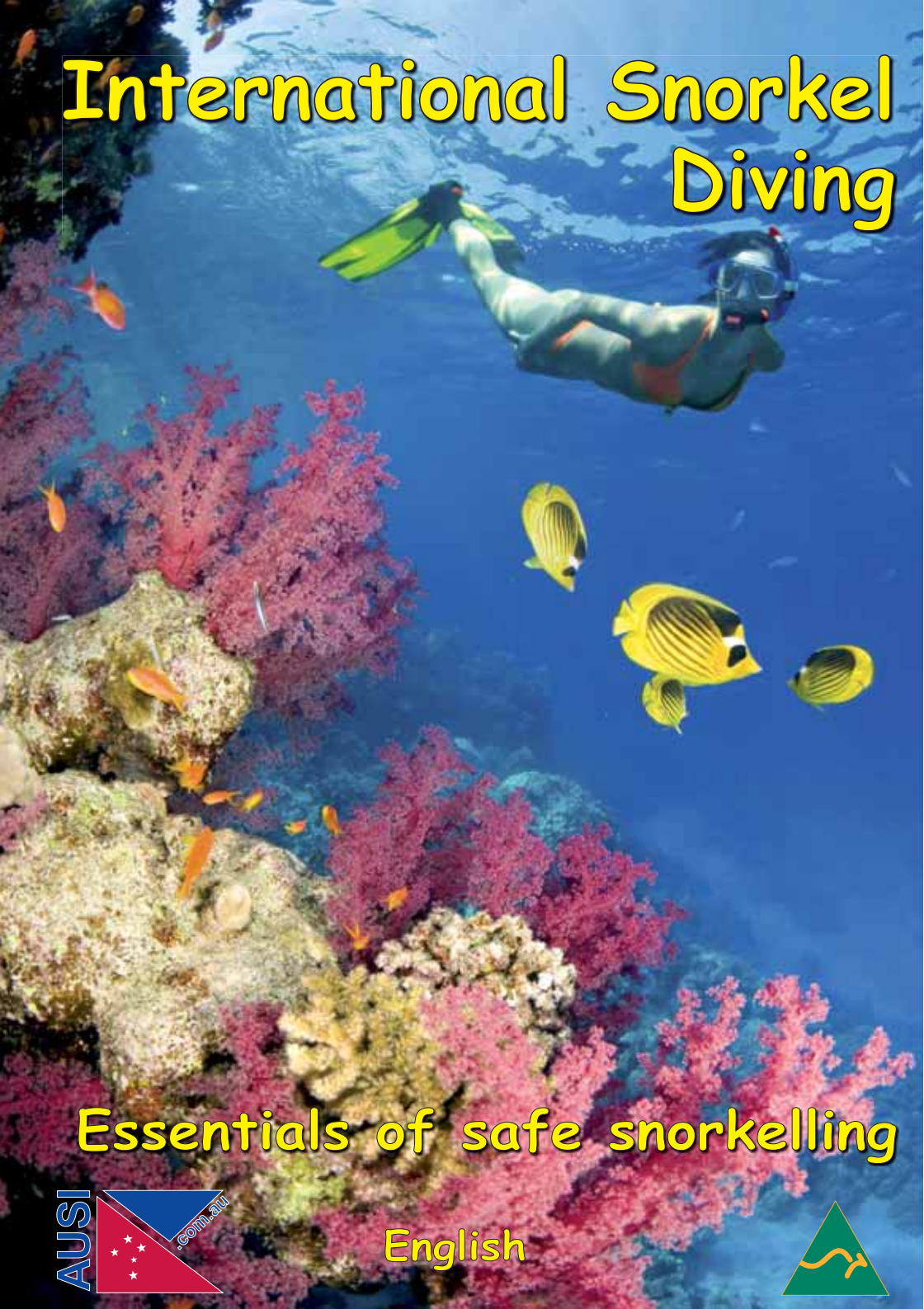
International Snorkel Diving
Essentials of safe snorkelling
English
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PO Box 202
Queenscliff
Victoria 3225
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Email: info@ausi.com.au
Web: www.ausi.com.au

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Disclaimer

The theory and requirements of snorkel and scuba diving as expressed in this book represent the author's view of current learning as of August 2009. However, the reader is cautioned that scuba diving is a relatively new and dynamically changing discipline. As such, as our understanding and knowledge increase, certain currently held beliefs (some of which are presently subject to some conjecture) may be disproved or modified. The reader is strongly advised to read new literature as it is released and, if necessary, to reassess areas of the text of this work accordingly.

While great care and effort have been taken in the preparation of the material presented in this book, neither the authors nor publisher warrants that the contents of this work will be entirely suitable for all circumstances which the reader may encounter. It is stressed that first aid procedures vary from time to time and should never be used or adopted to the exclusion of, or in substitution for, medical consultation.

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Course notes

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Family day out ©iStockphoto.com/Tammy Peluso

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The pathway to your internationally recognised snorkel certification

These notes cover the following three forms of snorkelling:

- **Snorkel swimming**
  Snorkelling with a buoyancy aid so you always float
- **Snorkel diving**
  Breath-hold diving where there is a risk of sinking
- **Free diving**
  Extreme snorkelling, breath-hold diving beyond 9m (30')

AUSI Snorkel Diver

The AUSI Snorkel Diver course consists of the following components:

- Administration
- Classroom presentations
- Practical skills training, and
- Ocean diving

Training requirements

Classroom sessions	Test	Practical sessions	Ocean modules	
			#	Ratios
3	✓	2	4	8:1

Ratios (student to instructor) are maximums for ideal conditions

Administration

Before you commence your training you must complete the following documentation:

- AUSI Medical History Form
- AUSI Dive School Participation Agreement

During your course, as the course progresses, you must complete the relevant sections of the AUSI Snorkel Diver Training Record.

At the conclusion of your course, before you receive your certification, you must sign the AUSI Snorkel Diver Certificate of Completion.

Welcome to AUSI

Free diving requires special training outside the guidelines of the AUSI Snorkel Diver course

If you have any comments regarding your AUSI instruction please write to:

AUSI
PO Box 202
Queenscliff
Victoria 3225
Australia

info@ausi.com.au

Theory

During classroom presentations, your AUSI Snorkel Instructor will guide you through these course notes carefully explaining all the relevant information important to your **safety** and **enjoyment**.

After each lesson you are required to complete a lesson review in private, and your instructor will then discuss the review to guide your **understanding** and **learning**.

At the conclusion of the classroom presentations, you will be required to pass a test designed to **assess** your understanding of snorkel diving.

Practical skills training

Before venturing into the ocean, your AUSI Snorkel Instructor will thoroughly teach you the relevant skills. Practical skills training, whenever possible, should be conducted in a pool.

Ocean diving

After your practical skills training sessions your AUSI Snorkel Instructor will take you on closely supervised snorkel dives in the ocean.

Before being issued an AUSI Snorkel Diver certificate you must complete four ocean modules over a minimum of two ocean dives. An ocean module must be at least 20 minutes duration.

Spear fishing ©iStockphoto.com/Tammy Peluso

Further training

- Rescue
- Free diving
- Spear fishing
- Underwater photography
- Underwater naturalist
- Plus many more...

AUSI Snorkel Swimming Instructor

- Can conduct snorkel swimming programs in a pool
- Can conduct snorkel swimming programs in sheltered water under the supervision of an AUSI Snorkel Guide or higher
- Can act as a lookout for snorkelling activities in open water under the supervision of an AUSI Snorkel Guide or higher

AUSI Snorkel Guide

- Can conduct snorkel swimming programs
- Can act as an in-water guide for uncertified snorkel divers in open water
- Can supervise snorkelling activities in open water

AUSI Snorkel Diver Instructor

- Can conduct snorkel swimming programs
- Can act as an in-water guide for uncertified snorkel divers in open water
- Can supervise snorkelling activities in open water
- Can train and certify AUSI Snorkel Divers
- Can train and certify AUSI Snorkel Swimming Instructors
- Can train and certify AUSI Snorkel Guides

AUSI Snorkel Diver Instructor Trainer

- Can perform the functions of an AUSI Snorkel Diver Instructor plus train and certify AUSI Snorkel Guides.

