FACULTY OF SCIENCE

SCHOOL OF BIOLOGICAL EARTH AND ENVIRONMENTAL SCIENCES

BIOS3601

ADVANCED FIELD BIOLOGY

TERM 1, 2022

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Faculty of Science - Course Outline

1. Information about the Course

Year of Delivery	2022
Course Code	BIOS3601
Course Name	Advanced Field Biology
Academic Unit	School of Biological Earth and Environmental Science
Level of Course	Undergraduate
Units of Credit	6UOC
Session(s) Offered	T1
Assumed Knowledge, Prerequisites or Co-requisites	BEES2041 and familiarity with the principles of systematics
Hours per Week	3 HPW

Summary of Course Structure (for details see 'Course Schedule')

Component	HPW/week	Time	Day	Location
Field trip	5 days	All day	**7th-11th February**	**SIMS, Chowder Bay**
Workshop 1: Statistics	3 hrs / week 1	2pm-5pm	**Thursday, 17th Feb**	**K-D26-G29 Bioscience Bldg**
Workshop 2: Statistics	3 hrs / week 2	2pm-5pm	**Thursday, 24th Feb**	**K-D26-G29 Bioscience Bldg**
Workshop 3: Individual projects development	3 hrs / week 3	2pm-5pm	**Thursday, 3rd March**	K-F23-312 - Mat 312
Workshop 4: Statistics	3 hrs / week 7	2pm-5pm	**Thursday, 31st March**	**K-D26-G29 Bioscience Bldg**
Workshop 5: Natural History exhibition	2 hrs / week 8	2pm-5pm	**Thursday, 7th April**	**Alan Wilton Tea Room, Rm 133 Samuels building**
Workshop 6: Presentations	3 hrs / week 10	2pm-5pm	**Thursday, 21st April**	K-F23-312 - Mat 312
TOTAL	Up to 60 hrs			
Special Details	• A compulsory field trip is run for the course 7th-12th February • Six workshops will be run during Week 1- Week 10			

2. Staff Involved in the Course

Staff	Role	Name	Contact Details	Consultation Times
Course Convenor		Prof. Mike Letnic	m.letnic@unsw.edu.au	Appointments via email
Additional Teaching Staff	Lecturers & Facilitators	Baptise Wijas Giulia Ferretto Assoc. Prof. Lee Rollins Assoc Prof Will Cornwell Joe Atkinson	bwijas@gmail.com g.ferretto@unsw.edu.au l.rollins@unsw.edu.au w.cornwell@unsw.edu.au j.atkinson@unsw.edu.au	Appointments via email
	Technical Staff	Mira van Der Ley Shinjiro Ushiama	m.vanderley@unsw.edu.au s.ushiama@unsw.edu.au	Appointments via email

TEACHING STAFF

Prof. MIKE LETNIC
My research and teaching is focused on the conservation and management of ecosystems. I am particularly interested in improving understanding of landscape and continental-scale processes that influence the structure of terrestrial ecosystems and threaten biodiversity. I am currently investigating the role that top predators play in sustaining biodiversity, improving the reintroduction success of endangered mammals, the ecology and biology of crocodiles and landscape scale approaches to control the impacts of invasive species, particularly, cane toads and foxes.

Assoc. Prof. LEE ROLLINS
I joined UNSW in 2017 and in my role as a Scientia Fellow, am primarily research-focused. My group uses genetic and epigenetic approaches to examine population and evolutionary processes. Specifically, I am interested in using molecular data to explain the mechanisms underlying rapid evolution often seen in invasive populations and improve the management of invasive and conserved species.

Assoc. Prof. WILLIAM CORNWELL
Will Cornwell grew up in California, studied at Cornell, Cambridge, and Stanford. He worked doing research in Canada (UBC), Holland (VU), and now in Australia (UNSW). His research is on plant diversity and how it affects ecosystem processes. He is especially interested in ecological processes on tiny scales that affect the carbon cycle and indirectly the global climate.

GIULIA FERRETTO
I always loved the sea and looking after the marine environment has been my dream since I was a child. I became a SCUBA diver at a very young age and from that moment my passion for the sea increased, so I decided to study marine biology. I undertook my undergraduate and Master's degrees in Italy. After some working experiences in Norway and Mexico I came to Sydney in 2018 to start my PhD at UNSW and I just submitted my PhD thesis! My research project focused on the ecological aspect of seagrass restoration, in particular I investigated the factors that can improve restoration success and enhance the biodiversity of seagrass-associated community. I am also passionate about science communication to raise awareness about the ecological importance of amazing seagrasses and marine ecosystems in general.

JOE ATKINSON
I'm currently undertaking a PhD in the field of restoration ecology. My work revolves around connecting ecological theory to restoration practice. In particular, I am interested in using functional trait ecology and long-term monitoring to improve the outcomes from landscape-scale tree-planting and restoration projects across Australia and the world. Before my PhD, I worked as a consultant ecologist in Tasmania, where I developed a love of plants and ecology searching for threatened and significant plants and animals across the state.

BAPTITSE WIJAS
Baptiste is from France and has lived in Australia as a young boy where he developed a vivid passion for the outdoors and wildlife that has never subsided since. He undertook his undergraduate degree in Zoology at the University of Glasgow in the cloudy and majestic Scotland. From there he learnt all the basics to pursue his career studying ecology. Dreaming of moving back to Australia and experiencing some sunny weather again, he decided to start his PhD in Sydney, where he is now studying the importance of apex predators and herbivore pressure on ecosystem processes in the arid lands of Australia. His interests reside mainly around interactions throughout food webs but he is now developing a passion for the diverse birds of Australia as well.

MIRA VAN DER LEY
I'm a Technical Officer in BEES and I support teaching and research in the earth sciences. Working (and studying) in BEES is a wonderful experience with so much fascinating and varied research with passionate people. My PhD focussed on hydrogeochemical indicators of groundwater-surface water process.

SHINJIRO USHIAMA
I'm a Technical Officer in BEES where I support both teaching and research. My background is in marine ecology where my previous research has focused on urban impacts along our foreshore and assessing mitigation strategies to better support our diverse marine invertebrate and fish communities.

3. Course Details

Course Description (Handbook Entry)	An advanced practical training in diversity, systematics, biology and identification of terrestrial animals and plants and aquatic invertebrates. The course is run principally as an intensive one (1) week course, which will be run in 2022 at the Sydney Institute of Marine Science Field Station at Chowder Bay, Mosman during O-week. Students will receive theoretical and practical training in current methods of trapping, collecting and identifying animals and plants, estimation of population size, biodiversity, the conduct of animal surveys, and data analyses. The course coverage will include both vertebrate and invertebrate animals and plants.
Course Aims	The course aims to: 1) Provide skills and knowledge in ecological research, including posing research questions, designing experiments and collecting and analysing data for a range of animals and plants and; 2) Provide understanding of issues in experimental design and sampling; 3) Develop skills in field observation, data analysis and presentation of findings in presentations and reports.
Student Learning Outcomes	There are four, broad learning outcomes expected from this course: 1) At the end of the course, students should be aware and have some experience of sampling methods for a range of terrestrial and aquatic animals and plants and; 2) Students will understand issues to consider when designing experiments and; 3) Students will gain experience in structuring ecological experiments to address research questions, including a) the careful formulation of hypotheses, b) the design of field experiments and sampling, c) collection of data, d) data analysis, and interpretation, and e) communication of results via presentations and scientific reports and; 4) Students will be able to develop their own ideas and research questions and undertake an independent research project. 5) Students will develop their powers of observation and recording of biological information.

Graduate Attributes Developed in this Course

Science Graduate Attributes	**Select the level of FOCUS** *0 = NO FOCUS* *1 = MINIMAL* *2 = MINOR* *3 = MAJOR*	**Activities / Assessment**
Research, inquiry and analytical thinking abilities	3	1) Field trip report 2) Design and implementation of small group research project 3) Natural history project
Capability and motivation for intellectual development	2	1) Self-directed assignments and small group project, with associated literature searches and interpretation
Ethical, social and professional understanding	2	1) Strong emphasis on the design and implementation of field based ecological research. 2) Awareness of ethical issues associated with ecological research
Communication	3	1) Written assignments 2) Oral presentations 3) Group work
Teamwork, collaborative and management skills	3	1) Field work, small group project and oral presentation
Information literacy	3	1) Literatures searches and referencing associated with reports

Major Topics (Syllabus Outline)	Major topics to be covered include: 1) Theoretical and practical training in current methods of trapping, collecting and identifying animals (vertebrates and invertebrates) and plants 2) Issues with the design and implementation of animal and plant research 3) Estimation of population size and biodiversity 4) The conduct of animal surveys, DNA extraction and plant identification. 5) Design of research projects, data analyses and presentation of findings (written and oral).
Relationship to Other Courses within the Program	This course complements other core courses offered within the Program, building on systematics, data analysis, experimental design and communication knowledge and skills developed in earlier years.

4. Rationale and Strategies Underpinning the Course

Teaching Strategies	1) A **field trip** will be undertaken to introduce students to sampling and analytical techniques they may encounter in the field of biology, with special relevance to sampling animals and plants. 2) The field trip will be complemented by several **computer-based workshops** where you will receive statistics training. These activities can be applied to both your major assignments. 3) **Student presentations** at the start and end of the small group research project and the end of the field trip help develop valuable skills in oral communication. 4) Several **practical modules** associated with identifying biodiversity are undertaken in the field course. These modules will give students an introduction in the relative magnitude of biodiversity in several groups of organisms (small mammals, plants, microbats, invertebrates and birds) across several habitats; and give students an appreciation of what biodiversity actually means in terms of morphological and ecological uniqueness of some small and lesser known vertebrate and invertebrate groups. 5) **Natural history project** is designed to develop students' skills in observation, recording and presentation of biological information. 6) **Written assignments** are designed to elucidate issues in designing and implementing experiments (Field Report) and develop growing skills in presenting scientific research (Small Group Project Report)
Rationale for learning and teaching in this course,	The focus on experimental ecology in the field modules and small group projects was chosen as this approach is most powerful in advancing our understanding of terrestrial and aquatic ecology, and developing sound scientific data to underpin conservation efforts. The ability to develop hypotheses from field observations and subsequently design and conduct rigorous experiments, analyse and interpret the resultant data and communicate effectively in written and oral form to a range of audiences are skills essential for graduates seeking employment in this field.

