feed on plankton and small crustaceans.
The leafy sea dragon is the official marine emblem of the state of South Australia.

Picture: Leafy Sea Dragon (*Phycodurus eques*)
http://divegallery.com/Leafy_Sea_Dragon.htm

Giant Manta Ray: (*Manta birostris)*

The Manta Ray is the largest species of the rays being up to 7.6 metres (25 ft) across and weighing up to 2.3 tonnes. They have a tail similar to stingrays, but have no stinger and thus are harmless to divers. They are related to sharks.

When Manta Rays swim, they appear to fly under the water.

They live in tropical waters usually around coral reefs.

They are bottom-feeders as well as open-ocean filter feeders. They consume plankton, fish larvae etc which are filtered from the water passing through their gills as they swim.

Picture: Giant Manta Ray (*Manta birostris*), Thailand.
http://en.wikipedia.org/wiki/File:Manta_birostris-Thailand4.jpg

Fishes 1 Honour: Trainer's Notes

REQUIREMENT 5: Describe how fish numbers are being depleted in some parts of the world and what can be done to preserve this part of God's creation.

Depletion of Fish Numbers

Based on: http://en.wikipedia.org/wiki/Fishes#Conservation

Overfishing

Overfishing is a major threat to edible fish such as cod and tuna. Overfishing eventually causes fish population to collapse because the survivors cannot produce enough young to replace those removed. Such commercial extinction does not always mean that the species is extinct; merely that it can no longer sustain a fishery. Given time without fishing, they usually recover.

Bad fishing practices

This includes using explosives to kill/stun fish or using poisons (eg cyanide). Another bad practice is bottom netting where a weighted net is dragged over the bottom, scraping and damaging everything in its path. Everything in the path of the net is captured. In some netting practices unwanted fish marine life is discarded and left to die.

Habitat destruction

A key stress on both freshwater and marine ecosystems is habitat degradation including water pollution, the building of dams and the removal of water for use by humans.

Introduction of exotic species

The introduction of exotic species of non-native species has occurred in many habitats. One of the best studied examples is the introduction of Nile Perch into Lake Victoria in the 1960s. Nile Perch gradually exterminated the lake's 500 endemic species. Some of them survive now in captive breeding programmes, but others are probably extinct.

Carp, snakeheads, tilapia, European perch, brown trout, rainbow trout, and sea lampreys are other examples of fish that have caused serious problems.

What can be done to preserve this part of God's creation?

Overfishing can be controlled by governments enforcing catch sizes, imposing fish-catching time periods and establishing 'no-fishing' zones in fish breeding and other fish-sensitive zones. Fish is an important source of food and employment for many nations. Governments are challenged to meet these demands as well as those from fisheries scientists and conservationists who push for more stringent controls.

Similarly, governments can prohibit bad fishing practices, enforce strategies to protect fish habitats and issue strict quarantine measures to restrict the introduction of harmful exotic species.

Fish farming is becoming more common and economically viable. It does reduce the reliance on wild fish stocks, but there are issues with pollution.

Another common practice is the breeding programs in fish hatcheries. Fingerlings are raised and then released into the wild.

On the personal level, it is our responsibility to take into account any actions which may cause distress to the wonderful world of fishes.

Fishes 1 Honour: Trainer's Notes

REQUIREMENT 6:

a. Give the day of the week when fishes were created.

The fish were created on the 5th day. See Genesis 1: 20 - 23

b. Tell or act out a story about fishes from the Scriptures. Give the reference where found.

Here are some stories relating to fishes. Note that we have deliberately left one well-known out. Can you identify it?

- Jesus calls the fishermen - Simon Peter, Andrew, James and John - to follow Him: *Matthew 4:18-22, Mark 1:16-20.*
- The Coin in the Fish's Mouth: *Matthew 17:24-27.*
- Jesus feeds the 5000: *John 6:5-15.*
- The huge catch of fish: *John 21:1-14.*
- The kingdom of heaven like a net which was thrown into the sea: *Matthew 13:47-50.*

REQUIREMENT 7: Do one of the following. Compile a brief report (approx 250 words)

Pathfinders love to see (and even touch) fish. Utilise whatever is available in the area. If you can, it's worthwhile doing both parts - (a) and (b). If both are done, Pathfinders only need to report on one. Use your imagination and make it FUN, but remember your duty of care! There's nothing like the real living things in God's Creation.

a. Observe fish in their natural environment.