Enhance your safety and enjoyment by furthering your training. For full details of AUSI snorkel professional programs go to www.ausi.com.au

Table of levels of certification & supervision

Professional level	Demonstrated duck dive	Can supervise to
Level 1	6 metres (20')	3 metres (10')
Level 2	9 metres (30')	6 metres (20')
Level 3	12 metres (40')	9 metres (30')

Snorkel Learning Module 1

Snorkelling equipment

- Mask & snorkel 2
- Fins & buoyancy vest 3
- Exposure suits & weight belt 4
- Accessories 5

Pressure & diving

- Depth–pressure relationship 6
- Effects of pressure 7

Equalising pressure & buoyancy

- Ears 8
- Equalising ears 9
- Other gas spaces 10
- Buoyancy 11

Gases

- Composition of air 12
- Lack of oxygen 13
- Excess carbon dioxide 14

Review questions

- Introduction to snorkel diving 15

Bigeye Trevally–Solomon Islands
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Mask

Function

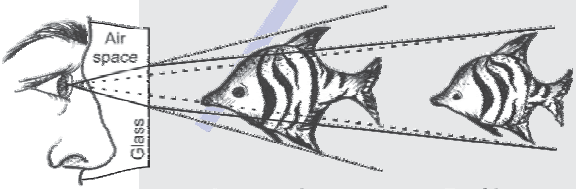
- Provides an air space so eyes can focus

Use

- Loosen strap
- Check seal by sucking in through nose
- To defog, rinse, spit and rinse
- Put on face, tighten strap to comfortable (not too tight)
- Re-check seal (no hair or or hood under seal)

Essential features

- Good seal
- Encloses nose–to avoid mask squeeze
- Compensator (soft nose piece)–to equalise ears
- Tempered glass–tougher, no splinters



When wearing a mask underwater, objects appear larger and closer

Snorkel

Function

- Aids breathing on the surface

Use

- Must be attached to left side of the mask

Essential features

- Length–30 to 40cm (12" to 16")
- Bore diameter–15 to 25mm (5/8" to 1")
- Comfortable, soft mouthpiece
- Self draining

Fins and booties

Function

- Aids propulsion and protects feet

Type & use

- **Open-heel**
  - Non adjustable
  - Invert fin heel, insert foot and roll fin over heel
- **Open heel**
  - Adjustable; easy on/off
  - Requires booties
  - Loosen strap, insert foot, then tighten strap around heel
- To fit use the "Figure of 4" method

Essential features

- Flexible blade
- Comfortable fit (most important)
- Length/size to fit individual

Buoyancy vest

Function

- Positive buoyancy on surface
- Assists in rescue

Use

- Ensure correct size
- Do not over tighten straps

Essential features

- Fully adjustable with quick release buckles
- Good comfortable fit–too tight can cause carbon dioxide excess and potential panic
- Emergency inflation device, for example CO_2 cartridge

©iStockphoto.com/ Irina Shoyhet

You are strongly advised to purchase your own personal equipment such as mask, snorkel, fins, boots, exposure suit & weight belt

Exposure suits

Function

Provides warmth, protection and buoyancy.

Types

- Lycra (stinger/rashie) suit–tropical water only
- Wet suit
  - Tropical: 3–5mm (1/8"–3/16") sports suits
  - Temperate: 5–7mm (3/16"–5/16") pro suits
- Semi-dry suit

Use

- Fit carefully, do not force
- Ensure the fit is not too tight around chest or neck, can cause breathing problems
- Be careful when removing hooded tops or tight neck seals

Essential features

- Comfortable fit
- Tight chest (hard to breathe) causes carbon dioxide excess, leading to panic
- Tight neck may cause nausea (Carotid Sinus Syndrome)
- Too loose–can get too cold

Weight belt

Function

Neutralises buoyancy of exposure suit on surface.

- Use a quick release buckle
- Arrange lead weights evenly
- Fit above waist and comfortably tight
- Do not tuck in loose ends

Essential features

- Quick release buckle–one hand operation

Ditching a weight belt

Only ditch when stressed or in an emergency.

- Never hesitate
- Break open buckle
- Pull clear, and release
- **Check below** if ditching on surface

Always secure the weights, never carry an open belt by the buckle

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Gloves

- Provide warmth and protection for hands

Catch bag

- Carrying accessories or collectables

Safety sausage

- Visible on surface during day

Knife

- Cutting, prodding and probing

Whistle

- Can be heard a long distance over water

Gear bag

- For carriage and storage of equipment

Care & maintenance

(Snorkelling gear and accessories)

- Wash in fresh water at end of dive day
- Shampoo exposure suits regularly (consult your professional dive store)
- When drying, avoid direct sunlight
- Store in a dry, cool place
- Regularly check straps
- Repair and replace problems immediately

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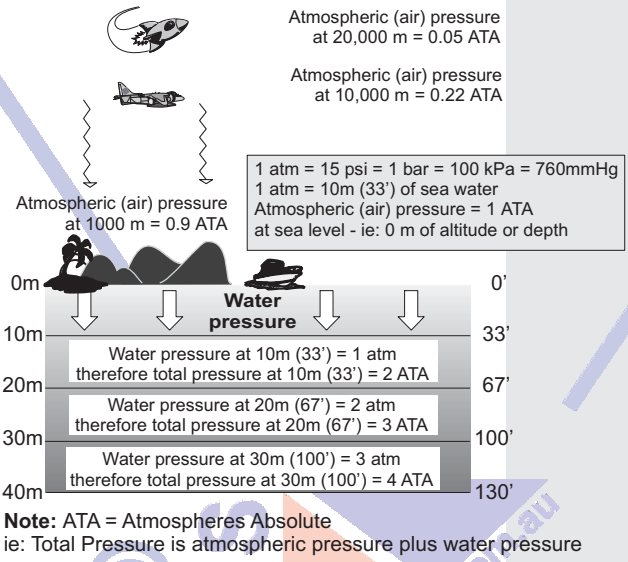
Pressure



Note: ATA = Atmospheres Absolute
ie: Total Pressure is atmospheric pressure plus water pressure

During the first **10m** (33') of descent the pressure **doubles**, it takes **20m** (67') to **double** the pressure again and a further **40m** (133') to **double** the pressure yet again.

Note: Total pressure is also referred to as ambient pressure and equals depth in metres divided by 10 (Water Pressure) plus 1 (Atmospheric Pressure)

ie Total Pressure (ATA) = $\frac{\text{Water Pressure (m)}}{10} + 1$

or Total Pressure (ATA) = $\frac{\text{Water Pressure (ft)}}{33} + 1$

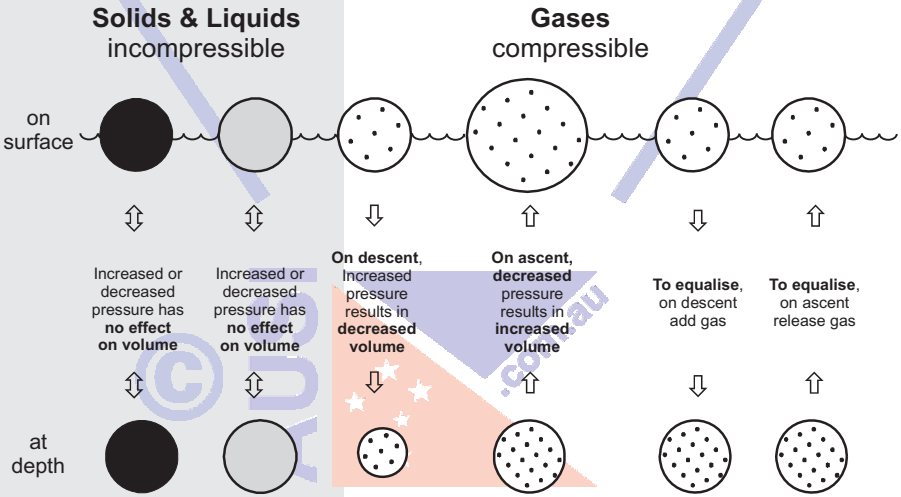
The greatest pressure changes occur near the surface

DEPTH	WATER PRESSURE (ATM)	AIR PRESSURE (ATM)	TOTAL PRESSURE (ATA)	DEPTH CHANGE (metres)	PRESSURE CHANGE (factor)
0m (0')	0	1	1		
10m (33')	1	1	2	10	x 2
20m (67')	2	1	3	20	x 2
30m (100')	3	1	4		
40m (133')	4	1	5	40	x 2
50m (167')	5	1	6		
60m (200')	6	1	7		
70m (233')	7	1	8		

States of matter

There are three states of matter:

- **Solids** (incompressible–transmit pressure)
- **Liquids** (incompressible–transmit pressure)
- **Gases** (compressible–do not transmit pressure).



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Failure to equalise pressure can cause injury to ears

Because gases are compressible:

- As a diver **descends, increasing** pressure will cause **decreasing** gas space volume, unless **equalisation** occurs
- As a diver **ascends, decreasing** pressure will cause **increasing** gas space volume unless **equalisation** occurs.

