Ecology and Conservation 生態與保育	
Credits	Three (lectures: 3 hr per week)
Organizers	Teng-Chiu Lin
Lecturers	Teng-Chiu Lin, Joe Chun-Chia Huang, Frank Hsu, Pei-Chun Liao, Chi-Chien Kuo, Chung-Chi Chen, Jyh-Min Chiang, Kuo-Fang Chung, Allen Chen, Sheng-Feng Shen, Benny Chan, Colin KC Wen, Shao-Lun Liu, Yiching Lin, I-Min Tso, 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 廖培鈞 Pei-Chun Liao: 100% Class participation including class and paper discussion 徐堉峰 Yu-Feng Hsu: 100 % Class participation and presentation 江智民 Jyh-Min Chiang : 100% Class participation and class discussion.

	沈聖峰 Sheng-Feng Shen : 50 % Class participation; 50 % Class discussion 鍾國芳-Kuo Fang Chung: 50 % Class participation; 50 % Class discussion 陳仲吉 Chung-Chi Chen : 100 % Class report/presentation 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 溫國彰 : Refer to "Reading materials" 劉少倫 Shao-Lun (Allen) Liu : 100% Class participation and class discussion. 林宜靜 Yi-Ching Lin : 50 % Class participation; 50 % Class discussion 卓逸民 I-Min Tso 50 % Class participation; 50 % Class discussion 張仲德 Chung-Te Chang : 50% Class participation; 50% Class discussion

Course work reminder: each student studies on assigned papers, field observations, and subsequent discussion according to each lecturer's specific requirement

Short Schedule

Date/Venue	**Content**	**Lecturer**
2/17 **NTNU**	Introduction Overall briefing	Teng-Chiu Lin
	Evolution, Genetics, and Conservation	
2/24 **NTNU**	Niche conservatism in conservation biology	Yu-Feng Hsu
3/3 **NTNU**	Listening to the dark: Bioacoustics of bats	Joe Chun-Chia Huang
3/10 **NTNU**	Integrating GEA into Conservation Genetics Strategies	Pei-Chun Liao
3/17 **NTNU**	Biodiversity conservation and infectious diseases	Chi-Chien Kuo
	Forest Ecosystems	**Lecturer**
3/24 **BRC**	Community assembly and ecosystem functions	Jyh-Min Chiang
3/31 **BRC**	Arthropod diversity and conservation from natural forests to urban areas	I-Min Tso
4/7 **BRC**	Spatial and temporal patterns in forest communities	Yiching Lin
Date to be decided	Forest Ecosystems I & II: field trip course -Global warming and Sustainable development -Insects communities/ environment interactions -Biogeography and Conservation 1&2	Sheng-Feng Shen Kuo-Fang Chung
	Marine Ecology	**Lecturer**
4/21 **BRC**	The conservation of coral community	Chaolun Allen Chen
4/28 **NTNU**	Physical and chemical conditions in the open ocean and anthropogenic impacts on marine ecosystem	Chung-Chi Chen
5/5 **BRC**	Introduction of blue carbon	Shao-Lun (Allen) Liu

5/12 BRC	Sustainable fishery in coral reefs	Kuo-Chang Wen
5/19 BRC	Natural and artificial rocky shores – a comparison	Benny K.K. Chan
6/2	Final report due date if there's any	

Reading Materials

Weeks taken	Content	Lecturer/ Reading Material
2/17	Introduction Overall briefing	**Teng-Chiu Lin**
Evolution, Genetics, and Conservation		
2/24	Breaking down barriers to fulfill the conservation shortfalls in Southeast Asia: Using bat as a model	**Joe Chun-Chia Huang** No readings
3/3	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	**Yu-Feng 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. 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.
3/10	Conservation genetics	**Pei-Chun Liao** **Reading materials:** Students should read the materials below prior to the class: 1. Aitken, S. N., Jordan, R., Tumas, H. R. 2024. Conserving Evolutionary Potential: Combining Landscape Genomics with Established Methods to Inform Plant Conservation. Annual Review of Plant Biology 75: 707-736 https://doi.org/10.1146/annurev-arplant-070523-044239 2. Dauphin, Benjamin, Christian Rellstab, Rafael O. Wüest, Dirk N. Karger, Rolf Holderegger, Felix Gugerli, Stéphanie Manel. 2023. Re-thinking the environment in landscape genomics. Trends in Ecology & Evolution 38 (3): 261-274 https://doi.org/10.1016/j.tree.2022.10.010 This course will introduce the principles of GEA and the application of landscape genomics in conservation genetics. After a brief overview of the research progress in this field, we will engage in an open discussion focused on the following four key topics: 1. What challenges arise when defining "adaptive loci" in landscape genomics, and how do these challenges influence conservation planning? 2. How can the concept of "adaptive landscapes" be applied to prioritize conservation efforts in fragmented habitats? 3. What role do historical demographic processes (e.g., bottlenecks, migration) play in shaping the current genetic landscape, and how can these be distinguished from recent adaptive changes? 4. How can adaptive landscapes address the risk of outbreeding depression when combining populations for genetic rescue? Students are expected to actively participate in the discussion, share their perspectives, and provide real-time feedback or counterarguments during others' presentations.

