Design sheet 1: Sections and topics from the QCAA syllabus

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Background

The QCAA syllabus has 4 units called Oceanography, Marine biology, Marine systems – connections and change and Ocean issues and resource management. Each unit has two topics.

Each topic has a set of un-numbered headings that contain assessable subject matter statements.

In all there are 160 un-numbered assessable subject matter statements.

The STEP project 2017 - 2021

The STEP project has taken these 160 un-numbered assessable subject matter statements and summarised them into 2-4 word statements so that 160 power points can be named.

To create these 160 power points, text and illustrations has been used from the past 30 years Wet Paper resources supplemented by text, illustrations and videos from the intellectual property from the copyright of the commons.

The project is over four years, self-funded and basically written by Bob Moffatt in his retirement for his Wet Paper customers over the last 30 years.

* The project design is based on the premise that teachers like to design their OWN units from a range of resources they LIKE and there is no attempt in the project to suggest units.
* The aim of the project materials is to provide text that teachers can copy and paste under a licence to create their OWN school unit and provide a sample powerpoint to back up the QCAA subject matter statement
	+ TEXT files contain a lesson introduction, rationale, content, activities and exam revision questions as a word or text document - see T001 Text file on our web site
	+ POWER POINTS are constructed from the text files with a mixture of Wet Paper photographs and illustrations from the past 30 years as well as using photographs and illustrations from wiki copyright of the commons - see T001 Bathymetric features on our web site

The project has made the QCAA un-numbered headings into SECTIONS and the QCAA subject matter statements have become the TOPICS

The prices for each power point and text file are yet to be sorted and largely will be determined by interest.

To register just send an email to bmoffatt@wetpaper.com.au

### STEP Sections

Oceanography

S01 Oceanography

S02 Ocean currents

S03 Ocean conservation

S04 Coastlines

S05 Coastal impacts

S06 Coastal conservation and monitoring impacts

Marine Biology

S07 Biodiversity

S08 Biotic components of marine ecosystems

S09 Abiotic components of the marine ecosystem

S10 Adaptations and classification

S11 Marine conservation

S12 Resources and sustainable use

Marine systems — connections and change

S13 Coral reef distribution

S14 Coral reef development

S15 Reef, habitats and connectivity

S16 Anthropogenic change

S17 Ocean equilibria

S18 Implications for marine system

Ocean issues and resource management

S19 Management and conservation

S20 Future scenarios

S21 Fisheries and population dynamics

S22 Australia’s fisheries management

S23 Aquaculture

### STEP Topics

Section 1. Oceanography text files

T 1 Describe the bathymetric features of the ocean floor, including the continental margin, ocean-basin floor, deep-sea trenches, mid-ocean ridges and abyssal plain

T 2 Apply models to understand the geological features of the Earth (e.g. sea floor modelling, tectonic plate movements, coastal landforms, stratigraphy)

T 3 Describe the processes of the following cycles: water, carbon and oxygen.

**S01 Oceanography power points**

T1 Bathymetric features

T2 Maine geology models

T3 Biogeochemical cycles

Section 2. Ocean currents text files

T 4 Describe how surface ocean currents are driven by temperature, wind and gravity

T 5 Describe how water, heat and nutrients are distributed across coastal regions and global ocean basins (e.g. upwelling and downwelling, El Niño and La Niña events, Langmuir circulation, Ekman spiral)

T 6 Describe the physical and chemical properties of water, including structure, hydrogen bonding, polarity, action as a solvent, heat capacity and density

T 7 Define thermocline, halocline and pycnocline

T 8 Recognise how thermoclines and nutrients produce the oxygen minimum within the open ocean

T 9 Explain how thermohaline circulation in the deep ocean is affected by salinity and water density.

**S02 Ocean currents power points**

T4 Currents and driving forces

T7 Cline definitions

T8 Thermocline influences

T9 Thermohaline effects

Section 3. Ocean conservation text files

T 10 Argue that knowledge of the oceans is limited and requires further investigation

T 11 Understand that the economic development of a nation and the value placed on marine environment, including the Exclusive Economic Zone (EEZ), affects decisions relating to resource management.