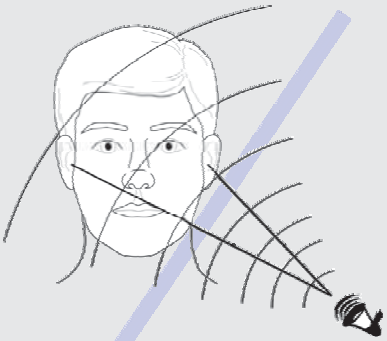
Function

Hearing

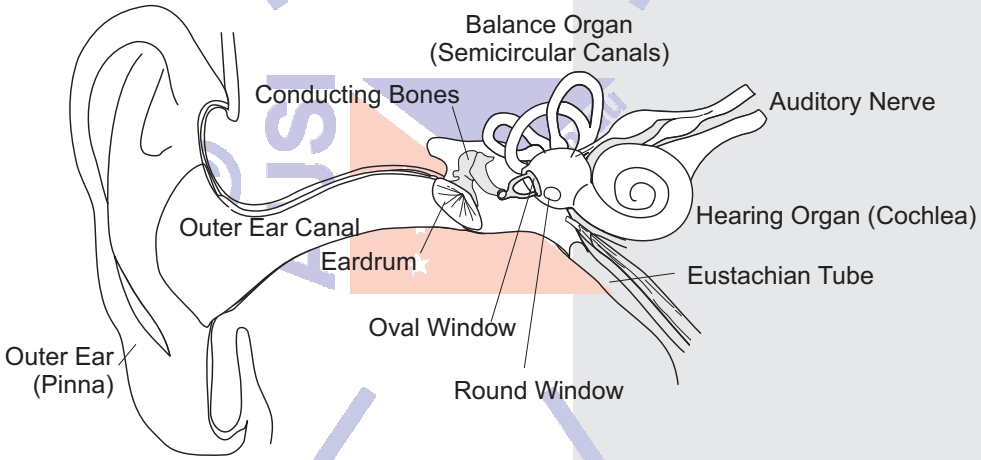
- Is affected underwater because increased speed of sound means we lose ability to determine the direction of sound–the Binaural Effect

Balance

- Can be affected if either **pressure** or **temperature** is different in each ear



Anatomy



The Eustachian Tube allows movement of air into and out of the middle ear so **equalisation** can be achieved

"Pop" ears on surface then continually during descent—**before pain occurs!** If pain occurs, ascend and try again

Over forceful equalisation can damage the Inner Ear

Equalisation on ascent is usually automatic

How to equalise

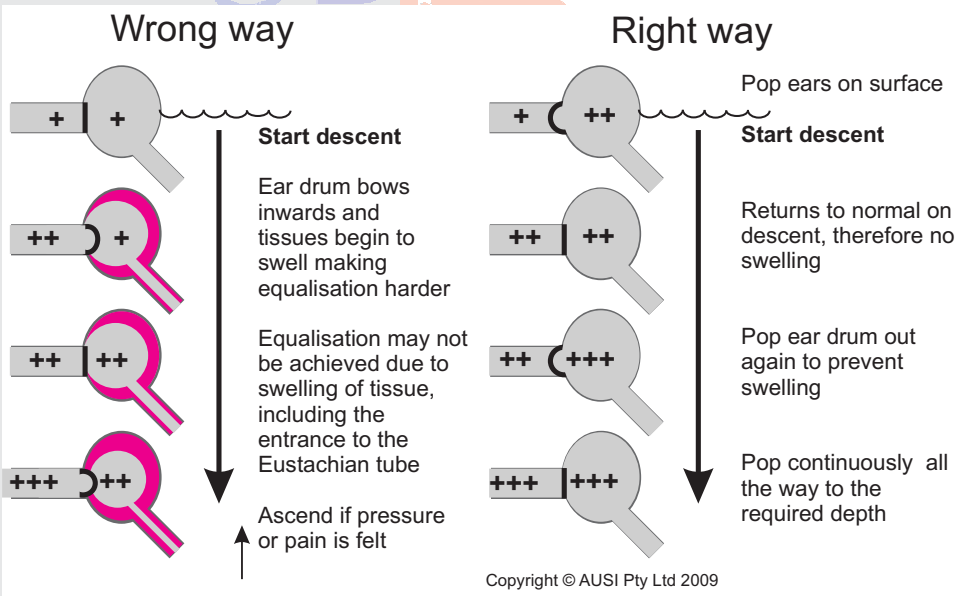
The gas space in the middle ear **must** be equalised during descent:

Method 1 Pinch nostrils and **gently** blow through nose to increase pressure.

Method 2 Pinch nostrils and **gently** blow through nose, wriggling jaw and/or stretching neck may help.

Method 3 Place bottom teeth in front of upper teeth, pinch nostrils, **gently** blow, and as pressure builds up swallow.

Other methods If the above methods don't work, **consult** your instructor or diving doctor.



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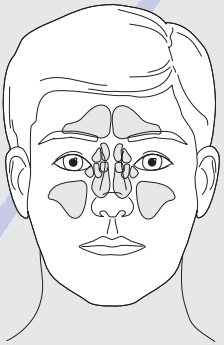
Never use ear plugs because they create an air space that cannot be equalised

Mask

- Continually breathe out through nose on descent—**never** use goggles
- Equalisation on ascent normally occurs automatically



Sinuses

- Diving with a cold or allergy can cause pain on descent followed by pain and bleeding from nose on ascent. **If severe**, seek medical advice.

Teeth

- An air space in a tooth or under a filling can cause pain on descent followed by pain on ascent. **If severe, see a dentist**.

Gut

- Excessive gas may cause pain on either descent or ascent. **Avoid** gas producing foods.

Lungs

- Compress on descent
- Expand on ascent

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Positive

Neutral

Negative

States of buoyancy

Positive—floating

Ideal for surface snorkelling

Neutral—suspended

Negative—sinking

Extremely dangerous while snorkelling

Always re-check buoyancy when using a different exposure suit or diving in different water density

Determining correct buoyancy

If weight belt is correct, diver should float on the surface after totally exhaling. Most people are neutrally buoyant when not wearing an exposure suit, and therefore require some form of buoyancy aid such as a wet suit for safe snorkelling.

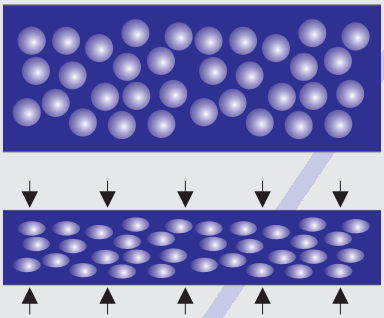
Factors affecting buoyancy

Wet suit Gas filled rubber - becomes less buoyant as it compresses with depth.

Weight belt Neutralises exposure suit on surface only.

Artifacts Increase negative buoyancy.

Fresh Water Less buoyant, so less lead required to neutralise buoyancy.



The table below illustrates the changes to buoyancy that can occur at depth due to wetsuit compression.

You cannot tread water when carrying net negative 5kg (10lb)!

Depth	Exposure suit buoyancy	Weight system buoyancy	Net buoyancy
On surface	+ve 10kg (20lb)	-ve 10kg (20lb)	**Neutral**
At 10m (30')	+ve 5kg (10lb)	-ve 10kg (20lb)	**-ve 5kg (10lb)**

Air is a mixture of gases

Oxygen (21%)

- Essential to life
- Produced in plants by photosynthesis
- Toxic in excess
- Deficiency causes unconciousness and death
- Used in first aid to oxygenate oxygen starved tissues

Sources of oxygen:

- Dental surgery
- Aquarium
- Craft centre
- Ambulance
- Hospital or medical centre
- Surf life saving club
- Veterinary surgery
- Mechanical workshop (eg. service stations)

Nitrogen (78%)

- Physiologically inert

Other gases (1%) including Carbon Dioxide

Carbon Dioxide (0.04%)

- Product of cellular respiration & combustion
- Main stimulant to breathe
- Hazardous in excess

Partial pressures in air

The total pressure is made up of the independent pressures due to nitrogen and oxygen.

The independent pressures are referred to as **partial pressures** (Pp) and the total pressure equals the sum of the partial pressures, ie. $Tp = pN_2 + pO_2$

On surface:

$pN_2 = 1 \times 0.8 = 0.8$ ata

$pO2 = 1 \times 0.2 = 0.2$ ata

O_2

Approx. 20% or 1/5

N_2

Approx. 80% or 4/5

CO_2

Approx. 0.04%

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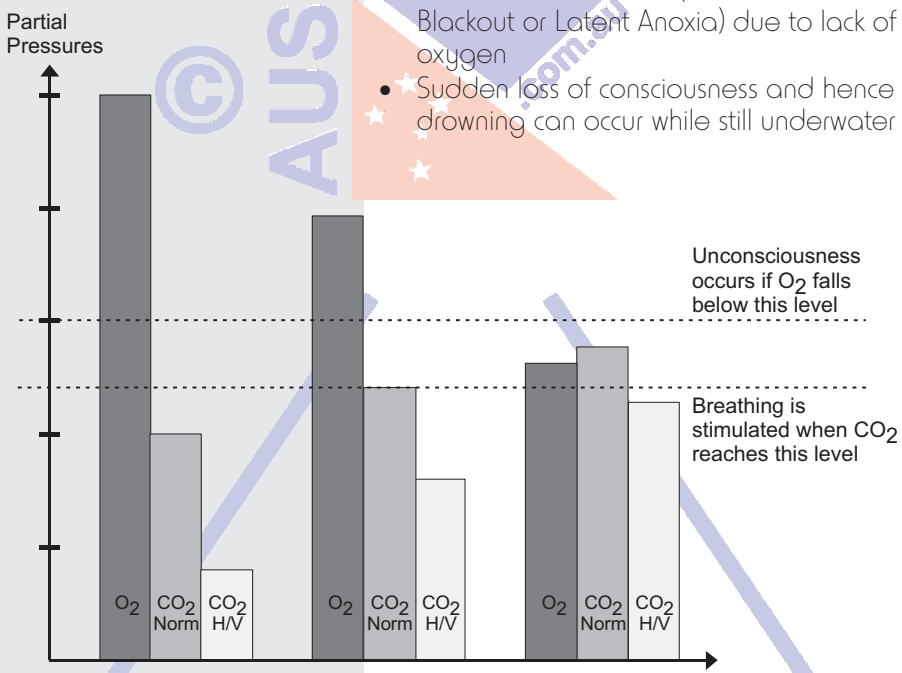
Not enough oxygen

- Unconsciousness and death can result from lower than normal levels of oxygen, eg. drowning, suffocation, strangulation, asphyxiation, respiratory and/or cardiac arrest all lead to decreased oxygen

Hyperventilation (over-breathing)

- More than **three** deep breaths before a breath-hold dive constitutes dangerous hyperventilation
- Hyperventilation does not significantly increase available oxygen
- Breath-hold diving and underwater swimming after hyperventilation can cause unconciousness (Shallow Water Blackout or Latent Anoxia) due to lack of oxygen
- Sudden loss of consciousness and hence drowning can occur while still underwater

Never hyperventilate before a breath-hold dive, underwater swim or when free diving



At 0 seconds
On a normal breath-hold dive CO_2 is only just below the level to stimulate breathing, while a diver who has hyperventilated is well below this level.

