

Ecology and Conservation 生態與保育	
Course Code	DIC 8001
Credits	Three (lectures: 3 hr per week)
Organizers	Chung-Chi Chen
Lecturers	Chung-Chi Chen, Teng-Chiu Lin, Chung-Ping Lin, Si-Min Lin, Frank Hsu, Shou-Hsien Li, Chi-Chien Kuo, Kuo-Fang Chung, Allen Chen, Sheng-Feng Shen, Benny Chan
Time	Monday 14:20-17:20
Place	S307, 3F, Research Building, NTNU Gongguan Campus B204, 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: each student studies on assigned papers, field observations, and subsequent discussion according to each lecturer's specific requirement

Short Schedule

Weeks taken	Content	Lecturer
Week 1 3/2 NTNU	Introduction Overall briefing	Teng-Chiu Lin
(Week #2-7)	Evolution, Genetics, and Conservation	
Week 2 3/9 NTNU	Diversification of Insects on Islands	Chung-Ping Lin
Week 3 3/16 NTNU	Conservation and conflicts in DMZ: A case study of reptile conservation on Kinmen Island	Si-Min Lin
Week 4 3/23 NTNU	Disease Ecology : an application of ecological principles	Chi-Chien Kuo
Week 5 3/30 NTNU	Conservation genetics	Shou-Hsien Li
Week 6 4/6 NTNU	Niche conservatism in conservation biology – using insects as an example	Frank Hsu
(Week #7-10)	Forest Ecosystems I. & II. Special Arrange: field trip	
Field trip:	Date & Location : to be decided Forest Ecosystems I. -Global warming and Sustainable development -Insects communities/ environment interactions Forest Ecosystems II. -Biogeography and Conservation 1 -Biogeography and Conservation 2	Sheng-Feng Shen Kuo-Fang Chung
(Week #11-18)	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 #12-18)	Coral Reef and Rocky Shores Ecosystems -Functions of coral reefs and rocky shores -Management (e.g. Designation of marine protected area)	
Week 12 5/18 AS	Field Trip: Natural and artificial rocky shores – a comparison Location: North East coast of Taiwan	Benny Chan
Week 13 5/25 AS	Natural and artificial rocky shores – a comparison (Discussion)	Benny Chan
Week 14 6/1 AS	Preparation for reading materials	
Week 15 6/8 AS	Coral reef ecology and conservation	Allen Chen
Week 16 6/15 AS	Coral reef ecology and conservation	Allen Chen
Week 17 6/22	Study week	
Week 18 6/29	Study week	

