Ecology and Conservation **生態與保育**	
Course Code	DIC 8001
Credits	Three (lectures: 3 hr per week)
Organizers	Teng-Chiu Lin
Lecturers	Teng-Chiu Lin, Joe Chun-Chia Huang, Frank Hsu, Shou-Hsien Li, Chi-Chien Kuo, Kuo-Fang Chung, Allen Chen, Sheng-Feng Shen, Benny Chan, Colin KC Wen, Shao-Lun Liu, Chung-Te Chang
Time	Monday:14:20-17:20 (NTNU) / 14:00-17:00(BRCAS)
Place	C302, 3F, Colleague of Science Building, NTNU Gongguan Campus B208, BRC Building, BRCAS (Interdisciplinary Research Building)
Description	This course aims to provide students with rigorous training related to ecology and conservation. The course will cover the following topics: 1. Structure and function of community and ecosystem: Interactions between physical setting and biological components Driving forces of ecosystem 2. Habitat requirement of non- human keystone species in ecosystem Identification and characterization of habitat required by species through its life history 3. Key processes related to ecosystem structure and function Net primary production Biogeochemistry Ecosystem stability, resistance and resilience 4. Conservation of ecosystem 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 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.
Purpose	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.
Evaluation Criteria	林登秋 Teng-Chiu Lin : 100 % Class participation and presentation 黃俊嘉 Joe Chun-Chia Huang: 50% short essay; 50% class participation 郭奇芊 Chi-Chien Kuo : 100% Class participation including paper discussion 李壽先 Shou-Hsien Li: 100% Class participation and class presentation 徐堉峰 Frank Hsu: 100 % Class participation and presentation

	沈聖峰 Sheng-Feng Shen : 50 % Class participation; 50 % Class discussion 鍾國芳-Kuo Fang Chung: 50 % Class participation; 50 % Class 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

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/venue	Content	Lecturer
Week 1 2/20 NTNU	Introduction Overall briefing	**Teng-Chiu Lin**
	Evolution, Genetics, and Conservation	
Week 2 2/27	Holiday	
Week 3 3/6 NTNU	Breaking down barriers to fulfil the conservation shortfalls in Southeast Asia: Using bat as a model	**Chun-Chia Huang**
Week 4 3/13 NTNU	Biodiversity conservation and infectious diseases	**Chi-Chien Kuo**
Week 5 3/20 NTNU	Conservation genetics	**Shou-Hsien Li**
Week 6 3/27 NTNU	Niche conservatism in conservation biology	**Yu-Feng Hsu**
	Forest Ecosystems	**Lecturer**
Week 7 4/3	Holiday	
Week 8 4/10 BRC	The Structure and Nutrient Cycling of Forest Ecosystem	**Chung-Te Chang**
Week 9 & 10 4/24-4/25 Field trip	Two days field trip Location: Wuling Farm Mountain Area -Global warming and Sustainable development -Insects communities/ environment interactions -Biogeography and Conservation	**Sheng-Feng Shen** **Kuo-Fang Chung**
	Marine Ecology	
Week 11 5/1 BRC	Natural and artificial rocky shores – a comparison	**Benny Chan**
Week 12 5/8 field trip	Field trip: North East coast of Taiwan	**Benny Chan**
Week 13 5/15 BRC	Reef fish and sustainable fishery	**Kuo-Chang Wen**
Week 14 5/22 BRC	Introduction of blue carbon	**Shao-Lun Liu**
Week 15 5/29 BRC	Coral reef ecology and conservation in the era of changing climate	**Allen Chen**
Week 16 6/5 Field trip	Field trip to observe coral community	**Allen Chen**

Reading Materials

Weeks taken	Content	Lecturer/ Reading Material
Week 1 2/20	Introduction Overall briefing	**Teng-Chiu Lin**
Evolution, Genetics, and Conservation		
Week 2 2/27	**Conservation Ecology** Breaking down barriers to fulfil the conservation shortfalls in Southeast Asia: Using bat as a model	.**Joe Chun-Chia Huang** No readings
Week 3 3/6	National Holiday: Peace Memorial day	
Week 4 3/13	**Disease Ecology:** Biodiversity conservation and infectious diseases	**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. Halliday, F.W., Rohr, J.R. and Laine, A.L., 2020. Biodiversity loss underlies the dilution effect of biodiversity. Ecology Letters, 23: 1611-1622. **2.** Eby, P., Peel, A.J., Hoegh, A., Madden, W., Giles, J.R., Hudson, P.J. and Plowright, R.K., 2023. Pathogen spillover driven by rapid changes in bat ecology. Nature 613: 340–344.
Week 5 3/20	**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. Benestan, L. M., Ferchaud, A.-L., Hohenlohe, P. A., Garner, B. A., Naylor, G. J. P., Baums, I. B., Schwartz, M. K., Kelley, J. L., & Luikart, G. (2016). Conservation genomics of natural and managed populations: Building a conceptual and practical framework. Molecular Ecology, 25(13), 2967–2977. https://doi.org/10.1111/mec.13647 2. Bertorelle, G., Raffini, F., Bosse, M., Bortoluzzi, C., Iannucci, A., Trucchi, E., Morales, H. E., & van Oosterhout, C. (2022). Genetic load: Genomic estimates and applications in non-model animals. Nature Reviews Genetics, 1–12. https://doi.org/10.1038/s41576-022-00448-x 3. Coates, D. J., Byrne, M., & Moritz, C. (2018). Genetic Diversity and Conservation Units: Dealing With the Species-Population Continuum in the Age of Genomics. Frontiers in Ecology and Evolution, 6. https://www.frontiersin.org/article/10.3389/fevo.2018.00165 4. Grueber, C. E., & Sunnucks, P. (2022). Using genomics to fight extinction. Science, 376(6593), 574–575. https://doi.org/10.1126/science.abp9874 5. Hogg, C. J., Ottewell, K., Latch, P., Rossetto, M., Biggs, J., Gilbert, A., Richmond, S., & Belov, K. (2022). Threatened Species Initiative: Empowering conservation action using genomic resources. Proceedings of the National Academy of Sciences, 119(4), e2115643118. https://doi.org/10.1073/pnas.2115643118 6. Nair, P. (2014). Conservation genomics. Proceedings of the National Academy of Sciences, 111(2), 569–569. https://doi.org/10.1073/pnas.1323086111 7. Willi, Y., Kristensen, T. N., Sgrò, C. M., Weeks, A. R., Ørsted, M., & Hoffmann, A. A. (2022). Conservation genetics as a management tool: The five best-supported paradigms to assist the management of threatened species. Proceedings of the National Academy of Sciences, 119(1), e2105076119. https://doi.org/10.1073/pnas.2105076119 8. Benestan, L. M., Ferchaud, A. L., Hohenlohe, P. A., Garner, B. A., Naylor, G. J., Baums, I. B., ... & Luikart, G. (2016).