After 30 seconds
Normal CO_2 reaches the level to stimulate breathing while there is still enough O_2 to sustain consciousness while a diver who has hyperventilated has no urge to breathe.

After 60 seconds
After hyperventilation CO_2 level takes longer to rise. Before CO_2 reaches the level to stimulate breathing, O_2 becomes too low, resulting in unconsciousness.

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High carbon dioxide levels

Cause

Inadequate ventilation due to:

- Tight exposure suit (particularly coat and neck)
- Tight buoyancy vest

Recognition

- Increased breathing rate (can be over-ridden)
- Headache (usually after dive)
- Nausea
- Anxiety

Action

- Stop all activity
- Try to control breathing
- Remove or loosen tight equipment
- Headache should disappear within 5–10 minutes

If headache persists administer oxygen and call DES (Diver Emergency Service) on 1800 088 200 free call within Australia.

High levels of carbon dioxide can lead to anxiety and panic

Your local DES number:

1. List four essential features of a good mask.

2. List three essential features of a good fin.

3. What is the essential feature of a weight belt?

4. When should you ditch a weight belt?

5. List three essential features of a exposure suit.

6. How is a buoyancy vest inflated in an emergency?

7. What is the total pressure at 12m (40')?

8. Where do the greatest pressure changes occur?

9. What happens to the volume of air in a sealed balloon during descent?

10. How can you maintain constant volume in a balloon on ascent?

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11. What is the function of the Eustachian Tube?

12. How do you avoid ear injuries on descent?

13. How often should you equalise your ears?

14. What can forceful ear equalisation cause?

15. How do you avoid mask squeeze on descent?

16. How does wetsuit compression impact a snorkel diver?

17. Which gas stimulates breathing?

18. What constitutes dangerous hyperventilation?

19. What can hyperventilation cause?

20. What is likely cause of a severe headache in a snorkel diver?

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Snorkel Learning Module 2

Preparation

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- Communication 19
- Pre-dive planning 20
- Conducting the dive 21

Understanding water

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- Waves 23
- Currents 24

Other considerations

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- Fitness 26
- Law & environment 27
- Further activities 28

Review questions

- Dive planning 29

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Why use the buddy system?

- Safety
- Sharing experience
- Comfort
- Dive planning
- Gearing up
- Emergency procedures

Duties

Pre dive

- Check training and experience
- Check hand signals
- Plan dive
- Help each other gear up
- Do dive safety checks
- Warn your buddy of any potential problems, eg. ear problems, seasickness or anxiety

During dive

- Always stay with your buddy and particularly the one-up, one down system
- Constantly check the well being of your buddy
- Point out things of interest

Emergency duties

- Equipment problems
- Entanglement
- Getting help
- First aid

The buddy system is fundamental to safe diving

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Be the buddy you wish to dive with and **never** dive alone

Always use the one-up, one-down system

OK on surface
(One hand)

OK on surface

Distress
(Pick me up)

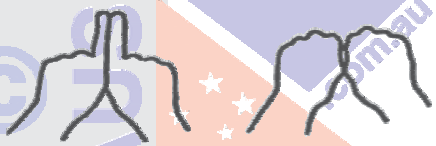
Are you OK

Something is wrong

Going down

Going up

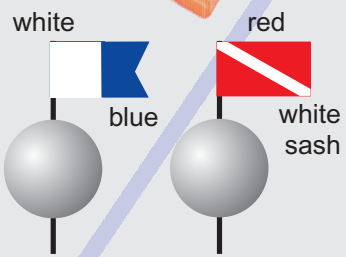
Stop
Stay there



Stay with buddy

Stay with group

Go this way



Always use a dive flag to warn boats of divers in the water

Signals

- Always check hand signals with your buddy
- Have a whistle or horn for recall

Slates

- A slate and pencil is useful for complex messages

Dive flags

- International (Blue/white)
- US (Red/white)

Area orientation

- If unfamiliar with conditions, eg. trained in tropics and diving in temperate waters, seek advice from a diving professional

Site selection

Select dive site by obtaining local knowledge from a local dive shop, and ensure the site:

- Suits everyone's training and experience
- Has minimum hazards eg. currents, rips, waves, etc.
- Has minimum boating traffic
- Has alternative sites, if possible
- Check weather forecast

Equipment preparation

Before going to the dive site:

- Adjust weight for water type
- Check BC size and adjust
- Check snorkelling equipment
- Inform someone of site and intended return time (and inform of return)
- Have dive flag

Always check on specific hazards, characteristics and emergency contacts for the area you are diving

Emergency procedures must be discussed with your buddy before a dive

Diving unfamiliar waters & sites requires area orientation
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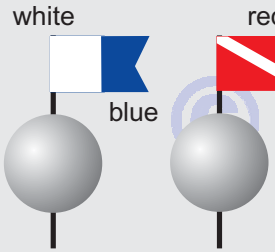
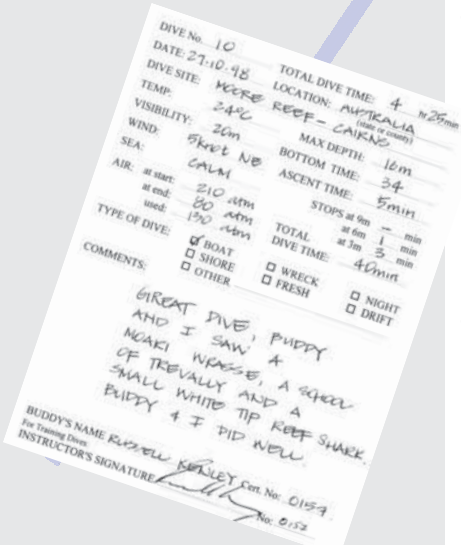
Hyperventilation is extremely dangerous, never breath hold dive after taking more than three deep breaths




DIVE No. 10
DATE: 27.10.98
DIVE SITE: MOORE REEF - CAIRNS
TEMP: 24C
VISIBILITY: 20m
WIND: 5knt NE
SEA: CALM
AIR: at start: 210 atm
at end: 80 atm
used: 130 atm
TYPE OF DIVE: ☑ BOAT ☐ SHORE ☐ OTHER
TOTAL DIVE TIME: 4 hr 25min
LOCATION: AUSTRALIA (state or country)
MAX DEPTH: 18m
BOTTOM TIME: 34
ASCENT TIME: 5min
STOPS at 6m – min
at 3m 3 min
TOTAL DIVE TIME: 40min
☐ WRECK ☐ FRESH
☐ NIGHT ☐ DRIFT
COMMENTS: GREAT DIVE, BUDDY AND I SAW A NOAKI WRASSE, A SCHOOL OF TREVALLY AND A SMALL WHITE TIP REEF SHARK. BUDDY & I DID WELL
BUDDY'S NAME RUSSELL KERSLEY Cert. No. 0154
For Training Dives
INSTRUCTOR'S SIGNATURE
No. 0152

Check

- Surface conditions
- Weather forecast
- Hazards, eg. breaking waves
- Own equipment
- Signals
- Buddy's gear
- Entry (depth)
- Exit and appropriate alternative exit
- Dive flag
- Weight belt has a quick release buckle and loose end is not tucked in

General safety rules

- Do not dive beyond level of training and experience
- Always listen carefully to the dive brief
- Never dive alone and always stay close to your buddy
- Always practise the one-up, one-down, system
- Stay within defined "Safe Snorkel Area", if appropriate
- If expecting difficulties, eg. seasickness or ear problems, inform the dive master and your buddy
- If unwell or can't equalise–do not dive
- Don't be afraid to abort a dive
- Drink plenty of fluids between and after dives
- Never hyperventilate
- Rest when tired or cold

After dive

- Check health
- Fill in log book
- Discuss dive
- Notify of return

Tides

Caused by the gravitational effect of the sun and moon on the earth's oceans.