Detail Syllabus

Weeks taken	Content	Lecturer/ Reading Material
Week 1 3/2	Introduction Overall briefing	Teng-Chiu Lin
(Week #2-7)	Evolution, Genetics, and Conservation	
Week 2 3/9	Diversification of Insects on Islands	<p>Chung-Ping Lin</p> <p>Reading & Homework Assignments:</p> <p>Before the class, students are expected to read all 3 recent papers from our laboratory and answer the assigned questions, which will be available one week before the lecture. Please print out your answers (with questions) and turn in the homework assignment in class. Also, bring with you a hard or electronic copy of the papers on the day of the lecture for discussion.</p> <p>These papers are downloadable from: http://web.ntnu.edu.tw/~treehopper/index.php?page=publications&lang=en</p> <ol style="list-style-type: none"> 1. Wang, L-Y., W-S. Huang, H-C. Tang, L-C. Huang and C-P. Lin (2018) Too hard to swallow: A secret secondary defence of an aposematic insect. <i>Journal of Experimental Biology</i> 221 (DOI: 10.1242/jeb.172486) Jan 25 2018. 2. Tseng, H-Y., W-S. Huang, M-L. Jeng, R.J.T. Villanueva, O.M. Nuñez and C-P. Lin (2018) Complex inter-island colonization and peripatric founder speciation promote diversification of flightless <i>Pachyrhynchus</i> weevils in the Taiwan-Luzon volcanic belt. <i>Journal of Biogeography</i> 45: 89–100 (DOI: 10.1111/jbi.13110). 3. Chen, Y-T., H-Y. Tseng, M-L. Jeng, Y-C. Su, W-S. Huang* and C-P. Lin* (2017) Integrated species delimitation and conservation implications of an endangered weevil <i>Pachyrhynchus sonani</i> (Coleoptera: Curculionidae) in Green and Orchid Islands of Taiwan. <i>Systematic Entomology</i> 42: 796–813 (DOI: 10.1111/syen.12242).
Week 3 3/16	Conservation and conflicts in DMZ: A case study of reptile conservation on Kinmen Island	<p>Si-Min Lin</p> <p>Reading materials:</p> <ol style="list-style-type: none"> 1. Si-Min Lin, Y. Lee, T.-H. Chen, J.-W. Lin. (2015) Habitat preference and management of a Chinese Pond Turtle population protected by the demilitarized Kinmen Islands. <i>Journal of Herpetology</i> 49(3): 399–404. (SCI) 2. You, C.-W., Y.-P. Lin, Y.-H. Lai, Y.-L. Chen, Y. Tang, S.-P. Chou, H.-Y. Chang, R. T. Zappalorti, Si-Min Lin*. (2013) Return of the pythons: first formal records, with a special note on recovery of the Burmese Python in the demilitarized Kinmen Islands. <i>Zoological Studies</i>, 52: 8. (SCI)
Week 4 3/23	Disease Ecology: an application of ecological principles	<p>Chi-Chien Kuo</p> <p>Reading materials:</p> <p>The assigned papers will be discussed in the class and students will be graded based on their participation in the discussion.</p> <ol style="list-style-type: none"> 1. Life-history change in disease-ravaged Tasmanian devil populations. 2008. <i>PNAS</i> 105: 10023-10027. <p>Invasive honeysuckle eradication reduces tick-borne disease risk by altering host dynamics. 2010. <i>PNAS</i> 107: 18523-18527</p>
Week 5 3/30	Conservation genetics 1. Why conservation needs genetics? 2. Delineating conservation units 3. Importance of genetic demography 4. Conservation of adaptive traits 5. Case studies	<p>Shou-Hsien Li</p> <p>Reading materials:</p> <p>Students should read the materials below prior to the class:</p> <ol style="list-style-type: none"> 1. Allendorf et al. 2010. <i>Nature Reviews Genetics</i> 11, 697. 2. Funk et al. 2012. <i>Trend in Ecology and Evolution</i>, 27, 489. 3. Xu et al. 2015. <i>Science</i> 348, 242. 4. Roman & Palumbi 2003. <i>Science</i> 301, 508. 5. Hung et al. 2014. <i>PNAS</i> 111, 10636.

