New marine science syllabus resources

PRE C M

MTAQ conference 2018



MTAQ life member

By [mapu] - originally posted to Flickr as Moreton Island, CC BY 2.0, https://commons.wikimedia.org/w/index.php?curid=6283138

Acknowledgements

Traditional owners

Marine teachers past and present

Conference organisers and volunteers



Presentation summary

- **1.** Origins of marine science
- 2. Materials developed
 - 3. Examples using syllabus verbs
 - 4. Availability and cost
 - 5. December 2 day workshop

One university

There was only one was university in Qld

Entry was by an external exam which was abandoned by the government in 1970.



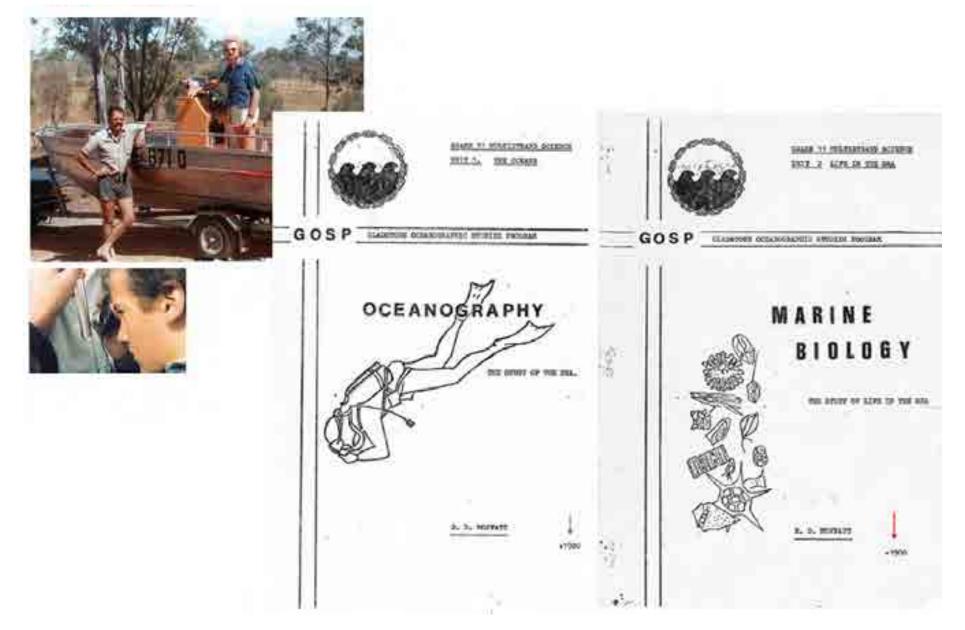
I did a 3 year Zoology degree with the aim of sailing the world chasing plankton.

14 of us graduated

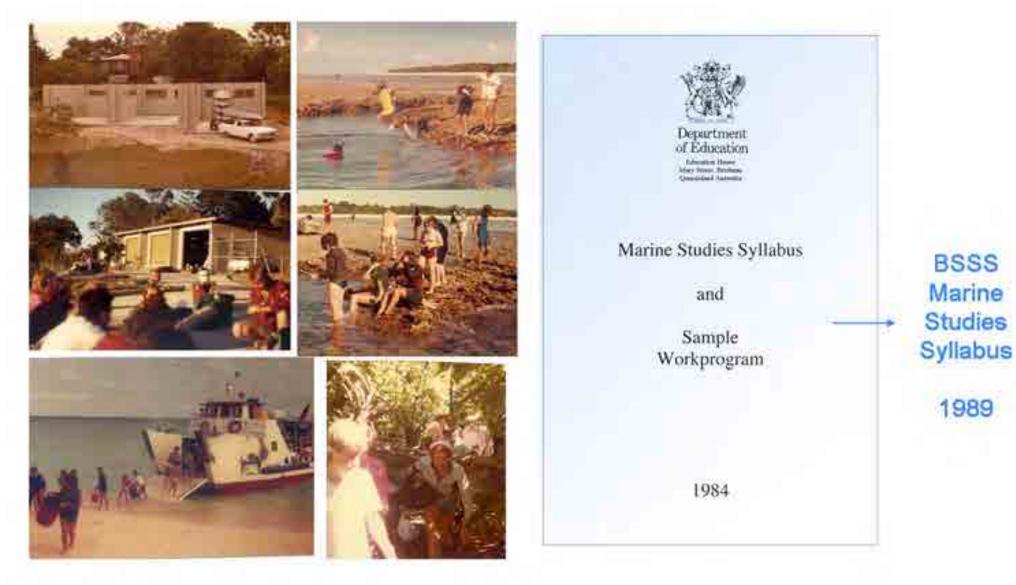
None of us got a job.

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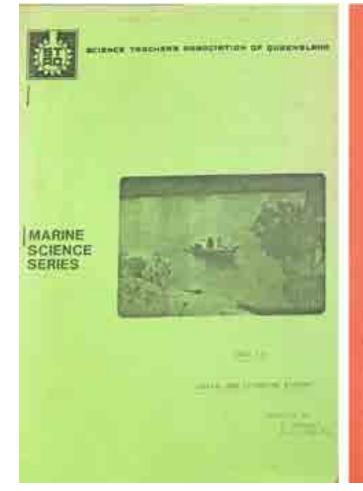
So I went teaching to Kingaroy – then Gladstone



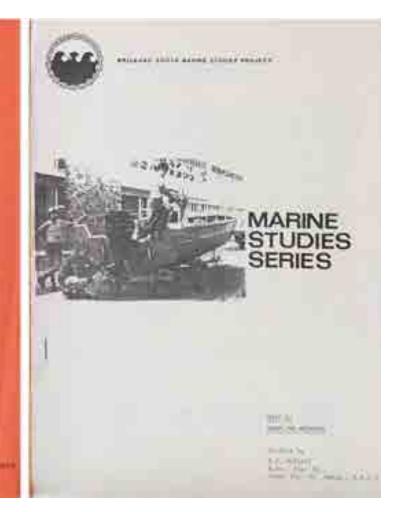
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Brisbane South and Marine Science publications



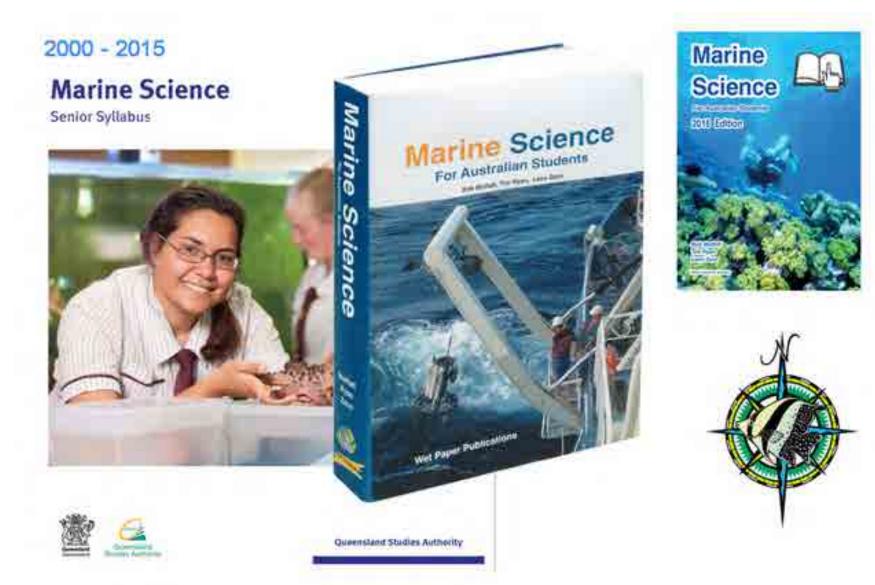
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Volunteering, consulting, publishing



Worked with QSA



Digital publishing ... then retirement!!!

Flipbooks - Available worldwide



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Oceanography

Teacher's Guide



workbook.























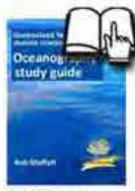
ANSWER





PUBLICATIONS

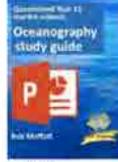
Qld New Syllabus Resources



F45R Pilot Oceanography study guide

Price:\$90.00 On Sale: \$3.00

This is a Pilot edition, \$3 for 30 users Student Flipbook read on line



F47PP Oceanography powerpoints

Price:

- based on your Initial enrolment X \$30. Min \$360

Oceanography approx 1020 slide power point with school agreement Teacher's power point downloaded and used in school under a licence agreement



F48R Marine biology study guide

Price:\$90.00

Available October 2018 - 95% available MTAQ Sept conference 2018



F50PP Marine biology powerpoints

Price:

- based on your initial enrolment X \$30. Min \$360

Available October 2018

The resources cover the syllabus exactly

Marine Science

Unit 1 Oceanography

- · Topic 1: An ocean planet
- Topic 2: The dynamic shore

Assessment

Formative internal assessment/s

Unit 2 Marine biology

- Topic 1: Marine ecology and biodiversity
- · Topic 2: Marine environmental management
- Assessment Formative internal
- assessment/s

Unit 3 Marine systems connections and change

- Topic:1: The reet and beyond
- Topic 2: Changes on the reat

Assessment

- Summative internal assessment 1 Data test (18%)
- Summative internal assessment 2 Student experiment 120%)

Unit 4

- Ocean issues and resource management
- Topic 1: Oceans of the future
- . Topic 2: Managing fishenes

Assessment

Summative internal assessment 37 Research investigation (20%)

Based on the syllabus statement

1.2.5 Subject matter

Subject matter is the body of information, mental procedures and psychomotor procedures (see Marzano & Kendall 2007, 2008) that are necessary for students' learning and engagement with Marine Science. It is particular to each unit in the course of study and provides the basis for student learning experiences.

Subject matter has a direct relationship to the unit objectives, but is of a finer granularity and is more specific. These statements of learning are constructed in a similar way to objectives. Each statement:

- describes an action (or combination of actions) what the student is expected to do
- describes the element expressed as information, mental procedures and/or psychomotor procedures
- is contextualised for the topic or circumstance particular to the unit.

Organisation of subject matter

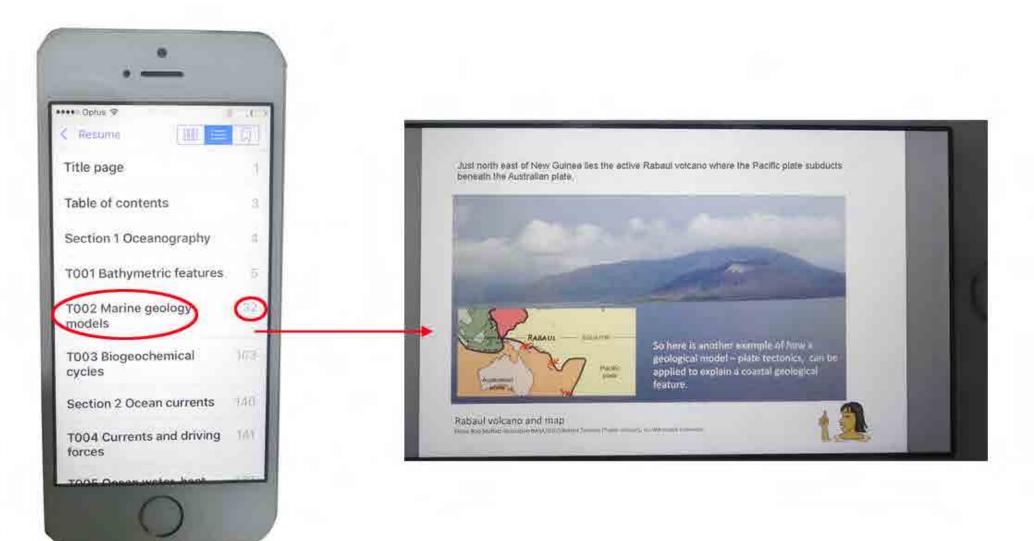
The subject matter is organised as topics within each unit.

The subject matter indicates the required knowledge and skills that students must acquire. Students should experience the mandatory practicals. It is expected that approximately five hours will be required to complete the mandatory practicals that involve fieldwork.