		Conservation genomics of natural and managed populations: building a conceptual and practical framework.
Week 6 3/27	1. The evidence for niche conservatism The implication of nich Niche conservatism in conservation biology -- using mammals as an example **Outlines:** 2. The concept of niche conservatism 3. e conservatism in conservation biology Case study: Thermal niche conservatism in mammals	**Frank Hsu** Reading materials : **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. 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		
Weeks 7 4/3	Holiday	
Weeks 8 4/10	The Structure and Nutrient Cycling of Forest Ecosystem	**Chung-Te Chang** 1.5-2 hours lecture, 1 hour discussion based on reading materials related to the topic of lecture, from which the evaluation of class preparation/participation include. Therefore, all students need to read three assigned papers below. Reading material: 1. Lin KC, Hamburg SP, Wang L, Duh CT, Huang CM, Chang CT, Lin TC (2017) Impacts of increasing typhoons on the structure and function of a subtropical forest: reflections of a changing climate. Scientific Reports 7: 4911. 2. Chang CT, Wang LJ, Huang JC, Liu CP, Wang CP, Lin NH, Wang L, Lin TC (2017) Precipitation control on nutrient budgets in subtropical and tropical forests and the implications under changing climate. Advances in Water Resources 103: 44-50. 3. Chang CT, Yang CJ, Huang KH, Huang JC, Lin TC (2022) Changes of precipitation acidity related to sulfur and nitrogen deposition in forests across three continents in north hemisphere over last two 1. decades. Science of the Total Environment 806: 150552.
Week 9 & 10 4/24-4/25	2 days field trip: Wuling Farm Mountain Area -Global warming and Sustainable development -Insects communities/ environment interactions -Biogeography and Conservation	**Sheng-Feng Shen** **Kuo-Fang Chung** No readings
Marine Ecology: Coral Reef and Rocky Shores Ecosystems -Functions of coral reefs and rocky shores -Management (e.g. Designation of marine protected area)		
Week 11 5/1	Natural and artificial rocky shores – a comparison	**Benny Chan** I will introduce natural and artificial rocky shores in the first lecture. Then I will bring students to visits a natural and a artificial wave breaker shore in NE coast in the second lecture. Students will carry samplings in these two types of shores and compare their diversity. My objective is to describe when shores become urbanized, their diversity is drastically reduced. I will send student a review paper on these two types of shores before my lecture.
Week 12 5/8	Field trip: North East coast of Taiwan	**Benny Chan**

Week 13 5/15	Reef fish and sustainable fishery	**Colin KC Wen** Students are required to read the provided papers and conduct a search for an additional study that investigates the ecology or biology of reef fishes with implications for sustainable fishery in coral reefs. It is preferable for the selected study to have been conducted in the student's country. Upon completing their reading, students should create an infographic using the figures/tables from their chosen papers or create their own. Afterward, students should fill out a report form, available at the following link: https://forms.gle/SW1zUxKgGGCM1zfYA. Finally, each student will present their findings to the class using a single slide/infographic. 1. Wen, C. K., Almany, G. R., Williamson, D. H., Pratchett, M. S., Mannering, T. D., Evans, R. D., ... & Jones, G. P. (2013). Recruitment hotspots boost the effectiveness of no-take marine reserves. Biological Conservation, 166, 124-131. 2. Price, N. W., Chen, K. S., Chen, C. A., & Wen, C. K. C. (2021). Scraping and grazing herbivorous/detritivorous fish display opposite feeding behaviours under different protection regulations. Marine Biology Research, 17(9-10), 876-891.
Week 14 5/22	Introduction of blue carbon	**Shao-Lun Liu** Lecture, no readings
Week 15 5/29	Coral reef ecology and conservation Class Discussion	**Allen Chen** Reading materials: download from NAS station. 1. Morrison et al. 2020. Advancing Coral Reef Governance into the Anthropocene. 2. Morrison et al. 2019. Save reefs to rescue all ecosystems. 3. Williams et al. 2019. Coral reef ecology in the Anthropocene.
Week 16 6/5	Field trip to observe coral community	**Allen Chen**