5. Course Schedule

Week	Week start date	Workshops	Assessment Tasks ***See Section 6 for more details*
Week 0	7th February	**FIELD TRIP 7th-11th February– SIMS, Chowder Bay**	
Week 1	14th February	**Workshop 1: Statistics with Mike Letnic** 2-5pm Thursday 17th February, **Bioscience Bldg, G29**	
Week 2	21ST February	**Workshop 2: Statistics with William Cornwell** 2-5pm Thursday 24th February **Bioscience Bldg, G29**	
Week 3	28TH February	**Workshop 3: Individual projects development** 2-5pm Thursday 3rd March**, Mathews 312,** K-F23-312	
Week 4	7th March	No class	
Week 5	14th March	No class	
Week 6	21st March	No class	Field trip report due (40%) **due 4pm, 25th March, BEES office**
Week 7	28th March	**Workshop 4: Statistics** **2-5pm Thursday 31st March, Bioscience Bldg, G29**	
Week 8	4th April	**Workshop 5: Natural history exhibition** **2-5pm Thursday 7th April. Alan Wilton Tea Room, Samuels Building Rm 113.**	Natural history project (10%) **due 4pm 6th April.**
Week 9	11th April	No class	
Week 10	18th April	**Workshop 6: Independent project presentations** **2-5pm Thursday 21st April, Mathews 312,** K-F23-312	Independent project presentations (10%) **IN WORKSHOP 1-4pm Thursday 21st April, Mathews 307 (K-F23-307)**
Week 11	25th April		Independent project report due (40%) **4pm Friday 29th April.**

FIELD TRIP STRUCTURE

Fieldwork each day will commence at 830 sharp and for the birds and plants groups will involve walking to field sites in the area, so make sure you are on time. All students will be involved with sampling the following subject areas: birds/habitat, DNA, marine, and plants. To do this, the class will be split into 4 groups, and each group will conduct a different study module with a different lecturer each day from Monday to Thursday (we will post a list of names for each group and a schedule of activities for each group on each day on the first day of the field trip). Data collected by each group will be collated and analysed each day and provided to the whole class at the end of the trip for the field trip report. An introduction to the survey techniques and objectives of the AFB sampling exercises for each module is outlined in the course notes that follow.

On Friday we will work through the analysis and discussion of the collective datasets, after all groups have been through the different taxa. We will set up a system for collating data from each taxon and each group will complete this each day, analysing the data collected in consultation with the lecturer involved. You will be required to think about what the data shows or doesn't show, sources of variation and bias, and to use your biometry skills where needed to explore the dataset. And following on from this we will go through more data analysis during workshops in Weeks 1-2, Thursdays 2pm-5pm.

Seminars and work-shopping student group project ideas

On the first morning there will be a briefing before we commence field work. During the field trip we will also discuss aspects of experimental design and the approach for writing your reports. You should take notes during these seminars, as this material will be useful in your field reports and individual project reports.

At the end of lunch on Monday and Wednesday there will be guest lectures from environment professionals whose work involves restoration and management of Sydney Harbour and urban bushland.

After lunch on Tuesday there will be a lecture on the natural history project assignment.

On Friday morning, there will be workshop about the group assignment project. Throughout the field trip, students need to be planning their small group research projects; forming groups and talking about their research ideas and questions. The field trip is an excellent opportunity to get feedback on the projects and on Friday morning we will workshop potential ideas for group projects. Ideas discussed at the workshop are informal and are designed to get feedback on questions and designs. They are not assessed!

On Friday afternoon, each of the four groups will give a brief presentation (5-10 minutes) of one of the main modules together with an interpretation of the results and issues surrounding the techniques and taxa. This talk is meant to be congenial, low key and is not assessed, so don't stress about it!! Following the talk by each group there will be a class discussion.

Inaturalist

Students are encouraged to explore around Chowder Bay and its surrounds and develop ideas and skills for their natural history and group projects. Please feel free to get involved in developing lists of flora and fauna seen on the field trip and trying to identify any unknown plants and animals that you come across. We have facilitated this by creating a project on the webapp Inaturalist (inaturalist.org). We strongly encourage you to download this app on your phone and to start contributing your sightings to the "inat" project we have created for the field trip (https://www.inaturalist.org/projects/unsw-advanced-field-biology-2022). Inaturalist is a great platform to develop your natural history skills because it is quite effective at suggesting identifications for species represented in images that you upload. Test your id skills by trying to identify species that you find and then uploading images onto to inat and comparing your id with inat algorithm and volunteers identifiers who provide an independent assessment of species identifications submitted to inaturalist. See who can get the most species and observations for the week.

FIELD-TRIP TIMETABLE

	EARLY MORNING 6:00-8:15	MORNING SESSION (8:15-13:00) BIRDS, PLANTS, DNA, MARINE	AFTERNOON SESSION (14:00-17:00)	EVENING
Monday	Arrive, Birdwatching, exploring and relaxing in Chowder Bay	Course briefing, fieldwork	Guest lecture. Andrew Piccum (SIMS) Laboratory work, data collation and data entry	
Tuesday	Arrive, Birdwatching, exploring and relaxing in Chowder Bay	Fieldwork	*Natural history projects lecture Laboratory work, data collation and data entry	
Wednesday	Arrive, Birdwatching, exploring and relaxing in Chowder Bay	Fieldwork	*Guest lecture, Stephen Wall (Mosman Council) Laboratory work, data collation and data entry	
Thursday	Arrive, Birdwatching, exploring and relaxing in Chowder Bay	Fieldwork	Laboratory work, data collation and data entry	Thursday 17:00-20:00h. Relaxing and barbeque in Chowder Bay
Friday	Arrive, Birdwatching, exploring and relaxing in Chowder Bay	*Group projects workshop Analyse data and prepare presentations	Group presentations	

6. Assessment Tasks and Feedback

NATURAL HISTORY: OBSERVING AND RECORDING NATURE

Natural History Portfolio (10%)

Being able to make observations of organisms and record those observations are fundamental skills for field biologists because this is how new insights and hypotheses are often generated. However, the making of observations without actually quantifying those observations is not necessarily science and frequently falls into the realm of “natural history”. While natural history is not science, most successful field biologists are skilled natural historians whose honed powers of observation have enabled them to obtain new insights or facilitate the development of quantitative approaches to test hypotheses. Indeed, the modern fields of ecology, zoology and botany stem from the writings and observations of 19th century natural historians including Darwin, Wallace and Banks. Even today there are many gifted natural historians whose skill in the bush and knowledge of their subject means that they, not scientists, are the foremost experts in their fields of study.

Your task for this assessment is to be a natural historian in its true sense. We are asking you to undertake a natural history study of any organism or taxa of your choosing in any medium you choose. Your study could be (but is not limited to) a collection of photographs, a herbarium, a seed collection, a pinned insect collection, a shell collection, a series of line drawings, painting/s, a film, a detailed list of sightings, or musings.

Your natural history study needs to be curated (themed) in such a way that it provides a study that could be for example, taxonomic (i.e. species identifications or a classification of organisms), biogeographical (the organisms of a particular location), ecological (a description of organisms’ interactions with their environment and other species), behavioural or even perhaps spiritual. Feel free to discuss your inspirations with AFB staff.

Some video examples from previous years
https://www.youtube.com/watch?v=2sZr4nvzS40

https://www.youtube.com/watch?v=27E4BqGNXs0

https://youtu.be/haTD1WHir14

Recommended reading
E.J. Banefield 1908 *Confessions of a Beachcomber*. University of Queensland Press.
Dakin, W.J 1980 *Australian Seashores.* Angus and Robertson.
Cribb, A.B. Cribb, J.W. 1975. *Wild food in Australia*. Collins.
Finlayson, H. H. 1979. *The Red Centre: Man and Beast in the Heart of Australia*. Angus & Robertson
Low T 2014 *Where Song Began: Australia's Birds and How They Changed the World*. Penguin.
Marshall J. and Drysdale R 1966. *Journey Among Men*. Sun Books
Ratcliffe F. 1938. *Flying fox and drifting sand: the adventures of a biologist in Australia*. London: Chatto and Windus.
Read, J.L .2003. *Red Sand, Green Heart: Ecological Adventures in the Outback.* Lothian Books
Rolls, E. 1969. *They All Ran Wild*. Angus and Robertson
Wilson S and Swan G 2003. *Reptiles of Australia*. Princeton, New Jersey: Princeton University Press.

Assessment
Your natural history study will be assessed on its presentation, the curation and documentation of the study i.e. is there a structured theme, taxonomic catalogue or habitat catalogue that provides observational insight.