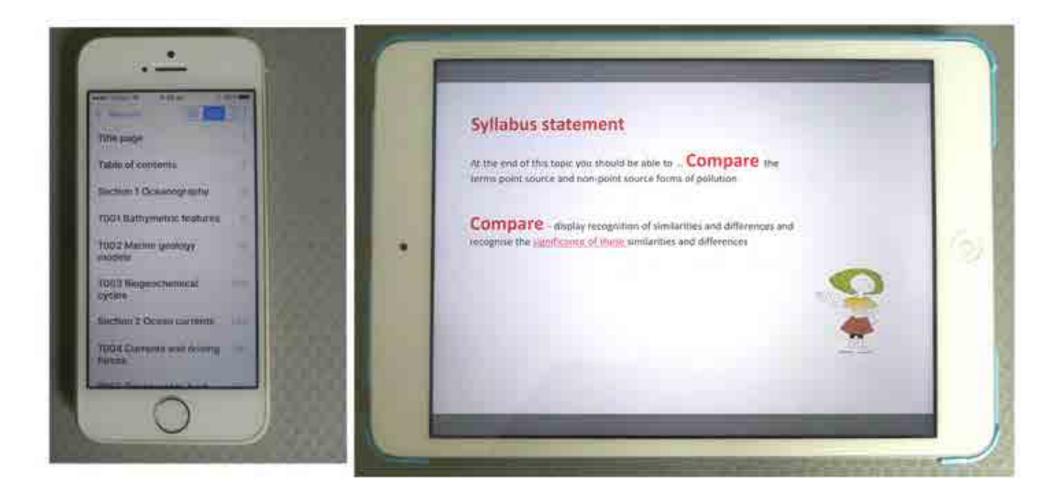
The subject matter from Units 3 and 4 will be assessed by the external examination.

Marine Science 2019 v1.0 General Senior Syllabus Queensland Curriculum & Assessment Authority July 2017

Designed for new generation phones



Navigation by a table of contents based on the syllabus subject matter statements



Wet Patier Membar Area II Marine Science 2010 Edition

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THE CRS

Direct Study Galetal - 120 - 121 / 42

The pages flip as they are read on a phone. Students then answer questions on a "second device"

Water also cycles through storm water pipes that can greatly affect water quality



Storm water drain

Kana tal

Water molecules are an essential part of the process for plants to grow by photosynthesis



Photosynthesis equation involves water subscript to water by the View / distributer beam of had been used to water be

ALL BOARD

The teacher's resource is one long power point supplied in its original format.

Queensland Year 11 marine science

Oceanography study guide



Bob Moffatt

Oceanography has 1028 slides and file size 132mB.

Unit 1: Oceanography

Chapter 1 Oceanography

01 Bathymetric features	 •••	•••	•••	Page 8
02 Marine geology models	 			Page 41
03 Biogeochemical cycles	 •••	•••	•••	Page 124

Chapter 2 Ocean currents

04 Currents and driving forces	•••	•••	•••	Page 165
05 Ocean water, heat and nutrien	t distrik	oution		Page 200
06 Seawater properties				Page 220
07 Effects of temperature, density	y and sa	linity		Page 275
08 Oxygen minimum zone				Page 292
09 Deep ocean circulation	•••	•••	•••	Page 309

Chapter 3 Ocean conservation

10 Oceans need further investigation	•••	 Page 333
11 Ocean resources and economic value	•••	 Page 353

Chapter 4 Coastlines

12 Shaping coastlines	•••	•••	•••	•••	Page 377
13 Tidal movements	•••	•••	•••		Page 407
14 Sand movement	•••	•••	•••		Page 427
15 Wave definitions	•••	•••	•••	•••	Page 452
16 Material movements	••••	•••	•••	•••	Page 472
16E Sand grain experiment		•••	•••	•••	Page 514
17 Coastal erosion	•••	•••			Page 533
18 Weather patterns	•••	•••			Page 553
19 Wave formation	•••	•••		•••	Page 572
20 Wave properties	•••	•••		•••	Page 598

Subject matter statements have been numbered

1 - 36

Chapter 5 Coastal impacts

21 Coastal engineering					Page	625
22 Longitudinal studies					Page	652
23 How organisms populate	areas				Page	677
24 Population density data					Page	704
25 Types of pollution	•••	•••	•••	••	Page	740

Chapter 6 Coastal conservation and impacts

26 Sustainable managemer	nt				Page 775
27 Stakeholder education					Page 798
28 Pollution source compar	risons	•••			Page 855
29 Monitoring water pollut	tion	•••	•••	•••	Page 886
30 Biochemical oxygen den	na <mark>nd</mark>	•••	•••	•••	Page 899
31 BOD use in pollution	•••	•••	•••	•••	Page 913
32 Eutrophication	•••	•••	•••	•••	Page 927
33 Pollution practices	•••	•••	•••	•••	Page 938
34 Measuring indirect pollu	ution le	vels	•••	•••	Page 962
35 Bio-indicator examples					Page 980
36 Water quality testing				•••	Page 997

Marine biology has 1036 slides and file size 140 mB.

Unit 2: Marine biology

Chapter 7 Biodiversity

T37 Three diversity types		Page 8
T38 Biodiversity		Page 27
T39 Ecosystem varieties		Page 45
T40 Ecosystem connectivity implication	ons	Page 73
T41 Diversity loss factors		Page 92
T42 Simpson's diversity index		Page 140
T43 Apply biodiversity indexes		Page 155
T44 Important ecosystem definitions		Page 183

Chapter 8 Biotic components of marine ecosystems

T45 Identify biotic components	S		Page 199
T46 Categorise biotic interaction	ons		Page 235
T47 Classify trophic levels			Page 267
T48 Describe matter cycling			Page 294
T49 Recall population terms			Page 327
T50 Assess population data			Page 360

Chapter 9 Abiotic components of marine

ecosystems

T51 Abiotic limiting factors		Page 397
T52 Distinguish abiotic components		Page 431
T53 Important limiting factors		Page 530
T54 Assess tolerance limit data		Page 576
T55 Apply zonation concepts		Page 634
T56 Population dynamic investigation	n	Page 702

Subject matter statements have been numbered 37 - 69

Chapter 10 Adaptations and classification

T57 Categorise animal groups	Page 726
T58 Classify adaptations	Page 734
T59 Describe adaptions role	Page 803

Chapter 11 Marine conservation

T60 Species habitat preservation	Page 812
T61 Marine ecosystem values	Page 840
T62 Stakeholder role	Page 863
T63 Stakeholder value systems	Page 890
T64 Marine ecosystem issues	Page 905
T65 Ecosystem health terms	Page 931

Chapter 12 Resources and sustainable use

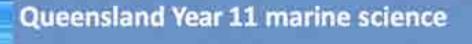
T66 Precautionary p	rinciple	es	Page 956
T67 MPA designs			Page 970
T68 MPA planning			Page 985
T69 MPA evaluation			Page 1021

All are designed so the original

files can be changed so you can

make your <u>own set</u> of school

notes.



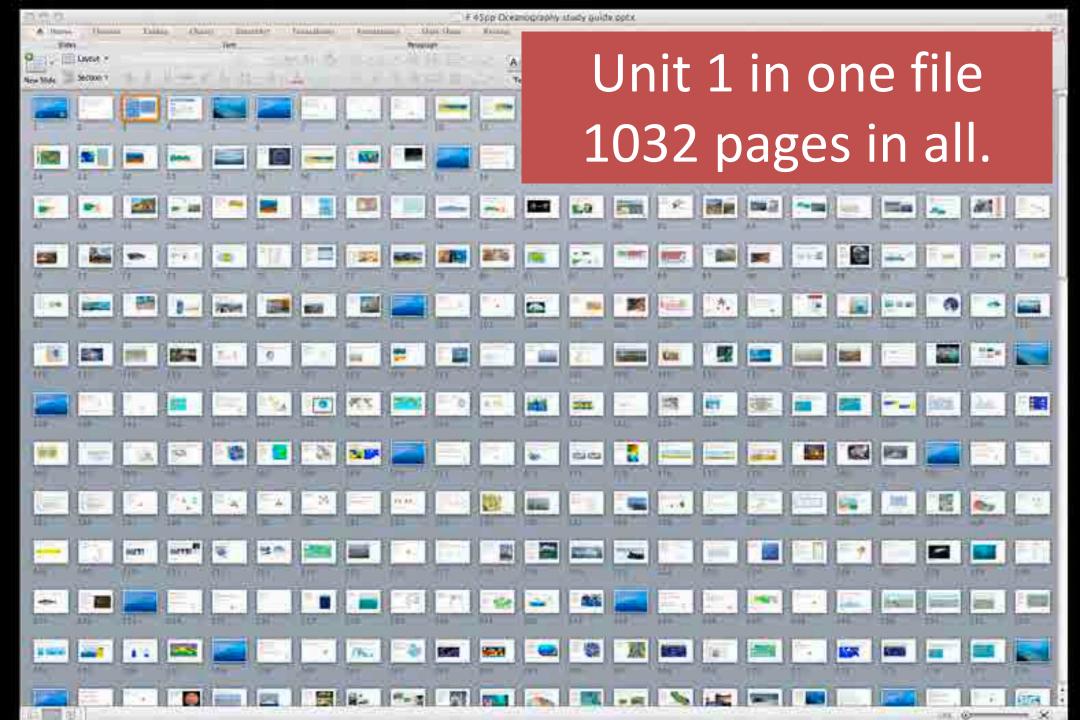
Oceanography study guide

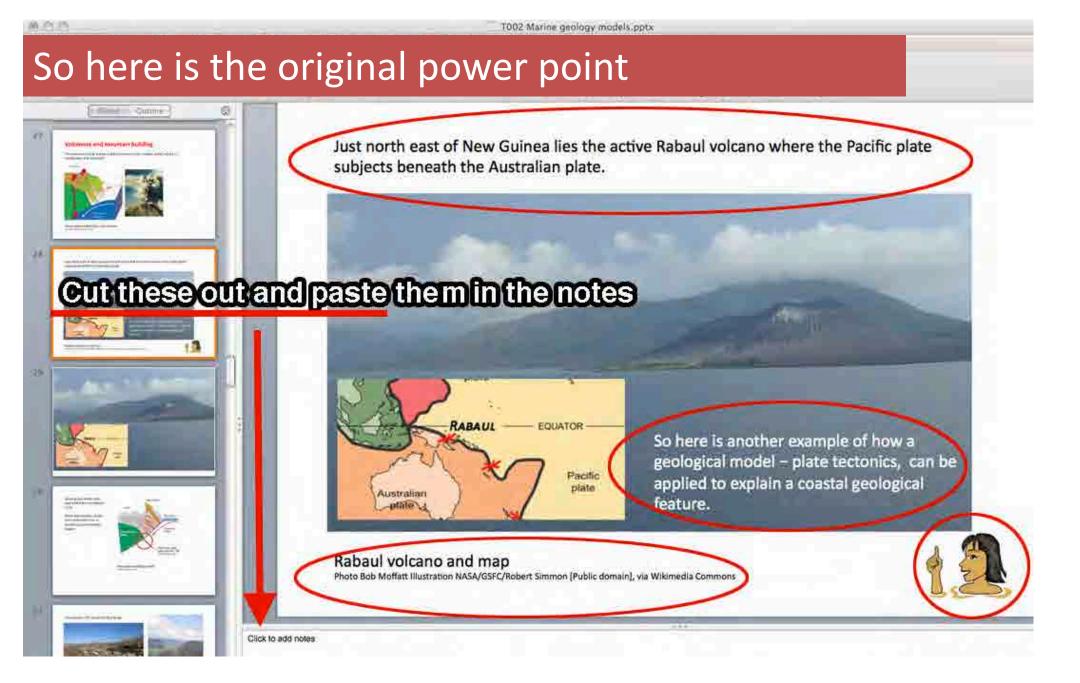
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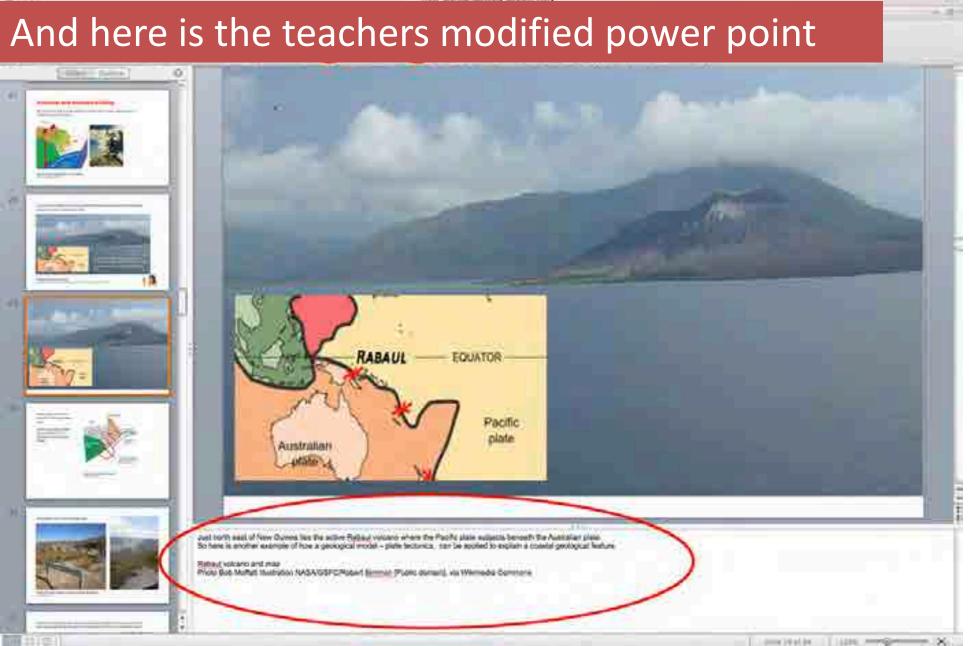
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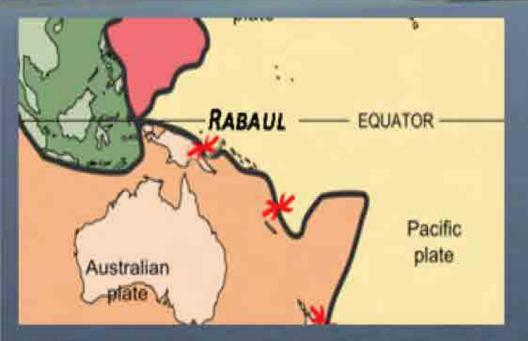