**S03 Ocean conservation power points**

T10 Limits of knowledge

T11 Exclusive Economic Zone

Section 4. Coastlines text files

T 12 Identify that coastlines are shaped by a number of factors, including tectonic plate movements, shifts in climate patterns and sea level change, weather patterns, and movement of sediments and water (e.g. waves, currents)

T 13 Recognise tidal movement in terms of gravitational pull, current strength and wave action

T 14 Define sand budget and longshore drift

T 15 Define refraction, reflection and diffraction

T 16 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)

T 17 Describe the processes of coastal erosion (in terms of accretion and erosion)

T 18 Identify the factors between the atmosphere and the oceans that drive weather patterns and climate (e.g. temperature, wind speed and direction, rainfall, breezes, barometric pressure)

T 19 Recall wave formation processes (e.g. fetch, relationship of wave height and type to water depth and wave celerity)

T 20 Explain how the properties of waves are shaped by weather patterns, natural formations and artificial structures (e.g. interference patterns, fetch, wave sets).

**S04 Coastlines power points**

T12 Shaping coastlines

T13 Tidal movements

T14 Sand movement

T15 Wave definitions

T16 Material movements

T17 Coastal erosion

T18 Weather patterns

T19 Wave formation

T20 Wave properties

Section 5. Coastal impacts text files

T 21 Explain how coastal engineering regulates water or sediment flow, affects currents and impacts the coastline, including marine ecosystems

T 22 Recognise that longitudinal studies allow scientists to observe changes occurring in marine environments (e.g. satellite imagery, aerial photography, field research)

T 23 Identify how organisms populate areas following changes in habitats (e.g. succession)

T 24 Assess population density data of coastal areas to identify the impact on the health of coastal water

T 25 Recall types of pollution of coastal zones, including organic wastes, thermal, toxic compounds, heavy metals, oil, nutrients and pesticides.

**S05 Coastal impacts power points**

T21 Coastal engineering

T22 Longitudinal studies

T23 How organisms populate areas

T24 Population density data

T25 Coastal pollution

Section 6. Coastal conservation and monitoring impacts text files

T 26 Define sustainable management practice

T 27 Discuss that the education of stakeholders is essential to encouraging sustainable management practices

T 28 Compare the terms point source and non-point source forms of pollution

T 29 Describe two direct methods of monitoring water pollution levels using an abiotic test (e.g. nitrate, phosphate, heavy metals) or a biotic test (e.g. faecal coliform)

T 30 Define the term biochemical oxygen demand (BOD)

T 31 Describe how BOD is used to indirectly assess water pollution levels

T 32 Define the process of eutrophication

T 33 Identify and describe land management practices that contribute to the health of marine ecosystems, including siltation, algal blooms and agricultural practices

T 34 Describe and explain an indirect method of measuring pollution levels using a biotic index

T 35 Recall a bio-indicator with an example.

T 36 Conduct water quality tests on a water sample (Mandatory practical)

**S06 Coastal conservation and monitoring impacts power points**

T26 Sustainable management

T27 Stakeholder education

T28 Pollution sources

T29 Monitoring water pollution

T30 Biochemical oxygen demand

T31 BOD use in pollution

T32 Eutrophication

T33 Pollution practices

T34 Measuring pollution levels

T35 Bio-indicator examples

T36 Water quality testing

Section 7. Biodiversity text files

T 37 Define the three main types of diversity (i.e. genetic, species, and ecosystem)

T 38 Recall the three unique characteristics of marine biodiversity (i.e. wide dispersal at sea, the need for structural complexity, critical nursery habitats)

T 39 Identify the variety of ecosystems (e.g. estuaries, coastal lakes, saltmarshes, mangroves, seagrass, rocky shores, temperate reefs, coral reefs, lagoons, shelf and deep water) that constitute Australia’s marine biomes

T 40 Describe the implications of connectivity to marine ecosystems

T 41 Identify factors that lead to a loss of diversity (e.g. natural hazard, loss/fragmentation of habitat, pollution, exploitation, introduction of new species, disease)

T 42 Calculate the biodiversity of a marine ecosystem using Simpson’s diversity index (SDI)

T 43 Apply data to determine the biodiversity of a marine ecosystem using diversity indices

T 44 Define ecosystem resilience, disturbance and recovery.