Due date Week 8, Wednesday 6th April, 4pm, Professor Mike Letnic's office Rm 110 Samuels Building
Show and tell exhibition: Week 8, Thursday 7th April, 2-5 pm Alan Wilton Tea Room, Rm 113 Samuels Building

Curation/documentation	Presentation	Zing	Total
5	2.5	2.5	10

FIELD REPORT
Field Report from field trip (40%)

You are required to provide a scientific report with Introduction, Methods, Results and Discussion using one of the data-sets collected during the AFB field trip. Your choice of the field course module to report on can be made in consultation with AFB staff. The Introduction should provide a brief background on the subject studies with reference to previous literature. The methods can include details of sites surveyed, field measurements, observations and statistical techniques used. Results should include a statistical analysis of the data graphs and/or tables. The discussion should provide an overview of the results in light of published literature on the subject. You are required to cite the literature you use in your Field Report. Details of the assessment criteria are shown on page 14 and the headings required and the marks assigned to each heading for each component are shown below;

Headings	5
Introduction	5
Methods	10
Results	10
Discussion	5
Structure and clarity	5
TOTAL	40

Due Date: Week 6, Friday 25th March 4:00pm. Word limit: 1500 words

INDIVIDUAL PRESENTATIONS
Individual Project Presentation (10%)

There will be a final presentation of the group project (see next page), worth 10% of the marks for the course, to be held during week 11. Each group will make a brief (~8 minute) presentation of their research question, approach and methods, results and discussion of the findings. The presentations will occur in the scheduled Thursday timeslot for AFB. **Due Date: Week 10, 21st April 2-5 pm Mathews 307.** The order of project presentation will done by lots.

INDIVIDUAL PROJECTS

Individual Project Report (40%)

You are required to undertake a field sampling exercise to answer a basic question in biology/ecology and write a report on your results in the format of a scientific paper. You will be using skills obtained during the field trip in terms of understanding methods and problems in field sampling. The introduction should use literature to set the context for the research question being addressed. It will help if you find a paper you like from a good journal and model your report on the style and structure.

Working in groups of 3-5 you will undertake the research into the best method, clearly define your question, undertake necessary sampling and analyse the data. Each person will write up their own report on the data which will be worth 40% of the final mark, but group work is encouraged for all other aspects of the project. Sample questions are provided but please discuss other options with us at Smiths Lake. Details of the assessment criteria are shown on page 14 and the marking scheme for this assignment is shown below;

Abstract	Introduction	Methods	Results	Discussion	Reference	Overall writing	Zing	Total
2	8	6	7	7	2	4	4	40

Due Date: Week 11, 29th April, 4pm, Word limit: 2000 words

ASSESSMENT TASK AND FEEDBACK SUMMARY

Task	Knowledge & abilities assessed	Assessment Criteria	% of total mark	Date of		Feedback		
				Release	Submission	WHO	WHEN	HOW
Natural History project	1. Ability to observe and record biological information;	1. Clearly identifies study objective 2. Records observations 3. Interprets observations with context	10	O week	Date tbc	Convenor Academics Demonstrators	By appointment	Marks and written comments
Field trip report	1. Places collection of field data in the context of the literature; 2. Accurately records the methods used 3. Evaluates hypotheses 3. Ability to synthesise data from the field trip to test a hypothesis and discuss data in context of the literature and constraints on experimental design.	1. Clearly defines aim of study and hypotheses tested. 2. Develops argument supported by literature search and field data 3. Applies appropriate analysis to the data. Correctly interprets analyses and places findings in the context of the literature. 4. Expression and articulation; 5. Complete and consistent reference style, and complete reference list.	40	O week	Date tbc	Convenor Academics Demonstrators	By appointment	Marks and written comments
Independent project presentations	1. Development of research problem and question; 2. Capacity to design experiment and put together appropriate methods to examine question 3. Ability to organise self and group to collect robust data 4. Ability to present and analyse key trends in data 5. Knowledge of topic through reading of literature 6. Ability to collaborate 7. Ability to communicate verbally	1. Clearly articulates problem/context and question 2. Simple outline of methods 3. Enthusiastic description of results with graphs and statistics 4. Synthesis and conclusion 5. Presentation style, content; 6. Contribution to the group	10	O week	Date tbc	Convenor Academics Demonstrators	During workshop	Marks and oral comments
Independent project report	Points 1-6 above 7. Ability to communicate in writing	1. Clearly articulates problem/context and question 2. Detailed description of methods 3. Results with graphs, statistics 4. Synthesis and conclusion 5. Contribution to the group 6. Thorough literature search; 7. Expression and articulation; 8. Complete and consistent reference style, and complete reference list.	40	O week	Date tbc	Convenor Academics Demonstrators	Examination period	Marks and written comments

7. Additional Resources and Support

Text Books	There are no prescribed text books for this course
Course Manual	You are reading it! (also available as .pdf from Moodle)
Required Readings	Reference to studies in the primary literature (i.e., original studies in journal articles rather than textbooks) will form an important part of the course. We highly recommend you take a short online tutorial offered by UNSW Library: http://elise.library.unsw.edu.au/home/welcome.html
Additional Readings	Additional readings (journal articles) may be suggested within the course lectures. These can be accessed via the University library *Sirius* and associated databases. Instructions on how to access these articles are provided in the UNSW Library tutorial suggested above.
Recommended Internet Sites	**Course web page (Moodle)** Lecture and workshop outlines, instructions for assessment and other useful resources will be posted throughout the session on the BIOS3601 web page. You will need to log on (using your student number and zpass) to Moodle at: http://lms-blackboard.telt.unsw.edu.au/webapps/portal/frameset.jsp
Computer Laboratories or Study Spaces	As a School of BEES student you have swipe card access to the School computer laboratory in G07. If you choose to join the UNSW student society Arc @ UNSW, you will also be granted access to the Arc Postgraduate Student Lounge (see details at http://www.arc.unsw.edu.au/)

8. Required Equipment, Training and Enabling Skills

Equipment Required	Field trip: Warm clothes, good wet weather gear, wetsuits (if possible), snorkel (if possible), dive booties or reef walkers, sleeping bag, pillows, swimmers, hats, beanies, sunglasses, sunscreen, towels, boots or other close toed shoes, lots of warm clothes. Detailed information on what to pack for the field trip will be provided ahead of time by Mira van der Ley and Shinjiro Ushiama.
Enabling Skills Training Required to 6Complete this Course	Reference to studies in the primary literature (i.e., original studies in journal articles rather than textbooks) will form an important part of the course. We highly recommend you take a short online tutorials offered by UNSW Library: http://elise.library.unsw.edu.au/home/welcome.html Students are required to observe OHS regulations during the fieldtrip and practicals - safety should be your top priority during fieldtrips and lab classes. If you are unsure of any procedures, please consult with staff. During field trips, it is essential to wear weather appropriate clothing, and always be aware of what is going on around you. Extra care must be taken on the lake shores due to wave action, boat traffic and slippery surfaces. **FIELD WORK GUIDELINES** Field work is an inherently dangerous pastime, and to ensure your safety we must insist that you follow a few basic guidelines for working to collect data for your project. • Always work in groups, no-one should go out collecting data alone. EVER!! • If you will work away from urban areas, take a mobile phone and tell someone where you are going and when you will return. If you will be late, let them know. • If working away from urban areas, take a basic first aid kit: we can lend you one if needs be. • Do not do anything illegal! This includes trespassing, so only work in areas you know that you are allowed to work in. • Tread lightly! Don't go blazing trails through bushland areas, be considerate of the environments you are working in. Observational work is preferred. • Wear sensible clothing for the environment you are working in. So in bushland areas, wear sensible hard-soled shoes, a hat, long trousers and sleeves. Be conscious of ticks, leeches, spiders and snakes. • If working in the intertidal zone, only work at low tide and always have someone watching for waves. • Do not pick any flora nor catch any vertebrate fauna without permission. In general you need a license from NPWS to do this, and we don't have a "cover-all" license for all sampling techniques everywhere. • Projects involving observations of subtidal marine organisms will only be approved if students have considerable snorkelling experience (preferably with current SCUBA licence).

9. Course Evaluation and Development

Student feedback is gathered periodically by various means. Such feedback is considered carefully with a view to acting on it constructively wherever possible. This course outline conveys how feedback has helped to shape and develop this course.

Mechanisms of Review	Last Review Date	Comments or Changes Resulting from Reviews
Major Course Review	NA	This course has run for more than decade, with a break in 2011. It has been running in its current format since 2012 and has undergone regular CATEI assessment, but not a major course review.
CATEI/MyExperience	2012 2013 2014 2015 2016 2017 2018	The CATEI**/**MyExperience process in 2012 and 2013 was used to modify the teaching approach to include workshops on statistics and expand the modules offered on the Smith's Lake field trip. Information on the assessment tasks was clarified within the manual and marks were reassigned based on student feedback of workload. Based on previous years feedback the File trip report due date has been moved forward to facilitate earlier feedback on marks. Evaluation will be undertaken again in 2019.

10. Administration Matters

Expectations of Students	Attendance on the field trip is compulsory, and attendance at workshops is highly recommended. Please remember that you pay fees to study at UNSW, and attending all classes will help you get the most out of your financial investment. In general, a minimum rate of 80% attendance is required to fulfil the course requirements.		
Assignment Submissions	Unless otherwise specified, submitted assignments are to be placed in the assignment box at the BEES Undergraduate Office (Rm G27). Assignments must fulfil conditions of the BEES Assignment cover sheet, which must be attached (see http://www.bees.unsw.edu.au/webfm_send/154). The cover sheet lists penalties for late submission, and there is a declaration stating that you have kept a copy and that the report is your own and has not been previously submitted for assessment. **School policy for late report submission** **For reports submitted up to seven (7) days late, a 10% per day penalty applies. Reports submitted more than seven (7) days late will not be marked.** If medical grounds preclude submission of a report by the due date, contact should be made with the course convenor as quickly as possible. A medical certificate will be required for late submission on medical grounds and must be appropriate for extension period. Assignment deadlines are essential for course management and for equitability amongst students. Please be warned that these penalties will be enforced.		
Occupational Health and Safety	Students are required to observe OHS regulations during the fieldtrip and practicals - safety should be your top priority during fieldtrips and lab classes. If you are unsure of any procedures, please consult with staff. Information on relevant Occupational Health and Safety policies can be found at: http://www.fin.unsw.edu.au/RiskManagement/RiskManagement.html Please also refer to the "Field work guidelines" in Section 8 of these course notes.		
Assessment Procedures **UNSW Assessment Policy**	**There is no final examination scheduled for this course.** For information on examinations see http://www.bees.unsw.edu.au/current/undergraduate/student-guidelines		
Equity and Diversity	Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course Convenor prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equity and Diversity Unit on 9385 4734 or http://www.studentequity.unsw.edu.au/ http://www.equity.unsw.edu.au/disabil.html Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.		
Student Complaint Procedure	**School Contact**	**Faculty Contact**	**University Contact**
	Dr. Jes Sammut j.sammut@unsw.edu.au	A/Prof Julian Cox Associate Dean (Education) julian.cox@unsw.edu.au Tel: 9385 8574 Or Dr Scott Mooney Associate Dean (Undergraduate Programs) s.mooney@unsw.edu.au Tel: 9385 8063	Student Conduct and Appeals Officer (SCAO) within the Office of the Pro-Vice-Chancellor (Students) and Registrar. Telephone 02 9385 8515, email studentcomplaints@unsw.edu.au University Counselling and Psychological Services Tel: 9385 5418

11. UNSW Academic Honesty and Plagiarism

What is Plagiarism?