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How a model explains a volcano



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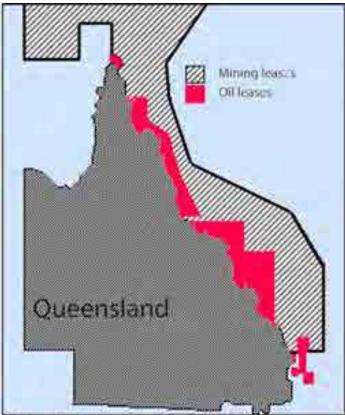
Eg: My slant on history

The original zoning plan by the Queensland Government of the day was to mine the reef for minerals and drill for oil.

The stakeholders in the main were senior politicians, mining and oil companies.

Zoning plan for reef 1971

Illustration Bob Moffatt



Zoning plan for the Great Barrier Reef 1971

Again a group of activists from the University of Queensland formed a Save the Barrier Reef Campaign and with a groundswell of support for the reef, lead to the creation of the Great Barrier Reef Marine Park Authority - a political decision made by the Australian Government. In the main, the activists were junior members of organisations.

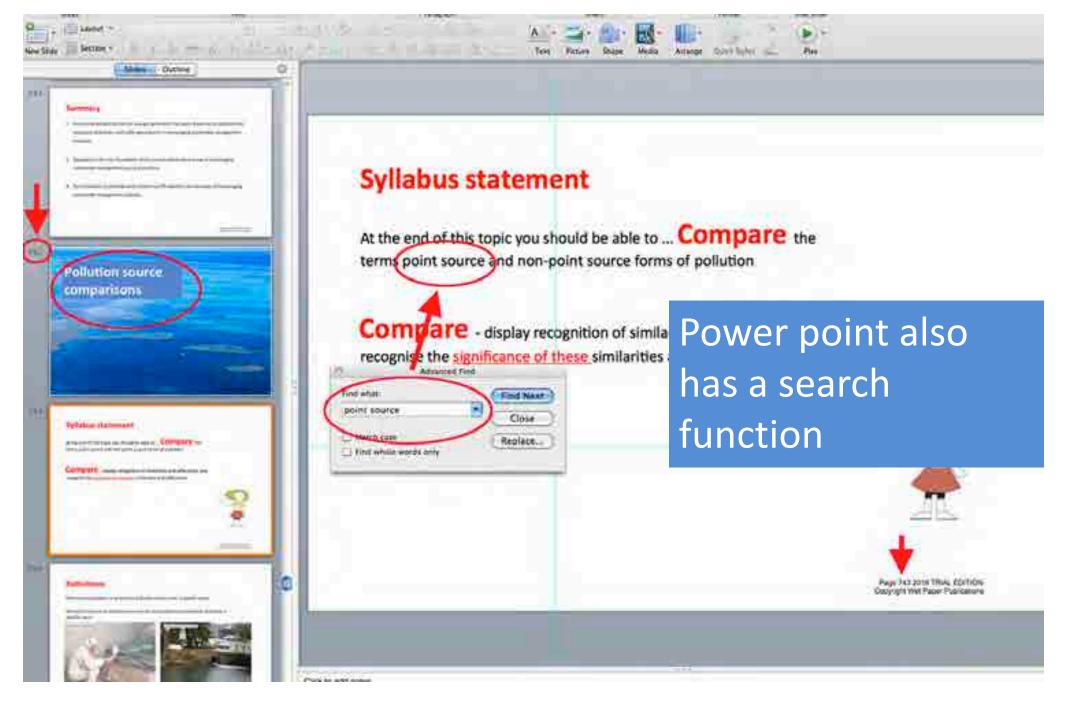


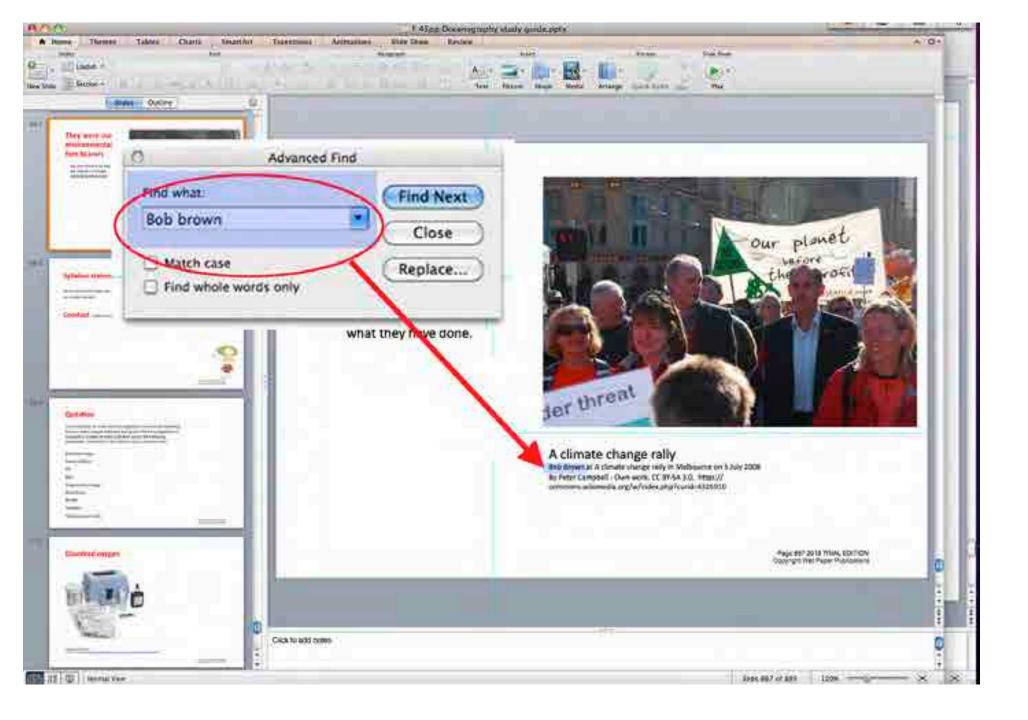
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Page 700 2018 TRIAL EDITION Copyright Wet Paper Publications

GBRMPA formation

Littoral society (now www.marineconservation.org.au), old and present GBRMPA logos







And when finished, save it as a pdf and put it on the school

Save your presentation file

Resources ~

Apprese To: PowerPoint Air Citios 345, PowerPoint 2018, PowerPoint 2013; Miles ...

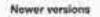
Account

As with any software program, it is a good idea to name and save your presentation immediately, and save your changes frequently while you work.

Temp

Training

server



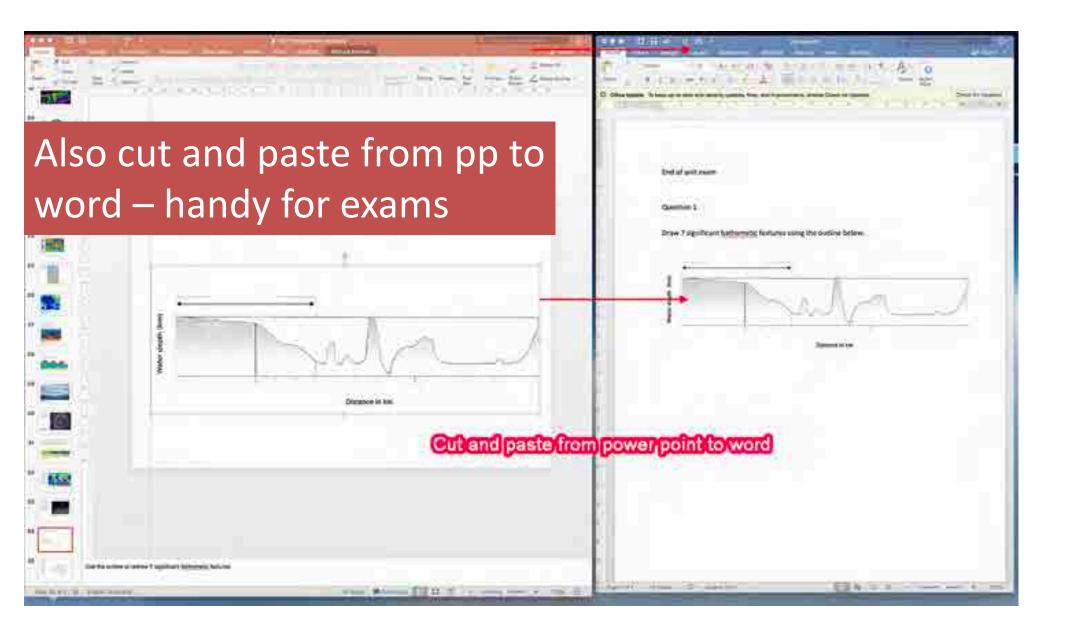
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1. On the File tab, select Save.





You can then make your own book, set of notes under a licence from Wet Paper



So lets have a look at 6 verbs

- 1. Describe (from T16)
- 2. Calculate (from T16 data test)
- 3. Compare (from T28)
- 4. Apply (from T43)
- 5. Evaluate (from T69)
- 6. Conduct (from T36)



The verbs have been classified into three stars

*	**	$\star \star \star$	
calculate (e.g. numerical answer; mathematical processes)	analyse	appraise	
clarify	apply	appreciate	
comprehend (meaning)	categorise	argue	
construct (e.g. a diagram)	classify	assess	
define	compare	comment (make a judgment)	
demonstrate	consider	conduct (e.g. investigations)	
describe	contrast	construct (e.g. an argument)	
document	critique	create (e.g. a unique product/ artefact; language texts; meaning)	
execute	deduce	decide/determine	
explain	derive	discuss/explore	
identify	determine	evaluate	
implement (e.g. a plan, proposal)	discriminate	experiment/test (e.g. ideas, methods)	
recall	distinguish	generate/test (e.g. hypotheses)	
recognise (e.g. features)	identify	investigate/examine	
select	infer/extrapolate	justify/prove (e.g. an argument, statement or conclusion)	
understand	interpret (e.g. meaning)	modify	
use		predict (e.g. a result)	

T016 Material movements

Syllabus statement

At the end of this topic you should be able to ...

Describe

the factors of wave action, wind and longshore drift

in

the management of the movement of water, nutrients, sand, sediment and pollutants (e.g. oil spills, debris)





- <u>give an account (written</u> or spoken) of a situation, event, <u>pattern</u> or process, or of the characteristics or features of something.



Question

Describe the factors of wave action, longshore drift, wind and tides in the management of the movement of water, nutrients, sand, sediment and pollutants (e.g. oil spills, debris) in a summary table.

