

Ecology and Conservation 生態與保育	
Course Code	DIC 8001
Credits	Three (lectures: 3 hr per week)
Organizers	Teng-Chiu Lin (7734-6240) and Chung-Chi Chen (7734-6328)
Lecturers	Teng-Chiu Lin, Chung-Chi Chen, 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 14:10-17:00
Place	S604, NTNU 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 2/20 NTNU	Introduction Overall briefing	Teng-Chiu Lin
Week 2 2/27	Adjusts to Holiday	
Week #3-4 Week#11-12	Forest Ecosystems I. & II. Special Arrange: two days field trip and lectures (Adjust to 5/7 , 5/8)	
5/7 , 5/8	Forest Ecosystems I.& II. -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 -Biogeography and Conservation 1 & 2	Sheng-Feng Shen Kuo-Fang Chung
(Week #5-10)	Evolution, Genetics, and Conservation	
Week 5 3/20 NTNU	Diversification of Insects on Islands	Chung-Ping Lin
Week 6 3/27 NTNU	Conservation and conflicts in DMZ: A case study of reptile conservation on Kinmen Island	Si-Min Lin
Week 7 4/3	Adjusts to Holiday	
Week 8 4/10 NTNU	Disease Ecology : an application of ecological principles	Chi-Chien Kuo
Week 9 4/17 NTNU	Conservation genetics	Shou-Hsien Li
Week 10 4/24 NTNU	Niche conservatism in conservation biology – using insects as an example	Frank Hsu
Week #3-4 Week#11-12	Forest Ecosystems I. & II. Special Arrange: two days field trip and lectures	
5/7	Forest Ecosystems I. 13:00-16:00 Insects communities/ environment interactions 17:30-20:30 Global warming and Sustainable development	Sheng-Feng Shen Kuo-Fang Chung
5/8	Forest Ecosystems II. 09:00-12:00 Biogeography and Conservation 1 13:00-16:00 Biogeography and Conservation 2	Sheng-Feng Shen Kuo-Fang Chung
(Week #13-17)	Marine Ecology	
Week 13 5/15 NTNU	Physical and chemical conditions in the open ocean and anthropogenic impacts on marine ecosystem	Chung-Chi Chen
(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 5/22 AS	Field Trip: Natural and artificial rocky shores – a comparison	Benny Chan
Week 15 5/29	Adjusts to Holiday	
Week 16 6/5	Natural and artificial rocky shores – a comparison (Discussion)	Benny Chan
Week 17 6/12 Week 18 6/19 AS	Coral reef ecology and conservation	Allen Chen

