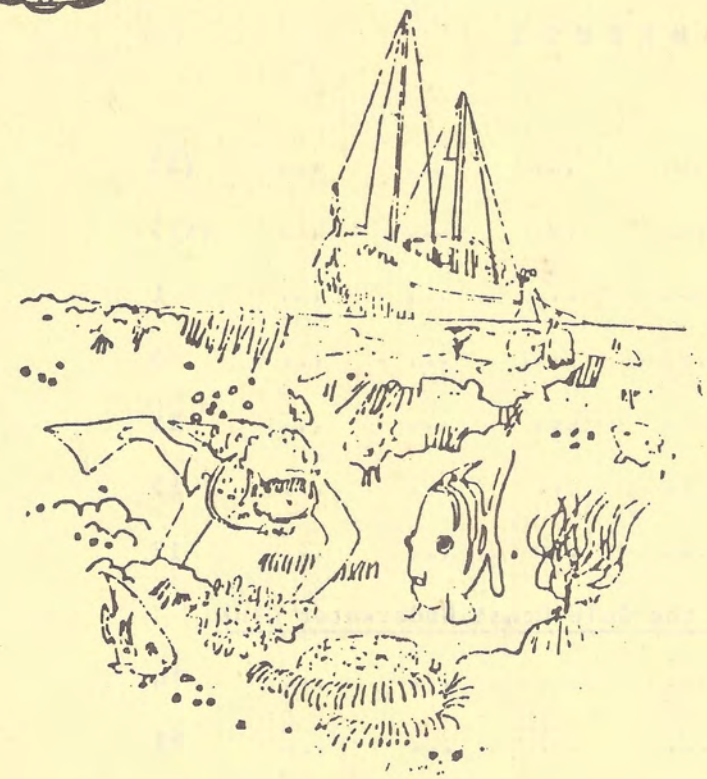
BRISBANE SOUTH MARINE STUDIES PROJECT



MARINE STUDIES SERIES

UNIT 2

SNORKELLING

written by

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The following Notes are taken from the Gold Coast Underwater Club

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SNORKELLING

Developed by R. D. Moffatt

for

The Brisbane South Regional Marine Studies Project

First Draft August 1985

Acknowledgements

The Project would like to thank the Gold Coast Underwater Club for allowing us to reproduce its training notes in First Aid section and Dr. Rex Neale for his support and advice to the Project.

Notes

This set of notes is a collection of articles. For a complete programme, consult the SEA Note book to see a complete course. The notes are also seen as an evolution to two separate courses- one SCUBA the other SNORKELLING. The notes at present contain a mixture of the two.

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WHY STUDY THIS UNIT

A study of snorkeling affords an opportunity for students to study two Syllabus Topics of the Multistrand Science Course. It also gets students into the water so that the study of marine life becomes more real. On excursions they can then become more involved with the sea so as to appreciate its beauty.

PERSONAL HEALTH

Consistent with the aim to prepare students for intelligent adult living, students should become aware of and understand their own bodies. To do this, they need a knowledge of the structure and the activity of the himan body in good health, and an awareness of possible impairment by disease, personal abuse and accident. Students should recognise their role in, and develop a responsible attitude to, the development and maintenance of good physical, mental and social health.

Schools are to select and study those systems which they consider most relevant to the above. The topic is not intended to provide a comprehensive survey of all physiological systems of the human body, but should lead to an understanding of a few selected systems.

A traditional descriptive approach to each selected system would probably provide less meaning, interest and future use for students than some form of an applied approach. *Examples* of this applied approach may include a first aid course; case studies of common diseases associated with poor nutrition, drugs, smoking, lack of exercise. Teachers may well think of other suitable ways to develop the topic.

BOSSS Draft Syllabus 1982

SCIENCE FOR RECREATION

One consequence of the rapid growth in the use of technology in our society is the increase of leisure time available. The demand for education in the sensible use of this leisure time provides a challenge to schools. Schools have the opportunity, indeed the responsibility, to provide a balanced curriculum which pays due attention to the development of potential recreational activities. The concept of this core topic is to encourage an appreciation of the role of science and scientific methods in recreational pursuits.

Four major areas of development - Reading, Electronic Media, Projects or Hobbies and Survival Techniques - are seen to make a special contribution to this topic. The school program should contribute to *at least one* of these four areas. Each area contains *suggestions* for development. These suggestions are not prescribed but are merely possible avenues of development and could be replaced by alternative subject matter. These four areas are deliberately kept broad to enable extensive variation in interpretation. The main thrust should be the development of processes, attitudes and skills which can be pursued beyond the immediate school days and which offer an opportunity for continued development.

BOSSS Draft Syllabus 1982

Diving Techniques

Resources: 1. Unit 9 Notes on Diving, B.S.M.S.P.
2. Unit 2 Notes on Snorkelling, B.S.M.S.P.

Objectives: You should be able to.....	Resource
1C. Recall the following basic requirements of safe snorkelling	P 6-7
2C. Recall the golden rules of diving	P 59,68
3C. Recall basic snorkelling gear (Wet suit, Mask, Snorkel, etc)	Demo.
4P. Predict common problems that may occur with snorkelling gear	Notes
5P. Discuss safety and general first aid proceedures	P 74
6S. Demonstrate general first aid and safety proceedures	P 74
7C. Recall First aid and rescue proceedures	T.Notes
8C. Recall safe ways to enter and leave a boat	T.Notes
9P. Predict dangerous snorkelling situations for a local area	T.Notes
10C. Recall dangerous snorkelling situations caused by *Currents *Waves *Tides *Rocks and Coral *Caves	Teacher Notes
11S. Go snorkelling in a pool. As a result of this activity students should be able to: *Adjust a face mask, wet suit, snorkel, flippers *Clear ears, mask under water *Fin with head down for the length of a pool *Retrieve an object from the bottom of a pool *Talk while treading water *Rescue a patient from water *Write your name under water *Demonstrate how to retreive a patient from the water *Demonstrate E.A.R, E.C.C *Assess a patient's condition	Local Pool Double Period

Dangerous Marine Life

Resources: 1. Unit 8 Notes on Diving B.S.M.S.P.
2. Slide set: Dangerous Marine Life and Booklet by S.L.S.A.

Objectives: You should be able to.....		Resource
1.C	List the general first aid procedures for injuries involving dangerous marine life	P74,75,76,77
2.C	Recall the definition of Medical Aid	P78
3.C	Make up a chart of dangerous marine life	P78/79
4.C	List the dangerous marine life that bites or cuts and the first aid procedures for each	P 80
5C	List the dangerous marine life that is venomous(stings) and describe the first aid for each	P 81/82/83
6P	Describe the safety precautions for a. Sea snakes b. Cone Shells c.Blue ringed octopus d. Stonefish e. Butterfly Cod f. Stingray g. Crown of thorns h. Sea Urchin i. Sea wasp j. Portugese man of war k. Sea anemone l. Stinging hydroid, Fire Coral, Coral ,m. Shark	P81-83 P 83 P 83
7P	Write an assignment of 600 words on one of the marine organisms mentioned above; Discuss such things as (a) Common Marine Habitats (Facts about the life of this particular Marine organism) (b) Safety precautions when diving/snorkelling in their presence (c) the life cycle of the Marine Organism (d) Common Marine Habitats (e) Safety	
8C	You should be able to spell and know the meaning of the following words SHOCK OXYGENATED BLOOD ABC EAR ECC(ECM(RECOMPRESSIONS DECOMPRESSIONS CONSTRICTIONS TOURNIQUET NEMATOCYST BARRACUDA MOLLUSC IMMOBILIZATION VENEMOUS	

Snorkelling Physiology

Resources: 1. Unit 8 Notes on Diving.
2. Models and charts of ear, eye, heart and lungs
3. Videos on Physiology

Objectives: You should be able to.....	Resource
1C. Recall the structures of the following organs *Ear, Nose and Throat *Teeth and lungs *Eustachian Tube *Heart/Lungs schematic diagram *Digestive system	P52/57 Teacher Notes P45/46/48
2C. Draw a fully illustrated diagram of the Ear	Teacher Notes
3C. Draw a fully labelled diagram of the heart/lung system	
4C. Recall the chemical effects inside the body that affect cause nitrogen narcosis/skin cancer and	Teacher
5C. Recall the effects that animal toxins have on the chemical system: Jelly fish, blue ringed octopus,coral, cone shell	Notes
6P. Present arguments in support of preventative action against skin cancer, heart attack, being stung by dangerous animals	Teacher Notes
7C. Recall and demonstrate on excursions, good health habits in relation to 6 above	
8S. You should be able to use a resuscitation manikin. As a result of this activity you should be able to: (a) Demonstrate mouth to mouth, mouth to nose (b) Demonstrate external cardiac compression (c) Identify the various parts of the manikin	Phys Ed Manikin
9A. Realise that snorkelling is a demanding sport and that there is a need to keep physically fit and maintain a good diet	

Practical Tests:

All tests will be conducted in open water by a qualified instructor or instructor of higher grade. Students must use a snorkel, mask and fins.