**S07 Biodiversity power points**

T37 Three diversity types

T38 Biodiversity characteristics

T39 Ecosystem varieties

T40 Ecosystem connectivity implications

T41 Diversity loss factors

T42 Simpson’s diversity index

T43 Apply biodiversity data

T44 Important ecosystem definitions

Section 8. Biotic components of marine ecosystems text files

T 45 Identify biotic components of marine ecosystems (i.e. trophic levels, food chains, food webs, interactions and population dynamics)

T 46 Categorise biotic interactions based on the following terms symbiosis (i.e. parasitism, mutualism, commensalism and amensalism) competition (i.e. intraspecific and interspecific) predation

T 47 Classify organisms in trophic levels in a food web based on the following terms producers, primary, consumers, secondary, consumers, tertiary, consumers, decomposers

T 48 Describe how matter cycles through food webs, including the process of bioaccumulation

T 49 Recall the terms population size, density, abundance, distribution (i.e. clumped, uniform, random), carrying capacity, niche, K-strategists and r-strategists, keystone species

T 50 Assess population data to measure population size, density, abundance, distribution, carrying capacity.

**S08 Biotic components of marine ecosystems power points**

T45 Identify biotic components

T46 Categorise biotic interactions

T47 Classify trophic levels

T48 Describe matter cycling

T49 Recall population terms

T50 Assess population data

Section 9. Abiotic components of the marine ecosystem text files

T 51 Understand that marine ecosystems are influenced and limited by abiotic factors in ways that may be different from terrestrial ecosystems due to the different physical and chemical properties of water compared to air

T 52 Distinguish abiotic components of marine ecosystems: light availability, depth, stratification, temperature, currents (water and wind), tides, sediment type and nutrient availability

T 53 Understand the importance of limiting factors and tolerance limits in population distributions

T 54 Assess data to identify an organism’s tolerance limit

T 55 Apply the concept of zonation using the following terms: intertidal, pelagic (neritic, oceanic), benthic and abyss.

T 56 Conduct an investigation to determine factors of population dynamics (e.g. density or distribution) and assess abiotic components of a local ecosystem case study. Emphasis should be placed on assessing processes and limitations of the chosen technique (e.g. quadrat, transect). When students identify and describe marine species, they use field guides and identification keys.

**S09 Abiotic components of marine ecosystems power points**

T51 Abiotic limiting factors

T52 Distinguish abiotic components

T53 Important limiting factors

T54 Assess tolerance limit data

T55 Apply zonation concepts

T56 Population dynamic investigation

Section 10. Adaptations and classification text files

57 Categorise different groups of animals using structural characteristics

58 Identify and classify adaptations as anatomical (structural), physiological (functional) or behavioural

59 Describe the role of adaptation in enhancing an organism’s survival in a specific marine environment.

**S10 Adaptations and classification power points**

T57 Categorise animal groups

T58 Classify adaptations

T59 Describe adaptions role

Section 11. Marine conservation text files

T 60 Recall the arguments for preserving species and habitats (i.e. ecological, economic, social, aesthetic, ethical)

T 61 Describe the direct and indirect values of marine ecosystems of Australia

T 62 Describe the role of stakeholders in the use and management of marine ecosystems

T 63 Discuss the specific value systems that identified stakeholders use (i.e. ecocentric, technocentric, anthropogenic)

T 64 Recognise the issues affecting a selected marine ecosystem

T 65 Apply the terms ecosystem resilience, disturbance and recovery as indicators of ‘health’ of marine environments to a chosen case study.

**S11 Marine conservation power points**

T60 Species habitat preservation

T61 Marine ecosystem values

T62 Stakeholder roles

T63 Stakeholder value systems

T64 Marine ecosystem issues

T65 Ecosystem health terms

Section 12. Resources and sustainable use text files

T 66 Recall the precautionary principle of the marine environmental planning and management process as well as a requirement that any network of marine protected areas be comprehensive, adequate and representative

T 67 Understand that criteria are used to inform decisions regarding the design of protected marine areas

T 68 Compare the strategies and techniques used for marine environmental planning and management with reference to a specific case study

T 69 Evaluate the marine environmental planning and management process using primary or secondary data of a specific case study (this may be linked to fieldwork).