Plagiarism is the presentation of the thoughts or work of another as one's own.
*Examples include:

- direct duplication of the thoughts or work of another, including by copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person's assignment without appropriate acknowledgement;
- paraphrasing another person's work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- piecing together sections of the work of others into a new whole;
- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and
- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed.†

For the purposes of this policy, submitting an assessment item that has already been submitted for academic credit elsewhere may be considered plagiarism.

Knowingly permitting your work to be copied by another student may also be considered to be plagiarism.

Note that an assessment item produced in oral, not written, form, or involving live presentation, may similarly contain plagiarised material.

The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does *not* amount to plagiarism.

The Learning Centre website is main repository for resources for staff and students on plagiarism and academic honesty. These resources can be located via:

www.lc.unsw.edu.au/plagiarism

The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

- correct referencing practices;
- paraphrasing, summarising, essay writing, and time management;
- appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre.

Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

* Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle
† Adapted with kind permission from the University of Melbourne

12. Course notes

BIRD/REPTILE SURVEYS AND HABITAT ASSESSMENT

Professor Mike Letnic & Baptiste Wijas

Aims and Background

Sydney is lucky in that is has retained many patches of bushland within its suburbs and particularly on its harbour foreshores (Benson and Howell 1990). These patches of urban bushland provide great amenity for local residents and tourists, but also provide valuable habitat for many species that have been lost from the surrounding areas which have been cleared and developed.

The story of biodiversity and urbanization is one of winners and losers (Parsons et al. 2010; Shea 2010). For example, among birds, species such as kookaburras, magpies, noisy miners, lorikeets and currawongs have readily adapted to our city and suburbs. However, a raft of other species are strongly dependent on the presence of natural bushland and rarely occur in developed landscapes. In particular, small birds have declined in number on Sydney's suburbs (Parsons et al. 2006).

For this project we will conduct surveys of birds (and reptiles) at the edge and interior of 4 urban bushland fragments. Our specific aims will be to 1) determine if there are differences in the number of species at the edge and interior of urban bushland fragments, 2) assess if there are differences in the species composition of bird/reptile assemblages at the edge and interior of urban bushland fragments and 3) determine if traits such as origin (introduced/native) and body size are linked to species preferences for edge and interior habitats. The results will provide insight into which species are winners and losers in Sydney's urban landscapes and will provide valuable information into the role that urban bushland can play in sustaining biodiversity.

Fig 1. (A) Many small birds such as the white browed scrubwren have declined in suburban areas due to loss of habitats and adverse interactions with larger birds such as (B) noisy miners.

Point and Transect Counts

We will use point counts and transect counts to survey birds in the interior and edges of urban bushland.

Point counts involve an observer remaining stationary at an observation point and counting and recording all birds observed, within a specified period of time. During our point counts will conduct targeted surveys for some small birds by counducting call playbacks. Most birds will investigate if they hear call made by conspecifics. We will take advantage of this behaviour as a way to survey small cryptic brds.

Straight-line transects involve an observer walking a specified distance, in a straight-line, over a specified period of time and counting and recording all birds encountered.

Application of these survey approaches depends on specific circumstances including the study question/aim. Generally, the following are true:

Point counts:

- Concentrate fully on birds without having to watch where you walk
- More likely to detect shy, cryptic species
- Conducive to surveys within small, discrete habitat patches.

Transect counts:

- Detect greater numbers of birds
- Less likely to double-count birds
- More likely to detect conspicuous species

Birds can be identified by visual observation and by their calls. Rapid recognition of birds and their calls is a specialised skill, but unknown birds can usually be identified from records of their characteristics (e.g. plumage colour and markings, beak shape and size, posture, size, flight pattern, behaviours and habitat), with reference to a field guide. Many smartphone field guides include call recordings, assisting identification of birds by their calls.

Quantifying habitat structure

Ecologists frequently make objective measurements of habitat attributes to describe animal habitats. In essence, this is the process of “turning nature into numbers”. The measurements taken can be used in statistical modelling techniques such as linear regression and generalized linear modelling to generate predictive models describing the habitat requirements of animal species. For example, some species may prefer habitats with dense vegetation cover, or a specific species of plant. Relating the capture success of animals to objectively measured habitat characteristics is a way of quantitatively identifying the habitat preferences of animals.

In our habitat assessment exercise we will use measurements to assess habitat structure that are similar to those used in the same region by Fox et al. 1996.

Understorey vegetation density will be assessed within 4, 5x5 m plots adjacent to each mammal trapping transect. The amount of vegetation is estimated from the proportion of the area of a 20 x 30 cm cover-board obscured by vegetation at a distance of 5m. This will be done for 5 horizontal layers from ground level to 2m, 0-20, 20-50, 50-100, 100-150 and 150-200 cm. This measure will be estimated for each layer at each of five positions on each subplot as the mean of the values for each stratum on each transect.

Canopy cover will be assessed by recording the presence or absence of canopy cover directly above every 5 steps along the transect.

Tree density will be measured by counting the number of woody stems (>10 cm diameter at breast height) within four, 20 x 20 m quadrats adjacent to the transect line. The value taken will be the mean for each transect.

Ground cover type will be recorded along each transect using the step point method. Ground cover will be classified into 4 types, water, bare, litter and vegetation. The data will be analysed as the proportion or percentage of points in each category recorded along the transect.

Analyses

Will use multidimensional scaling to compare differences in bird assemblages between interior and edge habitats (Quinn and Keogh 2002). We use linear mixed effects models to compare species richness of birds/reptile and abundances of target species in edge and interior habitats.

The structural attributes of the vegetation will be examined using a principal components analysis. This approach is useful for reducing the dimensionality of complex multivariate datasets that comprise correlated variables. This analysis can be done in most software programs and is typically titled principal components analysis or factor analysis. The scores for the first two components will be saved to the dataset and will plotted in a biplot and labelled by habitat type.

An alternative approach for ordinating multivariate data is multiple dimensional scaling (MDS) based on similarity matrices rather than correlations. MDS is often better suited to species data than PCA because many species detected in sampling programs tend to be rare and are often absent at some of the sites sampled. This characteristic of ecological communities can distort the results of PCA analyses which rely upon analysing linear trends among correlated variables. The program Primer is often used for MDS.

Plan for Bird/reptile surveys and habitat assessment

Monday-Thursday AM: Conduct bird and reptile surveys each morning. Each afternoon, the results will entered into spreadsheets. Friday conduct analysis and present data.

Selected References

Benson, D. H., & Howell, J. (1990). *Taken for granted: the bushland of Sydney and its suburbs*. Kangaroo Press.

Fox BJ et al. (1996). Comparison of regeneration following burning, clearing or mineral sand mining at Tomago, NSW: I. Structure and growth of the vegetation. Australian Journal of Ecology 21, 184-199.

Major, R. E., & Parsons, H. (2010). What do museum specimens tell us about the impact of urbanisation? A comparison of the recent and historical bird communities of Sydney. *Emu-Austral Ornithology*, *110*(1), 92-103.

Parsons, H., Major, R. E., & French, K. (2006). Species interactions and habitat associations of birds inhabiting urban areas of Sydney, Australia. *Austral Ecology*, *31*(2), 217-227.

Shea, G. M. (2010). The suburban terrestrial reptile fauna of Sydney-winners and losers. *The natural history of Sydney*, 154-197.

Quinn G P and Keogh MJ (2002) Experimental design and data analysis for biologists. Cambridge University Press.

White, A. W., & Burgin, S. (2004). Current status and future prospects of reptiles and frogs in Sydney's urban-impacted bushland reserves.

QUANTIFYING PLANT DIVERSITY IN SPACE
A/Prof Will Cornwell

Background & Aim

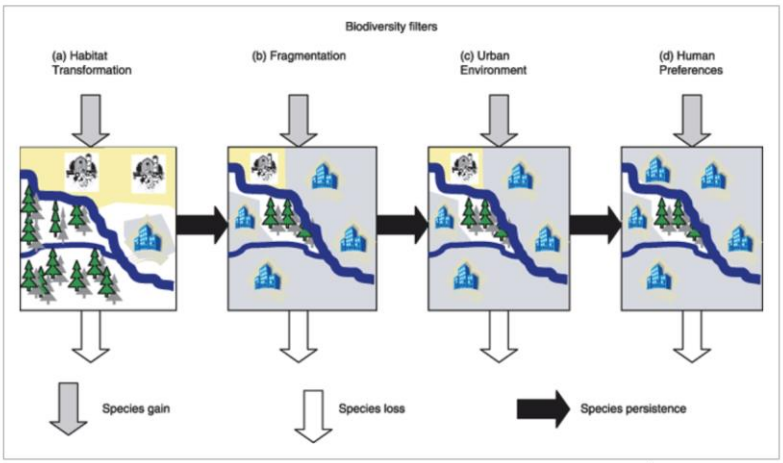


Figure 1 Open in figure viewer | PowerPoint

A schematic model of major urban filters that add (grey arrows) and remove (white arrows) plant species resulting in altered species persistence (black arrows). Urban areas (building icon) may be developed from either native vegetation (tree icon) or agricultural land (farm icon). Panels represent filters of plant diversity that may select on floristic composition, plant functional traits or the phylogenetic structure of communities. Although displayed in temporal sequence; different parts of an urban environment will likely experience each filter at different times, resulting in filters acting simultaneously within the entire urban environment. (a) *Habitat transformation* adds species by creating novel urban environments, and removes species due to the loss of native vegetation. (b) *Fragmentation* removes species that are unable to persist in small isolated areas, which can then be colonized by additional species. (c) *Urban environments* are unlike non-urban environments due to a suite of environmental changes (e.g. pollution, urban heat island) that can select for or against species. (d) *Human preferences* add and remove species. Each filter contributes to a suite of taxa that can persist in urban environments.