Factor	Management of water movement	Management of nutrient movement	Management of sand movement	Management of sediment movement	Management of pollution movement
Wave action					
Longshore drift					
Wind					
Tides Optional					

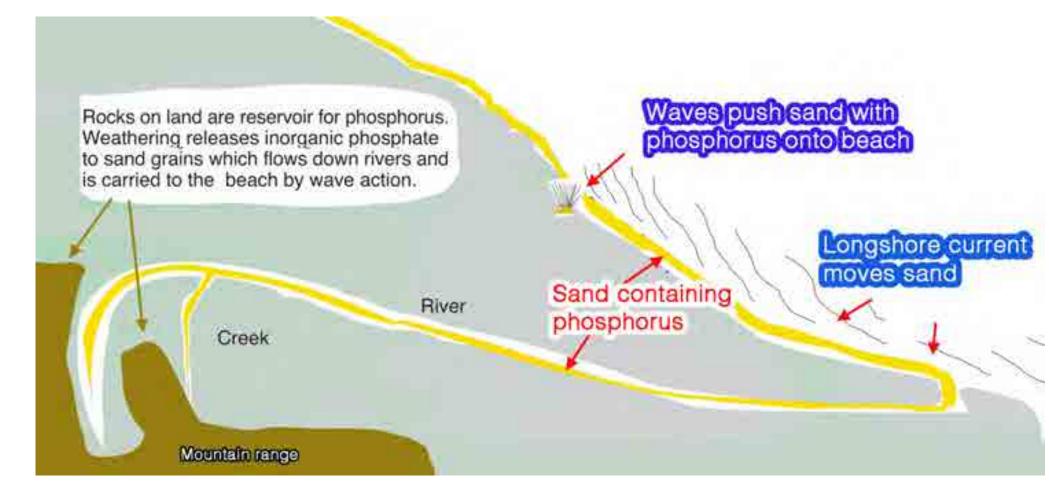
Waves move water into an estuary

Waves move water into rock pools



Waves move water into a reef lagoon

Waves move nutrients along the coastline



Phosphorus and sand enters a beach system

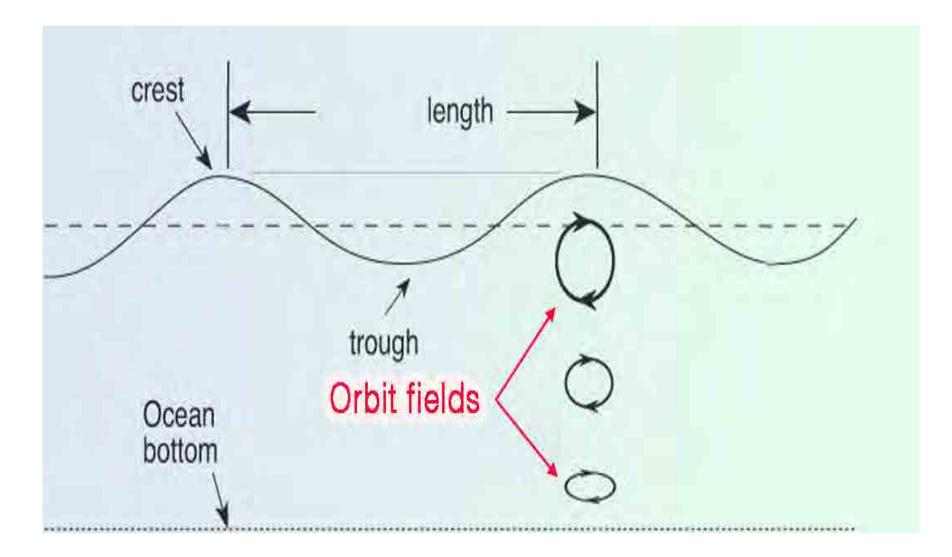
Illustration Bob Moffatt

Waves move nutrients onto beaches

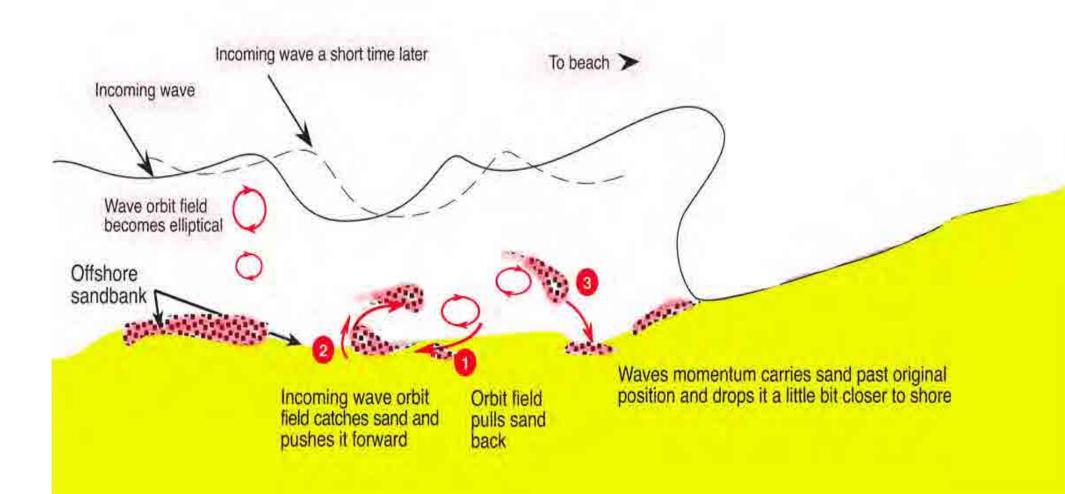


Photo Bob Moffatt

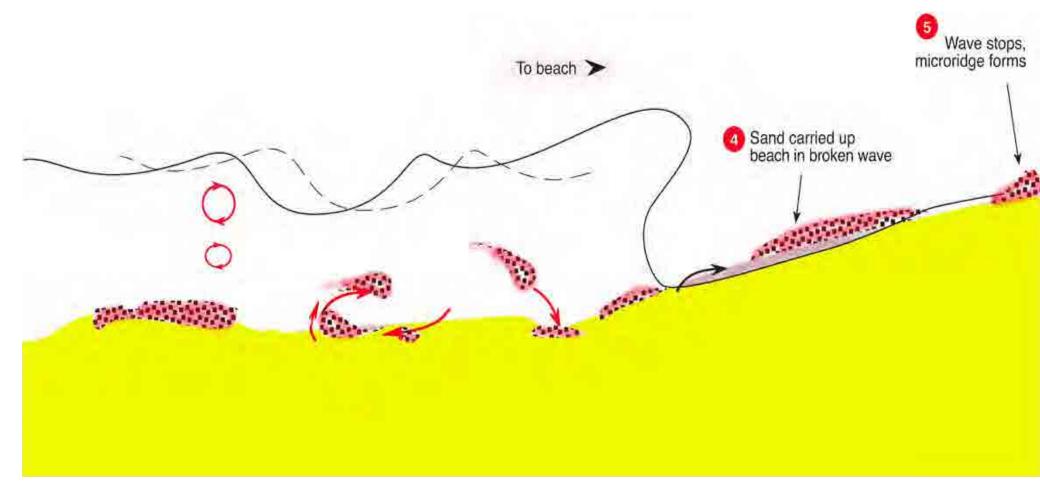
Waves move water in orbit fields



The orbit field pulls the sand back



And then throws it towards the beach in calm weather.



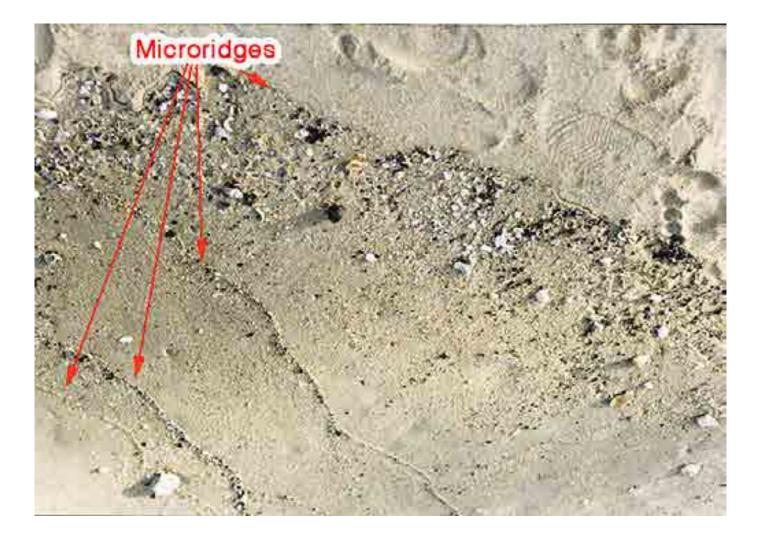


Wave bore under wave near beach

Wave bore in swash zone on beach

Microridge

Where it forms a microridge and then wind blows it up into the dunes.



Waves can also move pollution onto a beach



Or break up ships causing oil spills



And so on

Factor	Management of water movement	Management of nutrient movement	Management of sand movement	Management of sediment movement	Management of pollution movement
Wave action	Waves can move water up and down the beach in the swash zone, into rock pools, into a lagoon, into an estuary or along the coastline or in rip currents	Waves break over rocks bringing plankton for filter feeding barnacles	Waves move sand onto the beach	Waves move sediment in wave bores into microridges	Waves break up containers, ships grounded
Longshore drift	Longshore drift moves water along the coastline	Longshore drift moves planktonic larvae from one ecosystem to another	Longshore drift moves sand into spits and into estuaries	Longshore move sediment along the coastline	Longshore drift moves debris along the coast and into river entrances
Wind	Wind over tide backs up water, creates on and offshore surf.	Wind blows plant seeds from place to place	Wind blows sand into sand dunes	Wind dries sand on beach in microridges	Wind blows plastic bags into the sea
Tides	Move water in and out of estuaries	Deposit nutrients at high tide	Exposed sand from spring tides with strong winds creates dunes	High tidal range causes greater movement	Tides into and out of a river can slow pollution dispersal

So students save the table as a study guide for their end of year exam.

A CONTRACTOR OF THE OWNER	dynamic shore 28 hrs (14 weeks)	4:00	Clore	(acces	Class activity	Accordings	lantaina	Code	Fundimente
Week	Subject	Pre-	Class	Lesson	Class activity	Assessment	Learning	Code	Experiments
	matter	reading	time (hrs)	title	Eg: Worksheets, class discussion, acti	vity	experiences		and or activities and notes
Coastlines 1	7 hrs (4 weeks)	in a revelue		Working title					Vestines a local
Week 7	Identify that coastlines are shape	T012	0.5	Shaping coastlines	Power point lesson/show video	Ans Q's P406	Field trip preparat	th L	File answers for end of year test,
11-15 Mar	Recognise tidal movement in ter	T013	0.25	Tidal movements	Power point lesson/show video	Ans Q's P426	Class discussion	L, 21C, N	File answers for end of year test
	Define sand budget and longsho	T014	1	Sand movements	Wave tank longshore drift exp	Ans Q's P430	Class discussion	21C	Discuss page 450 re Tweed River
	Discussion/activity		1		Discuss experiment results			Ĺ	See marine environment manual
	Sub total		2.75	-					
Week 8	Define refraction, reflection and	1015	0.5	Wave definitions	Power point lesson/show video	Ans Q's P470/471	Class discussion	1	File answers for end of year test,
18 - 22 Mar	Describe the factors of wave act	T016	0.5	Material movements	Power point lesson/show video	Copy table PP476	Class discussion	L	Relate these to up coming excurs
enter de la companya de la comp	Discussion/activity	T016	1	Material movements	Biscuss tables on page 476 and 513	nanna seath saine she			Relate these to up coming excurs
	Discussion/activity	1	0.75	/					

Peer reviewed in 2018 and 2019 and upgraded to incorporate improvements.

Cleveland Redlands College



T016E Sand grain experiment With data test

T16E Student experiment and data test

From Marine Science for Australian students

See page 100

Made from

Weathering aprons (Bunnings) and 300 micron mesh (Swiss screens)

Exercise 4.2 Sand per cent composition

In this experiment you are going to work out where the big tand grams are so the beach that you collected in fixerence 4.1

MATERIALS AND EQUIPMENT (PER GROUP)

- Sieves Note:
 - For beaches with fine soud grains
 - sieves of sizes, 300 µ metres, 250 µ metres, 20\µ metres (See Figure 100.1A)

For beaches with larger grain sizes

- sieves al sizes, (00 μ metres, 400 μ metres, 200µ metres
- or larger neves an abown in Figure 100.1B
- aluminium pie dobes labelled as follows

 subsample. >300 pm. 250 pm. 200 pm, < 300 pm
- 2 ice cicam coblainnis
- completely dry said samples from top, middle and bottom of beach in plastic zip top bags.
- hib follance:
- 4 alaminum pie dishes or plastic jars as shown in Figure 100 2.



