Course Syllabus

SIT Study Abroad
School for International Training

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Biodiversity and Natural Resource Management Seminar

ENVI 3000 (3 credits / 45 hours)

SIT Study Abroad Program:
Madagascar: Biodiversity and Natural Resource Management

PLEASE NOTE: This syllabus represents a recent semester. Because courses develop and change over time to take advantage of unique learning opportunities, actual course content varies from semester to semester.

Course Description

This interdisciplinary course introduces students to a range of key policies and practices for the management of the unique and endemic natural resources in Madagascar. Using conceptual approaches drawn from environmental justice and political ecology, students explore diverse terrestrial and marine resources in a range of locales and consider the realities and challenges of developing effective and equitable natural resource management systems.

Key themes through which the issues are explored during the course include livelihoods and stakeholder analyses, protected area and community based management systems, basic tools for understanding and monitoring natural resources and the cultural practices and their influence on natural resource management.

The course includes excursions to a range of ecological sites chosen to represent Madagascar's exceptionally unique bio-diversity and the joys and challenges that Malagasy people encounter in managing and preserving their natural resources. These sites range from fishing communities, mining operations, urban and rural markets, state, private and community forest management organizations, research stations and rural agricultural communities. The semester exposes students to a range of climatic conditions and environmental systems including rainforests mangroves and coastal forests, coffee and sisal plantations, sub arid agro-pastoral areas and coastal communities.

Understanding the diversity of stakeholders engaged in natural resource management and their varying roles is a central aim of the course. Students will be taught by, visit and collaborate with a diverse range of Malagasy and international academics, representatives of NGOs, as well as local government and communities. Collaboration in the field and the classroom with students from the Androy Regional University Centre (CURA) also forms an important element of the course. The course is taught in the

program base of Fort Dauphin, as well as through extensive field trips and excursions to the community managed littoral forests of Sainte Luce, the rainforests and coffee plantations of Kianjavato, the Rio Tinto Mandena Illmentite Mine and National Parks such as Andohahela, Isalo and Ranomafana. Students will also engage with rural communities in the agricultural hinterland of Ambovombe during a rural homestay, and with coastal fishing communities in the Vangaindrano and Tulear regions.

Learning Outcomes

By the end of this course students will be able to:

- Describe the range of Madagascar's main terrestrial, coastal and marine ecosystems and their key features.
- Assess and discuss the major environmental management policies used for conservation and sustainable use of natural resources in Madagascar.
- Describe and discuss selected natural resource challenges from the perspectives of local livelihoods, cultural practice and economic systems.
- Critically analyze the management challenges from conservation and community perspectives for a range of natural resources including forests, minerals and fisheries; and
- Explain the varying roles of different stakeholders in natural resource management in Madagascar considering the particular perspectives of social justice and environmental sustainability.

Language of Instruction

The course is taught mainly in French with some SIT staff lectures in English. Readings are predominantly in English, supplemented by other documentary sources in French. Excursions and fieldwork are conducted predominantly in French. The rural and urban homestays provide students with the opportunity to deepen their Malagasy and French language skills. Most presentations given by students and two of the three written assignments are in French. A student led discussion and the third written assignment are undertaken in English.

Module 1: Understanding Madagascar's Biodiversity and Monitoring It

This module provides students with an understanding of Madagascar's unique and endemic flora and fauna. Considering unique biogeography and evolutionary processes, students learn theories of evolution and how they led to diverse habitats and species forming in different parts of Madagascar. New evidence of early human settlement, extinctions and genetic evidence for natural fragmentation of populations provide a fascinating lens through which students explore Madagascar's unique flora and fauna. A field course on the collection of botanical and plant community ecology provides students with the opportunity to understand the data collection protocols and context for the monitoring and management of biodiversity rich littoral forests.

Site Visits: Littoral Forests of Sainte Luce

Readings

Ganzhorn JU, Wilme L et Mercier J-L (2014) Explaining Madagascar's biodiversity, pp17-43 in Scales IR (ed) Conservation and Environmental Management in Madagascar, Earthscan, London.

Goodman SM and Jungers WL (2014) Extinct Madagascar: Picturing the Island's Past, University of Chicago Press, Chicago.

Quemere E et al (2012) Genetic data suggest a natural prehumen origin of open habitats in northern Madagascar and question the deforestation narrative in this region, Proceedings of the National Academy of Sciences, Vol 109 (32): 13028-13033.

Dewar RE (2014) Early human settlers and their impacts on Madagascar's landscapes, pp44-64, in Scales IR (ed) Conservation and Environmental Management in Madagascar, Earthscan, London.

Module 2: Environmental Policy and Stakeholders in Madagascar

This module introduces students to a broad range of policies, practices and stakeholders engaged in environmental management in Madagascar. The history of forestry, conservation, land use and environmental impact policies are considered through lectures, readings and sites visits. Critical engagement with the ongoing challenge of balancing biodiversity conservation, local resource use needs and economic development activities such as mining form a central part of this module. Students draw upon readings, documentaries and visits to a range of stakeholders around the forests and mining areas in the Fort Dauphin hinterland.