1. Demonstrate neutral buoyancy

2. Swim 15 metres underwater

3. Swim 50 metres on the surface without a mask, using a snorkel

4. Clear a flooded mask underwater

5. Swim 50 metres and dive to recover an "Unconscious ", snorkel diver lying at a depth of 3 metres.

6. Tow a patient 25 metres applying simulated expired air resuscitation and then remove the patient from the water. Continue with resuscitation and simulated external cardiac massage. Show action for:

   (a) regurgitation of food or fluid, and place

   (b) patient in recovery(coma) position.

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The Open Sea and Snorkelling

Resources: Unit 8 Notes "Diving", B.S.M.S.P.

Objectives: You should be able to.....		Resource
1P.	Discuss the advantages and disadvantages of wreck diving	P 84
2P.	Discuss the safety equipment necessary for small boats going offshore in Queensland Waters	P 85
3P.	Discuss in general terms, remembering that this will be done later in the course, the importance of:	
	(a) Weather	
	(b) Tides	
	(c) Charts	
	(d) General Rules of the road	P 86
4P.	Discuss the nature of the sea itself in relation to	
	(a) The international divers flag	P 87
	(b) Preparing for a dive	
	(c) Visibility	
	(d) Tides and currents	P 88
	(e) Rough weather	
	(f) Warnings on swell conditions and tide changes	P 89
	(g) Hints on boating generally	P 90
	(h) Some additional safety rules	P 91

Certificates/Practical Examinations

Resources: A.U.W.F. Diving Booklet (Cost $3.00)

Snorkelling Qualifications/Certificates

All students should endeavor to obtain the Australian National Qualification System, "Record of Diving Qualifications" book. $3.00

The standards contained in this booklet are those approved by the Australian Coaching Council for the National Coaching Accredition Scheme.

Standards in SCUBA Diving are controlled by Australian Government leglislation and if you keep this booklet and go further with your diving you may:

(a) Purchase SCUBA Diving equipment
(b) Fill your SCUBA tank anywhere in the world from a commercial filling agent.

The examination for the snorkel diver is the same as the booklet:

Pre-requisites:

1. Age limit 10 years
2. The student must be medically fit for strenuous water sport activities.

Preliminary Swimming Test

Swim 200 metres without swimming aids and without stopping. At the end of the swim, tread water for one minute with one hand out of the water.

Theory Test

Students must satisfactorily pass a written examination on the following topics:

Anoxia, hyperventilation, carbon dioxide build up, exhaustion, hypothermia, Safety regulations, Actions in emergencies, Equipment.

SNORKELING

PRACTICAL EXERCISES

1. Bouyancy
2. Diving
3. Signaling
4. Life Saving
5. Dissection of Vertebrate

STUDY ASSIGNMENTS

1. History of Diving
2. The Physiology of Nitrogen Narcosis
3. Underwater Cities
4. Costs of Diving
5. Diving Safety Chart
6. Dangerous Marine Animals
7. Animal Toxins
8. Swimmer's Ear, Punctured Lungs.
9. Design posters for Primary School Students/Parents on sun cancer

PERSONAL HEALTH

SNORKELING PHYSIOLOGY

Cardio vascular system

Respiratory system

Structure of Ear, Eye, Nose, Skin

Psychological systems

Chemical systems - sea sickness, skin cancer, the bends.

- effects of toxins on body

DIRECTED TOPICS

1. Knowledge of 2 Body Systems and 4 Body Organs
2. Chemical Systems and Snorkeling
3. Diseases from Snorkeling
4. Good Health Habits for Snorkeling

AUDIO VISUAL

1. Films by Jacques Cousteau
2. Underwater Charts on Bathyscapes, Old Diving Vessels
3. Films by Local Dive Clubs

PRACTICAL ACTIVITIES

1. Bouyancy
2. Clearing Mask
3. Finning, Diving
4. Compensating Ear Pressures
5. Dolphin Snorkel
6. Treading Water
7. Writing Underwater
8. Working Underwater
9. Underwater Hockey
10. Boyles Law

STUDY ASSIGNMENTS

1. History of Diving
2. Diving Wrecks
3. Photography Album

SCIENCE FOR RECREATION

A. *READING*

Diving Magazines
History of Diving

B. *ELECTRONIC MEDIA*

Watching Television Programmes on Diving

C. *PROJECTS/HOBBIES*

Underwater photography

D. *SURVIVAL TECHNIQUES*

Snorkeling/Diving Trip to uninhabited island/reef

DIRECTED TOPICS

1. Snorkeling Certificate
2. Underwater Hockey

AUDIO VISUAL

1. Local Dive Club Films
2. Films by Cousteau

CONTENT: The Student should have knowledge of:

a) Snorkeling gear (face mask, snorkel, spriggot, weight belt, wetsuit, fins, draftmans paper, underwater tools, scabard, knife.

b) Safety procedures (hyperventillating, signalling, dan buoy, diving flag, safe ways to enter and leave a boat.

c) Dangerous snorkeling situations - currents, drowning, waves, caves, walking over coral or barnacles.

d) Dangerous marine organisms (sharks, rays, coneshells, sea-fans, octopus, corals, etc).

e) First aid and rescue procedures (coral cut, invertebrate strings, over-exposure, sunburn.

PROCESS: The student should be able to:

a) Predict faults with snorkeling gear.

b) Discuss safety and first aid procedures.

c) Predict dangerous situations for a local area.

SKILL: The student should be able to:

a) Adjust and clear face mask and fit flippers (and wet suit optional).

b) Clear ears.

c) Signal messages (OK, Distress, Danger, Stop, OK)

d) Snorkel the width of the pool.

e) Dive to a depth of 2m.

f) Talk while treading water.

g) Demonstrate first aid and safety procedures.

ATTITUDE: Students should exhibit confidence and safe behaviour in water.

OBJECTIVE STATEMENT (TEACHER/STUDENT)

PERSONAL HEALTH:

CONTENT: The student should have knowledge of:

a) The structure and function of the cardio vascular and respiratory systems as well as knowledge of eye, ear, nose and skin.

b) 1. Chemical effects inside the body that affect/cause nitrogen narcosis, skin cancer, sea sickness.
2. Animal toxins that affect the chemical system: jellyfish, octopus, cone shells, coral

c) Sun and skin cancer, lung cancer, blood pressure.

d) Good health habits to prevent sun and lung cancer, and high blood pressure.

PROCESS: The student should be able to:

a) Relate high blood pressure to changes in blood vascular system, respiratory complaints to lung cancer, changes in moles and spots, sun cancers, pain, swelling and shock to the effect of toxins.

b) Propose good health habits to alleviate (a) above.

c) Present argument in support of preventative action against heartattack, skin cancer, lung cancer, being stung by dangerour marine organisms.

SKILL: The student should be able to:

a) Locate the heart and lungs in a toad or rat dissection and relate these to the human body.

b) Apply mouth/mouth resuscitation, rescue a person by swimming 100m (without fins) and 400m (with fins), treat a person for coral cuts, jellyfish stings and/or other toxins.

AFFECTIVE: The student should have the opportunity to:

a) Visit the Gold/Sunshine /Barrier Reef Coasts to appreciate the complexity and beauty of the human body.

b) Realize that snorkeling is a demanding sport and the need to keep fit and maintain a good diet for personal health.

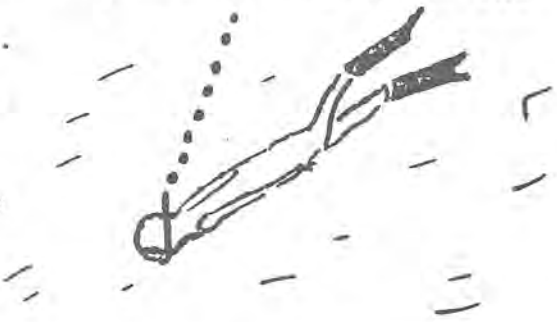
c) Experience the difficulties in working underwater.

CHAPTER 1.

INTRODUCTION

1.1 *From the Deep*

Fifty Metres out and two strange looking creatures surface and swim slowly towards the beach. Their skin is covered with a shiny black coat and strange tubes poke out of their heads. The water splashes around their feet and they move uneasily in the surf. They reach the edge of the beach and are met by two companions.



"What's the water like?" they ask eagerly. "Wonderful," comes a spluttered reply. "We've never seen so much life on the reef. It's teeming with fish. You'd better hurry up. There's only an hour left before the tide turns."

This scene is common enough these days. Snorkeling and Diving are growing sports. However, anyone watching this scene could ask themselves, What makes people dive; the water looks so cold. Why on earth would anyone want to swim underwater?

1.2 *Why People Go Under Water*

Many peoples' jobs are underwater. *The Diver* on an oil platform welds huge steel plates together to hold up the Rig. A *Salvage Diver* works to recover valuable articles from ship wrecks. A *Navy Diver* checks out the superstructure of a destroyer for damage. A *Pearl Diver* off the West Coast of Australia plucks clam shells off the ocean floor hoping one will contain a valuable treasure.

To others underwater swimming is a fast growing sport and is not a bad way of spending a weekend in the hot Australian Summer. To the *Marine Biologist*, a dive provides him the opportunity to study marine life in its natural state.

The sea bed is still largely untouched by man. The only signs that he has been around are wrecks and rubbish that he has dumped there. The creatures of the sea are a lot different than on land; many are extremely beautiful, some are dangerous, but most are harmless.