Detail Syllabus

Weeks taken	Content	Lecturer/ Reading Material
Week 1 2/20	Introduction Overall briefing	Teng-Chiu Lin
Week 2 2/27	Adjusts to Holiday	
(Week #3-4)	Forest Ecosystems I. & II. Special Arrange: two days field trip and lectures	
Week 3 Week 4 Adjust to 5/7 , 5/8	<p>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</p> <p>Forest Ecosystems II. Biogeography and Conservation 1 & 2</p>	<p>Sheng-Feng Shen Chapter 3-5, Lee Hannah (2011) Climate Change Biology. Academic Press. (Textbook in TIGP reservation area at Life Science Library, Academia Sinica)</p> <p>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, The History of Biogeography. 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) Paleorefugia and neorefugia: the influence of colonization history on community pattern and process. <i>Ecology</i>, 1999 - Eco Soc America</p>
(Week #5-10)	Evolution, Genetics, and Conservation	
Week 5 3/20	Diversification of Insects on Islands	<p>Chung-Ping Lin Reading & Homework Assignments: Before the class, students are expected to read all three papers and answer the assigned questions, which will be available one week before the lecture. Please turn in the homework assignment in class on the day of the lecture.</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. Tseng, H-Y., C-P. Lin, J-Y Hsu, D.A. Pike and W-S. Huang. 2014. The functional significance of aposematic signals: geographic variation in the responses of widespread lizard predators to colourful invertebrate prey. <i>PLoS ONE</i> 9(3):e91777. 2. Su, Y-C., J-F. Wang, R. J. T. Villanueva, O. M. Nuñez and C-P. Lin. 2014. Hopping out of Mindanao: Miocene-Pliocene geological processes and cross-island dispersal as major drivers of diversity for Philippine treehoppers. <i>Journal of Biogeography</i> 41(7):1277–1290. 3. Lee, Y-H. and C-P. Lin. 2012. Pleistocene speciation with and without gene flow in <i>Euphaea</i> damselflies of subtropical and tropical East Asian islands. <i>Molecular Ecology</i> 21(15):3739-3756.
Week 6 3/27	Conservation and conflicts in DMZ: A case study of reptile conservation on Kinmen Island	<p>Si-Min Lin 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. Zoological Studies, 52: 8. (SCI)
Week 7	4/3	Adjusts to Holiday
Week 8	4/10	Disease Ecology: an application of ecological principles
		Chi-Chien Kuo Reading materials: The assigned papers will be discussed in the class and students will be graded based on their participation in the discussion. 1. Life-history change in disease-ravaged Tasmanian devil populations. 2008. PNAS 105: 10023-10027. 2. Invasive honeysuckle eradication reduces tick-borne disease risk by altering host dynamics. 2010. PNAS 107: 18523-18527
Week 9	4/17	Conservation genetics 1. Why conservation needs genetics? 2. Delineating conservation units 3. Importance of genetic demography 4. Conservation of adaptive traits 5. Case studies
		Shou-Hsien Li Reading materials: Students should read the materials below prior to the class: 1. Allendorf et al. 2010. Nature Reviews Genetics 11, 697. 2. Funk et al. 2012. Trend in Ecology and Evolution, 27, 489. 3. Xu et al. 2015. Science 348, 242. 4. Roman & Palumbi 2003. Science 301, 508. 5. Hung et al. 2014. PNAS 111, 10636.
Week 10	4/24	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
		Frank Hsu 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.
Forest Ecosystems I. & II. Special Arrange: two days field trip and lectures		
(Week #3-4)	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) Climate Change Biology. Academic Press. (Textbook in TIGP reservation area at Life Science Library, Academia Sinica)
(Week #11-12)	Forest Ecosystems II. Biogeography and Conservation 1	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 Oreomyrrhis (Apiaceae): phylogenetic affinities and biogeographic implications, American Journal of Botany 92 (12), 2054-2071 2. Chapter 2, The History of Biogeography. Biogeography, Lomolino, Riddle, Whittaker and Brown. Sinauer Associates
	Forest Ecosystems II. Biogeography and Conservation 2	Kuo-Fang Chung Reading materials: 3. KF Chung, WC Leong, RR Rubite, R Repin, R Kiew, Y Liu, CI Peng (2014) Phylogenetic analyses of Begonia sect. Coelocentrum and allied limestone species of China shed light on the evolution of Sino-Vietnamese karst flora. Botanical Studies 55 (1), 1 4. JC Nekola (1999) Paleoreugia and neoreugia: the influence of colonization history on community pattern and process. Ecology, 1999 - Eco Soc America

(Week #13-17)	Marine Ecology	
Week 13 5/15	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 30 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: 1444335456. (Ch. 1, 2, 7, 11, 12). (Textbook in TIGP reservation area at Life Science Library, Academia Sinica) 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 #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 5/22	Field Trip: Natural and artificial rocky shores – a comparison	Benny Chan
Week 15 5/29	Adjusts to Holiday	
Week 16 6/5	Natural and artificial rocky shores – a comparison (Discussion)	Benny Chan
Week 17 6/12 Week 18 6/19	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

Evaluation

Lecturers	Evaluation Criteria
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