**S12 Resources and sustainable use power points**

T66 Precautionary principles

T67 MPA design

T68 MPA planning

T69 MPA evaluation

Section 13. Coral reef distribution text files

T 70 Identify the distribution of coral reefs globally and in Australia

T 71 Identify abiotic factors that have affected the geographic distribution of corals over geological time including dissolved oxygen, light availability, salinity, temperature, substrate, aragonite and low levels of nitrates and phosphates

T 72 Recall that corals first appeared within the geological record over 250 million years ago but not in Australian waters until approximately 500 000 years ago

T 73 Recognise that the Great Barrier Reef of today has been shaped by changes in sea levels that began over 20 000 years before present (BP) and only stabilised 6500 years BP

T 74 Recall the different types of reef structure (e.g. fringing, platform, ribbon, atolls, coral cays)

T 75 Recognise the zonation within a reef cross-section (e.g. reef slope, reef crest/rim, lagoon/back reef).

**S13 Coral reef distribution power points**

T70 Identify reefs globally

T71 Coral geographic distribution

T72 Coral geologic appearance

T73 GBR geology shaping

T74 Difference reef structures

T75 Recognise reef zonation

Section 14. Coral reef development text files

T 76 Recall the three main groups of coral (i.e. Alcyonacea: soft corals, sea fans and Scleractinia: stony/hard corals)

T 77 Classify a specific coral to genus level only, using a relevant identification key

T 78 Identify the anatomy of a typical reef-forming hard coral including skeleton, corallite, coelenteron, coral polyp, tentacles, nematocyst, mouth and zooxanthellae

T 79 Recall that the limestone skeleton of a coral is built when calcium ions [Ca2+] combine with carbonate ions [CO32–]

T 80 Describe the process of coral feeding (including night-feeding patterns and the function of nematocysts)

T 81 Identify and describe the symbiotic relationships in a coral colony (including polyp interconnections and zooxanthellae)

T 82 Recall the life cycle stages of a typical reef-forming hard coral (asexual: fragmentation, polyp detachment; sexual: gametes, zygotes, planulae, polyp/asexual budding)

T 83 Explain the process of larval dispersal, site selection, settlement and recruitment

T 84 Explain that growth of reefs is dependent on accretion processes being greater than destructive processes

T 85 Assess data of abiotic factors (e.g. dissolved oxygen, salinity, substrate) that affect the distribution of coral reefs.

**S14 Coral reef development power points**

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 reef data

Section 15. Reef habitats and connectivity text files

T 86 Recognise that corals are habitat formers or ecosystem engineers

T 87 Explain that habitat complexity (rugosity), established by corals, influences diversity of other species

T 88 Explain connectivity between ecosystems and the role this plays in species replenishment

T 89 Understand that fish life cycles are integrated within a variety habitats including reef and estuarine systems

T 90 Describe how fish, particularly herbivore populations, benefit coral reefs

T 91 Identify ecological tipping points and how this applies to coral reefs

T 92 Describe hysteresis and how this applies to the concept of reef resilience

T 93 Assess the diversity of a reef system using a measure that could include (but is not limited to) line intercept transects, quadrats and fish counts using underwater video survey techniques, benthic surveys, invertebrate counts and rugosity measurements

T 94 Analyse reef diversity data, using an index, to determine rank abundance

T 95 Interpret, with reference to regional trends, how coral cover has changed on a reef over time

T 96 Recognise that some of the factors that reduce coral cover (e.g. crown-of-thorns) are directly linked to water quality

T 97 Understand that the processes in this sub-topic interact to have an overall net effect, i.e. they do not occur in isolation.

T 98 Examine the concept of connectivity in a habitat by investigating the impact of water quality on reef health. Mandatory practical:

**S15 Reef habitats and connectivity power points**

T86 Corals as engineers

T87 Reef rugosity

T88 Explain connectivity

T89 Fish life cycles

T90 Fish reef benefits

T91 Ecological tipping points

T92 Reef hysteresis

T93 Assess reef diversity

T94 Analyse reef diversity

T95 Interpret reef changes

T96 Water quality on reefs

T97 Water quality overall effects

T98 Conduct connectivity experiment

Section 16. Anthropogenic change text files

T 99 Analyse results from models to determine potential reef futures under various scenarios

T 100 Recall the global anthropogenic factors affecting the distribution of coral (i.e. coral mining, pollution: organic and non-organic, fishing practices, dredging, climate change, ocean acidification and shipping)