In this unit you will learn how to get around the waters edge. We are concerned with diving with a *SURFACE BREATHING TUBE (SNORKEL)* and not with *self contained underwater breathing apparatus (SCUBA)*. It concerns itself with those new to diving who are anxious to learn the basic facts about the sport and all that goes with it.

CHAPTER 2.

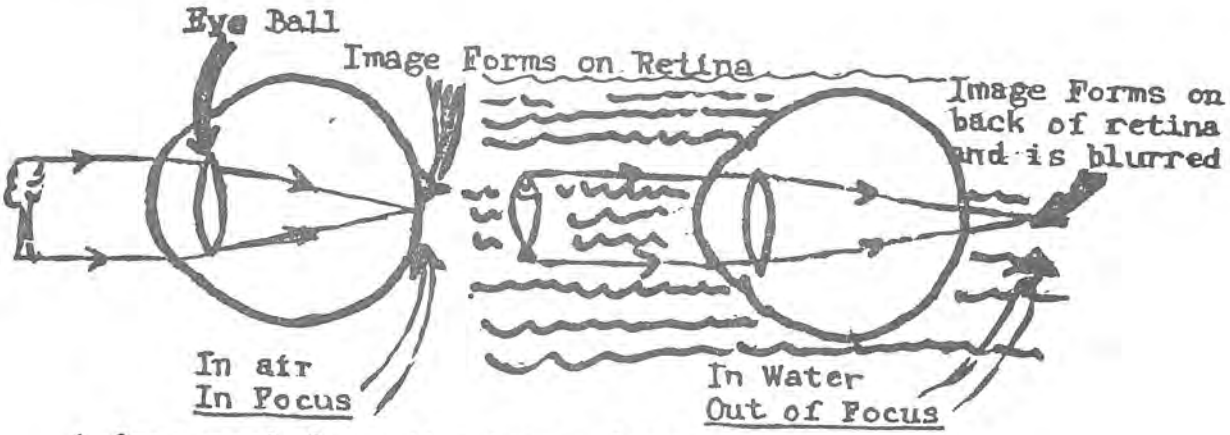
USING YOUR EQUIPMENT

2.1 *About your Gear*

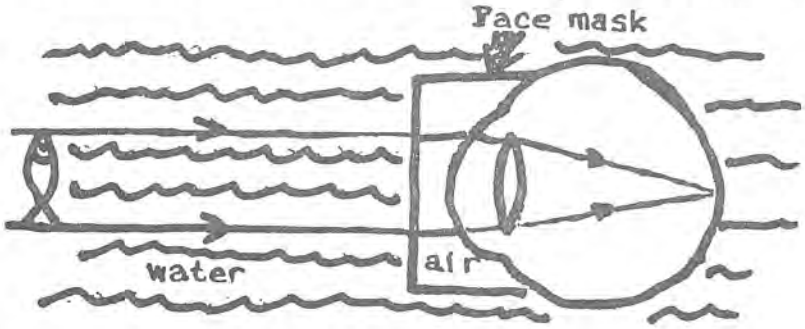
A surface swimmer is at a considerable disadvantage. He has to use his arms and legs to get about in the water and has to lift his head every time he wants to take a breath. When he wants to look under water he can't see far and it's all blurred. The gear for snorkeling is designed to help you swim, breathe and see better in the water. What then will help you do this?

2.2 *All the better to see you with My Dear!*

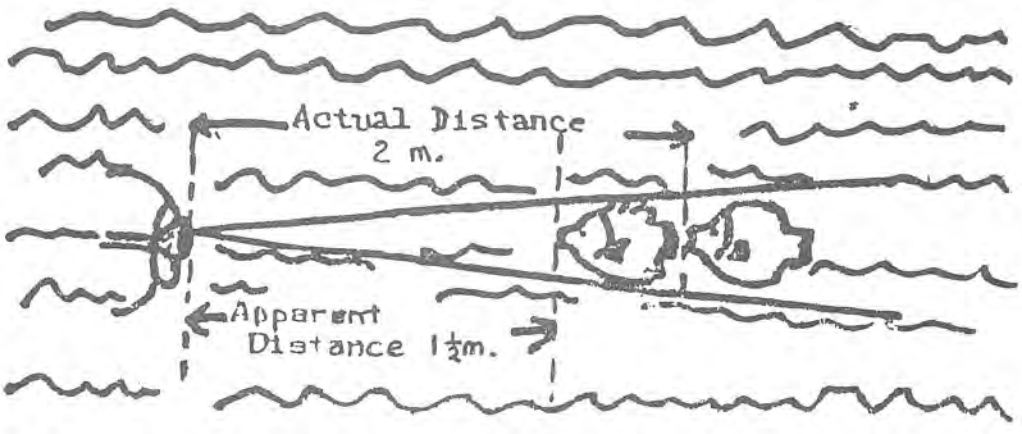
Our eyes are not suited to looking underwater and it is only by using a face mask, and exposing our eyes to air, can we see properly



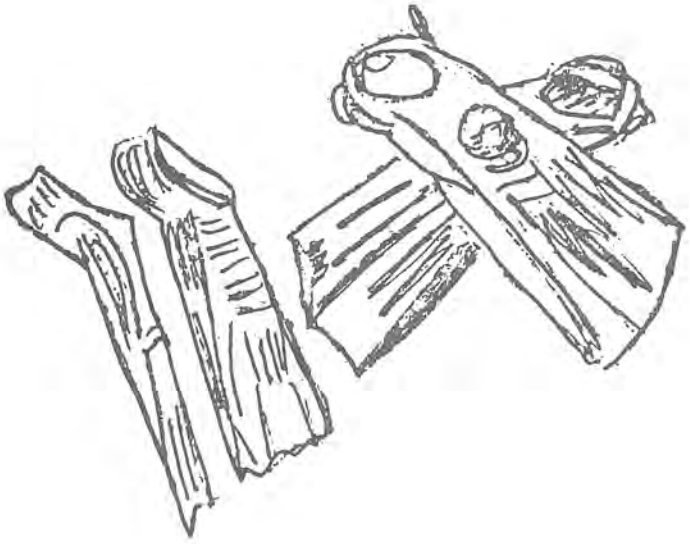
A face mask lets the image focus on the retina



Your face mask however will play tricks on you. Water has a magnifying effect. Things seen through a face mask under water are about a third bigger than they really are. Things also appear closer



2.4 Fins



These are designed to help you swim faster so that you don't get puffed out. They are made of rubber and have either a solid shoe or one adjustable strap.

2.5 Using your Gear

To properly test and become familiar with your gear, it's best to start in the pool. Make sure you have another swimmer in the pool near by - just in case.

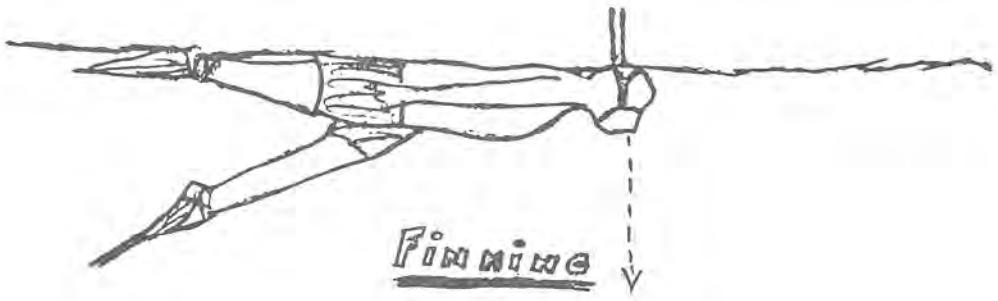
First start with your flippers. Its best to wet your feet and flippers first before putting them on.

Now have a go with your face mask. You don't have to have a tight fit - adjust it so that it fits comfortably. It's best if you get used to breathing through your mouth on land before trying ti out in water. When you feel confident, try the snorkel. The spriggots are clenched between the teeth and the tube is adjusted so that when your head is down, it points directly upwards. Don't forget to spit into your mask first and and then wash it out. This stops fogging.

When you have all this mastered you are ready for Finning.

The correct finning action starts from the hips and consists of alternating up and down movements of the legs and feet.

The whole leg moves from the hip down but is kept fairly straight with a slight flexing at the knees.