 For beaches with fine hand grains

> For beaches with farger grain sizes



FIELD WORK HINTS

- Often it is impractical to take a balance into the field. In this case the use of small plastic containers as shown in Figure 100.2A may be of assistance.
- You will need a labelled comminer for each sieve as shown and are a rough estimation as shown in Figure 100.2B to work out the percent.
- Use sig-top plastic bags to collect other send samples that can be taken back to the lab and analysed if time-permits

TO MAKE SIEVES

- Mesterd very fluet numberation is available doom Swiss Suprems, Ramball St. Sheets Creek, QM, 4127. Plasme increase in shown are available from Bandie Jolen, in a moder back of 10, and are called a traditioning apone. Stream product code in VO 7450, The silk commit in waldor ranging from 500 12000aac and a 125-men long artigerial analysis of service of the universe protocord above. If you and the Sterm weathering apone, there can the 125mm strip interview open lugarets.
- 2. The a tablect test we hold down the needs and that add boadcore glue arroad the robber bank. Take the all weathering tage and bind the people to the steve. Pull-down the tage to you bind to make a strong seal. Allow to dry for 24 hours. Make new you mink the sawe with the correct size.





Figure 100.2 Field analysis

Study site



Sample sites



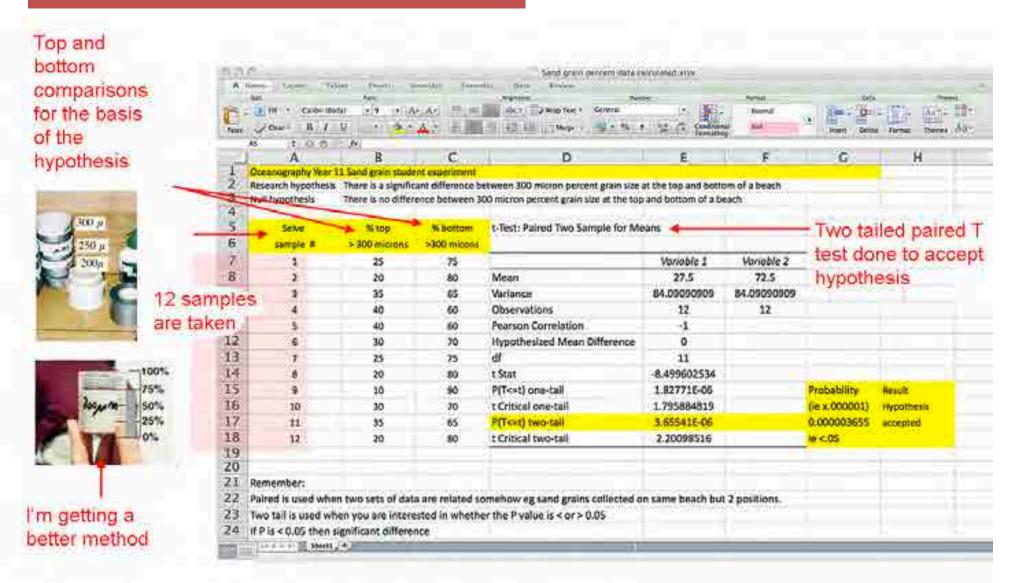
Bob Moffatt

Sun dried samples



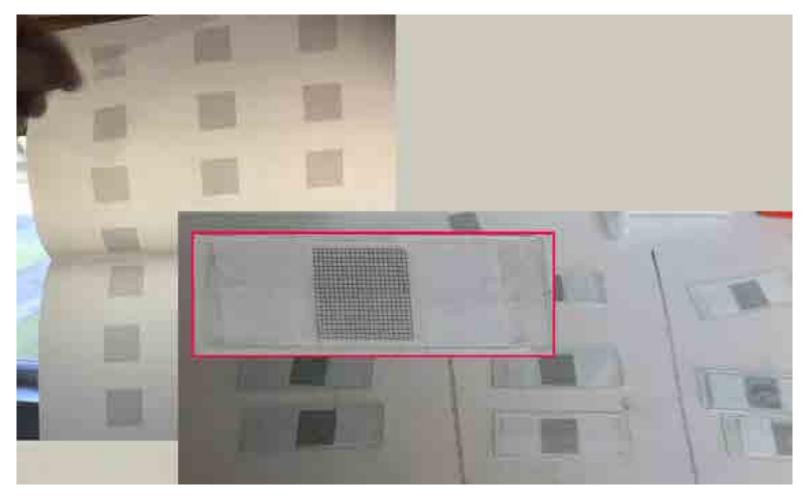
Bob Moffatt

With statistics added



Alternative method

Equipment – home made slides from Danny Stevens (PBC) office works wedding invitation paper



Bob Moffatt



Use your mobile phone to get pics and count on the squares

Count the numbers of sand grains in the squares (if a sand grain was partly in a square it was counted).

Bottom



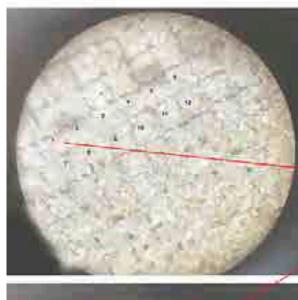
Тор



Bob Moffatt

Bob Moffatt

To be peer reviewed end of the year





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And so on



T028 Pollution source comparisons

Syllabus statement

At the end of this topic you should be able to ...

Compare the terms point source and non-point source forms of pollution





display recognition of similarities and differences

and

recognise the <u>significance of these</u> similarities and differences.



Objective

Give examples to show similarities and differences between point source and non-point source forms of pollution recognising the significance of the differences.



Rubbish comparisons mangroves supermarket which is easier to control? Photos Dave Claridge, Bob Moffatt

Question

Complete the table . (You could use a VEN diagram)

Factor	Similarities - Point source and non-point source pollution Significance
Cleanup expenses	
Environmental damage	
Legislation	

Differences	Point source	Non point	
Definite single source vs no definite single source			
Local vs widely diffused			
Ease of preventing and controlling the pollution			
Levels of dilution			
Scale of measures needed to address the pollution			

Similarities

Cleanup expenses

Environmental damage

Legislation



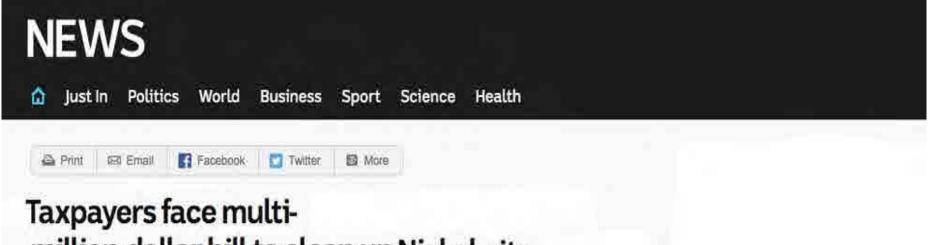
Clean up expenses

Both involve money (Similarity).



Seal Penguin and oil AMSA Oil pics

Significance – its expensive in many cases



million-dollar bill to clean up Nickel site



Environmental destruction

Death to mangroves, diseases in fish (Similarity)



Significance – the damage is huge

Both kill marine life

And both decrease biodiversity.





You can legislate (Similarity)

and then prosecute law breakers (Significance)





Home > Media Room > Latest news > Regal recreational fishing fine increased to \$2100

Illegal recreational fishing fine increased to \$2100

Published: 30/06/2017

Recreational fishers caught poaching from no-take areas in the Great Barrier Reef will face higher penalties from this weekend, with fines increasing from \$1800 to \$2100.

The Increase in the Commonwealth penalty units from formorrow (July 1) supports the tough stance the Grout Barrier Reef Marine Park Authority is taking to protect the Reef, adopting a no-tolerance approach to green zone poaching.

Great Barrier Reaf Marine Park Authority director Richard Quincey sold it was important Marine Park users knew the rules before heading out on the water.

"People who choose to fish in a no-take green zone could receive a \$2100 fine or a prosecution," Mr Quincey said.

"The effects of green zone posching are cumulative — every fisher who takes fish from a green zone has an impact on the health of the Reef.

AND DOMESTIC AND DOMESTIC AND DOMESTICS

Differences between point and non point pollution

1.Definite single <u>source</u> vs no definite single source

2.Local vs widely diffused

3.Ease of preventing and controlling the pollution

4.Levels of dilution

5.<u>Scale</u> of measures needed to address the pollution



But some are more easy to prosecute that others

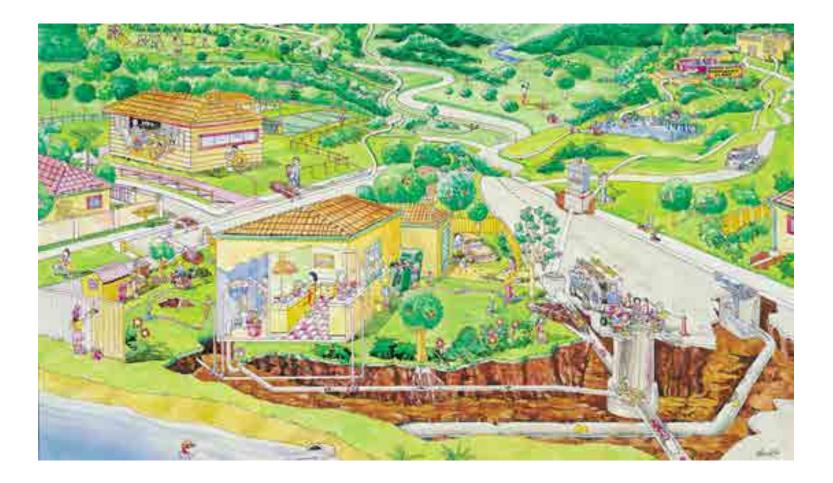


Non point is also difficult to locate



Local vs widely diffused

- Point source is more localised



And so on

Peer reviewed next year



T043 Apply biodiversity data

Syllabus statement

At the end of this topic you should be able to ...

Apply data to determine the biodiversity of a marine ecosystem using diversity indices





-use knowledge and understanding in response to a given situation or circumstance; carry out or use a procedure in a given or particular situation

-[formula will be given]

-You need excel





Questions

Q1: Using data and Simpsons index below to determine if plants from one sand dune area on a beach are more diverse than another.

$$D = 1 - \left(\frac{\sum n(n-1)}{N(N-1)}\right)$$

Q2. Using the same data apply Shannon diversity index (H) to account for abundance and evenness to see if this index put a different interpretation on diversity.

$H = -\sum (n/N) \ln(n/N)$

Q1. Comparison of two beaches

$$D = 1 - \left(\frac{\sum n(n-1)}{N(N-1)}\right)$$

Where

 $\mathbf{n} = \text{the total number of organisms of a particular species}$ $\mathbf{N} = \text{the total number of organisms of all species}$ $\mathbf{\Sigma} = \text{the sum of}$

= is Simpsons index



Beach A

Species	Number (n)
Spinifex	12
Goats foot	2
Sea oak	0
Pig face	0
Pandanas	1
	N=15



Species	Number (n)
Spinifex	12
Goats foot	2
Sea oak	0
Pig face	0
Pandanas	1
	N=15





Species	Number (n)		
Spinifex	2		
Goats foot	8		
Sea oak	1		
Pig face	1		
Pandanas	3		
	N=15		

Species	Number (n)
Spinifex	12
Goats foot	2
Sea cak	Q
Pig face	0
Pandanas	3
	N=15



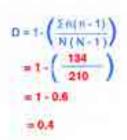


species	Number (n)
spinifex	2
Boats foot	8
šea oak	1
Ng face	1
andanas	3
	N=15

 $D = 1 - \left(\frac{\sum n(n-1)}{N(N-1)}\right)$

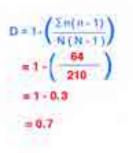
Beach A

Species	Number (n)	n(n-1)
Spinifex	12	132
Goats foot	2	2
Sea oak	0	0
Pig face	0	0
Pandenas	1	0
	N=15	Σn(n-1) 134



Beach B

Species	Number (n)	n(n-1)
Spinifex	2	2
Goats foot	8	56
Sea oak	.1	0
Pig face	-1	0
Pandanas	3	30
	N=15	Σn(n-1) 64



marine reserve



Rezoning application marine reserve edge



$H = -\sum(n/N) \ln(n/N)$

- H Shannon's diversity index
- N total number of species in the community (richness)
- n/N proportion of N made up of the number of n species
- In is the natural log of the product of n/N

Species evenness refers to how close in numbers each species in an environment is.