Here are a few suggestions:

- Include this requirement with other water-based honours (ie snorkelling, scuba).
- Make it an activity, especially on Sabbath on a campout. It's surprising how many fishes can be seen if folks are quiet and observant.
- Do the '*Underwater World'* Pursuit of the South Pacific Division's '*Way to Go'* Pathfinder Program.
- Check out wharves, jetties and boardwalks. Their pylons often attract numerous fish.
- Go on a fishing trip, get a ride on a fishing trawler or other type of fishing boat.

b. Visit a place where fish are displayed. (Aquariums, pet shops, museums etc).

An advantage over Option (a) above is that more species are displayed and identified.

REQUIREMENT 8: Name five ways by which fish impact on the lives of people. Some of these must relate to people of your country or where you live.

Fish are used for:

- Food.
- Fertiliser.
- Fish oils and a base for some medicines.
- Recreation (fishing, keeping aquariums, snorkelling / scuba diving).
- Keeping reefs, waterways and oceans in balance.
- Bizarre spectator events such as wrestling in rotting fish tubs (Yuk! we couldn't resist including this one).

The fish was used by the early Christians as a symbol of Christ's followers. Fish stories and legends are found in many cultures.

Fishes 1 Honour: Trainer's Notes

REQUIREMENT 9: Identify and briefly describe ten fishes found in your country. For each include its habitat, what it eats and its breeding habits.

It is expected that those doing this honour will carry out this requirement by visiting fish in their natural habitat. Consider where fish live. Here are a few ideas:

- The open ocean
- Tidal estuaries
- The ocean shoreline
- Reefs
- Fresh water streams, rivers and lakes.

As an example, we've included Queensland Lungfish – a fascinating creature. Plus there's another member of the fishes family – the Moray Eel. There's more information than what would be expected of a young Pathfinder doing this honour.

Queensland Lungfish (*Neoceratodus forsteri)*
Based on http://en.wikipedia.org/wiki/Australian_lungfish
Picture: http://www.dpi.qld.gov.au/28_14688.htm

Description:

The Lungfish has a stout, elongated body with an eel like tail. It is brown to olive colour with a whitish belly. It is covered by rows of large scales. It has a flattened head and small eyes.

A Lungfish grows to about 1.5 m (4.9 ft) with a weight of about 43 kg (95 lb).

Adults have a high survival rate and are long-lived (at least 20–25 years).

Unlike most fish, the Lungfish has a lung-like swim bladder which is used to supplement the oxygen supply through the gills. During times of excessive activity, times of drought or high temperatures (when water becomes deoxygenated), the Lungfish can rise to the surface and swallow air into its lung. The sound of the Lungfish exhaling air at the surface prior to inhaling a fresh breath has been compared to that made by a small bellows

Habitat

The Queensland Lungfish is native only to the Mary and Burnett river systems in south-eastern Queensland. It has been successfully distributed to Queensland's more southerly rivers and dams. During the January 2011 floods, stranded Lungfish were found on the spillway of the North Pine dam which is situated just north of Brisbane.

The Queensland Lungfish is essentially a sedentary species, spending its life within a restricted area. Its home range rarely extends beyond a single pool or, occasionally, two adjacent pools.

This species lives in slow-flowing rivers and still water (including dams) that have some aquatic vegetation present on the banks. It occurs over mud, sand, or gravel bottoms and lives in small groups under submerged logs, or in underwater caves formed by the removal of substrate under tree roots on river banks. The Lungfish is tolerant of cold, but prefers waters with temperatures between 15-25 °C

It can live out of water for several days if the surface of the skin is constantly moist.

Diet and feeding habits

The Queensland Lungfish is primarily nocturnal, and is essentially carnivorous. In the wild its prey includes frogs, tadpoles, fishes, a variety of invertebrates and plant material.

Breeding habits

The age of first breeding is estimated to be 17 years for males and 22 years for females. The Lungfish does not necessarily spawn every year. A good spawning season occurs approximately once every five years, regardless of environmental conditions.

After an elaborate courtship, the Lungfish spawn in pairs, depositing large adhesive eggs amongst aquatic plants. They spawn from August until November.

The Lungfish does not make a nest and there is no guarding or parental care once it lays its eggs. When spawning does take place, the pair of fish will lie on their sides or become entwined. They usually deposit their eggs singly, occasionally in pairs, but very rarely in clusters. The male Lungfish fertilizes each egg as it emerges, and the eggs are deposited in dense aquatic vegetation.

The newly laid egg is hemispherical in shape and delicate. Each egg is approximately 3 mm in diameter and, including its jelly envelope, has a total diameter of about 10mm (0.4 in). The egg is sticky for a short while until silt and small aquatic organisms have covered it, but long enough for it to become attached to submerged vegetation. If it falls to the dam or river bed it is unlikely to survive to hatching.