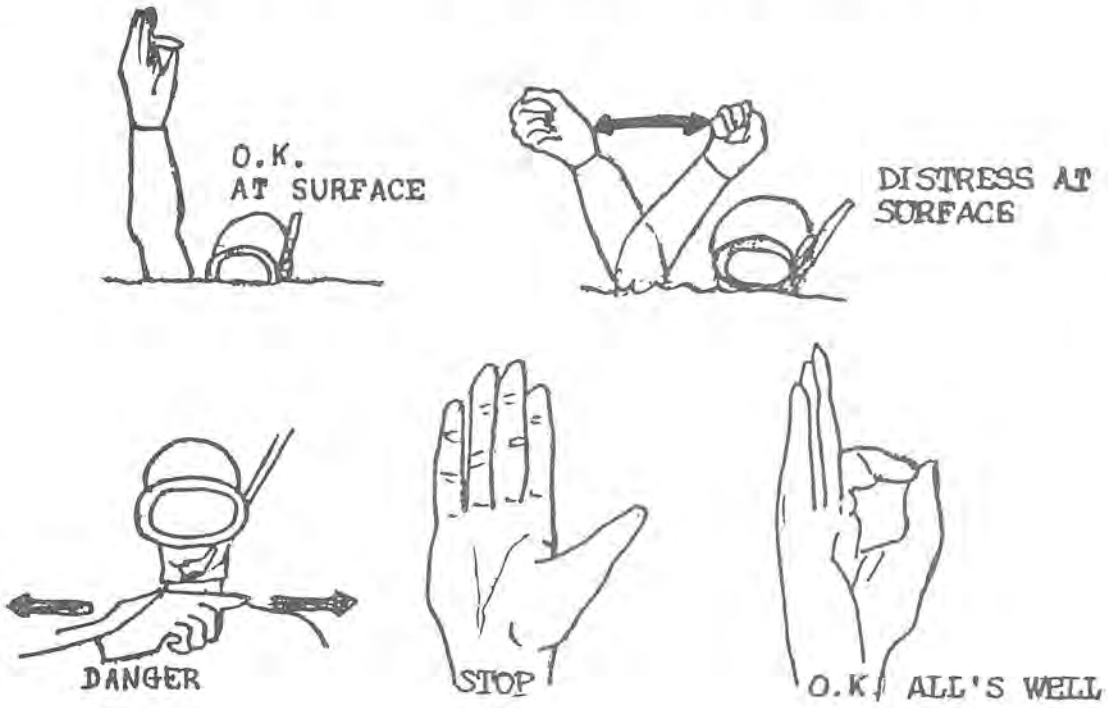


ABOVE ALL YOU MUST REALIZE that when you dive under water, your snorkel will fill up with water. On surfacing, you must get rid of this water by having enough air left to blow it out. You'll probably come out spluttering the first few times but don't worry, it will soon become 2nd nature to you.

2.7 *Some Safety Hints*

BEFORE GOING OUT into the Sea its best to know a few of the common hand signals so that you need not pull your snorkel out of your mouth every time you wish to talk.

Some of these are shown in Fig. 10 below.



ENTERING THE WATER can be a hazard especially if you are on a rocky slope. *"Check the area out"* for the best possible entry. Look at the rocks for dangerous objects and make a plan of entry. Avoid rocks with sharp barnacles and areas where waves crash on rocks. NEVER SNORKEL AROUND ROCKS IN HEAVY SURF. From a boat is relatively easy however look around first. Don't dive in and watch any loose ropes inside the boat. DON'T CLIMB DOWN LADDERS with flippers, get your face mask and snorkel in position and put your flippers on in the water. When you get into a boat, take your flippers off in the water and toss them into the boat and then climb in. NEVER DIVE HEAD FIRST INTO THE WATER while wearing a mask.

The length of time you can stay under water depends on many factors. Body temperature, water temperature, physical fitness are but a few. The desire to breath is caused by carbon dioxide build up in the lungs. This desire can be reduced by taking deep breaths in quick succession - This lessons the amount of carbon dioxide and is called *HYPERVENTILATION*. It is practiced by many spear fishermen so that they can stay underwater longer. By *HYPERVENTILATING* they no longer have natures safety valve. IT'S A DANGEROUS THING TO DO. If you don't breath in when your body wants more oxygen, it can cause you to blackout!!

3. *PRACTICAL EXERCISES*

ON LAND EXERCISES

(a) Exercise 1 - Hold your nose and breath through your mouth for 30 seconds.

(b) Exercise 2 - Put on a face mask and breath through your mouth for 30 seconds.

(c) Exercise 3 - Put on a face mask, snorkel and breath through the snorkel for 30 seconds.

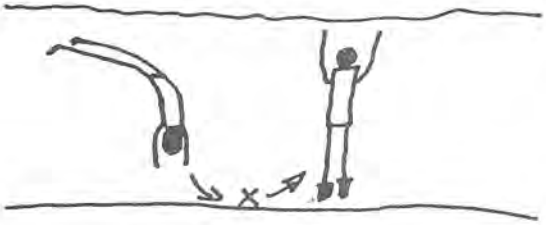
WATER EXERCISES — If your mask gets cloudy - spit in it -

(a) Exercise 1 - Finning

* Enter the water
* Snorkel the width of the pool.

(b) Exercise 2 - The Dive

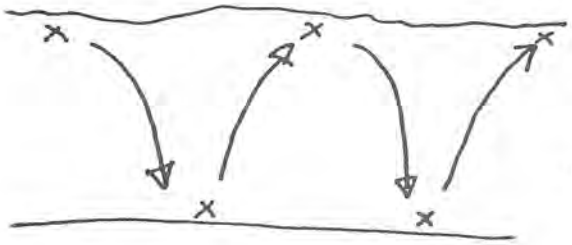
* Enter the water
* Surface snorkel and dive to recover a rock.
* Surface and exhail the water trapped in the snorkel.



(c) Exercise 3 - The Porpoise (OPTIONAL)

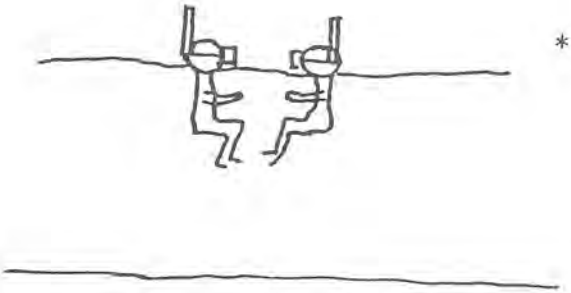
Surface

* Snorkel
* Dive, surface, exhail
* Surface snorkel
* Dive, surface



(d) Exercise 4 - The Talking Jellyfish

* Float with snorkel and face mask on head.
* Tread water for 30 seconds and tell your neighbour your name and when you were born and say Susy says slimy sharks see.



(e) Exercise 5 - The Shakespeare

* Dive down
* Copy onto a special board a poem written on the bottom of the pool.

CHAPTER 3.

SNORKELING PHYSIOLOGY

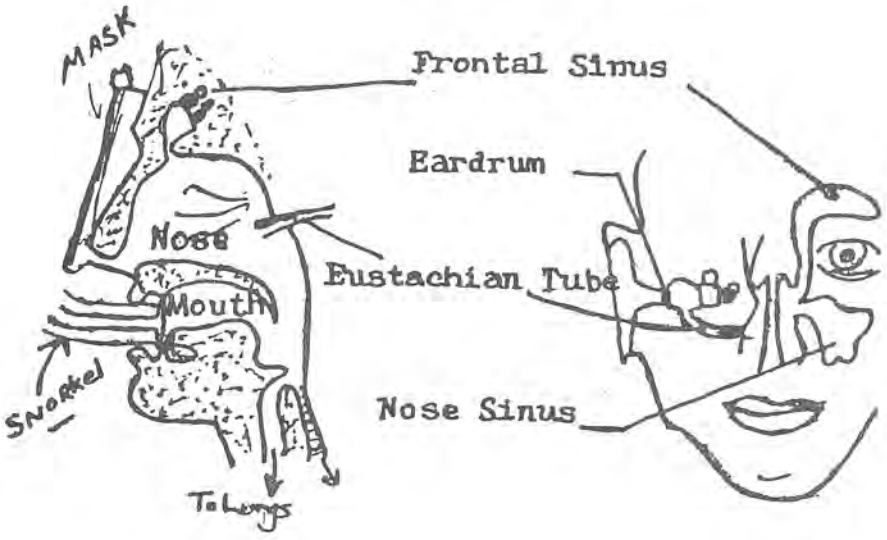
3.1 *Equal Pressure*

As you swim down, even if it is to a depth of the deep end of the pool there are two important things to do.

1. *Equalise the pressure between inside and outside your facemask.*

As you dive deeper the pressure in the outside of your mask will increase. If this is not corrected then eventually this would push the face plate into your eye. To avoid this, you need only to breathe gently into your mask through your nose. This will increase the pressure inside and balance it outside.

Snorkeling Physiology



2. *Equalise the pressure inside or outside your eardrum.*

Secondly, you may feel pain in your ears as you dive down. This is because the pressure on the outside of your eardrum is greater than the pressure inside. This can be fixed up by allowing air from your lungs to pass into your middle ear through your *Eustachian* (U-Station) tube. This makes the pressures on both sides of your eardrum the same and stops the pain.

3.2 *Pinch and Blow!!*

You can do this by using the *Compensator*. Pinch your nose and blow until your ears pop. Another way is to swallow hard. Chewing gum an hour before snorkelling also helps clear the *Eustachian Tube*. It is necessary to clear your ears whenever you dive down. If you feel a pain this means that you have gone too

3.5 *Hot and Cold*

Also watch out for sunburn while snorkling and down at the water's edge. Find a good waterproof sunburn cream and use it every time in the Queensland sun. You can also wear a tight fitting shirt underwater and don't forget the back of your legs when finning.

In cold weather a rubber wet suit is terrific but if you can't afford it, a tight fitting jumper is not bad. The idea is to get a layer of water close to the skin which can be warmed up. If you get too cold you will get cramps or suffer from exposure.

LEARNED SO FAR

* when diving underwater you must equalize pressure in your mask and ears.
* never dive underwater if your sinuses cannot be cleared.
* never use ear plugs underwater.
* never hyperventilate or compete to see how long you can stay under water.
* use a sunburn cream in hot weather and a wet suit or similar protector in cold.