So if there are 4 Goat's feet, and 100 Spinifex plants per 10 square metres, the community is not very even. But if there are 4 Goat's feet and 6 Spinifex plants per 10 square metres, the community is quite even.

The higher the number the higher the evenness.

This index provides information about

<u>Rarity</u> and <u>commonness</u>



Video

https://www.youtube.com/watch?v=0fsZr5U07aw



Beach A	Species	Number	Beach A		No.	220 22	
		n	Contraction of the second	and the second second	21/27		. Inter
	Spinifex	13		Beach B	the P	ALL TRADES	- Y
	Goats foot	2				- 新学用家	-
	Sea oak	0			Deach D	Constant	Monthe
	Goats foot	0		1000 C	Beach B	Species	Numbe
	Pandanas	0		1530	1	Caluteral	n 2
		0.04			-	Spinifex	
	3 species	15			1	Goats foot	8
						Sea oak	1
						Goats foot	1
						Pandanas	3

ñ

00						
61					Natural	Product of
62	Beach	Species	Number	Proportion	log of n/N	proportion * natural log
53	В	name	n	n/N	ln(n/N)	n/N x ln(n/N)
64		Spinifex	2			
65		Goats foot	8			
66		Sea oak	1			
57		Goats foot	1	-		
68		Pandanas	3			
59						
70	5 species	Total (N)	15			
24						

.....

	A	В	C
1	Shannon-Weiner D	ive	
2			
3			
2 3 4 5			
5	Example		Number
6	Beach B	Species	n
6 7 8 9		Spinifex	2
8		Goats foot	8
9		Sea oak	1
10		Goats foot	1
11		Pandanas	3
12			
13	5 species	Total (N) Step 1	=SUM(C7:C11)
14	2010/01/01/02 00 0		
15	Shannon index H	equals - Sum(n/N x In(n/N):
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	A	B	C [
r	Shannon-	Weiner Divers	ity Index
2			
3			
4			
2 3 4 5 5	Example		Number
5	Beach B	Species	a
7		Spinifex	2
7		Goats foot	8
3		Sea oak	1
0		Goats foot	1
1		Pandanas	3
2			
3	5 species	Total (N)	15 Step 1
4	Let any Card Chamber	Cherry Cherry Control	

N = 15



	A	В	c	D		A	В	C	D
1	Shannon-Weiner	Dive			1	Shannon-	Weiner Divers	ity Index	
2				Step 2	2				Course of
3				Otop 2	2			I. S	Step 2
4					4				-
s	Example		Number	Proportion	5	Example		Number	Proportion
5	Beach B	Species	n	n/N	6	Beach B	Species	n	n/N
7		Spinifex	2	=(C7/C13)	7	Prost Marcow	Spinifex	2	0.13
B		Goats foot	8	=(C8/C13)	8		Goats foot	8	0.53
9		Sea oak	1	=(C9/C13)	9		Sea oak	1	0.07
0		Goats foot	1	=(C10/C13)	10		Goats foot	1	0.07
1		Pandanas	3	=(C11/C13)	11		Pandanas	3	0.20
2					12				
3	5 species	Total (N)	=SUM(C7:C11)		13	5 species	Total (N)	15	
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3					Olep 0	3					Step 3
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5	Example		Number	Proportion	log of n/N	5	Example		Numb	per Proportion	log of n/N
5	Beach B	Species	n	n/N	in(n/N)	6	Beach B	Species	n:	n/N	In(n/N)
7		Spinifex	2	=(C7/C13)	=LN(D7)	7		Spinifex	2	0.13	-2.01
8		Goats foot	8	=(C8/C13)	=LN(US)	8		Goats foot	8	0.53	-0.63
9		Sea oak	1	=(C9/C13)	=LN(D9)	9		Sea oak	1	0.07	-2.71
0		Goats foot	1	=(C10/C13)	=LN(D10)	10		Goats foot	1	0.07	-2.71
1		Pandanas	3	=(C11/C13)	=LN(D11)	11		Pandanas	3	0.20	-1.61
2	_					12					
13	5 species	Total (N)	=SUM(C7:C11)			13	5 species	Total (N)	15		
л											

	_		c	D	E	F
1	Shannon	Weiner Dive	rsity Index	9		The second
2						Step 4
l					Natural	Product of
5	Example		Number	Proportion	log of n/N	proportion * natural log
ŝ.,	Beach B	Species	n	n/N	ln(n/N)	n/N x in(n/N)
ŕ.		Spinifex	2	={C7/C13}	=LN(D7)	=SUM(07*E7)
8		Goats foot	8	={C8/C13}	=LN(D8)	=SUM(D8*E8)
9		Sea oak	1	={C9/C13}	=LN(D9)	=SUM(D9*E9)
0		Goats foot	1	=(C10/C13)	=LN(D10)	=SUM(D10*E10)
1		Pandanas	3	={C11/C13}	=LN(D11)	=SUM(D11*E11)

	A	8.	- C	0	Ŧ	F
1	Shannon-	Weiner Divers	sity Index			
2						Step 4
3					(Lesson and a second	
4		1			Natural	Product of
5	Example		Numbe	r Proportion	log of n/N	proportion * n
6	Beach B	Species	n	n/N	in(n/N)	n/N x ln(n/N)
7		Spinifex	2	0.13	-2.01	-0.27
8		Goats foot	8	0.53	-0.63	-0.34
9		Sea oak	1	0.07	-2.71	-0.18
10	1	Goats foot	1	0.07	-2.71	-0.18
11		Pandanas	3	0.20	-1.61	-0.3Z
-						

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hannon-Weiner D	WE.				
		1		Natural	Product of
xample		Number	Proportion	log of n/N	proportion * natural log
leach B	Species	n	n/N	in(n/N)	n/N x In(n/N)
	Spinifex	2	=(C7/C13)	=LN(D7)	-SUM(07*E7)
	Goats foot	8	-(C8/C13)	=LN(D8)	»SUM(08*E8)
	Sea pak	1	=(C9/C13)	=LN(D9)	«SUM(D9*E9)
	Goats foot	1	=(C10/C13)	=LN(D10)	+SUM(D10*E10)
	Pandanas	1	*(C11/C13)	=LN(D11)	«SUM(D11*E11)
species	Total (N)	«SUM(C7:C11)			
hannon index H	equals - Sum(n/N x ln(n/N)		_	Step 5	=-\$UM(F7:F11)

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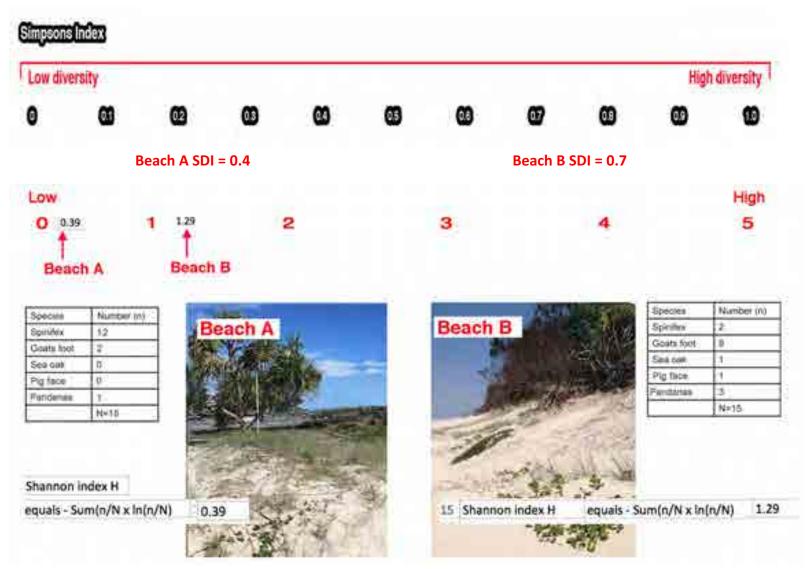
ε					Natural	Product of
ŝ.	Example		Number	Proportion	log of n/N	proportion * natural log
Ø.,	Beach B	Species	'n	n/N	In(n/N)	$n/N \times ln(n/N)$
1		Spinifex	2	0.13	-2.01	-0.27
ť,		Goats foot	8	0.53	-0.63	-0.34
9		Sea oak	1	0.07	-2.71	-0.18
à,		Goats foot	1	0.07	-2.71	-0.18
ź		Pandanas	3	0.20	-1.61	-0.32
2		-				
3	5 species	Total (N)	15			
ñ,			-		-	

5

So what about Beach A

		A		8	C			D		E
1	Shannon-	Weiner Div	ne:				-			
2										
3										
13	Example						Proporti	on	log of Pi	proportion * natural log
4	Beach A		Species		Number		Pi		InPi	Pi*InPi
5	Darriet a faile fail to		Spinifex		13		=(C35/C	41)	=LN(D35)	=SUM(D35*E35)
6			Goats foot		2	-	={C36/C		=LN(D36)	=SUM(D36*E36)
2			Sea oak		0		=(C37/C	STATE -	0	=SUM(D37*E37)
8			Goats foot		0		=(C38/C		0	=SUM(D38*E38)
9		_	Pandanas		0		=(C39/C	1 . / X	0	=SUM(D39*E39)
0										
1			3 species		=SUM(C35	5:C39)				
2						- CH-RHITE				
3	Shannon	hannon index H equals - Sum of F		of Pi*InPi			=-SUM(F35:F39)		
								1		
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	A		8	C	D	E E		F		
3	Example				Proportion	logo	f Pi	proportion n	atural log	
4	Beach A	Species		Number	Pi	InPl		Pi*lnPi		
5		Spinifex		13	0.87	-0.14	5	-0.12		and a starting of
G		Goats foo	rt.	2	0.13	-2.01	8	-0.27	-∑(n/N)	In(n/N)
7		Sea oak		0	0.00	0.00		0.00	200000	
8		Goats foo	t	0	0.00	0.00		0.00		
9	_	Pandanas	8—	0	0.00	0.00		0.00		
þ				1		1		Post of Contract o		
1		3 species		15	1	10				
2		-01			1		_ 1	-		
з	Shannon	r equals - S	um of Pi*InPi	1	0.39 🔶		- 1			
4				1		1				

Interpretation



Recommendation to council

So if Shannon's index is a measure of abundance and evenness of the species present, we can say that the <u>abundance</u> and <u>evenness</u> of dune plants is low and needs to be PROTECTED.



Application of data



And so on



T069 MPA evaluation

Syllabus statement

At the end of this topic you should be able to ...

Evaluate

the marine environmental planning and management process using primary or secondary data of a specific case study (this may be linked to fieldwork).





Question

Using data, show how the use of no take zones protect coral reefs from crown of thorns outbreaks.

Data from

https://www.aims.gov.au/docs/data/data.html

Acknowledgement Hugh Sweatman Australian Institute of Marine Science

Research paper from http://epubs.aims.gov.au/handle/11068/7783

Pdf version from https://core.ac.uk/download/pdf/82736474.pdf



Current Biology Vol 18 No 14 R598

No-take reserves protect coral reefs from predatory starfish

Hugh Sweatman

The crown-of-thorns starfish, Acanthaster planci, is a predator of corals that is a major management issue on coral reefs [1]. It occurs throughout the Indo-Pacific and shows boom-bust population dynamics with low background densities and intermittent outbreaks.

Three waves of population outbreaks have affected Australia's Great Barrier Reef (GBR) since the 1960s.

The waves of outbreaks appear to start ~15'S [2] and progress southward through the central GBR (Figure 1A), causing major losses of living coral on many reefs across a large area and dwarfing losses from other disturbances such as storms or coral bleaching over the same period [3].