Neap tides

- Gravitational pull of sun and moon perpendicular to each other
- Low tidal range
- Less current

Spring tides

- Gravitational pull of sun and moon in opposite or same directions as each other
- High tidal range
- Strong currents

Ebb tide

- Outgoing tide
- Tide against swell, waves bigger and may break

Flood tide

- Incoming tide
- Clearer water
- Better for shore dives

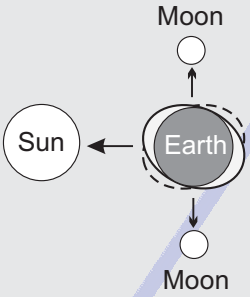
Slack water

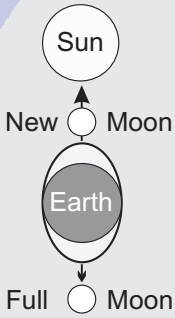
- Period between tides
- No current
- High water slack is usually clearer

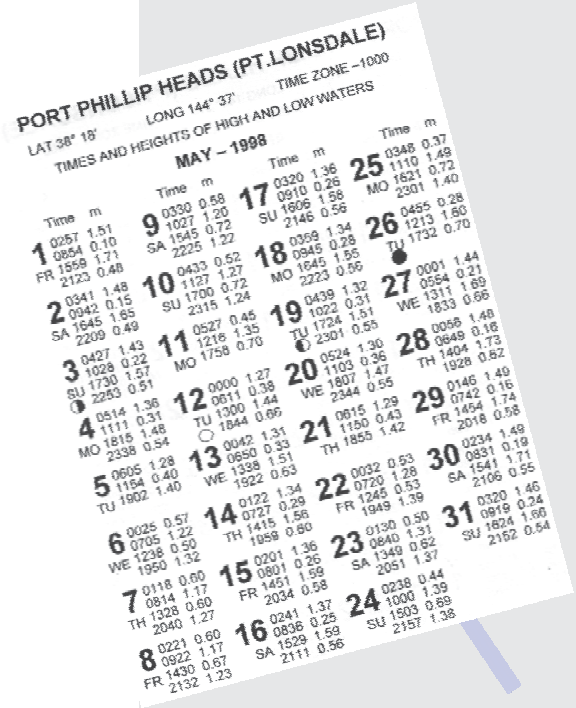
Tidal information

Consult:

- Tide tables
- Newspapers







PORT PHILLIP HEADS (PT.LONSDALE)

LAT 38° 18' LONG 144° 37' TIME ZONE -1000

TIMES AND HEIGHTS OF HIGH AND LOW WATERS

MAY – 1998

	Time	m	Time	m	Time	m
1 FR	0257	1.51	9 SA	0330	0.58	17 SU	0320	1.36	25 MO	0348	0.37
	0854	0.10		1027	1.20		0910	0.26		1110	1.48
	1559	1.71		1545	0.72		1606	1.56		1621	0.72
	2123	0.48		2225	1.22		2146	0.56		2301	1.40
2 SA	0341	1.48	10 SU	0433	0.52	18 MO	0359	1.34	26 TU	0455	0.28
	0942	0.15		1127	1.27		0946	0.28		1213	1.60
	1645	1.65		1700	0.72		1645	1.55		1732	0.70
	2209	0.49		2315	1.24		2223	0.56			
3 SU	0427	1.43	11 MO	0527	0.45	19 TU	0439	1.32	27 WE	0001	1.44
	1028	0.22		1216	1.35		1022	0.31		0564	0.21
	1730	1.57		1758	0.70		1734	1.51		1311	1.69
	2253	0.51					2301	0.55		1833	0.66
4 MO	0514	1.36	12 TU	0000	1.27	20 WE	0524	1.30	28 TH	0056	1.48
	1111	0.31		0611	0.38		1103	0.36		0649	0.16
	1815	1.48		1300	1.44		1807	1.47		1404	1.73
	2338	0.54		1844	0.66		2344	0.55		1928	0.62
5 TU	0605	1.28	13 WE	0042	1.31	21 TH	0615	1.29	29 FR	0146	1.49
	1164	0.40		0650	0.33		1150	0.43		0742	0.16
	1902	1.40		1338	1.51		1855	1.42		1454	1.74
				1922	0.63					2018	0.58
6 WE	0025	0.57	14 TH	0122	1.34	22 FR	0032	0.53	30 SA	0234	1.48
	0705	1.22		0727	0.29		0720	1.28		0831	0.19
	1238	0.50		1415	1.56		1245	0.53		1541	1.71
	1950	1.32		1958	0.60		1949	1.39		2106	0.55
7 TH	0118	0.60	15 FR	0201	1.36	23 SA	0130	0.50	31 SU	0320	1.46
	0814	1.17		0801	0.26		0840	1.31		0919	0.24
	1328	0.60		1451	1.59		1349	0.62		1624	1.66
	2040	1.27		2034	0.58		2051	1.37		2152	0.64
8 FR	0221	0.60	16 SA	0241	1.37	24 SU	0238	0.44			
	0922	1.17		0836	0.25		1000	1.39			
	1430	0.67		1529	1.59		1503	0.89			
	2132	1.23		2111	0.56		2157	1.38			

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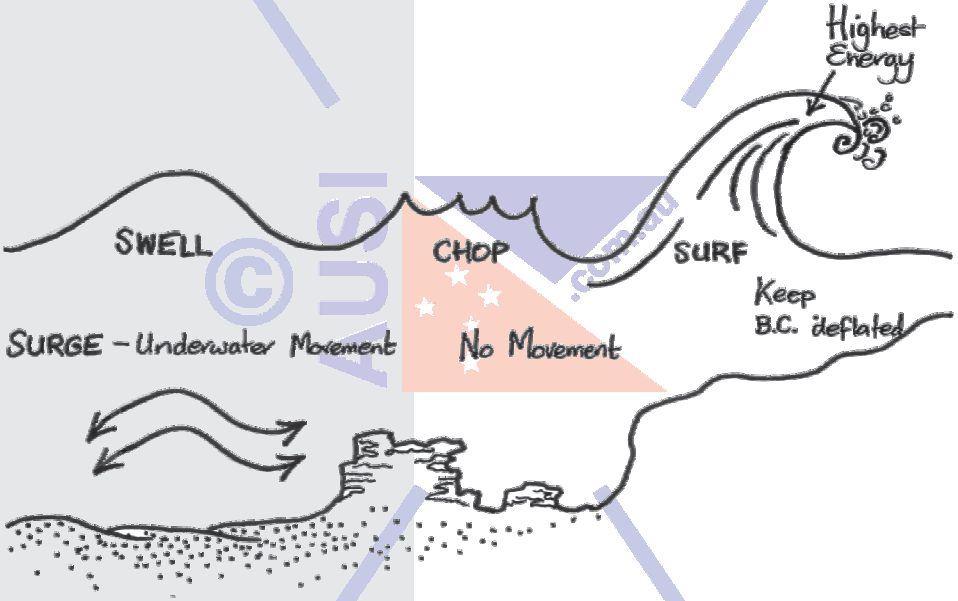
Waves

Caused by wind and tide:

- **Swell**–long rolling movement on surface
- **Surge**–back and forth movement underwater due to swell
- **Surf**–swell gains speed in shallow water and then breaks
- **Chop**–wind generated small surface waves



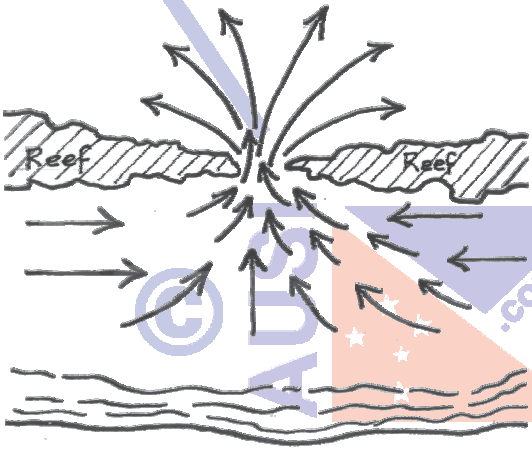
Always have an exit point each side of your entry point

Surf entry and exit

- Gear up above water line
- Deflate buoyancy vest
- Mask on, snorkel in mouth
- Walk in backwards, side by side with buddy, watching for waves and pot holes
- If you fall over, duck under wave–to avoid high point of waves and swim out
- Once past surf, surface, inflate vest, realign gear, re-check buddy and commence diving
- Exit procedure is the reverse of entry

Rip currents

- Caused by offshore reefs and tides
- Distinguished by broken surf/wave line and dirty water
- If caught in rip, inflate vest, don't swim against it, go with it or across it until it dissipates
- Ditch weight belt if necessary



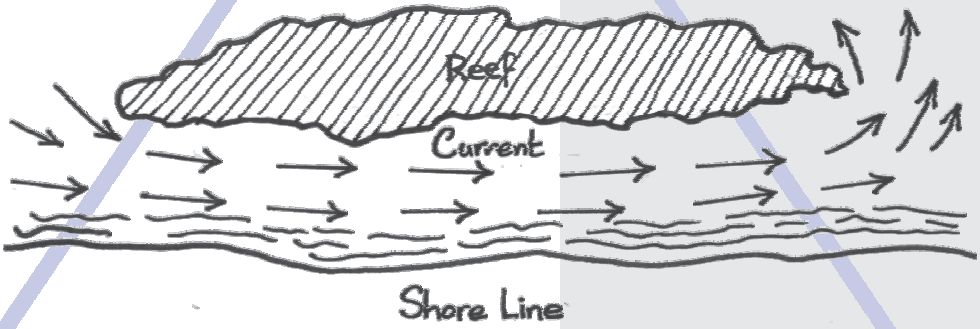
Waves deposit water over reef

Excess water drains back through gap

When shore diving, always plan an exit either side of your entry point

Long shore currents

- Due to tidal movement
- Run parallel to shore
- Plan dive to swim into current so return swim is with the current