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1. *REVIEW EXERCISES*

1. Name the following parts on a set of snorkeling gear : mouth piece, glass window, snorkel clip, face mask strap, adjustment points for (flippers, face mask, snorkel).
2. What are compensators in the face mask used for? Why are they important?
3. What can happen if your face mask and flippers are too tight?
4. Why should you be able to talk while floating?
5. Why is it necessary to be able to draw under water?

LAB EXERCISE 1

WATER DENSITY AND TEMPERATURE

This activity has two objectives : 1) to discover whether salt water is heavier or lighter (higher or lower density) than fresh water, and : 2) to discover whether warm water is heavier or lighter than cool water.

MATERIALS

two flat and rimmed flasks
food coloring and table salt
3 x 5 cards
plastic dishpan

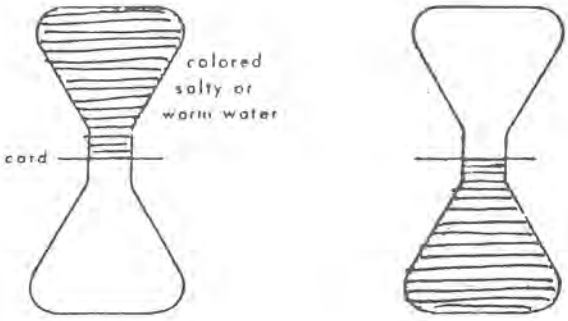
PROCEDURE

A. Is salt water heavier or lighter than fresh water?

1. Fill both bottles with fresh water. Dissolve ½ teaspoon of salt in one bottle and add a drop of food coloring. Place a 3 x 5 card on top of the salt water bottle and carefully invert it; upward pressure of air will hold card in place. (Do this over dishpan, just in case!)
2. Place the salt water bottle on top of the fresh water container. Have someone carefully remove the card, and observe.
3. Next, repeat the experiment, but place the bottle of fresh water on top and remove the card. Observe.
4. Repeat again except hold the flasks horizontally and remove the card.

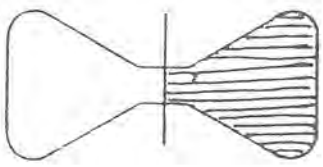
B. Is warm water heavier or lighter than cool water?

1. Fill one bottle with warm water and the other with cool water. Add a drop of food coloring to warm water.
2. Do the same variations as in the last experiment (hot water on top, on the bottom and horizontally).



QUESTIONS

1. Is salt water heavier or lighter (higher or lower density) than fresh water?
2. What happens to river water when it flows into the ocean?
3. Is warm water heavier or lighter than cool water?



4. Where, in the world's oceans, might these factors be noticed? Where does heating take place? Where does the most dilution of seawater occur ?
5. It is easier for a human to swim in salty or fresh water? In cool or warm water?

GENERAL FIRST AID

DIVING ACCIDENTS

1. The Urgent And Over-Riding First Action in all first aid at sea or ashore is to keep the patient alive, by ensuring a supply of oxygen to the brain.

2. All else is secondary - injuries can be dealt with after the brain is assured of a constant supply of oxygen.

   This is achieved by ABC:

   A = Airways
   B = Breathing
   C = Circulation

3. Remember brain damage occurs after the brain is starved of oxygen for 3 minutes some authorities quote 4 minutes. No longer period is quoted. Some quote 2 minutes.

4. Oxygen is sent to the brain, and through the body by the circulation of the blood. The blood obtains the oxygen from the air in the lungs. See that air flows to the lungs and that the heart pumps the blood.

5. If blood is spurting from a severed artery this must be stopped immediately by direct pressure first. If the blood is spurting you know the heart is working.

6. The blood is the only carrier of oxygen to the brain. Every drop is precious.

7. SHOCK is loss of effective circulation blood volume. So treat shock urgently by:

   1. Stopping blood loss YSP arterial bleeding
   2. Getting the blood flowing again from the dilated blood vessels, in the body.

8. After the brain is getting oxygenated blood, then treat injuries and obtain medical aid.

9. It is earnestly recommended that divers undergo the first aid course of St John Ambulance Association through OATB.

ASSISTANCE AVAILABLE

1. Medical

Doctors:

Your Club Doctors - Dr Terry McGrath 32 1822
Dr Wes Fowler 32 1344

Ambulance:

Always know where your nearest ambulance station is. Find the numbers inside the front cover of the telephone book. To keep yourself up to date, students, check your telephone books and insert locations and numbers here:

2. Urgencies:

Ring 000 ... no coins needed.

Ring 013 ... no coins needed. (Directory Assistance)

Both numbers apply throughout Australia. In some locations 000 is not available but 013 is. Tell operator your problem. She will assist you.

3. Recompressions:

The nearest recompression chamber to Queensland is at the R.A.N. Base in Sydney, N.S.W. If you ring them they will organize R.A.A.F transport. It would be advisable, especially if doubtful, before starting this interstate drama, to check with your club Doctor or president first.

SYDNEY

The R.A.N. particulars are:

Medical Officer in Charge
School of Underwater Medicine
H.M.A.S. Penguin
BALMORAL NSW 2091

Duty Diving Officer (at the same address)

Telephone: (02) 960 0321 Diving Centre
960 0333 Doctor
960 0444 Main Gate

TOWNSVILLE:

A Recompression Chamber is available.
Ring Townsville General Hospital: (077) 819211

4. Decompression

In Decompression emergencies it is good to warn doctor at H.M.A.S. Penguin or Townsville general hospital but the drill is to get patient to a hospital, or to a diving doctor, who can speak professionally to doctor at H.M.A.S. Penguin, or townsville hospital thus give more information to go on before ordering an R.A.F. aircraft.

DANGEROUS MARINE LIFE

1. FIRST AID IN ALL CASES

1.1 Remove patient from the cause or cause from the patient.

1.2 Lay patient down to rest patient and maintain blood supply to brain.

1.3 Give reassurance: "Unconscious" patient may hear.

1.4 Constrictions:
For venomous bites and stings. Do not use tourniquets for venoumous bites and stings. Do use constrictive bandages with limb immobilization.

But only for Sea Snake bite, Blue Ringed Octopus and Conus Shell stings.

For Arterial Bleeding:
Direct pressure with hands or pads and bandages.
Elevate bleeding limb.
For otherwise uncontrollable bleeding use tourniquets.

1.5 Pain:
Use such pain killers as:
Aspirin - Lignocaine - Paracetemol - Betnovate Gel - Local Anaesthetic.

1.6 Do not leave patient unattended.

1.7 Treat for shock.

1.8 Seek medical aid.

2. MEDICAL AID

Medical aid means aid from ambulance:
Doctor:
Hospital:
From Boat:
Radio for Helicopter:
Or Ambulance to meet at shore:
Telephone: Know number of local ambulance or hospital.
Urgency and no coins needed 000 or 013.

3. CONSTRICTIVE BANDAGES AND TOURNIQUETS

Medical advice on the use differs even in the latest text-books. (1981). In this course we follow the advice in these matters of

Dr. S. K. Sutherland of C.S.L. Melbourne.

IF INJURED - FIRST AID	Get patient from cause or cause from patient. If necessary, ABC and treat shock. "C" includes stop arterial bleeding. Leave patient in wet suit. Seek medical Aid, which is usually an Ambulance. If no Ambulance seek but not undulyrush to Medical Aid	Get patient from cause or cause from patient. If necessary ABC and treat shock. Pressure Bandage (also known as ligatures and Lymph Vessel Ligatures) SNAKES: As for land snake bites. STINGOSE: (not for snake bite) Immerse limb in hot water 45^{o} - 50^{o} C (Not for snake bite or Blue Ringed Octopus or Conus Shell stings	Get patient from cause etc..... If necessary ABC etc.. Vinegar (Sea Wasp and Portugese Man of War) Stingose. Xylocaine Jelly. Betnovate Gel. Raw Onion!	Get patient from cause etc..... If necessary ABC etc... .....Ditto Coral Abrasions: scrub clean with Nail Brush - even raw flesh. Cover with Plastic Skin.	Get patient from cause etc ..... If necessary ABC etc ... STOP, REST, VENTILATE.
MEDICAL AID	Radio or telephone for ambulance or helicopter. Telephone - call 000 or 013 to alert rescue organisations	.....Ditto	.....Ditto Antivenine is available.	.....Ditto Usually first aid is sufficient. If severe seek medical aid.	As for Overexertion and exhaustion. IBID snorkel course.

DANGEROUS MARINE LIFE

DANGEROUS MARINE ANIMALS

INJURIES - VENOMOUS:

They are stingers injecting poison from their mouths.

1. NAMES

Sea Snake

Cone Shell Mollusc

Blue ringed Octopus

2. DANGER

The common factor is.

1. All inject the venom from their mouths.
2. First aid for all is the same but in addition especially watch and treat probable respiration failure from Blue Ringed Octopus bites, also Cone Shell Mollusc.

SEA SNAKE

Is territorial. May attack if senses danger.

CONE SHELL MOLLUSC

Is pretty and people like to pick it up. It shoots a little harpoon from mouth and can reach big end of its shell.

Do not touch with hands.