The eggs hatch after 3–4 weeks and resemble tadpoles.

Moray Eels (Family *Muraenidae)*

Based on: http://en.wikipedia.org/wiki/Moray_eel

Worldwide there are about 200 species. At least 15 different species live in north-western Australia.

Description:

Despite their snake-like appearance, Moray Eels are actually fish. All Moray Eels have one long fin that extends from the head to the tail. Because it looks quite ferocious, the Moray Eel has a fearsome reputation. Roman legend tells of Nero throwing slaves into watery pits filled with Moray Eels so bored aristocrats could gain pleasure from seeing people eaten alive. In reality, Moray Eels will attack only when threatened or if they confuse a human as being easy food.

Picture: Mediterranean Moray Eel also called Roman Eel (*Muraena Helena*)
http://upload.wikimedia.org/wikipedia/commons/5/57/Muraena_helena.2_-_Aquarium_Finisterrae_edit.JPG

Most species have long, sharp canine teeth but some have low, nodular teeth. They are usually one to two metres long, though some species will reach up to three metres and 300mm (12 inches) in diameter. The colour varies from black to brownish-yellow with a pale underside.

Fishes 1 Honour: Trainer's Notes

Habitat:
As Moray Eels tend to be shy, they like places where they can hide and which provide a certain amount of darkness. Thus they are found in coastal reefs, small crevices, ship wrecks, and rocks. Moray Eels are attracted to coastal waters given their shallow depth; however, some of the larger Moray Eels species live in deeper waters.

Moray Eels like warmer waters such as the tropical oceans of the Indo-Pacific Oceans. For instance they are very common in marine parks such as the Great Barrier Reef of Queensland and the Rowley Shoals Marine Park of Western Australia. Some Moray Eels also require waters of varying salinity levels; brackish and even fresh water. All Moray Eels cannot survive in fresh water for a prolonged period of time.

Diet and feeding habits:
Moray Eels have poor eyesight but a highly developed sense of smell. They rarely venture far from the crevices in which they live and feed by concealing themselves in the reef and waiting for an unwary meal to swim by. Morays with long, canine teeth feed mainly on fish, and occasionally on octopuses and crustaceans. Other species with blunt, crushing teeth prey principally on crustaceans, especially crabs. Moray Eels can tie their bodies into knots to anchor themselves when tearing at food.

Behaviour:
Individuals nearly always have their mouth open, and appear ready to bite. In fact, the mouth is open to allow water to pass through the gills, enabling them to breathe.

Picture: Fimbriated Moray Eel (*Gymnothorax fimbriatus*)
http://en.wikipedia.org/wiki/File:Gymnothorax_fimbriatus.JPG

Breeding habits:
When courting, Moray Eels open their mouths very wide, then they wrap their bodies around each other for hours. They do not separate until the female has laid her eggs and the male has fertilised them. Once hatched, all eels go through a larval phase (known as a leptocephalus) as juveniles, in which they form part of the plankton.

How you can protect moray eels:
To avoid accidentally bumping into (or venturing too close to an eel they have not seen), divers should always maintain proper buoyancy so they are swimming just above the reef. This helps safeguard the diver from an attack by an eel. It also protects delicate corals. Spearing these animals is a sure way to have a very annoyed Moray Eel attached to your leg. Feeding eels is strongly discouraged, as it has the potential to make eels seeking food aggressive towards divers.

Fishes 1 Honour: Trainer's Notes

ADDITIONAL REFERENCES

General

http://fishindex.blogspot.com/

http://www.bukisa.com/articles/364793_fish-extremes-extraordinary-facts-you-want-to-know-about-fishes

Website dedicated to Moray Eels:
http://www.morayeel.info/

Australia

Australian Museum:
http://australianmuseum.net.au/Find-a-fish

http://saltaquarium.about.com/gi/o.htm?zi=1/XJ&zTi=1&sdn=saltaquarium&cdn=homegarden&tm=30&gps=580_367_1916_844&f=00&tt=14&bt=0&bts=1&zu=http%3A//www.amonline.net.au/fishes/fishfacts/index.htm

Fishes of Australia: http://foa.webboy.net/

Guide to Sea Fishes of Australia. Rudie H Kuiter, New Holland Publishers, 2009

New South Wales Government Fisheries Department
http://www.dpi.nsw.gov.au/fisheries/recreational/saltwater/sw-species