

Ecology and Conservation	
Course Code	DIC 8001
Credits	Three (lectures: 3 hr per week)
Organizers	Teng-Chiu Lin (7734-6240) and Chung-Chi Chen (7734-6328)
Lecturers	Chung-Chi Chen, Allen Chen, Tung-Yuan Ho, Sheng-Feng Shen, Benny Chan
Time	Monday 14:10-17:00
Place	S604, NTNU B208, BRC, AS
Description	<p>This course aims to provide students with rigorous training related to ecology and conservation. The course will cover the following topics:</p> <ol style="list-style-type: none"> 1. Structure and function of community and ecosystem: <ul style="list-style-type: none"> Interactions between physical setting and biological components Driving forces of ecosystem 2. Habitat requirement of non- human keystone species in ecosystem <ul style="list-style-type: none"> Identification and characterization of habitat required by species through its life history 3. Key processes related to ecosystem structure and function <ul style="list-style-type: none"> Net primary production Biogeochemistry Ecosystem stability, resistance and resilience 4. Conservation of ecosystem <ul style="list-style-type: none"> Global warming threat and human responses and adjustments Characterizing ecosystem or habitat that needs for maintenance, wise use, or restoration practices (case studies) in conserving ecosystems 5. Ecological services and valuation of ecosystem: From structure, function, and services of ecosystem to human well-being <p>Selected readings that represent major advancement in ecology and conservation and related to the above topics will be given to students for in depth discussion. Professor(s) will give brief lectures on the topics and lead the discussion for approximately one quarter of the semester and students will lead the discussion for the rest. Through the discussion each student is expected to develop a review essay as a term paper. Questions and solutions raised in the discussions are expected to make major contributions in ecology and conservation. Novel approaches and inter-disciplinary studies are highly encouraged.</p>
Purpose	<ol style="list-style-type: none"> 1. Lectures and assigned readings are designed to provide fundamental knowledge in ecology and conservation. 2. Students will identify an area of interest and come up with a research proposal that aims to answer an outstanding question in that area.

Course work reminder:

1. each student hands in Midterm paper essay
2. each group hands in Term paper essay
3. each student studies on assigned papers, field observations, and subsequent discussion according to each lecturer's specific requirement

Short Schedule

Weeks taken	Content	Lecturer/ Reading Material
Week 1 3/2 NTNU	Introduction Overall briefing	Teng-Chiu Lin
(Week #2-3)	Forest Ecosystems	
Week 2 3/9 Week 3 3/16 AS	-Insects communities/ environment interactions -Global warming and Sustainable development Introduction of Forest ecosystem: Biodiversity of forest ecosystem Impacts of Global Change on Forest ecosystem: Impacts of climate change and habitat alternation on the forest ecosystem	Sheng-Feng Shen
(Week #4-8)	Evolution, Genetics, and Conservation	
Week 4 3/23 NTNU	Diversification of Insects on Islands	Chung-Ping Lin
Week 5 3/30 NTNU	Conservation and conflicts in DMZ: A case study of reptile conservation on Kinmen Island	Si-Min Lin
Week 6 4/6	Adjusted to Holiday	
Week 7 4/13 NTNU	Niche conservatism in conservation biology -- using mammals as an example	Pei-Jen Lee Shaner
Week 8 4/20 NTNU	Population genetics and hybridization	Pei-Chun Liao
Week 9 4/27 NTNU	Ecological Plant Physiology	Craig E. Martin
Week 10 5/4 NTNU	Disease Ecology:	Chi-Chien Kuo
(Week #11-17)	Marine Ecology	
Week 11 5/11 NTNU	Physical and chemical conditions in the open ocean and anthropogenic impacts on marine ecosystem	Chung-Chi Chen
Week 12 5/18 Week 13 5/25 AS	Open ocean ecosystems	Tung-Yuan Ho
(week #14-17)	Coral Reef and Rocky Shores Ecosystems -Functions of coral reefs and rocky shores -Management (e.g. Designation of marine protected area)	
Week 14 6/1 Week 15 6/8 AS	Field Trip: Natural and artificial rocky shores – a comparison Natural and artificial rocky shores – a comparison (Discussion)	Benny Chan
Week 16 6/15 Week 17 6/22 AS	Coral reef ecology and conservation	Allen Chen
Week 18 6/29 NTNU	Discussion	Teng-Chiu Lin