BLUE RINGED OCTOPUS

Is pretty so people like to touch, especially children finding them in rock pools. Bites with beak, like parrot. The saliva is poisonous and often shuts down victims breathing apparatus. Victim suffocates.

3. REMAIN FREE FROM INJURIES

Your mind is your main weapon.

SEA SNAKE

Be calm. Let him investigate even winding around diver. No quick movements. Do not strike at snake or it may be quite savage. If so give it flipper to bite. Only big specimens can bite through wet suit. DEPART.

CONE SHELL MOLLUSC

Do not collect them. But if you must, pick up with tool, not hands and keep them away from you. They may injure through wet suit.

BLUE RINGED OCTOPUS

Leave them alone.

4. SPECIAL FIRST AID

With all use constrictive bandage with limb immobilization. If with paralysis of breathing especially Cone Shell Mollusc and Blue Ringed Octopus injuries give resuscitation until with doctor. If resuscitation not necessary, place in recovery position to prevent swallowing vomitus.

Leave poison on skin surface for doctor to identify, especially snake bites.

Treat for shock. Seek medical aid.

DANGEROUS MARINE LIFE

DANGEROUS MARINE ANIMALS

1. NAMES

Sea Wasp	(Box Jelly Fish - Chironex Fleckeri and similar)
Portugese Man of War	(Blue Bottle)
Blubber Jellyfish	
Sea Anemone	
Stinging Hydroid	These look like plants but they are groups of living Polyps
Fire Coral	
Coral (Abrasings)	

2. DANGER

Again these animals do not seek victims. The danger is touching, or brushing against them. They deposit on the diver's skin masses of microscopic cells called Nematocysts. Each Nematocyst is like a small egg containing toxin, a little "Spring", and a little spear. When disturbed the "Spring" shoots the "Spear" and toxin out and into the skin. A wet suit or even nylon stocking material gives protection.

The Sea Wasp is very dangerous, the others much less so.

3. REMAIN FREE FROM INJURIES - STAY HEALTHY

Look but not touch is again the rule.

The dangerous Box Jelly Fish and similar types, as well as less dangerous Portugese Man Of War, are very difficult to see.

Take notice of local advice. Avoid the seasonal dangers.

Wear Protective clothing.

4. SPECIAL FIRST AID

You have three tasks. To stop more nematocysts opening, to treat injuries from those opened, and to keep patient alive.

There are currently two medicines, spray affected parts of body with either Stingose or Vinegar. (any sort of Vinegar).

Methylated spirits or alcohol are not longer considered effective.

If you are going to use Stingose, do not use Vinegar first.

For Coral abrasions scrub even raw flesh with nail brush or tooth brush with peroxide if available to get Coral pieces out. Then treat as above, use plastic skin over open wound to stop secondary infection.

The Box Jelly Fish is so dangerous that victims can die in minutes, quickly giving first aid and seek MEDICAL ATTENTION.

DANGEROUS MARINE LIFE

DANGEROUS MARINE ANIMALS

INJURIES - VENOMOUS:

They are stingers injecting poisons from spines. (Lances not backbones).

1. NAMES

Stonefish	Most venemous fish known. The "Waiting One". "Ruscus" in New Hebrides and nearby Island groups.
Butterfly Cod	and similar scorpion like fish.
Stingray	
Sea Urchins	
Crown of Thorns	(A. Planchi)

2. DANGER

Again these animals do not seek victims. The danger is treading on or brushing against them, thus pressing their spines into oneself. The Stingray if stepped on curls tail up and stings.

STONEFISH

Is the deadly one. When the spines are depressed, poison is forced along a groove in the spine and so into victim. Intense pain.

Death rare, but can occur.

STINGRAY

Injury may be more serous than first indicated. When buried in sand very difficult to see.

ALL CAN GIVE SEROUS STINGS

BEARDED GHOUL

Has been known to move to attack from say 50cms.

3. REMAIN FREE FROM INJURIES - STAY HEALTHY

Your mind is your main weapon. Look but not touch.

STONEFISH

Use thick soled footwear to walk in water. You will usually not be able to see them so put "Armour" on feet. Stonefish waits and does not go far, even after being trodden on. So you can tread on again perhaps with other foot.

STINGRAY

Shuffle feet when walking in sand. It departs.

OTHERS

Can be seen. Look but not touch.

4. FIRST AID ADDITIONAL TO "FIRST AID IN ALL CASES"

4.1 Immobilise and elevate the limb.
4.2 Resuscitation if indicated. (ABC)
4.3 Heat denatures the poison. Immerse limb in hot water up to 50°c splashing surrounding skin to avoid scalds. Put Permqnganate Potash (Condy's Crystals) in water if you have it.
4.4 Sting does if can get it into wound. (STINGOSE)
4.5 For Stonefish Emetine Hydrochloride (ph of 3.4) into each wound, if you are qualified. Also tap with flat of knife.
4.6 CONSTRICTIONS Do not attempt to restrict the movement of injected toxins from Stonefish and other stinging fish. No need for constrictive bandages. Some texts advise constrictions but not according to latest as per C.S.L. Dr Sutherland research.

DANGEROUS MARINE LIFE

DANGEROUS MARINE ANIMALS

INJURIES:

BITING AND CUTTING

1. NAMES

Sharks	Moray Eels
Crocodiles	Barracuda
Killer Whales	Surgeon Fish

2. DANGER

All can give serious injuries. There is some similarity to serious road or industrial injury. Not poisonous but can infect from general uncleanliness of teeth and spines.

3. REMAIN FREE FROM INJURIES - STAY HEALTHY

Your mind is your main weapon.

SHARKS

Keep watching - if by drop off back to it, or if by ocean floor, sit on it to, break up sharks attact pattern, keep calm and appear confident.

Murky water is source of danger. So is lone diver.

Injured flapping fish seem to bring sharks quicker than small amount of blood.

Fin away on your back so you can keep watching shark.

SEA WATER CROCODILES

If a log drifts past and winks at you get back in boat - extremely dangerous. No known defence. Keep still - they have been known to pass by. They even kill sharks.

KILLER WHALES

May not be dangerous at all but until fully proven show discretion. Get into boat.

MORAY EELS AND BARRACUDA

In Australia and New Guinea live and let live. Keep your distance and go about your business. Unusual for them to attack.

SURGEON FISH

Can inflict deep slashes with spines on sides near base of tail.

Keep your distance.

IN ALL CASES TREAT WITH SAME RESPECT YOU
WOULD A TOUGH CHARACTER ON FOOTPATH

4. SPECIAL FIRST AID

Stop the bleeding. Keep air going to lungs, and heart beating, to get oxygen to brain. Treat for shock. Seek medical aid.

DANGEROUS MARINE LIFE

(Main Local Ones and Others)

	ANIMALS		ANIMALS		PLANTS
TYPES	BITING AND TEARING	STINGING - POISONOUS	NEMATOCYST TYPES STING - POISONOUS		ENTANGLING
NAMES	Sharks Moray Eels Barracuda Crocodiles Killer Whales Surgeon Fish	Stonefish, Butterfly Cod, Stingray, Blue Ringed Octopus, Sea Urchins, Crown of Thorns CONE SHELLS. SEA SNAKES.	Sea Wasp (Box Jellyfish) Portugese Man of War (Blue Bottle), Blubbler Jellyfish, Fire Coral, Sea Anemone	Stinging Hydroid, Most Coral abrasions.	Any long Seaweeds. Any masses of Weeds. Kelp. Old Fishing Lines and Hooks.
DANGER	Biting and Tearing injuries similar to serious Road accidents and Industrial accidents.	Injection of poison. Stinging animals do not go about seeking people to sting. DO NOT HANDLE OR TREAD ON. BE PERFECTLY STILL while Sea Snake investigates.	Nematocyst injection of poison.	Injection of poison. Infections.	Entangling and exhausting diver.
YOUR MIND IS YOUR MAIN WEAPON	Keep out of water when danger known to be about. If approached by shark, keep watching it. Two divers back to back. If have air and ocean floor close, sit on it. If by cliff, back to cliff. Appear confident.	Look but not touch. Learn to recognise. Sea Snakes: Diver to be still. Let them look and touch. Do not slap or move quickly. If attacked, give them flipper to bite. They can rarely bit through wet suit.	Keep out of water in Sea Wasp season. Wear protective clothing as e.g. wet suits. Be observant. Look but not touch.	LOOK BUT NOT TOUCH.	KEEP COOL! If entangled cut your way free with diver's knife. Take it easy. Come away!

5. For other locations of Recompression Chambers, see your testbook

6. Emergency Recompression In Water Using 02

The G.C.U.C. owns apparatus for emergency use. However, there is a list of trained operators. Check first with senior club members, especially DR Terry McGrath ... 32 1822

Similar equipment is available throughout Australia. Refer to your textbook.

7. Oxygen on Surface

This is useful in emergencies for pulmonary Barotrauma and/or Decompression Sickness. At dive camps, your Club Doctor will have an emergency supply.

ASRO and Coast Guard:

These are rival organizations. Both provide excellent voluntary rescue services. They maintain Radio Watches though not continuously. They will provide rescue services and will know whatever other local help is available. Get their local telephone numbers from Directory Assistance, 013, or the telephone book.

Police and S.E.S.

In major disasters throughout Australia, the police are the best people to call first. They control the highly competent and voluntary State Emergency Services, and know the various avenues of help available. A telephone call to the police will start the whole rescue procedure.