3/17	**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.
3/24	**Community assembly and ecosystem functions**	**Jyh-Min Chiang** 1. Tilman D., Isbell F., Cowles J.M. (2014) Biodiversity and ecosystem functioning. Annu. Rev. Ecol. Evol. Syst. 45:471–93 2. Chiang J.M., Spasojevic M.J., Muller-Landau H.C., Sun I.-F., Lin Y., Su S.-H., Chen Z.-S., Chen C.-T. Swenson N.G., and McEwan R.W. (2016) Functional composition drives ecosystem function through multiple mechanisms in a broadleaved subtropical forest. 3. Castillioni K. and Isbell F. (2023) Early positive spatial selection effects of beta-diversity on ecosystem functioning. Landscape Ecology https://link.springer.com/article/10.1007/s10980-023-01786-9
Forest Ecosystems		
3/31	Arthropod diversity and conservation from natural forests to urban areas	**I-Min Tso** Readings materials: Student should read the following articles before the class. The lecturer will give an overview about these two articles and relevant researches. Then discussions will be conducted on the questions listed in the outline. Students are expected to actively participate in the discussion to realize the impacts of human activities on arthropod diversities in natural as well as urban habitats and to reflect on feasible and realistic ways of conserving biodiversity in these areas. 1. Huang, P. S., Lin, H. C., Lin, C. P. & Tso, I. M. 2014. The effect of thinning on ground spider diversity and micro-environmental factors of a subtropical spruce plantation forest in East Asia. European Journal of Forest Research, 133:919-930. 2. Huang, P. S., Tsai, S. M., Lin, H. C. & Tso, I. M. 2015. Do biotope area factor values reflect ecological effectiveness of urban landscapes? A case study on university campuses in central Taiwan. Landscape and Urban Planning. 143: 143-149. **Outlines** 1. What are the characteristics of spider diversities in natural and plantation forests? What environmental factors might be responsible for the observed differences? 2. How does transforming the natural forests into plantation forests impact the spider diversity? 3. What strategies can we adopt to enhance the arthropod diversities in plantation forests? 4. What is the concept of ecological effectiveness? What are the commonly used ways of estimating ecological effectiveness in the cities? Are they accurate? 5. How to establish an accurate way of estimating the ecological effectiveness of urban areas? 6. What are the feasible and realistic ways we can apply to enhance biodiversity in urban areas?

4/7	Spatial and temporal patterns in forest communities	**Yiching Lin** Reading material: 1. Ben-Said, M. 2021. Spatial point-pattern analysis as a powerful tool in identifying pattern-process relationships in plant ecology: an updated review. Ecological process, 10: 56. 2. Lin, Y.-C., L.-W. Chang, K.-C. Yang, H.-H. Wang, and I.-F. Sun. 2011. Point patterns of tree distribution determined by habitat heterogeneity and dispersal limitation. Oecologia 165:175-184. Species-area relationships explained by the joint effects of dispersal limitation and habitat heterogeneity. Ecology 90:3033-3041.
Date to be decided	field trip course: -Global warming and Sustainable development -Insects communities/ environment interactions -Biogeography and Conservation	**Sheng-Feng Shen** **Kuo-Fang Chung** No reading materials
Marine Ecology: Coral Reef and Rocky Shores Ecosystems -Functions of coral reefs and rocky shores -Management (e.g. Designation of marine protected area)		
4/21	The conservation of coral community	**Allen Chen** TBD
4/28	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; Hypoxia in the East China Sea.	**Chung-Chi Chen** Each student should select article(s) based on their own interests about human impacts on marine ecosystems and deliver a 20-minute presentation during class Reading materials: 1. Speight, M. R. and R. A. Henderson. 2010. Marine Ecology: Concepts and Applications. 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., C.-h. Hsieh, Y.-H. Cheng, W.-J. Huang, W.-C. Chou, F.-K. Shiah, G.-C. Gong, C.-C. Chung, and T.-Y. Chen (2024). Effect of a tropical cyclone on the pelagic ecosystem of a continental shelf. Limnology and Oceanography : . doi: 10.1002/lno.12730 3. Chen*, C.-C., W.-C. Chou, C.-C. Hung, and G.-W. Gong (2024). Nutrient sources, phytoplankton blooms, and hypoxia along the Chinese coast in the East China Sea: Insight from summer 2014. Marine Pollution Bulletin. 205, Art. no. 116692. doi: 10.1016/j.marpolbul.2024.116692 4. 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. Biogeosciences 14: 2597-2609. 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. Mar. Environ. Res. 64: 399-408.
5/5	Introduction of blue carbon	**Shao-Lun Liu** Lecture, no readings

5/12	**Grading Criteria:** **1. Selection of Study (10 points):** **2. Implications for Sustainable Fishery (30 points):** **3. Infographic Creation (35 points):** **4. Class Presentation (25 points):** **Note:** The details of grading criteria can be found in the report form google form. Make sure to adhere to the guidelines and requirements outlined in the assignment. If you have any questions, feel free to seek clarification from the instructor."	**Colin KC Wen** **Task:** 1. **Skim Reading and Search:** • Skim read the provided papers. • Conduct a search for a study similar to those provided, focusing on the ecology or biology of reef fishes. • Preferably select a study conducted in your country. 2. **Implications for Sustainable Fishery:** • Provide your own implications for sustainable fishery in coral reefs based on the findings of the chosen paper. 3. **Infographic Creation:** • Create an infographic by modifying figures/tables from the chosen paper or design your own. 4. **Report Form:** • Complete the report form available at this link: Report Form Link. 5. **Presentation:** • Present your findings to the class using a single slide/infographic. **Submission Details:** • Submit your infographic and report form by 2024/May/5. • Ensure that your chosen paper and infographic align with the provided guidelines. • Be ready to present your findings in class on May/12. Provided paper 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.
5/19	Field trip: North East coast of Taiwan	**Benny Chan** I will introduce natural and artificial rocky shores. Then I will bring students to visits a natural and an 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.
6/3	Final report due date if there's any	