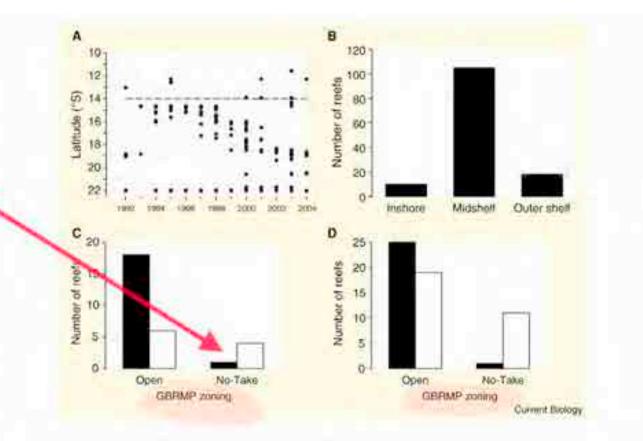


Figure 1. Crown-of-thorns starfish outbreaks on Australia's GBR.

(A) Location of reefs with outbreaks of A. planci 1992-2004 by latitude, showing southerly drift in the central GBR (14-21'S) and the consistent presence of outbreaks in the Swain Reefs (-22'S). (B) Number of records of outbreaks 1985-2004 on all GBR reefs grouped by position on the continental shelf. (C) Occurrence of outbreaks 1994-2004 on open and no-take reefs in the mid-shelf region of the GBR where most outbreaks occur; number of reefs with outbreaks (black bars) and without outbreaks (white bars) (n = 29, one-tailed Fisher's exact test p = 0.036). (D) As (C), but including inshore, mid-shelf and outer shelf reefs (n = 56, one-tailed Fisher's ict test p < 0.003).</p>

https://core.ac.uk/download/pdf/82736474.pdf

Figure 1. Crown-of-thorns starfish outbreaks on Australia's GBR.

(A) Location of reefs with outbreaks of *A. planci* 1992–2004 by latitude, showing southerly drift in the central GBR (14–21°S) and the consistent presence of outbreaks in the Swain Reefs (~22°S).

(B) Number of records of outbreaks 1985–2004 on all GBR reefs grouped by position on the continental shelf.

(C) Occurrence of outbreaks 1994–2004 on open and no-take reefs in the mid-shelf region of the GBR where most outbreaks occur; number of reefs with outbreaks (black bars) and without outbreaks (white bars) (n = 29, one-tailed Fisher's exact test p = 0.036).

(D) As (C), but including inshore, mid-shelf and outer shelf reefs (n = 56, one-tailed Fisher's exact test p < 0.003).</p>

Reference

https://en.wikipedia.org/wiki/Fisher%27s_exact_test

We all need to learn a LOT MORE help.

The power points will be reviewed in 2019.

WHEN the syllabus changes.



Workshop Convenor Dr Gurion Ang Science Engagement Unit Faculty of Science The University of Queensland (07) 3346 4129 | chiam.ang@uq.edu.au

Facilitator Jennifer Evans

Tuesday 11 September 2018 4pm = 6.30pm

Albany Creek State High School, Building L (Library)

Across the new suite of science General Senior Syllabuses for implementation in 2019, there is greater emphasis for students to improve their scientific numeracy through proficiency in basic data analysis and data interpretation. These skills are fundamental to enhancing creative and critical thinking in our next generation of STEM practitioners.

In this workshop, we will demonstrate the appropriate approaches to statistical analyses and interpretation on data collected in experimental investigations. These methods of statistical analyses are applicable to data collected in the Biology, Agricultural Science, and Marine Science syllabuses.

You will need access to a (Windows or Mac) computer/laptop with an updated version of Microsoft Excel 2013 or more recent. T036 Water quality testing experiments Includes student investigation

Syllabus statement

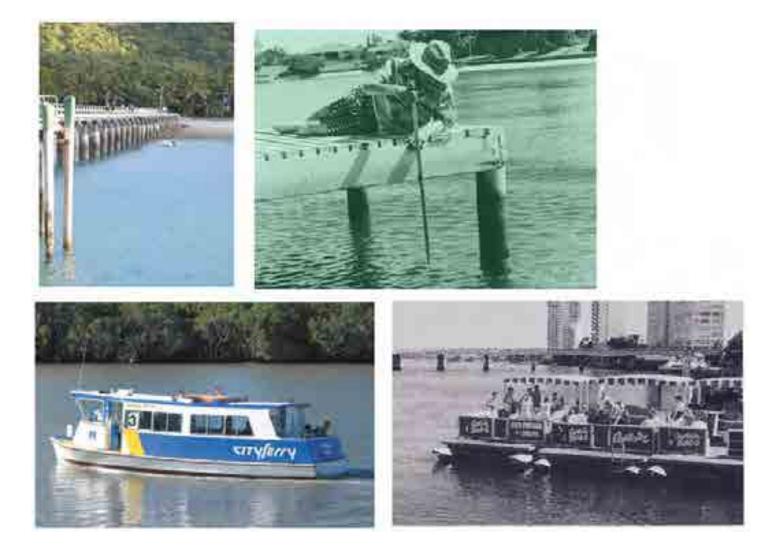
At the end of this topic you should be able to ...

Conduct water quality tests on a water sample.



Oceanography investigation

- how healthy is our local water in .. (estuary, waterway, reef, mangroves, river etc)



Water quality tests

WQI values and their significance are summarised below:

Variable	Results (Column A)	Column B (From Q table	Factor s) (Column C)	Column D
1. Dissolved oxygen	130%	91	0.17	15.47
2. Faecal coliform	colonies 130/100ml	41	0.16	6.56
3. pH	8.8 units	58	0.11	6.38
4. B.O.D.	6.5 p.p.m.	48	0.11	4.28
5. Temperature	+0.5∆°C	90	0.10	9.00
6. Total Phosphorous	0.3 mg/l	82	0.10	8.20
7. Nitrates	0.62 mg/l	98	0.10	9.80
8. Turbidity	90 cm	30	0.08	2.40
9. Total solids (-salinity)	430 mg/l	42	0.07	2.94
	Overall wa	65.03		

Water quality measurement table After Mitchell and Stapp (Reproduced with permission)

From

Chapter 13 Water quality – the old green bible



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Variable	Results (Column A)	Column B	Factor (Column C)	Column D
1. Dissolved oxygen			0.17	
2. Faecal coliform	obionies /100ml		0.16	
3. рН	units	<u>`</u>	0.11	
4. B.O.D.	p.p.m.		0.11	
5. Temperature	∆°C		0,10	
6 Total Phosphorous	mg/l		0,10	
7. Nitrates	mg/l		0.10	
8. Turbidity	cm		0.08	
9. Total solids (-salinity)	mg/l		0.07	

AAst Whore's and single 1648

Fig. 22 Water quality data table (After Mitchell and Stapp 1988)

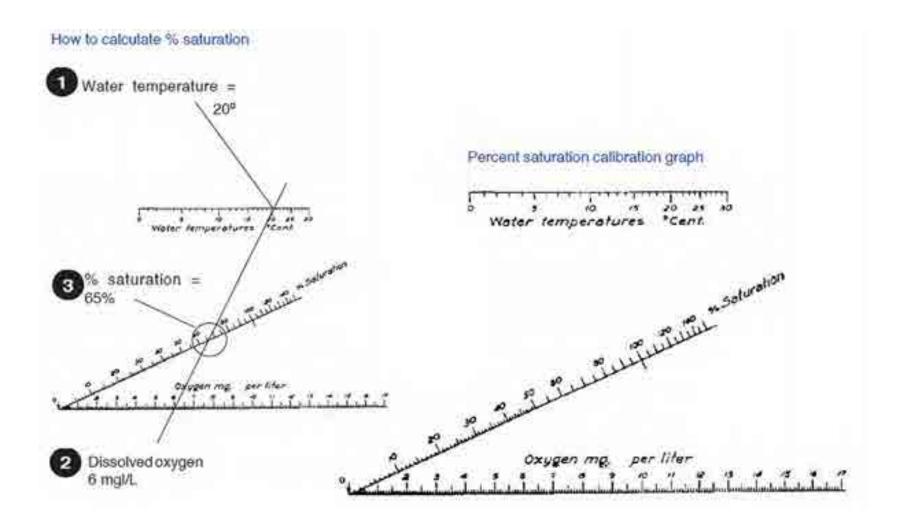
A parameter is taken

Eg: Dissolved oxygen

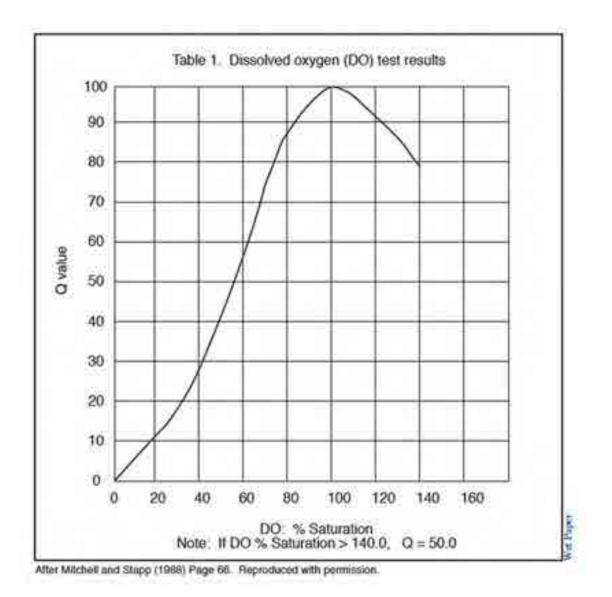


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Data collected and analysed



A high Q value meant the water is healthy.



Results discussed

Water quality tests

WQI values and their significance are summarised below:

• 90 - 100	excellent
• 70 - 90	good
• 50 - 70	medium
• 25 - 50	bad
• 0 - 25	very bad

Example

Variable	Results (Column A)	Column B (From Q teble	Factor (Column C)	Column D
1. Dissolved oxygen	130%	91	0.17	15.47
2 Faecal coliform	colonies t30/100ml	41	0.16	6.56
зрн	8.8 units	58	0.11	6.38
4 BOD	65 p.p.m.	48	0.11	4.28
5 Temperature	+0.5∆°C	90	0.10	9.00
6. Total Phosphorous	0.3 mg/	82	0,10	8.20
7. Nitrates	0.62 mg/l	86	0.10	9.80
8. Turbidity	90 cm	30	0.08	2.40
9. Total solids (-sittinity)	430 mg/l	42	0.07	2.94
	Overall wa	65.03		

Water quality measurement table After Mitchell and Stapp (Reproduced with permission)

Research claim, other data and research presented etc etc

Water quality tests

WQI values and their significance are summarised below:

• 90 - 100 excellent

- 70 90 good
- 50 70 medium
- 25 50 bad
- 0 25 very bad

Va	arlable	Results (Column A)	Column B (From Q table)	Factor (Column C)	Column D
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8	Turbidity	90 cm	30	0.08	2.40
9.	Total solids (-salinity)	430 mg/l	42	0.07	2.94

Water quality measurement table After Mitchell and Stapp (Reproduced with permission)

Note:

This has passed peer review in QCAA Sunshine Coast panels for the past 10 years and is a historic method but easy to understand.

There are other ways to interpret the data.

AVAILABILITY and cost

Wet Paper Year 11 Marine science

PO Box 540 Coolangatta 4225 0418 769 790 bmoffatt@wetpaper.com.au



Year 11 Study guides Read as a flipbook from the internet

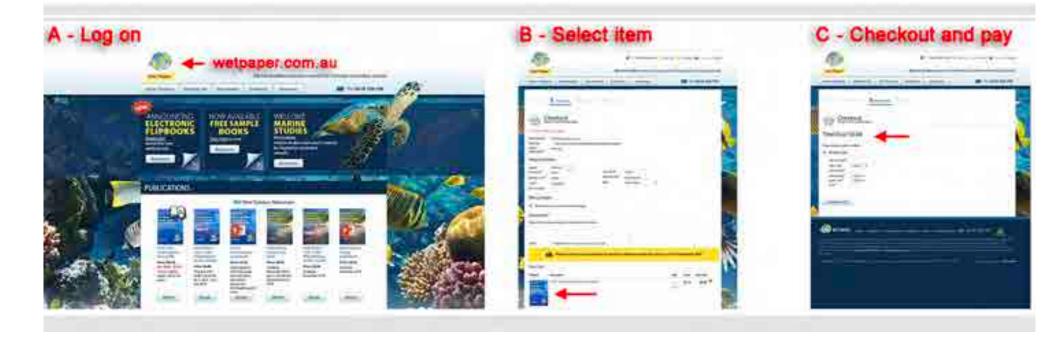


Year 11 Study guide and power points package

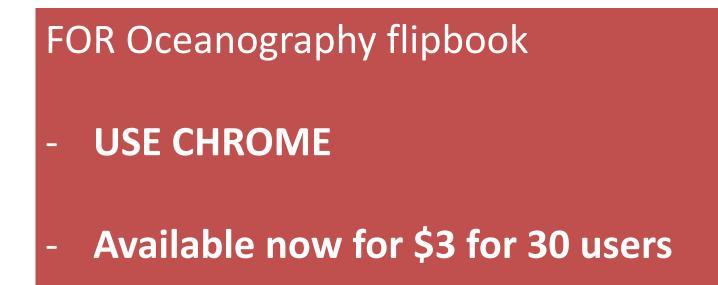


Option A

Study guides is by web ordering







Option B The power point package

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Schildele 1: As per www.weipaper.com.au

F47 PP Oceanography power point File modifiable by your school, approximately 900 slides and notes

- FSO PP Marine biology power point file modifiable by your school, approximately 900 sildes and notes
- FOL # Marine Science for Australian Scudents 3rd Edition
- F13 P Mangroves in focus 2nd Edition

Schedule 2: Nominated tracher to detail number of enrolled students

School/college nominated person details (g, details of person to supply numbers of students 2019, (involve will be based on this number x 560

Name: _____

initial proviment estimate

X \$60 =

EXECUTED as an Agroement

Email

Execution by the author Execution by the teacher Witness by the headmaster/mistress/principal

Cost

It will cost you \$60 x your estimated 2019 enrolment. Example Est. enrolment 20 , invoice = \$1200

If you like the year 11 power points, it will cost you another \$60 x the number who come back and do year 12 in 2020.