Get police local telephone numbers from the telephone book or ring 000 or 013.

YOUR TELEPHONE IS YOUR FRIEND!

ACTION OF FIRST AID

1. REFER: "The Diver's Medical Companion"
   by Dr Robert Thomas, and
   Dr Bart McKenzie
   Appendix H. Pages 171-172 and all app.

2. Refer back to the section of these notes:
   Anatomy of Diver.

3. Show Model: Flat wooden of Airways.

4. Work on Resuscitation Model.

5. Learn the meaning of:

   ABC: Airways Breathing Circulation
   EAR: Expired Air Resuscitation
   ECM: External Cardiac Massage

6. Learn: Log Book: General First Aid.

7. Instructor give questions and answers including diving accidents.

LAB EXERCISE 2

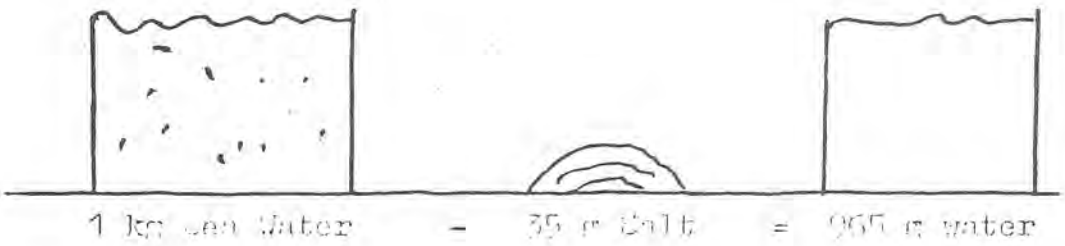
GRAPHING SALINITY WITH LATITUDE

AIM

To prepare a graph of the salinity of sea water with the ocean's position.

INTRODUCTION

Salinity or S /oo can be thought of as follows :



A kilogram of sea water which contains 35 grams of dissolved salts has a salinity of 35 /oo.

PROCEDURE

Obtain a sheet of graph paper and graph S /oo (Y axis) versus latitude (X axis). Make sure 0 is in the middle of the GRAPH.

SALINITY /oo	LATITUDE
32.0	80 N
33.0	70 N
32.6	60 N
33.5	50 N
35.0	40 N
35.8	30 N
35.3	20 N
34.5	10 N
35.0	0
35.5	10 S
35.7	20 S
35.5	30 S
34.5	40 S
34.0	50 S
33.9	60 S
33.9	70 S
34.0	80 S

RESULTS

Paste your graph into your Lab. Book.

DISCUSSION

1. The relationship between Northern and Southern hemisphere.
2. The area of the ocean with the highest and lowest S°/oo and any reasons for this difference.

2. *STUDY ASSIGNMENTS*

1. You may like to look up in the library about Jaques Cousteau or James Piccard.
2. Find out about S.C.U.B.A. and skin diving. What other water sports are there in the sea?
3. What is hyperventilation and why is it dangerous?
4. Why should sunburn cream be used on a boat and in the water? If you were snorkling all day, would you have to use sunburn cream in the water?
5. Make a list of the clothing you would need to take on a snorkling trip.
6. Why is spear fishing dangerous?
7. What is the observer's job in a boat?
8. Diagram the International Diving Flag.
9. Why was decompression a problem to early divers?

   How did staying underwater help?

   How does a decompression chamber function?
10. What is an aquanaut? Find out more about the American Aquanaut programme.
11. What is the purpose of a Plimsoll line on an ocean-going ship? Go to the harbour and draw one. Visit the local harbour master and ask him why these lines are important.
12. What is a Bathysphere and Bathyscope?

    Find out all you can about these machines and give a brief history of their performance.
13. What gas mixtures do divers breathe? Why can't they breathe on ordinary air mixture?

    What effect do these new gas mixtures have on communication?

3. *AUDIO VISUAL*

1. Chart of dangerous marine life available from Department of Health.
2. Underwater drawing boards and paper can be made from perspex.
3. Marine specimens of stone fish and stinger.

4. *DIRECTED TOPICS (note to teachers)*

The aim to gain confidence. Like bushwalking, snorkeling has its dangers but with one supervising teacher in the water and one as observer, a calm sea and well drilled students, very little can go wrong.

5. *EXAMINATION*

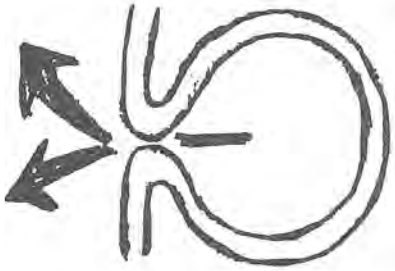
A check list and certificate are issued.

far before clearing your ears and you should come up and start again. If you can't clear your ears - don't dive.

3.3 *Your sinuses are important also*

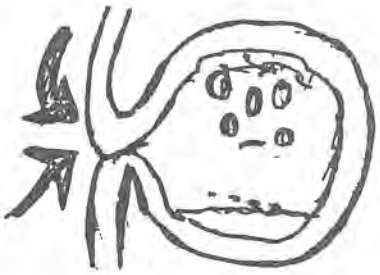
Apart from the ears there are other air spaces in the head which need attention. Look back at Fig. 11 and find the sinuses. There are two main ones - below and above the eye. The sinuses are spaces in the skull so as to make the head lighter and are connected to the nose by small tubes. When these tubes are open, the pressure inside and outside them is the same but when they are closed or congested they can be painful.

CLEAR SINUS



OK TO SNORKEL

CONGESTED SINUS



DO NOT SNORKEL

If you feel pain or you have a cold, don't dive - just fin at the surface. If you do, you could force mucous into the sinuses and cause infection. NEVER USE EAR PLUGS UNDER WATER.

3.4 *How deep can you go?*

Apart from the air spaces in your bones, your body will not shrink in water. The limiting factor in deep snorkel diving is how much your rib cage can be squeezed due to pressure.

In theory, the depth limit is about 30 metres (100 ft) but the record is almost 60 metres (200 ft). Don't attempt deep dives as *they are extremely dangerous*. Don't take deep breaths (hyperventilation) so you can stay under water longer. Blackouts are caused by doing this and even the experts can blackout. Most clubs would consider a snorkel dive of 7 - 10 metres (20 - 30 ft) a reasonable standard.

4. *THE AIMS OF THE EXERCISES ARE TO ENABLE YOU*

(a) Breathe through a snorkel : Ex's 1,2,3 land.

(b) Adjust a face mask, snorkel and pair of flippers to fit comfortably and safely : Ex. 1.

(c) Snorkel on the surface for looking at animals : Ex. 1.

(d) Snorkel to a depth, compensate for pressure and surface to get rid of water in the snorkel : Ex.'s 2,3.

(e) Communicate with a friend in case of emergency : Ex. 4.

(f) Draw under water : Ex. 5.

5. *AUDIO VISUAL MATERIAL / REFERENCES*

Wall Charts : McMillian Series "The Sea" Set showing early diving methods. Also flash cards are available. See Science Department.

This could kill you if it happened under water. It's no big deal to stay under water the longest so use your common sense and LISTEN TO YOUR BODY telling you when to surface and take a breath.

LEARNED SO FAR

* Objects can be seen better in water with a face mask and appear bigger and closer than in real life.
* Snorkeling along the surface is called *FINNING*.
* Two dives a snorkler can do are the *Jack Knife* and *Vertical dive*.
* There are a set of universally used signals in *communicating in water*.
* *Know your safety rules* before entering the water.

---

1. *REVIEW EXERCISES*

   1. What are two things that a face mask does to fool you about objects under water?
   2. What is the name of the two rubber pieces in a face mask which allow you to clear your ears?
   3. TRUE OR FALSE

      (1) You can breathe through your snorkel underwater.
      (2) It's best to wet both your feet and your flippers before putting your flippers on.
      (3) The SPRIGGOTS are clamped in your teeth when snorkeling.
      (4) Finning is when you collect rocks from the sea bottom.
      (5) Snorkeling in heavy surf is O.K.

   4. Name two ways a snorkler can dive under water.
   5. Grab a partner and get him to demonstrate the following signals to you. Distress at surface, O.K. all's well; Stop, O.K. at surface.