T 101 Describe the specific pressures affecting coral reefs (i.e. surface run-off, salinity fluctuations, climate change, cyclic crown-of-thorns outbreaks, overfishing, spills and improper ballast)

T 102 Recognise that during the Holocene no evidence of coral bleaching or ocean acidification can be found within coral cores dating back 6000 years

T 103 Explain the concept of coral bleaching in terms of Shelford’s law of tolerance

T 104 Interpret thermal threshold data for reefs in the northern, central and southern sections of the Great Barrier Reef in relation to the likelihood of a bleaching event

T 105 Use a specific case study to evaluate the ecological effects on other organisms (e.g. fish) after a bleaching event has occurred

T 106 Describe the conditions necessary for recovery from bleaching events

T 107 Compare the responses to bleaching events between two regions, while recognising that coral cover increases on resilient reefs once pressures are reduced or removed

T 108 Interpret data, including qualitative graphical data of coral cores, that demonstrates that coral cores can act as a proxy for the climate record (i.e. they provide information on the changes in weather patterns

**T099 Determine reef futures power points**

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

Section 17. Ocean equilibria text files

T 109 Explain the reason for differences between ocean pH and freshwater — presence of carbonate buffering system

T110 Explain that the carbonate system is linked to geological processes and operates on geological timescales

T 111 Recognise that increases in atmospheric carbon dioxide influences both global temperature and ocean pH

T 112 Describe sources of carbon dioxide in the atmosphere and how this influences ocean chemistry

T113 Describe the effect of ocean acidification on sea water in terms of increasing the concentration of hydrogen ions decreasing the concentration of carbonate ions

T114 Explain how the carbonate compensation depth (CCD) varies due to depth, location and oceanographic processes such as upwelling and coastal influences

T 115 Understand that the ocean’s capacity to absorb carbon dioxide is changing and is linked to temperature (uptake) and changes in primary productivity (storage, e.g. biological pump).

**S17 Ocean equilibria power points**

T109 pH and carbonates

T110 Geology and carbonates

T111 C02 and ph

T112 C02 and oceans

T113 Ocean acidification

T114 Carbonate compensation depth

T115 Oceans C02 capacity

Section 18. Implications for marine systems text files

T 116 Recognise that the type of carbonate ions and concentration of ions have an implication for the development of shell-forming and skeletal-forming organisms including hard corals (Scleractinia), coralline algae, molluscs, plankton and crustaceans

T 117 Interpret trends in data in relation to the carbonate system and changes in pH

T 118 Distinguish between laboratory-scale and field-based experiments and what they demonstrate about ocean acidification

T 119 Describe the potential consequences of ocean acidification for coral reef ecosystems

T 120 Explain how resilience may partially offset ocean acidification responses in the short term.

T 121 Investigate the effects an altered ocean pH has on marine carbonate structures (Mandatory practical).

**S18 Implications for marine systems power points**

T116 Carbonates and shells

T117 Carbonate systems data

T118 Ocean acidification experiments

T119 Ocean acidification consequences

T120 Acidification and resilience

T121 Altered pH practical

Section 19. Management and conservation text files

T 122 Recall and use the arguments for preserving species and habitats (i.e. ecological, economic, aesthetic, ethical) through identifying their associated direct and indirect values in a given case study

T 123 Recall and explain the criteria (i.e. site selection, networking and connectivity, replication, spacing, size and coverage) used to design protected marine areas

T124 Identify management strategies used to support marine ecosystem health (e.g. managing threats, zoning, permits, plans, longitudinal monitoring)

T 125 Evaluate the success of a named protected marine area

T 126 Compare the roles of government and non-government organisations in the management and restoration of ecosystems and their relative abilities to respond (e.g. speed, diplomatic constraints, political influence, enforceability).