If you want the power points now – sign up and I'll invoice you in November payable February 14th 2019

(Min 12)

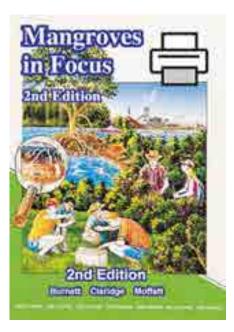
All money raised goes to employing a teacher to do the year 12 power points.

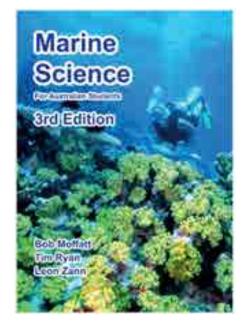
You also get a 2019 workbook time calculator and sample workbook

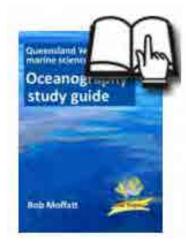
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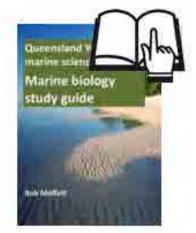
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Week and dates	Subject matter	Pre- Class reading time (hrs)	Lesson Little	Eg: Worksheets, class discussion, activi	Assessment	Learning experiences	Lode	Depenments and or activities and notes	
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And other stuff









3 years free rent

Pdf printable file

And an end of the year a 2 day workshop - limit is 30 - preference given to practicing teachers

South Coast Marine Science Workshop

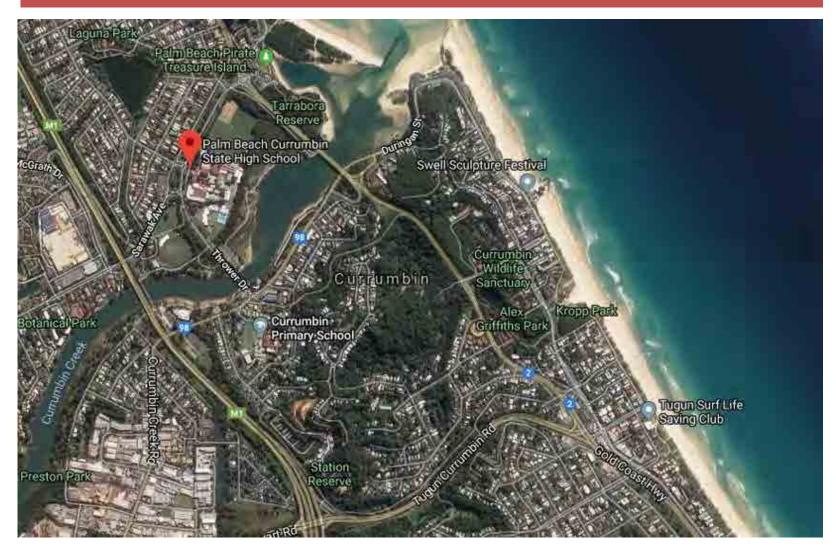
Syllabus content as it relates to field trips and lab experiments DRAFT – depends on funding sources

Monday 3rd / Tuesday 4th December

Palm Beach SHS Science Department Thrower Drive, Currumbin 4223 - Gold Coast, Queensland

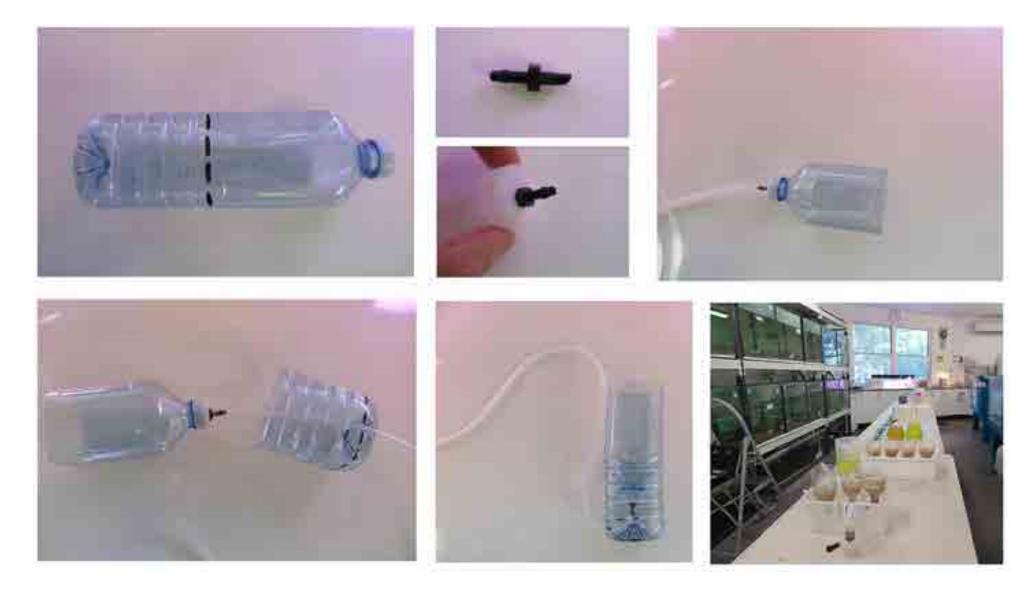
Cost

Free to Wet Paper Power Point licence holders (BYO food or buy it, accommodation up to you) Sponsored by Wet Paper, Palm Beach SHS, have approached <u>MTAQ</u> and local scientific supply company Accommodation up to you – Local Caravan Park (Burleigh council park twin share for \$70 Monday 3rd, motels, air B&B <u>Breakfasts at local Subway</u>. Lunch you pay, dinner Monday night bring a plate and what you want to drink. Estuary, high energy coast, fractured ecosystem, mangroves, environmental stakeholders, purpose built aquaculture room, caravan park up the road.

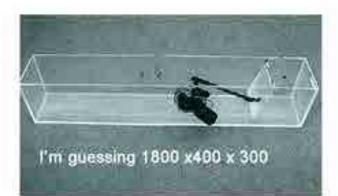


A chance to see and do the activities from the power points

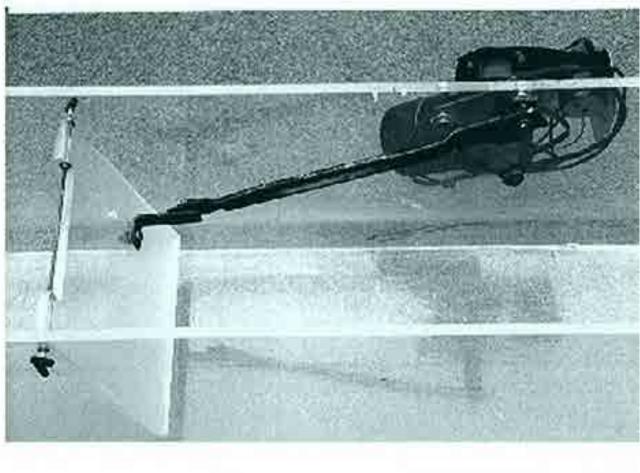
• Set up Artemia for a two-day hatching experiment



• Building a wave tank







- Make a simple salinity hydrometer, secchi disc and water collection bottles
- Convection current apparatus experiment
- Biscuit and syrup plate tectonics experiment
- Sand grain and micro-plastics analysis
- Sand sieving experiment
- Making oceanographic models
- Using excel for Students t test data and Shannon's index
- Using a mobile phone for microscope photos
- Two hour field trip dynamic shore
- Two hour field trip mangroves
- One hour water testing
- Open session using digital techno in the classroom
- Visit Geko House meet Surfrider foundation environmental stakeholders
- View 2000 powerpoint slides
- Networking BBQ



- Setting up for class experiments
- Building aquarium racks for water testing experiments



So it's a long term project in partnership with schools who like teaching from power points

AND as I said

Funds go to employing someone to write year 12 and improve the power points developed this year.



There are 90 year 12 power point to do

List 13 Coral reef distribution

170 Identify reefs globally **T71** Coral geographic distribution T72 Coral geologic appearance T73 GBR geology shaping T74 Difference reef structures T75 Recognize reef zonation

List 14 Coral reef development

T76 Three coral groups T77 Classify to genus **T78** Coral anatomy T79 Coral limestone skeleton T80 How corals feed T81 Coral symbiosis T82 Coral life cycle **T83 Laval dispersion** T84 How corals grow T85 Assess roof data

List 15 Reef habitats and connectivity **T86** Corals as engineers

T87 Reef measity **T88** Explain connectivity T89 Fish life cycles T90 Fish reef benefits **T91** Ecological tipping points **T92 Reef hysteresis** T93 Assess reef diversity T94 Analyse roof diversity T95 Interpret reef changes T96 Water quality on reefs **T97 Water quality overall effects**

T98 Conduct connectivity experiment

Unit 3: Marine systems -- connections and change

List 16 Anthropogenic change T99 Determine reef futures T100 Global anthropogenic factors T101 Specific reef pressures T102 Holocene no bleaching T103 Shelford's law bleaching T104 GBR thermal data T105 After bleaching effects T106 Bleaching recovery conditions T107 Compare regional bleaching T108 Coral core data

List 17 Ocean equilibria

T109 pH and carbonates T110 Geology and carbonates T111 C02 and ph T112 C02 and oceans T113 Ocean addition T114 Carbonate compensation depth T115 Oceans C02 capacity

List 18 Implications for marine systems

T116 Carbonates and shells T117 Carbonate systems data **TI18** Ocean scidification experiments T119 Ocean acidification consequences T120 Acidification and resilience T121 Altered pH practical

Unit 4: Ocean issues and resource management

List 19 Management and conservation

T122 Use conservation arguments T123 Explain MPA design criteria T124 Marine ecosystem health T125 Evaluate MPA success T126 Compare management roles.

List 20 Future scenarios

T127 Evaluate marine systems T128 Historical geological data T129 Ocean acidification consequences T130 Climate driving factors T131 Global temperature impacts

List 21 Fisheries and population dynamics

T132 Define fishery types T133 Wild catch significance. T134 World fisheries declines **T135** Fish population distribution T136 Assess recesity data T137 Assess bioaccumulation effects T138 Thermal regime effects T139 Compare fish populations T140 Use Lincoln index T141 Assess fish pop data T142 Recognise international agreements T143 Appraise sustainable yields T144 Fisheries management shifts T145 MPAs and sustainability T146 Apply Lincoln index

List 22 Australia's fisheries management

T147 Identify AFZ **T148 Infer Fisherics status** T149 Identify seafood export T150 Assess scafood imports T151 Recall fisheries values T152 Total allowable catch T153 Spatial fish management T154 Fish precautionary principles

Chapter 23 Aquaculture

T155 World aquaculture state. T156 Analyse ABARES reports T157 Identify marketing attributes T158 Predict carrying capacity T159 Contrast squaculture systems T160 Understand aquaculture issues So if you like what I'm doing sign up – I <u>need</u> the money.

It's my Wet Paper legacy project.