The world has urbanized rapidly for the last several centuries, and in some heavily populated areas, like Sydney, there are only small fragments left. Understanding the effect of the urbanization process's effect on biodiversity is an important goal. Figure 1 (from Williams et al. 2009) lays out the major filters that affect biodiversity in urban areas. Habitat transformation, fragmentation, urban environmental factors like pollution, and the idiosyncratic human choices for land use may all have profound effects on biodiversity (Duncan et al. 2011). In this practical exercise we focus on fragmentation.

Fragmentation and edge habitat

Fragmentation by humans creates many edges. These edges then create winners and losers. Jin et al. (2021) found that the percentage of fleshy-fruited species declined with distance from the edge, perhaps related to bird dispersal of fleshy fruited species near the edge. Faster growing species with thin leaves and invasive species may also be more abundant at the edge of patches compared to the interior. In this practical we will sample near the edge and in the interior of relatively intact vegetation patches. We will then compare our data to a recently published data on plant traits (Falster et al. 2021) to test hypotheses about the effect of edges on plant traits.

Plant identification

Identifying plants to species (or genus, or family) takes time, even for the experienced, and this can be done later. For now, we are going to locate all the species in our quadrat and split them into **morphospecies** for sampling.

Specimens of our morphospecies will be photographed for identification and the Smiths Lake Herbarium after we sample them. We will discuss the importance of good plant photography, to allow for subsequent identification.

References:

Duncan, Richard P., et al. "Plant traits and extinction in urban areas: a meta-analysis of 11 cities." *Global Ecology and Biogeography* 20.4 (2011): 509-519.

Falster, Daniel, et al. "AusTraits, a curated plant trait database for the Australian flora." *Scientific data* 8.1 (2021): 1-20.

Jin, Chao, et al. "Functional traits change but species diversity is not influenced by edge effects in an urban forest of Eastern China." *Urban Forestry & Urban Greening* 64 (2021): 127245.

Williams, N. S., Schwartz, M. W., Vesk, P. A., McCarthy, M. A., Hahs, A. K., Clemants, S. E., ... & McDonnell, M. J. (2009). A conceptual framework for predicting the effects of urban environments on floras. *Journal of ecology*, *97*(1), 4-9.

BIODIVERSITY IN MARINE HABITATS

Giulia Ferretto

Aims and Background

The overall aim of this module is to gain knowledge of some of the theory surrounding the processes structuring biodiversity, to design robust sampling strategies to test hypotheses and experience in some of the methods we use to sample marine rocky shores and artificial structures. You will also gain skills in sorting and identifying marine invertebrates.

Foundation species provide most of the habitat structure, influence the dynamics and densities of associated organisms and have a disproportionately important role in structuring ecological communities (Dayton, 1972). Globally, significant foundation species include trees on land, corals in tropical oceans and seagrasses and macroalgae in estuarine systems.

Coastal habitats are among the most affected marine environments due to high densities of human populations, leading to coastal development (Neumann et al., 2015, Häder et al., 2020) and the expansion of artificial structures (e.g., wharves and marinas). Urbanisation has been a major driver of decline in coastal ecosystems. The loss of foundation species or the change in their levels of complexity is expected to have a profound influence on marine communities.

Macroalgae are among the most common foundation species in estuarine and coastal habitats and provide habitat, food and protection for a diverse range of fauna. Macroalgae are found in different habitats, from rocky shores to artificial structures. Would the associated community be different based on the habitat?

Macroalgae differ in many fundamental ways and, among other differences, present a variety of morphological characteristics. Consequently, understanding the interaction between their morphology and the associated community is of great importance to ecologists working in marine environment. Previous studies suggest that trait-based approaches are useful to predict the abundance of fauna associated with foundation species (e.g., macroalgae) (Stelling-Wood et al., 2020).

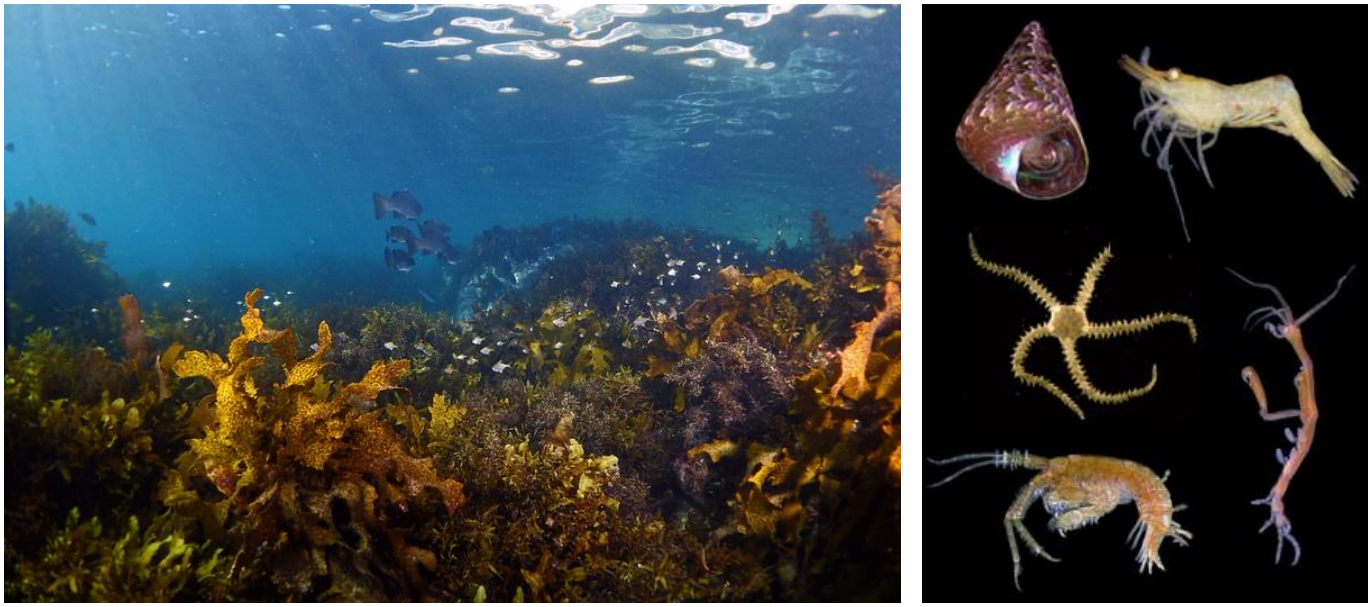
Through observations and sampling of rocky shores and artificial structures in Sydney Harbour we will investigate whether (a) the community associated with macroalgae differs between natural vs. artificial habitat and (b) macroalgae morphological traits are related to the associated community.

Overview of sampling

Although developing appropriate sampling designs can appear daunting, the more specific we can be about our objectives the easier it is to develop appropriate designs. In fact, we generally need to consider the same issues whether we are sampling forests, deserts, rocky shores. It's just some of the mechanics of sampling change in different ecosystems. Following development of clear objectives and hypotheses, we need to think about how we sample, how to we avoid spatially confounding effects (sounds complicated but it's not really), how do we standardize our sampling, what sample size (or quadrat) do we use, what do we need to measure to answer our questions. We will discuss all these issues prior to sampling so that you understand why the

issues are important and how to address them. We will then collectively decide on a sampling strategy to test our hypotheses.

Briefly, you will collect samples of macroalgae (and the communities that are in them) from different habitats. Back in the lab we will determine biodiversity in all the samples and key traits of the foundation species.



Examples of macroalgae (left) and invertebrates associates to macroalgae (right). Credits: John Turnbull and Alistair Poore.

A similar approach can be applied to investigate the deposits of algae and seagrass that are washed up after storms (named 'wrack'). Many coastal councils clean their beaches of wrack. While this is desirable from the perspective of many beach users, the deposits of wrack are an essential food supply for the sandy beach fauna (mostly small invertebrates), which are themselves important food for vertebrate consumers (e.g., shorebirds).

References and Recommended Reading

Dayton, P. K. Toward an understanding of community resilience and the potential effects of enrichments to the benthos at McMurdo Sound, Antarctica. Proceedings of the colloquium on conservation problems in Antarctica, 1972. Allen Press Lawrence, Kansas, USA, 81-96.

Häder, D.-P., Banaszak, A. T., Villafañe, V. E., Narvarte, M. A., González, R. A. & Helbling, E. W. 2020. Anthropogenic pollution of aquatic ecosystems: Emerging problems with global implications. *Science of the Total environment,* 713**,** 136586.

Neumann, B., Vafeidis, A. T., Zimmermann, J. & Nicholls, R. 2015. Future coastal population growth and exposure to sea-level rise and coastal flooding-a global assessment. *PloS one,* 10.