**S19 Management and conservation power points**

T122 Use conservation arguments

T123 Explain MPA design criteria

T124 Marine ecosystem health

T125 Evaluate MPA success

T126 Compare management roles

Section 20. Future scenarios text files

T 127 Evaluate future scenarios for a named marine system through the analysis of different atmospheric condition datasets

T 128 Compare historical geological data (e.g. of coral cores) with changes in land use practices and global carbon dioxide and temperature levels

T 129 Recognise that ocean acidification has indirect consequences on the ocean and its uses

T 130 Identify the factors between the atmosphere and the oceans that drive weather patterns and climate (e.g. temperature, wind speed and direction, rainfall, breezes and barometric pressure)

T 131 Understand that average global temperature increases impact on marine environments by altering thermal regimes and changing physical and chemical parameters

**S20 Future scenarios power points**

T127 Evaluate marine systems

T128 Historical geological data

T129 Ocean acidification consequences

T130 Climate driving factors

T131 Global temperature impacts

Section 21. Fisheries and population dynamics text files

T 132 Understand that the term fishery has a variety of meanings and that there are three main types (i.e. artisanal, recreational and commercial)

T 133 Understand the significance of wild caught fish as the major source of protein globally

T134 Understand that the world’s fisheries are in decline

T 135 Explain how distribution of fish populations are determined by temperature, primary productivity and nutrient dispersal, and these are influenced by currents, upwelling and seasonal factors

T 136 Assess rugosity data and link this to fish diversity

T 137 Assess the impact of bioaccumulation through the food web into edible seafood

T 138 Explain how the alteration of thermal regimes caused by climate change is affecting the distribution of fish populations

T 139 Compare a case study of a fish population in decline with a case study of a fish population that is in recovery in relation to fisheries management practices

T 140 Interpret fish population data using the Lincoln index (capture–recapture method) and identify the reliability of this data to inform fisheries management decision-making on quota and total allowable catch

T 141 Identify the factors (e.g. sampling techniques, fish behaviour, temporal and spatial movement, life history) that determine the reliability of fisheries population data and consider the limitations of these factors

T 142 Recognise an international agreement that is used to manage migratory pelagic species

T143 Appraise the use of maximum sustainable yields and maximum economic yields

T 144 Recognise that fisheries management has shifted from single species maximum sustainable yield towards ecosystem-based fisheries management

T 145 Understand the value of marine protected areas including estuarine and open-water environments to fisheries sustainability.

T 146 Apply the Lincoln index in a modelled capture–recapture scenario (Mandatory practical).

**S21 Fisheries and population dynamics power points**

T132 Define fishery types

T133 Wild catch significance

T134 World fisheries declines

T135 Fish population distribution

T136 Assess rugosity 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 yeilds

T144 Fisheries management shifts

T145 MPAs and sustainability

T146 Apply Lincoln index

Section 22. Australia’s fisheries management text files

T 147 Identify the Australian Fishing Zone (AFZ)

T 148 Infer that the status of Australian fisheries is due to science-based management, the rule of law and good governance

T 149 Identify an example of a major Australian edible seafood export product and an import product

T 150 Examine the factors that lead to a higher proportion of the seafood consumed in Australia being imported

T 151 Recall that Australian Fisheries have an economic value

T 152 Explain monitoring and control of total allowable catch and fixed quotas

T 153 Describe dynamic spatial zoning fish management (including e-monitoring) as a fish management technique in terms of ecosystem-based management in relation to a case study

T 154 Describe the use of the precautionary principle as applied to ecosystem management.

**S22 Australia’s fisheries management power points**

T147 Identify AFZ

T148 Infer Fisheries status

T149 Identify seafood export

T150 Assess seafood inports

T151 Recall fisheries values

T152 Total allowable catch

T153 Spatial fish management

T154 Fish precautionary principles

Section 23. Aquaculture text files

T 155 Recognise why the current state of aquaculture in the world cannot address food security

T 156 Analyse Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) fisheries reports to determine changes in fisheries practices over the past 10 years, including economic contribution of aquaculture relative to wild catch, the top five aquaculture species in Australia by volume and value

T 157 Identify attributes (e.g. resilience, fast growth rate, low-feed conversion ratio) of an aquaculture species detailing its life cycle, adaptations, requirements and marketability that would make a species desirable to farm

T 158 Predict the maximum carrying capacity of an aquaculture system based on the size of ponds or tanks, the requirement of a species, and farming technique

T 159 Contrast different aquaculture systems (e.g. open, closed or recirculating, intensive and extensive)

T 160 Understand issues with output pollution, biosecurity and waste removal and production of feed for aquaculture

**S23 Aquaculture power points**

T155 World aquaculture state

T156 Analyse ABARES reports

T157 Identify marketing attributes

T158 Predict carrying capacity

T159 Contrast aquaculture systems

T160 Understand aquaculture issues