Do not continue the dive if feeling unwell on surface

If panic occurs on the surface - use extreme caution, don't approach unless positively buoyant, ditch diver's weight belt, inflate diver's vest

Seasickness

Avoid by:

- Gearing up quickly
- Not thinking about it
- Medication (see a diving doctor)
- Gear up at last minute, particularly wet suit coat or neck seals
- No hangover (will worsen effects)
- If feeling sick, get in water and snorkel until it settles

Stressed or tired diver

- Difficulty in breathing, uncomfortable on the surface or out of breath

Action on surface

- Stop
- Inflate buoyancy vest
- Drop weight belt, if necessary
- Keep regulator in mouth
- Keep mask in place
- Calm down and regain control of breathing
- **Reassure**

Note: Do not continue the dive unless diver is totally calm and in control, otherwise assist diver back to boat or shore.

Entanglement

Eg. fishing line; rope; kelp.

- Stop
- Attract buddies attention
- Buddy removes entanglement

Rescue

Eg. unconscious diver at depth

- Recover diver:
  - Ditch weight belt and surface
- On surface:
  - Give two rescue breaths
  - Maintain one rescue breath–every five seconds until solid platform is reached
- Commence CPR
- Call for help

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Medical and physical fitness

- Need to be physically fit to dive **safely** and **enjoyably**
- If donating blood wait 48 hours before diving
- After major illness or injury get clearance from a diving doctor
- If you develop an illness associated with lungs, heart, ears, fitting or loss of consciousness consult a diving doctor for clearance to dive

Smoking, drugs and alcohol

- Do not mix with diving
- Do not dive with hangover
- Avoid smoking, particularly for some hours before diving
- Do not dive under the influence of any drugs

Medication

- Check your medication with a diving doctor
- Avoid diving while on any medication that can mask symptoms of diving related problems, eg. decongestants

Breath-holding techniques

Extending capacity

Breath-holding capacity can be extended by:

- Avoiding stress by ignoring peer pressure, not setting high goals
- Maximise surface interval between dives
- Minimising the number of dives to avoid overexertion and CO_2 build up
- Visualisation of the dive will help reduce anxiety
- Increasing concentration by meditationRelaxation
- Practising holding breath against the clock on land eg. between train or bus stops
- Setting realistic incremental increases
- Using only comfortable equipment including exposure suit
- In-water comfort levels are increased by all water activities

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Environmental awareness

- Anchoring can cause damage, so take care, particularly on coral reefs
- Finning can damage marine life, especially coral
- Harvesting–only take what you can eat and what is legal
- Don't litter the ocean–especially with plastic, tape, rope and string
- Pollution–be careful with boat fuel and oil
- Touching animals may harm both you and them

Australian Fur Seal injured by fishing net
(Photo: Kim Beasley–Melbourne Zoo)

Historic ship wrecks

- Check local laws and regulations, restrictions which may apply
- Usually there is free access, but some require a permit, and some are restricted
- Cannot move wreck or any part of it
- Cannot remove any artefacts

Marine parks and reserves

- Contain areas of high conservation value
- Check for local parks and their laws

Fisheries laws

Check local, state and commonwealth laws for things such as:

- Closed seasons
- Closed or restricted waters
- Bag limits
- Size limits
- Taking invertebrates from inter-tidal zone
- Spear fishing

Whales

- No boats within 100m (333')
- No swimmers (divers) within 30m (100')
- Don't get between mother and calf
- Do not feed or disturb

Boat diving

- Always carry mandatory equipment, particularly life jackets, flares and fire extinguishers
- Have licence, where required
- Extra diving gear eg. oxygen equipment, mermaid line, dive flag, radio
- Tell someone where you are going and when you expect to return
- Always have someone on the boat while diving
- Swim into and up current (except if tide change is expected)
- Ensure appropriate depth before entry
- Always display appropriate dive flag

Diver's flag

- Always use the appropriate dive flag required for the area

Spear fishing

- Never load or shoot a spear gun out of water
- Always keep safety catch on until ready to shoot
- Never tie fish to your waste, use a float with at least 10m of rope
- Only kill what you intend to eat

Free diving

Free Diving is extreme snorkelling ie. breath-hold diving beyond 9 metres (30ft):

- Usually practiced when spear fishing and competitive diving
- Shallow Water Blackout becomes a very real potential hazard
- Requires specialist training and surface support

Scuba diving

- Needs further training to understand the dangers and potential hazards

Divers operating small boats should seek further training

These flags indicate: "Danger diver below —keep clear"

Americal–Red flag, white sash

International–Blue tips

Never exceed your comfortable personal breath-holding limit

Never breathe compressed air without training & never take a breath of compressed air while on a breath-hold dive

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1. List six reasons for using the buddy system.

2. What is the One Up, One Down system?

3. Describe or draw the international divers flag.

4. What is area orientation?

5. List five considerations when selecting a dive site.

6. List nine things to check before entering the water.

7. What is a spring tide?

8. What is slack water?

9. What causes surf?

10. When shore diving, where do you plan your exit?

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11. List your actions if caught in a rip.

12. How can you best avoid seasickness?

13. What action would you take if your buddy showed signs of stress on the surface?

14. List your actions for entanglement.

15. List the four stages of a snorkel rescue.

16. List five important environmental considerations when diving.

17. List six important areas of consideration with respect to Fisheries Laws.

18. What are the legal distances for approaching whales?

19. List eight important considerations when boat diving.

20. List two safety concerns when spear fishing.

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Snorkel Learning Module 3

General first aid

- Basic life support 32
- Bleeding & envenomation 33
- Shock 34
- Exposure 35

Diving Injuries

- Ear problems 36
- Marine animals 38

Scuba diving

- The AUSI scuba pathway 40

Review questions

- Diving first aid 41

Snorkelling with a turtle
©iStockphoto.com/Tammy Peluso

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Non-responsive adult victim

- Check for **Danger**
- Check for **Response**–gently shake and ask:
  - Control severe bleeding (pressure and elevation)
- Call for **Help** (Call for Ambulance–000)
- Open **Airway** (Head tilt and jaw lift)
- Check **Breathing** (look, listen, feel)
  - If breathing is not normal, give two rescue breaths (one second each)
  - Use pocket mask where possible
- Give 30 chest **Compressions**:
  - Locate centre of chest
  - Compress one third (4–5cm, 1–1.5")
  - Rate of 100 per minute (nearly 2 per second)
- **Defibrillate**–use AED if available & trained to use
- **Effect CPR**–2 breaths to 30 compressions:
  - Continue until qualified help arrives, normal breathing resumes or exhaustion
- **First aid** upon recovery:
  - Give 100% oxygen as soon as possible
  - Call for medical assistance
  - Manage shock
  - Administer specific first aid treatment

Danger

Response

Help

Airway

Breathing

Compressions

Defibrillate

Effect CPR

First aid

Don't hesitate to try and help—a non-responsive person with a blocked airway is unlikely to survive

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Severe bleeding must be controlled immediately

Envenomation

Cause

- Snake (both land and sea)
- Cone shell
- Blue ringed octopus
- Spider bites

Action

- Apply **pressure** and **immobilise,** as below
- Check circulation every 10-15 minutes—fingers and toes should be pink

Severe bleeding

Cause

- Propellers—most likely
- Bites & spines
- Spear gun and knife

Action

- Apply **direct pressure** using hand, pressure pad, packing or bandage
- **Elevate** the limb
- Use ice
- Treat for shock
- Do not move unnecessarily
- Get on-site medical assistance

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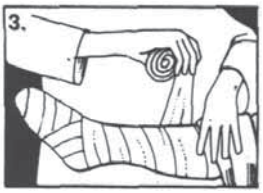
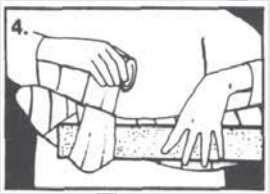
1. Apply a broad pressure bandage over the bite as soon as possible. Keep the bitten area still. Do not wash wound.

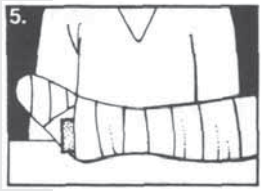
2. The bandage should be as tight as you would apply to a sprained ankle. Fingers or toes should remain pink, with normal sensation.



3. Extend the bandage as high as possible.



4. Apply a splint to the limb.



5. Bind it firmly to as much of the limb as possible. Do not remove until proper medical support is available.

6. Bites on hand or forearm. 1. Bind to elbow with bandages. 2. Use splint to elbow. 3. Use sling. 4. Do not remove bandage.