Week 6 4/6		Frank Hsu Reading materials: Students should read the materials below prior to the class: 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. <i>Ecology Letters</i> 13: 1310-1324. 2. Losos, J. B. 2008. Phylogenetic niche conservatism, phylogenetic signal and the relationship between phylogenetic relatedness and ecological similarity among species. <i>Ecology Letters</i> 11: 995-1007. 3. Bradford A. Hawkins, B. A. & P. J. DeVries. 2009. Tropical niche conservatism and the species richness gradient of North American butterflies. <i>Journal of Biogeography</i> 36: 1698–1711.
(Week #7-10)	Forest Ecosystems I. & II. : Special Arrange--field trip: Date & Location to be decided	
	Forest Ecosystems I. -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) <i>Climate Change Biology</i> . Academic Press. (Textbook in TIGP reservation area at Life Science Library, Academia Sinica) Kuo-Fang Chung Reading materials: -KF Chung, CI Peng, SR Downie, K Spalik, BA Schaal (2005) Molecular systematics of the trans-Pacific alpine genus <i>Oreomyrrhis</i> (Apiaceae): phylogenetic affinities and biogeographic implications, <i>American Journal of Botany</i> 92 (12), 2054-2071 -Chapter 2, <i>The History of Biogeography</i> . Biogeography, Lomolino, Riddle, Whittaker and Brown. Sinauer Associates -KF Chung, WC Leong, RR Rubite, R Repin, R Kiew, Y Liu, CI Peng (2014) Phylogenetic analyses of <i>Begonia</i> sect. <i>Coelocentrum</i> and allied limestone species of China shed light on the evolution of Sino-Vietnamese karst flora. <i>Botanical Studies</i> 55 (1), 1 -JC Nekola (1999) Paleoreugia and neoreugia: the influence of colonization history on community pattern and process. <i>Ecology</i> , 1999 - <i>Eco Soc America</i>
	Forest Ecosystems II. Biogeography and Conservation 1 Biogeography and Conservation 2	Kuo-Fang Chung Reading materials: 1. KF Chung, CI Peng, SR Downie, K Spalik, BA Schaal (2005) Molecular systematics of the trans-Pacific alpine genus <i>Oreomyrrhis</i> (Apiaceae): phylogenetic affinities and biogeographic implications, <i>American Journal of Botany</i> 92 (12), 2054-2071 2. Chapter 2, <i>The History of Biogeography</i> . Biogeography, Lomolino, Riddle, Whittaker and Brown. Sinauer Associates Kuo-Fang Chung Reading materials: 3. KF Chung, WC Leong, RR Rubite, R Repin, R Kiew, Y Liu, CI Peng (2014) Phylogenetic analyses of <i>Begonia</i> sect. <i>Coelocentrum</i> and allied limestone species of China shed light on the evolution of Sino-Vietnamese karst flora. <i>Botanical Studies</i> 55 (1), 1 4. JC Nekola (1999) Paleoreugia and neoreugia: the influence of colonization history on community pattern and process. <i>Ecology</i> , 1999 - <i>Eco Soc America</i>
(Week #11-18)	Marine Ecology	
Week 11 5/11	Physical and chemical conditions in the open ocean and anthropogenic impacts on marine ecosystem 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.	Chung-Chi Chen Each student should pick up an article based on his (her) own interesting and do 20-25 mins presentation on how human interference on marine ecosystems Reading materials: 1. Speight, M. R. and R. A. Henderson. 2010. <i>Marine Ecology: Concepts and Applications</i> . Wiley-Blackwell. ISBN-10:

		<p>1444335456. (Ch. 1, 2, 7, 11, 12). (Textbook in TIGP reservation area at Life Science Library, Academia Sinica)</p> <p>2. Chen, C.-C., G.-C. Gong, W.-C. Chou, and F.-K. Shiah (2020). Hypoxia in autumn of the East China Sea. <i>Marine Pollution Bulletin</i> 152, Art. no. 110875. doi: 10.1016/j.marpolbul.2019.110875.</p> <p>3. Chen, C.-C., G.-C. Gong, W.-C. Chou, C.-C. Chung, C.-H. Hsieh, F.-K. Shiah, and K.-P. Chiang (2017). The influence of episodic flooding on pelagic ecosystem in the East China Sea. <i>Biogeosciences</i> 14: 2597-2609.</p> <p>4. 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.</p> <p>5. 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.</p>
(week #12-18)	Coral Reef and Rocky Shores Ecosystems	
	-Functions of coral reefs and rocky shores -Management (e.g. Designation of marine protected area)	
Week 12	5/18	Field Trip: Natural and artificial rocky shores – a comparison
		Benny Chan
Week 13	5/25	Natural and artificial rocky shores – a comparison (Discussion)
		Benny Chan
Week 14	6/1	Preparation for reading materials
Week 15	6/8	Coral reef ecology and conservation -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
		Allen Chen
Week 16	6/15	Coral reef ecology and conservation
		Allen Chen
Week 17-18	6/22, 6/29	Study week

Evaluation

Lecturers	Evaluation Criteria
陳仲吉 Chung-Chi Chen	100 % Class participation and presentation
林登秋 Teng-Chiu Lin	100 % Class participation and presentation
沈聖峰 Sheng-Feng Shen	50 % Class participation; 50 % Class discussion
郭奇芊 Chi-Chien Kuo	100% Class participation, including paper discussion
陳國勤 Benny K.K. Chan	100 % Class report/presentation
陳昭倫 Allen Chen	20 % Class participation; 20 % Class report/presentation; 30 % Class discussion; 30 % Assignments