Stelling-Wood, T. P., Gribben, P. E. & Poore, A. G. 2020. Habitat variability in an underwater forest: Using a trait-based approach to predict associated communities. *Functional Ecology,* 34**,** 888-898.

THE BODY FARM: GENETIC SAMPLING TO MAXIMISE DNA QUALITY
A/Prof Lee Rollins

Background and Aims

DNA analyses can be used to investigate ecological and evolutionary processes in wild populations including dispersal, population demographics and connectivity, animal behaviour, mating systems, phylogenetic relationships and cryptic taxonomy. Genetic analyses also are a key component of wildlife forensics. But in order to conduct these analyses, it is vital that samples are collected in a manner that maximised their utility for a variety of genetic analyses. Importantly, these possible uses and collection practices should be considered BEFORE starting any field project to maximise the potential of these approaches. In this module, we will discuss best practices for DNA collection. Then we will use a (non-human!) "body farm" to demonstrate how environmental conditions degrade DNA and discuss why DNA quality matters.

A body farm is a facility that enables the study of decomposition. The original idea was to use cadavers donated to science to recreate decomposition under a variety of natural conditions to assist human forensic scientists to better identify the manner and timing of death. These facilities have greatly advanced the field of forensics. If you are interested in this topic, check out "Death's Acre: Insite the Legendary Forensic Lab the Body Farm Where the Dead Do Tell Tales" by William Bass, the scientist who conceived this idea – it's a riveting read!

While human body farms primarily focus on insect community succession, we will be using this approach to examine how various environmental conditions and time affect DNA quality. Using samples placed in the environment over a range of time points, we will sample tissue using best-practice, extract DNA and determine its quantity and quality. We will use these data to discuss how various genetic analyses have different DNA requirements. The primary aim of this module is to teach you how to maximise the quality of the DNA that will result from samples you collect in future.

What degrades DNA?

DNA is generally quite stable but does degrade with time; the half-life of mitochondrial DNA has been estimated at 521 years and nuclear DNA is estimated to degrade twice as fast (Allentoft et al. 2012). However, many environmental, preservation and storage conditions can damage the integrity of the molecule. For example, even short exposures to UV light, high temperatures and pH extremes can damage DNA. Tissue preservation methods themselves can damage DNA integrity and subsequent handling of these tissues can also have an effect on quality (e.g. freeze-thaw cycles). We will analyse the effects of a range of these conditions in this module.

Summary of module:

1. Best practices discussion
2. Collecting samples from the "body farm"
3. DNA extraction
4. DNA analyses
5. Discussion of results

Samples:

1. 2 mo. old shade
2. 2 mo. old sun
3. 1 mo. old shade
4. 1 mo. old sun
5. 1 week old shade
6. 1 week old sun
7. Microbiome swab
8. Fresh skin
9. Fresh bone
10. Fresh muscle
11. Freeze/thaw muscle extract
12. Bench top muscle extract
13. UV exposed muscle extract

Equipment

Sampling material
Esky
Gloves, masks, eye protection
Sampling tubes (2 ml)
Preservatives (EtOH, DMSO/salt solution, RNALater)
Foil, forceps, pipette tips, blades, dremel
Swabs
Sharpie
Extraction kit
Pipettes
Centrifuge
Vortex
Water bath
Microwave
Agarose
TE Buffer
GelRed
Power pack
Gel tray and tank
UV transilluminator (and black plastic to cover windows?)
Qubit
Qubit tubes
Qubit BR DNA kit
Biohazard bags
Sharps bin
Liquid waste containers (buffer / ethanol)
Funnel

DNA extraction protocol

This protocol is for purification of genomic DNA from 5–10 mg fresh or frozen solid tissue using the Gentra Puregene Tissue Kit.

1. Dissect tissue sample quickly and preserve.
2. Chop tissue into ~1ml pieces and place in a 1.5 ml tube with 250 ul of Cell Lysis Solution. Add 1.5 ul of Proteinase K, vortex briefly and incubate at 55°C for 3 h or until tissue has completely lysed. Invert tube periodically during the incubation.
3. RNA step here – we will skip this step for this prac.
4. Add 100 ul of Protein Precipitation Solution, and vortex vigorously for 20 s at high speed.
5. Place on ice for 5 minutes.
6. Centrifuge for 3 minutes at maximum speed (13,000-16,000 x g). The precipitated proteins should form a tight pellet. If the protein pellet is not tight, incubate on ice for another 5 min and repeat the centrifugation.
7. Pour supernatant into a 1.5 ml tube containing 300 ul of isopropanol. Be sure the protein pellet is not dislodged during pouring.
8. Mix by inverting gently 50 times.
9. Centrifuge for 1 minute at maximum speed.
10. Carefully discard the supernatant, and drain the tube by inverting on a clean piece of absorbent paper, taking care that the pellet remains in the tube.
11. Add 300 ul of freshly made 70% ethanol and invert several times to wash the DNA pellet.
12. Centrifuge for 1 minute at maximum speed.
13. Carefully discard the supernatant. Drain the tube on a clean piece of absorbent paper, taking care that the pellet remains in the tube. Allow to air dry. Note: The pellet might be loose and easily dislodged. Avoid over-drying the DNA pellet, as the DNA will be difficult to dissolve.
14. Add 50 ul of DNA Hydration Solution and flick tube to mix.
15. Incubate at room temperature (15–25°C) overnight with intermittent mixing. Ensure tube cap is tightly closed to avoid leakage.

Gel electrophoresis protocol

1. Prepare gel form with comb.
2. Pour 0.42 g of agarose into 35 ml of 0.5x TBE buffer. Melt in microwave until solution is clear.
3. Add 3 ul of GelRed to melted agarose and pour into gel form, removing any bubbles.
4. Allow get to set (at least 15 minutes but do not leave for hours!).
5. While gel is setting, add dye to DNA samples.
6. Remove gel from form and place in electrophoresis tank.
7. Add 0.5x TBE buffer to cover gel.
8. Place lid on tank and attach to power pack.
9. Run gel for 20-30 minutes, ensuring that dye front does not run past the end of the gel.
10. Examine gel on transilluminator and photograph.

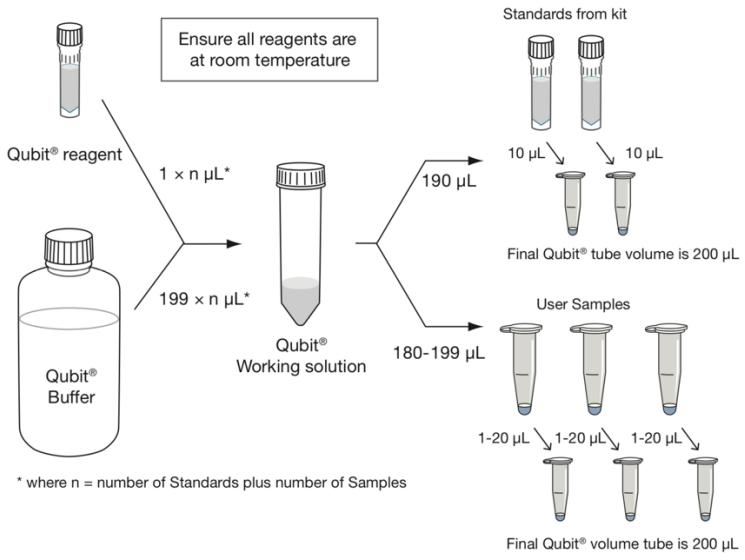
Qubit quantification

NOTE: For best results, store the dye and the buffer at room temperature. Store the DNA, RNA, and protein standards at 4°C. Ensure that all assay reagents are at room temperature before you begin.

1. Set up two Assay Tubes for the standards (three for the protein assay) and one Assay Tube for each user sample.
2. Prepare the Qubit® Working Solution by diluting the Qubit® reagent 1:200 in Qubit® buffer. Prepare 200 µL of Working Solution for each standard and sample.
3. Prepare the Assay Tubes* according to the table below.
4. Vortex all tubes for 2–3 seconds.
5. Incubate the tubes for 2 minutes at room temperature (15 minutes for the Qubit® protein assay).
6. Insert the tubes in the Qubit® Fluorometer and take readings. For detailed instructions, refer to the Qubit® Fluorometer manual.

	Standard Assay Tubes	User Sample Assay Tubes
Volume of Working Solution (from step 2) to add	190 µL	180–199 µL
Volume of Standard (from kit) to add	10 µL	—
Volume of User Sample to add	—	1–20 µL
Total Volume in each Assay Tube	200 µL	200 µL

* Use only thin-wall, clear 0.5 mL PCR tubes. Acceptable tubes include Qubit® assay tubes (set of 500, Cat. no. Q32856) or Axygen PCR-05-C tubes (VWR, part no. 10011-830).



13. Literature searches, Endnote and referencing

Endnote is a powerful tool for collecting, organising, managing and using information derived from your literature searches. Endnote removes the need to ever manually type in reference details, as the information is imported onto your hard-drive from databases on the www, and inserted into your papers and assignments (in MS Word) automatically by using Endnote. Endnote is a great resource for scientific writing, and developing these skills will benefit you for the remainder of your career.

Endnote is available free to all undergraduate students, postgraduate students, and staff at the University of NSW, and can be downloaded from the UNSW IT software distribution website

http://www.it.unsw.edu.au/

UNSW Library offers tutorials of on how to search databases http://www.library.unsw.edu.au/HowDoI/databases.html and how to use Endnote http://www.endnote.com/training/, however a synthesis of this information relevant to our work is provided below to assist you in the preparation of your assessment papers.