Drawings courtesy of Dr Straun Sutherland

Action

- Quickly lay down
- **Reassure**
- Control severe bleeding
- Protect from exposure
- Loosen tight clothing
- Monitor vital signs, **CPR** as necessary
- 100% oxygen
- Call for medical help

Don't

- **Don't** move patient unnecessarily–wait at least 20 minutes
- **Don't** give fluids by mouth (especially alcohol)
- **Don't** panic patient with careless statements about their condition

Cause

- Accident or injury
- Severe fright or emotional trauma
- Illness (eg. severe vomiting, diarrhoea)

Recognition

- Pale, cold, clammy skin
- Weak rapid pulse
- Rapid shallow breathing
- Nausea
- Anxiety
- Unconsciousness
- Heart or respiratory failure

No matter how minor the cause, treat for shock—
shock can kill

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Beware of hypothermia even in tropical water—heat is drawn away from the body 25 times faster in water than in air of the same temperature

Hot & cold

Normal temperature

- Body core is maintained at 37°C (98°F)

Too hot

- Sweating–evaporative cooling
- Skin becomes flushed–radiates heat

Too cold

- Shivering–generates heat
- Goose bumps–raise hairs for insulation
- Skin becomes pale–reduces radiation

	°C	Condition	Skin	Colour	Alertness	Muscles	Action
Energy production exceeds energy loss	+ 37°C 98°F	**HEAT STROKE**	dry	red	unconcious		apply ice patches cool by fanning URGENT medical help lie victim down
	+ 37°C 98°F	**HEAT EXHAUSTION**	excessive sweating	pale	faint	cramps	**sponge down cool in shade drink cool fluids**
	⇧	**HOT**	sweating	flushed			cool shower cool in shade drink fluids
	37°C	**NORMAL TEMPERATURE RANGE**					Copyright © AUSI Pty Ltd 2009
Energy loss exceeds energy production	⇩	**COLD**	shivering	pale		numbness	dry warm shower warm drink
	- 37°C 98°F	**MILD HYPOTHERMIA**	uncontrolled spasmodic shivering	blotchy skin and blue extremities	vague	cramps	dry body contact medical help car heater
	- 37°C 98°F	**SEVERE HYPOTHERMIA**	shivering stops	blue	unconcious	muscle rigidity	dry body contact urgent medical help wrap in plastic

Prevention of hyperthermia

- Stay hydrated, drink plenty of non-alcoholic fluids
- Avoid direct sunlight–stay in shade
- Remove exposure suit on hot days
- Avoid over exertion

Prevention of hypothermia

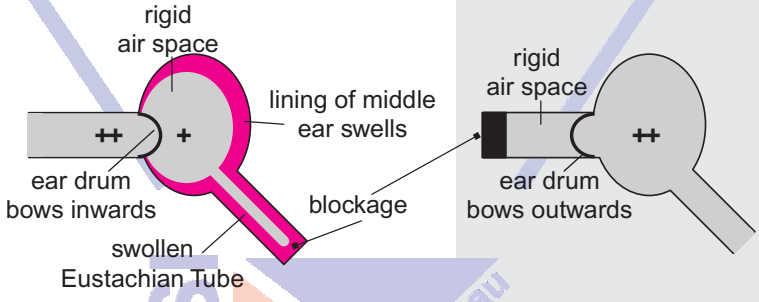
- Remove wet exposure suits and avoid
- wind-chill
- Wear appropriate exposure suit (page 4)
- Abort dive when feeling cold
- Avoid alcohol, before and after diving
- Adequate diet

Causes

On descent (ear squeeze)

- Failure to equalise Middle Ear
- Blocked Eustachian Tube
- Using ear plugs
- Tight hood

All can lead to ruptured ear drum



On ascent (reverse ear squeeze)

- Failure to automatically equalise middle ear due to blocked Eustachian Tube

Recognition

- Pain
- Bleeding from nose, mouth or ear
- Feeling of fullness (like water in the ear)
- Hearing difficulties
- Rotational dizziness (vertigo) and/or nausea
- If ear drum ruptures, air can leak out if equalising is attempted

Deafness, vertigo and especially ringing in ears (tinnitus) are symptoms of inner ear damage. Immediate medical assistance is required, give patient 100% oxygen and call DES 1800 088 200

Forceful equalisation can damage the inner ear

If you can't equalise then don't dive

Never use ear plugs!

Action

- Cover ear (or both ears if unsure)
- Hang on to line or buddy if vertigo occurs
- Surface with buddy
- Dry and cover ear (or both ears if unsure)
- Don't attempt to pop ears
- Don't dive again
- Seek medical advice from a diving doctor

Treatment

- Rest from diving until ears are functioning correctly
- Maybe anti-biotics and decongestants

Prevention

- **Always pressurise ears on surface** and **continually equalise** during descent **before** pressure or pain is felt
- **If you feel pressure or pain**, ascend and then try again
- Don't dive with a cold, hay fever or other respiratory allergies
- Avoid smoking
- Don't use ear plugs or wear a tight hood
- Don't use decongestants

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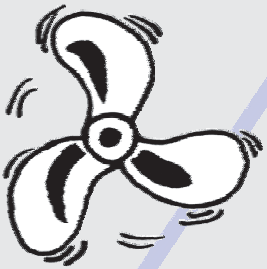
Potentially dangerous marine animals

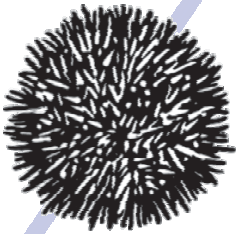
Most marine creatures are harmless

- Defense and predatory mechanisms can unintentionally harm man
- Avoid touching unknown animals
- Take extreme care when spear fishing
- Wear protective clothing
- Seek local knowledge



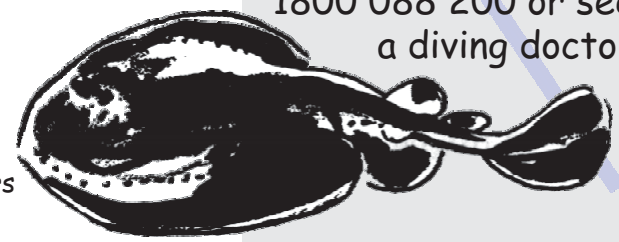
Propeller
Found in most waters

Types of injury	Animals or objects responsible	Recognition	Action
Non-venemous injury	• Propellor (most likely) • Spear gun • Shark	• Severe bleeding • Pain • Shock	• Control bleeding • Treat for shock
Venemous bites	• Cone Shell • Blue Ringed Octopus • Sea snake	• Respiratory failure • Paralysis	• Pressure Immobilisation Technique • Rescue breaths
Spines	• Stonefish (venemous) • Butterfly Cod (venemous) • Stingray (may be venomous) • Cobbler (venemous) • Old Wife • Sea Urchin	• Some bleeding • Pain • Shock	• Remove if possible • Hot water–approx. 57°C (135°F) • Pain killer (spray) • X-Ray
Stings	• Jellyfish (eg. Box Jelly, Irukandji) • Hydroid • Coral (eg. Fire Coral) • Anemone	• Pain • Shock • Irritation	• Vinegar (30 seconds) • Remove tentacles carefuly • Pain killer (spray/ice)
Electric shock	• Numbfish (Electric Ray)	• Numbness	• No treatment