Detail Syllabus

Weeks taken	Content	Lecturer/ Reading Material
Week 1 3/2	Introduction Overall briefing	Teng-Chiu Lin
(Week #2-3) Forest Ecosystems		
Week 2 3/9 Week 3 3/16	-Insects communities/ environment interactions -Global warming and Sustainable development Introduction of Forest ecosystem: Biodiversity of forest ecosystem Impacts of Global Change on Forest ecosystem: Impacts of climate change and habitat alternation on the forest ecosystem	Sheng-Feng Shen Chapter 3 -5, Lee Hannah (2011) Climate Change Biology. Academic Press.
(Week #4-8) Evolution, Genetics, and Conservation		
Week 4 3/23	Diversification of Insects on Islands	Chung-Ping Lin
Week 5 3/30	Conservation and conflicts in DMZ: A case study of reptile conservation on Kinmen Island	Si-Min Lin
Week 6 4/6	Adjusted to Holiday	
Week 7 4/13	Niche conservatism in conservation biology -- using mammals as an example Outlines: 1. The concept of niche conservatism 2. The evidence for niche conservatism 3. The implication of niche conservatism in conservation biology 4. Case study: Thermal niche conservatism in mammals	Pei-Jen Lee Shaner Reading materials: Student should read the materials below prior to the class. After a brief introduction by the lecturer, there will be open discussion on each of the 4 topics listed in the outlines. Students are required to actively participate in the discussion by sharing their unique insights. 1. Wiens, J. J., Ackerly, D. D., Allen, A. P., Anacker, B. L., Buckley et al. (2010). Niche conservatism as an emerging principle in ecology and conservation biology. Ecology Letters 13: 1310-1324. 2. Cooper, N., Freckleton, R. P., & Jetz, W. (2011). Phylogenetic conservatism of environmental niches in mammals. Proceedings of the Royal Society B: Biological Sciences 278: 2384-2391.
Week 8 4/20	Population genetics and hybridization Outlines: 1. Gene flow between populations 2. Hybridization and introgression 3. The genetic impact of invasive species and introgression 4. Case study: An unseen threat to the genetic lost: introgression between Cycad species	Pei-Chun Liao Students are requested to give a brief presentation and discussion on the reading papers. I will also lead a discussion on a case study about the introgression of cycads by horticultural introduction. Every student should provide his/her own comments on this study. Reading materials: 1. Twyford AD & Ennos RA (2012) Next-generation hybridization and introgression. Heredity 108(3): 179-189 2. Ellstrand, NC et al. (2013) Introgression of Crop Alleles into Wild or Weedy Populations. Annual Review of Ecology, Evolution, and Systematics 44: 325-345 3. Chiang YC et al. (2013) Asymmetric introgression in the horticultural living fossil <i>Cycas</i> sect. <i>Asiorientales</i> using a genome-wide scanning approach. Int J Mol Sci 14(4):8228-8251
Week 9 4/27	Ecological Plant Physiology	Craig E. Martin
Week 10 5/4	Disease Ecology: an application of ecological principles	Chi-Chien Kuo
(Week #11-17) Marine Ecology		
Week 11 5/11	Physical and chemical conditions in the open ocean and anthropogenic impacts on marine ecosystem	Chung-Chi Chen Each student should pick up an article based on his (her) own interesting and do 15 mins presentation on how human interference on

	<ol style="list-style-type: none"> 1. Overview of marine environment; 2. Effects of climate change on marine ecosystems: example from the East China Sea; 3. Hypoxia in the East China Sea. 	<p>marine ecosystems</p> <p>Reading materials:</p> <ol style="list-style-type: none"> 1. Speight, M. R. and R. A. Henderson. 2010. <i>Marine Ecology: Concepts and Applications</i>. Wiley-Blackwell. ISBN-10: 1444335456. (Ch. 1, 2, 7, 11, 12). 2. Chen, C.-C., G.-C. Gong, F.-K. Shiah, W.-C. Chou, and C.-C. Hung (2013). The large variation in organic carbon consumption in spring in the East China Sea. <i>Biogeosciences</i> 10: 2931-2943. doi:10.5194/bgd-10-2931-201 3. Chen, C.-C., F.-K. Shiah, K.-P. Chiang, G.-C. Gong, W. M. Kemp (2009). Effects of the Changjiang (Yangtze) River discharge on planktonic community respiration in the East China Sea. <i>J. Geophys. Res.</i> 114, C03005, doi: 10.1029/2008JC004891. 4. Chen, C.-C., G.-C. Gong, and F.-K. Shiah (2007). Hypoxia in the East China Sea: one of the largest coastal low-oxygen areas in the world. <i>Mar. Environ. Res.</i> 64: 399-408.
Week 12 5/18 Week 13 5/25	<p>Open ocean ecosystems</p> <ul style="list-style-type: none"> -Marine environments -Climate change and Sustainable development -Acidification <p>Global Environmental Changes in the Ocean: Ocean acidification and temperature increase in oceanic surface waters</p>	<p>Tung-Yuan Ho</p> <ol style="list-style-type: none"> 1. Scott C. Doney, Victoria J. Fabry, Richard A. Feely, and Joan A. Kleypas (2009). Ocean Acidification: The Other CO₂ Problem. <i>Annual Review of Marine Science</i>. Vol. 1: 169-192 2. Scott C. Doney (2010). The Growing Human Footprint on Coastal and Open-Ocean Biogeochemistry. <i>Science</i> 328, 1512 3. Orr JC, Fabry VJ, Aumont O, Bopp L... Totterdell IJ, Weirig MF, Yamanaka Y, Yool A. (2005). Anthropogenic ocean acidification over the twenty-first century and its impact on calcifying organisms. <i>Nature</i> 437, 681-686
(week #14-17)	<p>Coral Reef and Rocky Shores Ecosystems</p> <ul style="list-style-type: none"> -Functions of coral reefs and rocky shores -Management (e.g. Designation of marine protected area) 	
Week 14 6/1 Week 15 6/8	<p>Field Trip: Natural and artificial rocky shores – a comparison</p> <p>Natural and artificial rocky shores – a comparison (Discussion)</p>	<p>Benny Chan</p>
Week 16 6/15 Week 17 6/22	<p>Coral reef ecology and conservation</p> <ul style="list-style-type: none"> -Natural and anthropogenic disturbances on coral reefs -Historical degradation of coral reefs -Response mechanisms of coral reefs to climate change -Marine protected areas and conservation of coral reefs 	<p>Allen Chen</p>
Week 18 6/29	Discussion	Teng-Chiu Lin

Evaluation

	Evaluation	Note
林仲平 Chung-Ping Lin		
林思民 Si-Min Lin		
李珮珍 Pei-Jen Lee Shaner	50% Class participation 50% Essay on "Does niche conservatism play a role in biodiversity homogenization in human-dominated ecosystems?" (<1,500 words, 5-10 references)	
廖培鈞 Pei-Chun Liao	Class participation: 50% Reading report: 50%	
郭奇芊 Chi-Chien Kuo		
陳仲吉 Chung-Chi Chen		