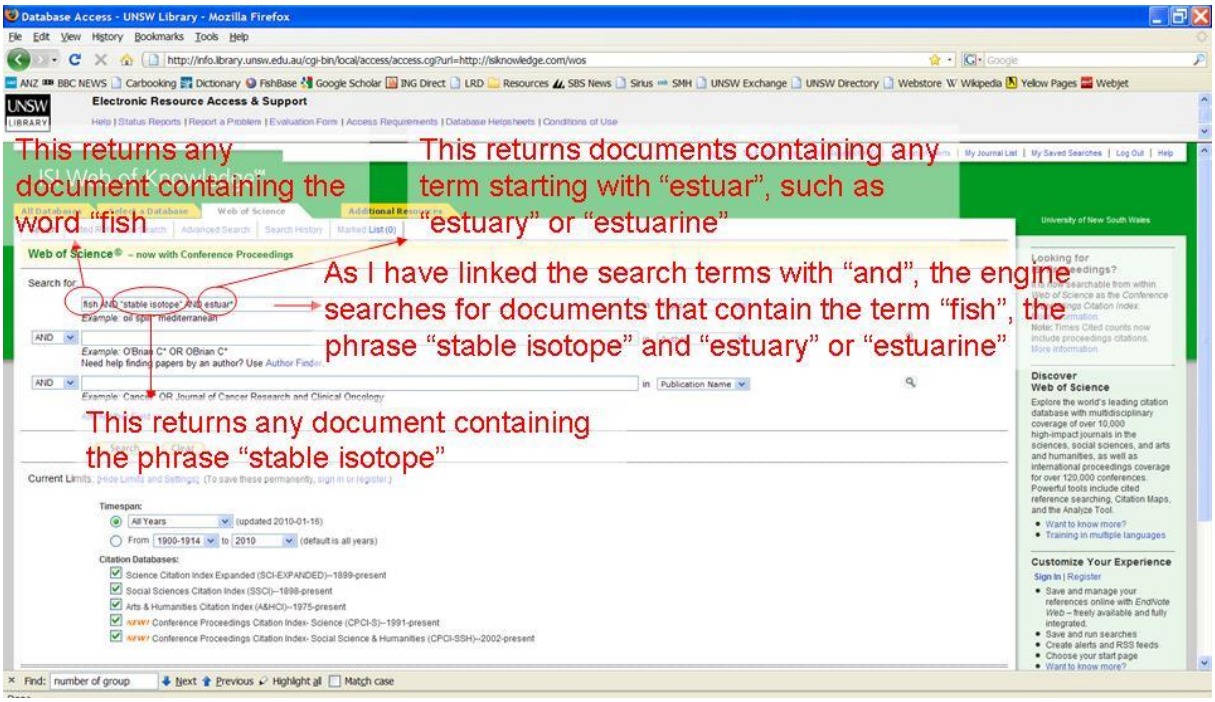
Setting up your Endnote library
Download and install EndNote on your computer.

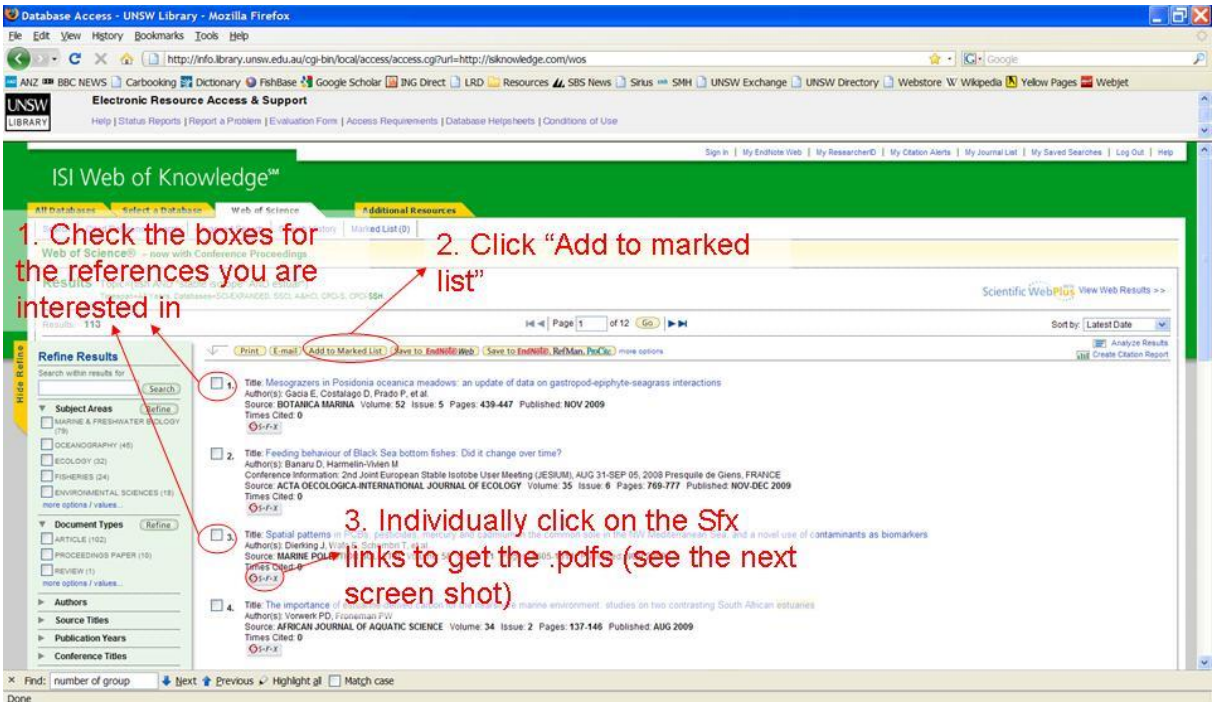
https://www.it.unsw.edu.au/students/software/endnote.html

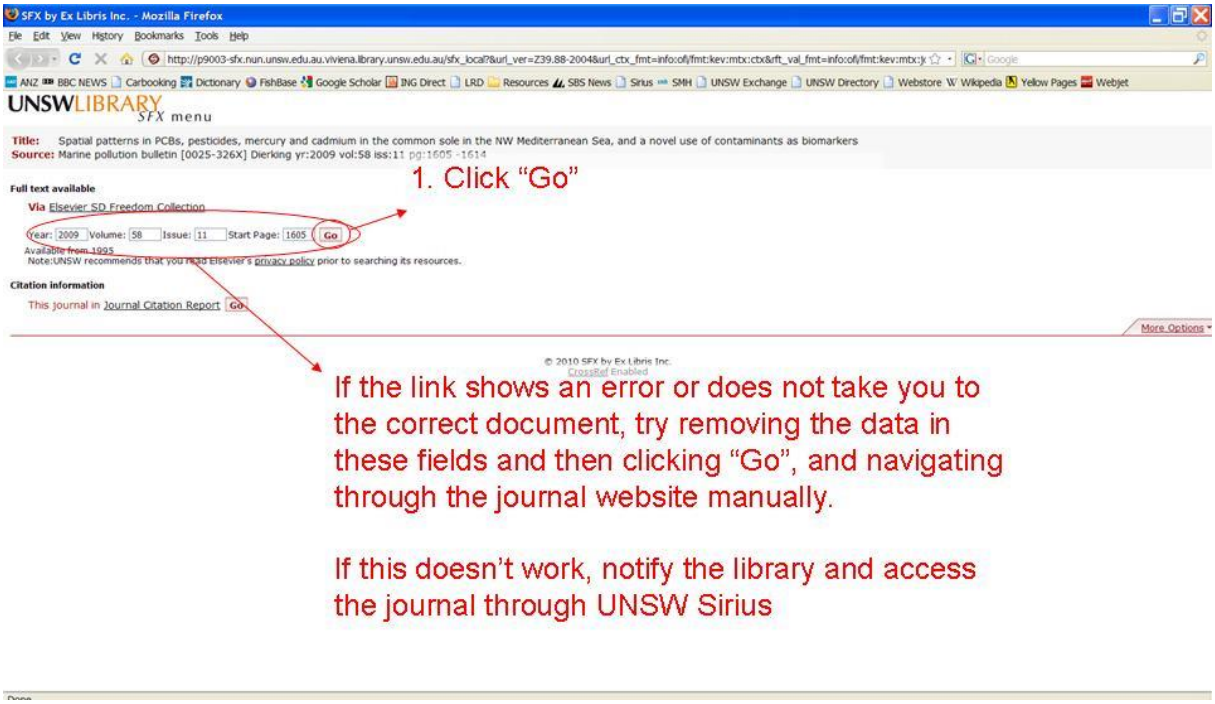
Open EndNote and create a new library by selecting File/New...

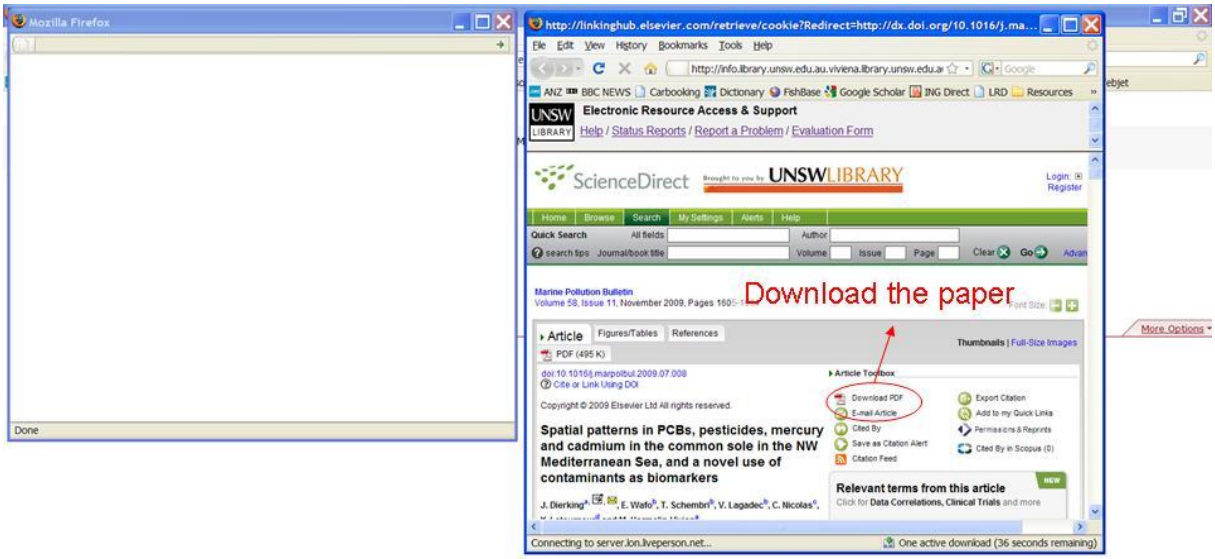
Literature searches and importing to Endnote and maintaining your database