2. *STUDY ASSIGNMENTS*

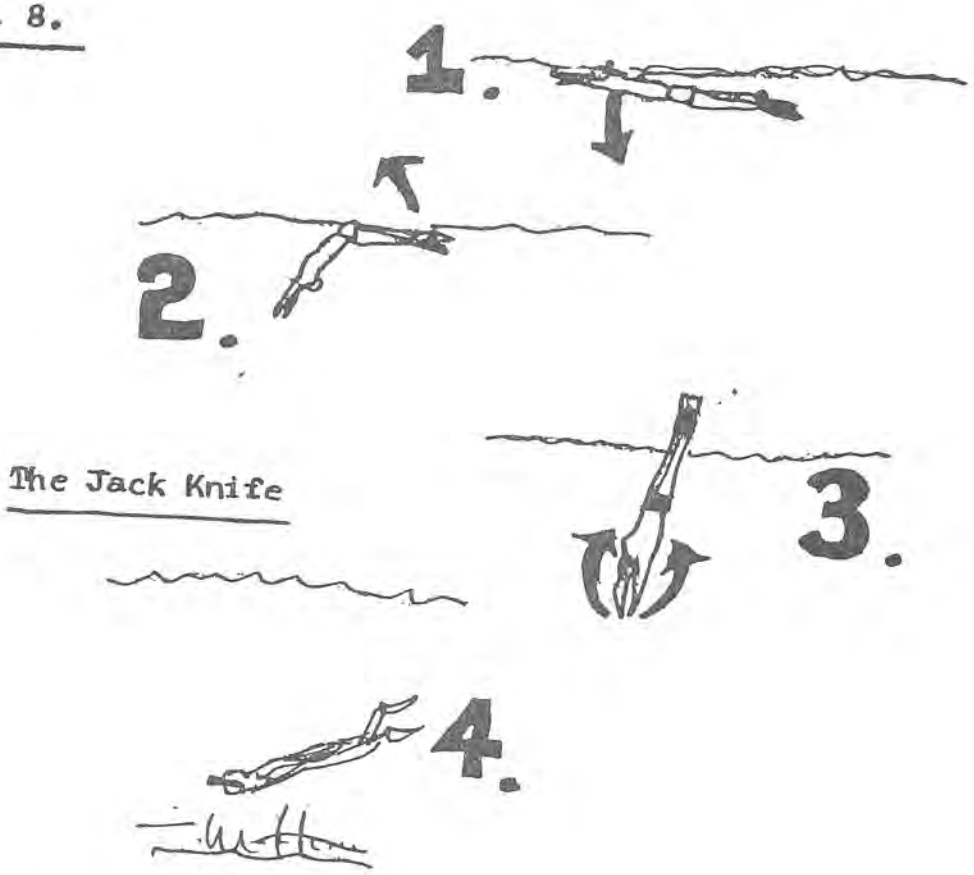
   1. Prepare a report on the history of Diving and comment on the problems early divers experienced.
   2. You may like to join a local Diving Club or play Underwater Hockey.
   3. Research problems associated with diving. What are the *"bends"* and how are they cured?
   4. If you were to construct a underwater Townhouse, what special design would have to be made?
   5. Research the cost of purchasing a full set of diving equipment.

Avoid bending the knees too much as this develops an inefficient *'cycling' action.* Also avoid wasting energy by rolling the body; this is usually cured by keeping your backside down in the water.

2.6 *Surface Dives*

There are two ways. In the *Jack-Knife*, the snorkel swimmer takes a breath. Dives as shown in Fig. 8.

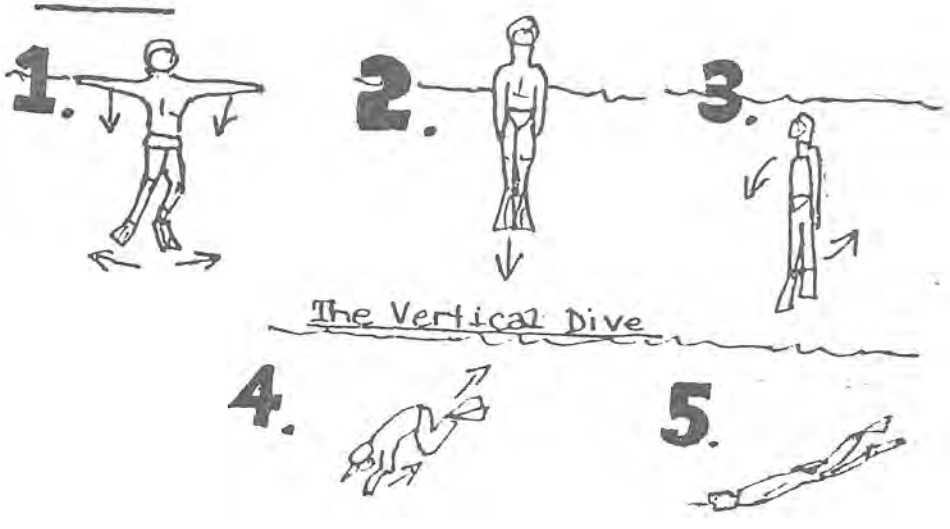
Fig. 8.



The Jack Knife

The other less common method, is the *Vertical surface dive.* By treading water vigorously, you can raise yourself out of the water (1), suddenly stop (2), turn (3), crouch (4), and then dive (5), as in Fig. 9.

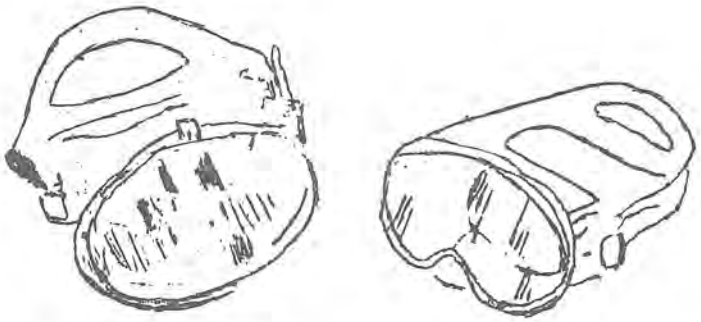
Fig. 9.



The Vertical Dive

So be careful and don't be fooled if you can't reach things at first, and don't be disappointed if things that you collect are smaller than you thought.

Your mask is made of Rubber and Glass and fits over your nose so that you can breathe through your mouth.



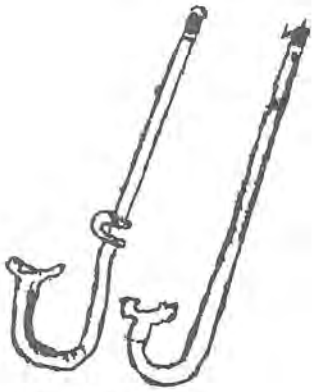
Masks

Most masks have two rubber pieces which fit beside the nose. These are *Compensators* (com - pen - say - terz) and are used to equalize pressures. Some masks have a one-way valve which is used to clear water from the mask by exhaling through your nose.

2.3 Breathing under Water

The snorkel tube lets you breathe while looking down from the surface. It has a red strip at one end to let others see you. The mouth piece is usually adjustable and consists of a rubber flange which fits between the gums and the lips. The two rubber spriggots projecting from the flange are clenched between the teeth.

Some snorkels will have a rubber clip which will allow you to connect your snorkel to the strap of your face mask.



Snorkels


Phil King

BENOWA HIGH SCHOOL PARENTS & CITIZENS ASSOCIATION

PRESIDENT: Roger Brewster
Ph. 381 755 Bus.
501 660 A.H.

SECRETARY: Leslie Ponti
Ph. 323 782

17th July, 1986

Mr. R. Moffatt,
Benowa State High School,
Mediterranean Drive,
BENOWA. QLD. 4217

Dear Bob,

On behalf of the P & C Association and the students of the school, I would like to express our deep appreciation for your personal commitment and untiring efforts in relation to the Marine Studies program.

The P & C Association has benefitted financially from your generous loan of the copyright over the Marine Studies classroom notes. The sale of notes to other schools has defrayed the costs of establishing the Marine Studies program here at Benowa as well as assisting many other schools in Queensland to begin their school programs.

This letter acknowledges the return of the copyright over the following classroom notes to yourself as owner:

Navigation, snorkelling, coastal physics, fisheries biology, estuarine chemistry, oceanography, science of diving, field methods, boating and marine radio.

The P & C Association will continue to be able to sell copies of the sea notes which will continue to operate under the Marine Studies Sub Committee. The Association acknowledges that these notes were produced in school time and therefore remain the property of the Education Department.

Finally, we are very pleased that the inaugural Castrol Sea Safety Award was made to you. It is a fitting tribute and worthy honour to your entrepeneurial achievement.

Yours faithfully,

Roger J Brewster

ROGER J. BREWSTER
PRESIDENT

MARINE STUDIES SERIES

OTHER UNITS :

There are two types of Classroom Note : Practical & Applied

(a) Practical Notes

Unit 1 : Navigation	: Features of the Coastline, Navigation Methods, Practical, Weather, Pilotage, Tides, Exam.
Unit 2 : Snorkelling	: Physiology, Techniques, First Aid, Dangerous Marine Animals, Safety, Certificate.
Unit 3 : Radio	: Components, Features, Discipline, Types, Practice Excercises, Certificate.
Unit 4 : Boating	: Buying a Boat, Safety, Seamanship skills, Handling, Maintenance, Licence.
Unit 5 : Camping	: Types of, Equipment for Camping with a boat, Campsites, Practical Conservation, Safety, Leadership Skills.

(b) Applied Notes

Unit 6 : Fisheries Biology	: Plankton, Nekton, Benthos, Fishing Methods, Protected Species, Fisheries Management
Unit 7 : Estuarine Chemistry	: Laboratory Methods, Pollution, Salinity, Temperature, Ph, and other parameters.
Unit 8 : Coastal Physics	: Waves, Tides, Beach Erosion, Beach Protection, Coastal Management, Local Coast Management
Unit 9 : Diving Science	: Boyles Law, Charles Law, Effects of Pressure on Diver, Marine Medicine.
Unit 10 : Sampling Methods	: Marine Technology in Scientific sampling apparatus, student project, collection methods.