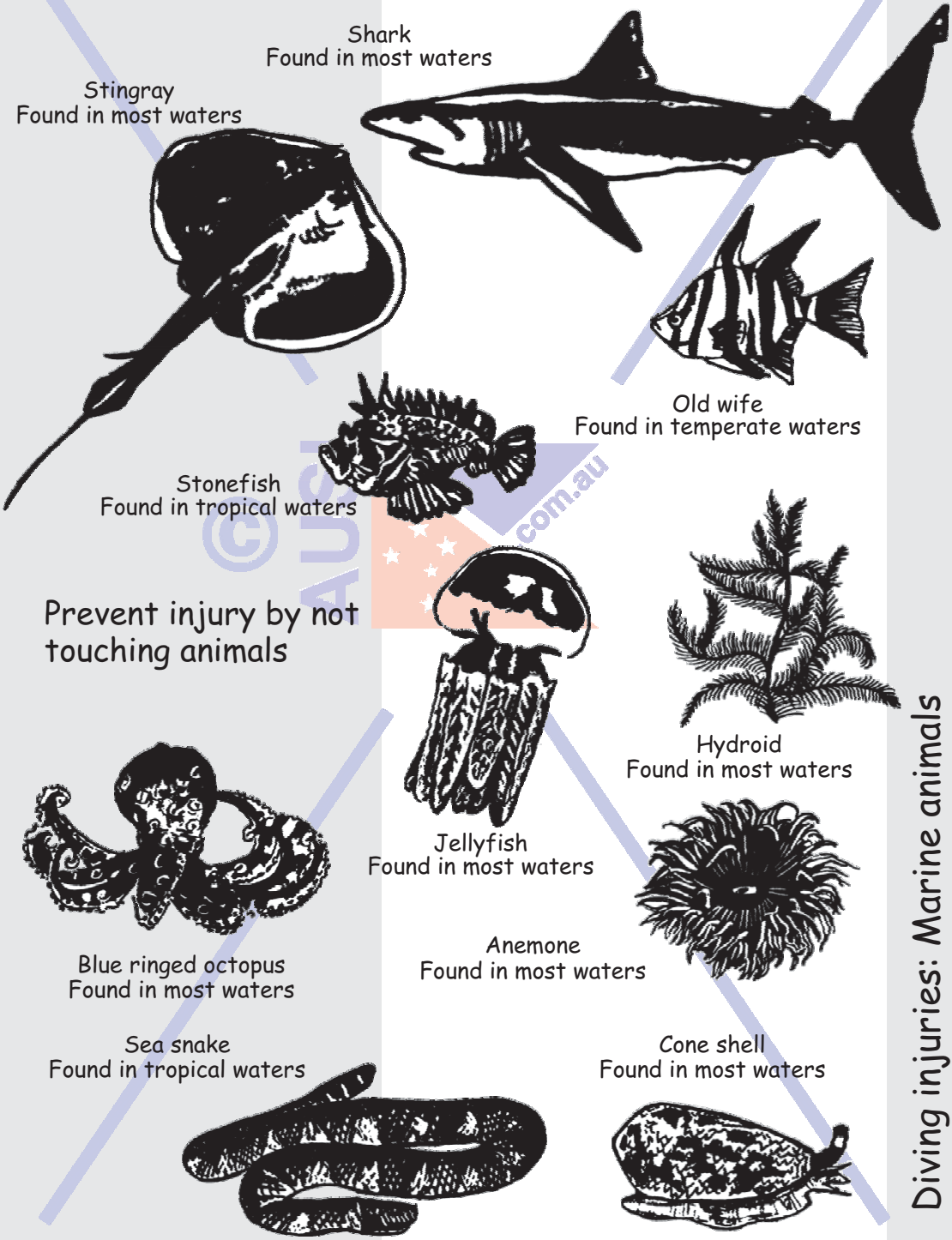


Sea urchin
Found in most waters

Always treat for shock, resuscitate as necessary and if severe call DES—1800 088 200 or see a diving doctor



Electric ray
(Numbfish)
Found in temperate waters



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Supervised diving

AUSI Scuba Adventure
introductory scuba dive
a guided dive to a maximum depth of 6 m (20')

AUSI Level I Scuba Diver
supervised scuba diver
trained to dive to 18m (60') in daylight with an instructor

Recreational diving

AUSI Level II Scuba Diver
international open water diver
trained to dive to 18m (60') in daylight unsupervised

AUSI Level III Scuba Diver
advanced diver
trained to dive to 30m (100') in daylight and 18m (60') at night

AUSI Level IV Scuba Diver
deep diver
trained to dive to 39m (130') in daylight

AUSI Level V Scuba Diver
rescue diver
Level IV with Rescue specialty

AUSI Level VI Scuba Diver
master diver
AUSI's highest non-professional level of training

Professional levels

AUSI Level VI Pro (Dive Master)
Assistant Instructor, Resort Instructor, Scuba Instructor
Instructor Trainer & Instructor Examiner

Special interest courses

- Rescue
- Wreck
- Night
- Underwater naturalist
- Underwater photographer
- Technical diving
- Navigation
- Sinkhole
- Cave

plus - many, many more...

Scuba diving is very dangerous without proper training

Never breathe compressed air at depth while on a breath-hold dive as it could be fatal

Scuba diving in Fiji

1. What does DR H ABCDEF stand for?

2. What is the recommended rate for CPR?

3. How do you control severe bleeding?

4. When should you use the Pressure Immobilisation Technique?

5. List four signs and symptoms of shock.

6. What is the first aid for shock?

7. List three don'ts when treating shock.

8. What are the main distinguishing factors between cold, mild hypothermia and severe hypothermia?

9. List two things you must not do when treating hypothermia?

10. What is the best way to prevent hypothermia?

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11. What is the first aid for heat related difficulties?

12. What is the main cause of Middle Ear Squeeze?

13. List five signs or symptoms of an ear injury.

14. List six ways of preventing an ear injury.

15. What is the best way to avoid a marine animal injury?

16. What action should you take for a propeller injury?

17. Describe your action for a Blue Ringed Octopus bite.

18. List the first aid for a stingray spine injury.

19. How would you treat the victim of a jellyfish sting?

20. What is your Diver Emergency Service phone number?

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Dive number ☐ Date _____

Location _____

Dive site _____

Tropical ☐ Temperate ☐ Boat ☐ Shore ☐

Wind _____ Surface conditions _____

Visibility _____ Water temperature _____

Current _____ Time in water _____

Comments

Dive store stamp

Buddy's name _____

Buddy's signature _____

For training dives:

Instructor's name _____

Instructor's signature _____

Dive number ☐ Date _____

Location _____

Dive site _____

Tropical ☐ Temperate ☐ Boat ☐ Shore ☐

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Current _____ Time in water _____

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Buddy's signature _____

For training dives:

Instructor's name _____

Instructor's signature _____

Lic # 32311

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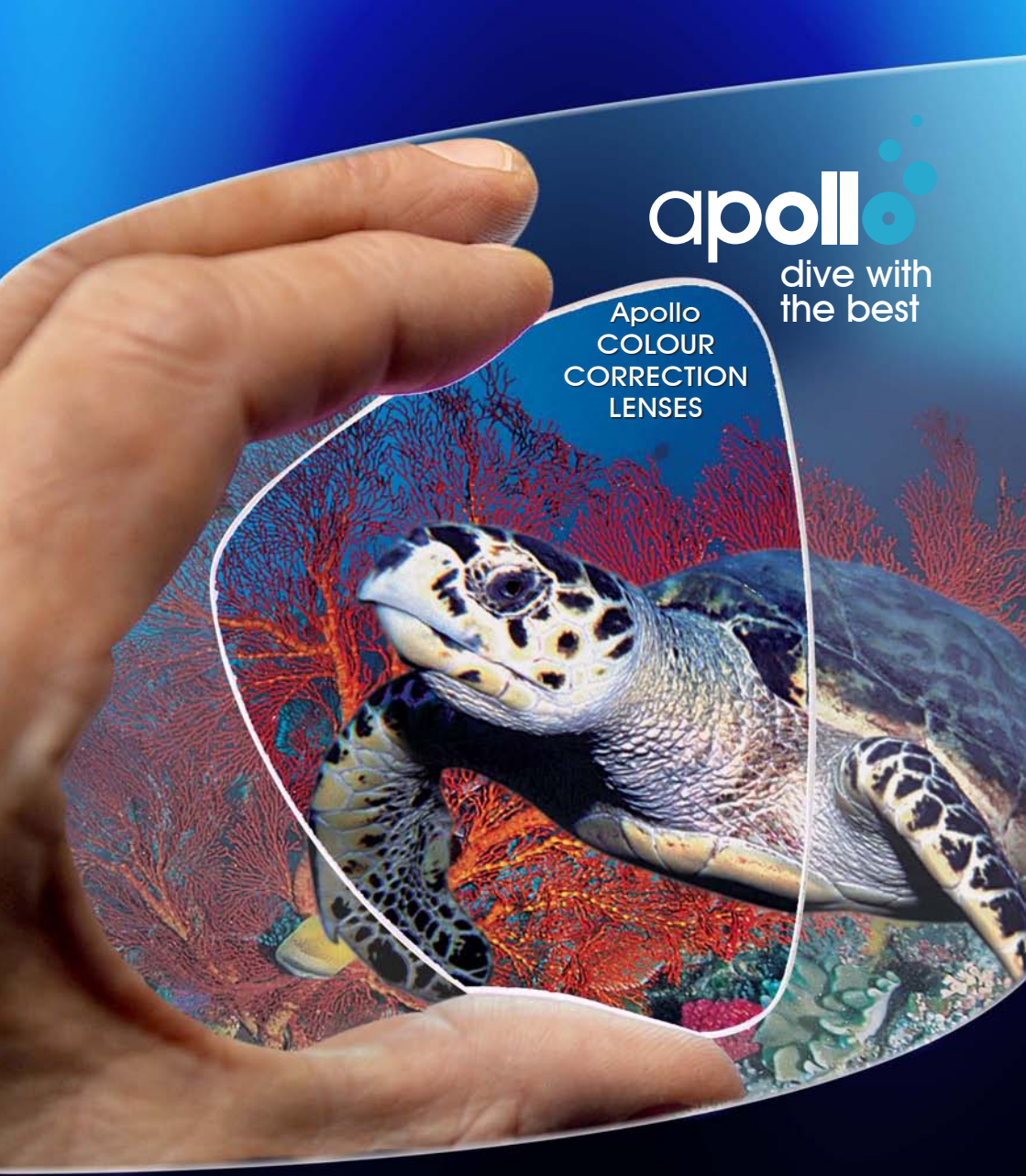

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Apollo Australia Pty Ltd
PO Box 391, Winston Hills NSW 2153Australia
Unit 1 / 20 Artisan Road, Seven Hills NSW 2147 Australia
Tel: (02) 9620 9577 Fax: (02) 9620 9744 Toll Free Fax: 1800 061 742
E-mail: sales@scubaonline.com.au Website: www.scubaonline.com.au