1. Web of Science (WoS) http://info.library.unsw.edu.au/cgi-bin/local/access/access.cgi?url=http://isiknowledge.com/wos is by far the most elegant and comprehensive search engine available to us, and you should use this one for your searches.
    - The interface links easily with the UNSW *Sfx* system so you can readily access .pdfs for most of the papers you find
    - I often complement WoS searches with Google Scholar http://scholar.google.com.au/ searches. This is useful as it searches the actual text of the full article for your specified combination of search terms, rather than just the abstract, title and keywords
2. Search WoS as you would any database

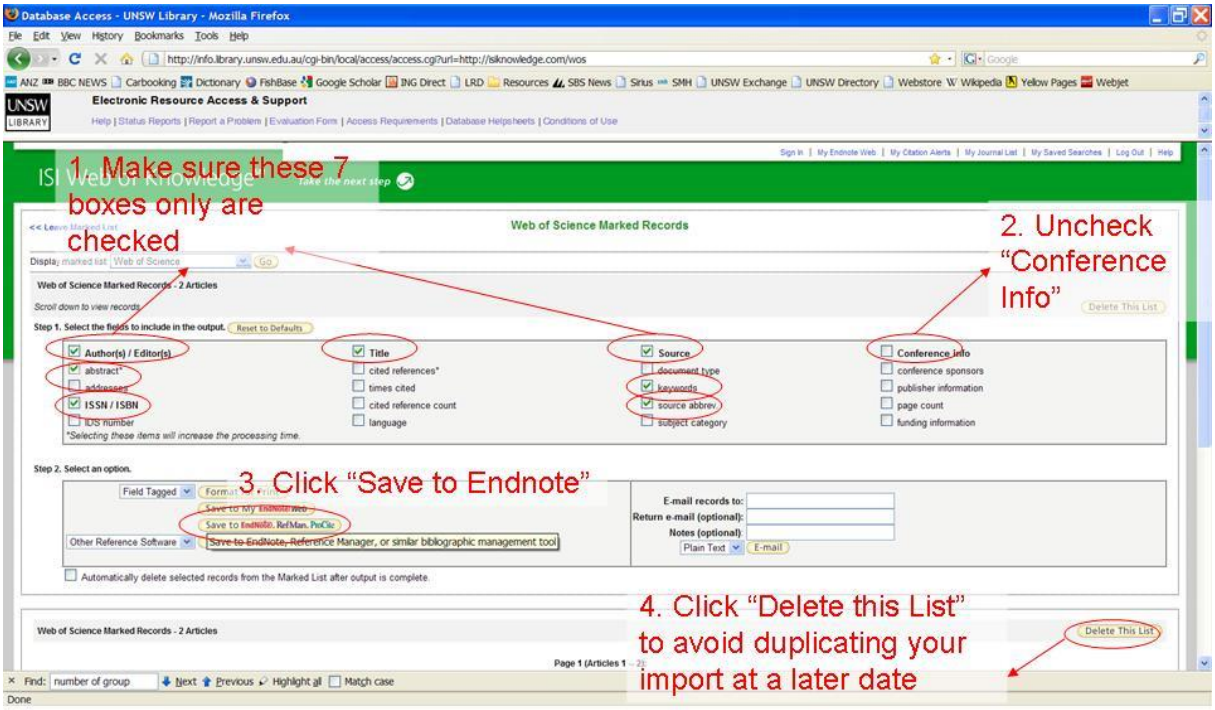



1. Check the boxes for the references you are interested in
2. Click "Add to marked list"
3. Individually click on the Sfx links to get the .pdfs (see the next screen shot)

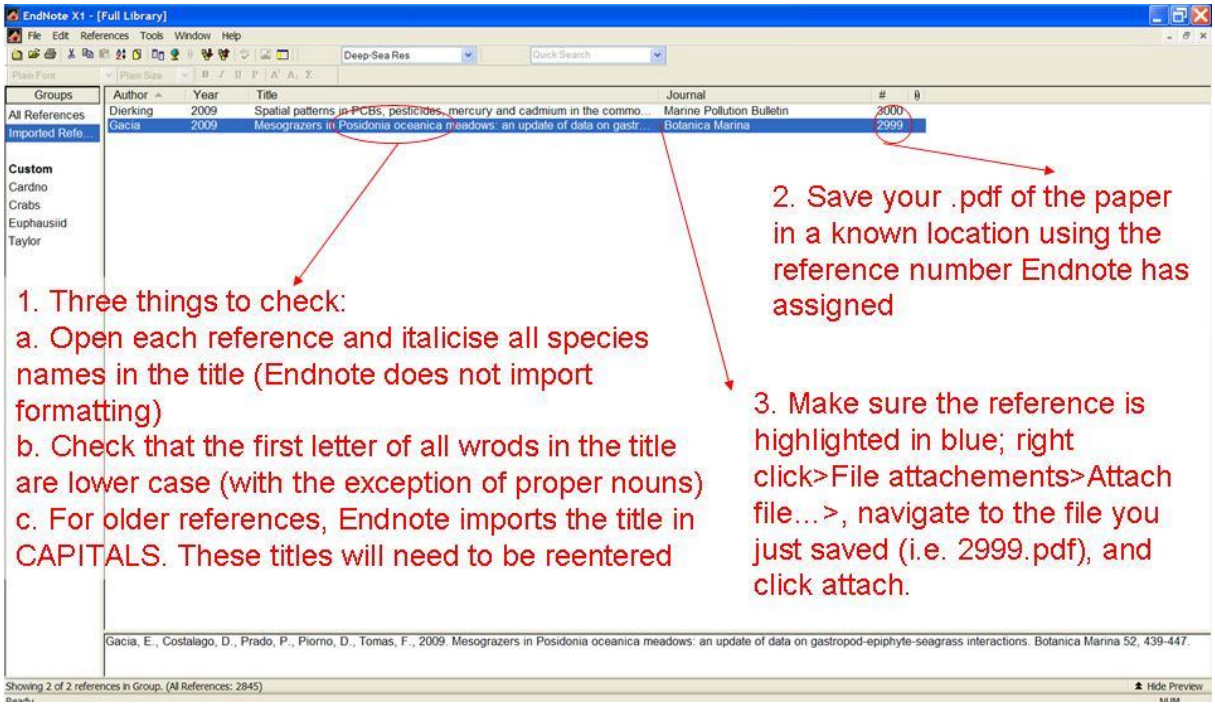

1. Click "Go"
If the link shows an error or does not take you to the correct document, try removing the data in these fields and then clicking "Go", and navigating through the journal website manually.
If this doesn't work, notify the library and access the journal through UNSW Sirius



3. Once you have finished collecting your .pdfs, then download your references from the marked list, by first clicking on the “Marked List” tab at the top of the WoS search screen



4. The references will download to Endnote, and a “pop up” screen in Endnote will appear for you to select the library you wish to import to (the one you set up earlier) and click “OK”.



5. Your reference is then imported, in the correct format, and has the .pdf linked to it permanently. You can now get rid of the saved .pdf if you desire (i.e. 2999.pdf)
6. It is important to check that the references are imported without any errors. If errors are present they will be copied to your MS Word document when you insert the reference, which makes for tedious changes later.

Using Endnote in MS Word

1. To ensure the correct output style to be used in the bibliography in MS Word, you must ensure the template style is activated in Endnote;
2. In Endnote, select Edit>Output styles>Open Style Manager and check the box next to the style you desire. If the style you desire is not there, then click "Get more on the web" and search for your desired style. Download your desired style and save it to this location on the C (or main) drive: Program Files>Endnote>Styles;
3. Close Endnote and open it again, navigate to Style Manager, and click the checkbox next to the reference you just imported;
4. In Endnote, select Edit>Output styles and select your desired output style which should now be present in the menu. Endnote will now import references in MS Word according to the rules specified in that style;
5. In MS Word, select where you wish to insert the reference
6. Click the icon  in the Endnote toolbar
7. Enter the name of the first author and click 'Find'
8. Select the correct reference and click 'Insert'
9. Endnote will inset the citation in the appropriate format, and add the reference to a bibliography at the end of the document
10. Click your cursor over the inserted citation, and you should see it turn grey. Right click on the grey and select 'Edit Citation'. This is where you can modify how the citation appears
    - To include a citation in text e.g. 'Black *et al*. (2003) stated that fish swim backwards in the northern hemisphere…', you need to check the box 'Exclude Author'. Otherwise, your citation will appear like this 'Black *et al*. (Black *et al*. 2003) stated that fish swim backwards in the northern hemisphere…'
    - To include a text within the citation e.g. 'Fish swim backwards in the northern hemisphere (e.g. Black *et al*. 2003)…', you need to type into the 'Prefix' field the text that is to appear in the citation. In this case it is 'e.g. ' – DON'T FORGET THE 'SPACE', otherwise the citation will appear as (e.g.Black *et al*. 2003)
    - If you try to type 'e.g.' just into the citation without using these steps, Endnote will delete it every time it reformats (every time you add a new citation to the document)
    - Do not use ';' in the Prefix or Suffix fields, as they stuff up Endnote