Site Visits: Rio Tinto Mine, communities impacted/displaced by the mine, Mandena Conservation Zone and Andohahela National Park.

Readings

Ferguson H.B et al (2015) Governing Ancestral Land in Madagascar: Have Policy Reforms Contributed to Social Justice, pp:63-93 in Sowman R and Wynberg M (eds) Governance for Justice and Environmental Sustainability, Routledge, London.

Huff A (2016) Black Sands, Green Plans and Conflict: Structural Adjustment, Sectoral Reforms and the Mining–Conservation–Conflict Nexus in Southern Madagascar, IDS Evidence Report: 183.

Keller ES (2009) Who are "they"? Local understandings of NGOs and State Power in Masoala Madagascar, Tsantsa 14:76-85.

Kull CA (2014) The roots, persistence and character of Madagascar's Conservation Boom, pp:146-171 in Scales IR (ed) Conservation and Environmental Management in Madagascar, Routledge, London.

Seagle C (2012): Inverting the impacts: Mining, conservation and sustainability claims near the Rio Tinto/QMM ilmenite mine in Southeast Madagascar, Journal of Peasant Studies, 39:2, 447-477.

Module 3: Fisheries: Livelihoods and Policies

This module introduces students to the marine and coastal areas of Madagascar, their socio-economic importance for local communities and the Malagasy government, as well as exposing students to the policies developed for managing fisheries. The program base in Fort Dauphin, the main source of domestic and exports of pelagic and fresh water fish, shrimp, lobster and oyster, provides examples of emergence of formalized community based fishery management, commercialization and value in addition to local produce as well as traditional fisheries systems. Despite these positive trends, there is evidence of significant declines in the fisheries. Students will learn from technical fisheries experts, from government agencies, local NGOs and directly from fisher peoples themselves to gain an understanding of the complex social and ecological systems that make up Madagascar's fisheries.

Site Visits: Hovatraha, Lokaro and Manafiafy Fishing Villages, Fort Dauphin's Tanambao Fish Market, Libanona Landing Site and Ankoba/Ambinanikely Oyster Vendors.

Readings

Barnes-Mauthe et al 2013 The total economic value of small-scale fisheries with a characterization of post-landing trends: An application in Madagascarwith global relevance, Fisheries Research 147:175– 185.

Bruggemann, J. H., M. Rodier, M. M. M. Guillaume, S. Andréfouët, R. Arfi, J. E. Cinner, M. Pichon, F. Ramahatratra, F. Rasoamanendrika, J. Zinke, and T. R. McClanahan. 2012. Wicked social–ecological problems forcing unprecedented change on the latitudinal margins of coral reefs: the case of southwest Madagascar. *Ecology and Society* **17**(4).

Cooke A, Lutjeharms JRE and Vasser P (2003) Marine and Coastal Ecosystems, pp 179-208 in Goodman SM and Benstead J (eds) Natural History of Madagascar, University of Chicago Press.

LeManach F et al (2012) Unreported fishing, hungry people and political turmoil: the recipe for a food security crisis in Madagascar? Marine Policy 36:218–225.

Module 4: Protected Areas and Community Based Natural Resource Management

This module introduces students to the principles and practices of natural resource management in a diverse range of Madagascar's terrestrial protected areas. Students explore the renowned state managed National Parks and a range of forms of community managed areas, including the devolution of forest management responsibilities to local user groups. The module uses lectures, readings and presentations from conservation professionals as well as field visits to a range of parks, covering diverse habitats from rainforest to the unique spiny forests. Students will gain an understanding of conservation planning processes including public participation, the development of management plans, habitat restoration and ecological monitoring activities.

Site Visits: Varies by semester but typically includes at least five protected areas such as Andohahela, Andasibe, Isalo and Ranomafana National Parks, Ambato Atsinanana/Sainte Luce, Mahabo, Ifotaka and Berenty Forests and the Manombo Special Reserve.

Readings

Cullman G (2015) Community Forest Management as Virtualism in Northeastern Madagascar, Human Ecology DOI 10.1007/s10745-015-9725-5

Gardner CJ 2011 IUCN management categories fail to represent new, multiple-use protected areas in Madagascar, Oryx, 45(3), 336–346

Lockwood M, Worboys GL and Kothari A (2006) Managing Protected Areas: A Global Guide, Earthscan, London.

Rasolofoson RA (2016) Impacts of Community Forest Management on Human Economic Well-Being across Madagascar, Conservation Letters, doi: 10.1111/conl.12272

Module 5: Agro-pastoral Livelihoods, Culture and Development

This module draws from the development literature to facilitate students in developing an understanding of rural livelihoods, especially in the dryland agro-pastoral Androy region. Students will draw from readings and lectures to learn about economic and socio-cultural perspectives on the agricultural activities of the Antandroy people, including historical perspectives. This understanding is deepened through the week long homestay with a farming family and a Malagasy student counterpart from the regional university CURA (*Centre Universitaire Regionale de l'Androy*). The module also allows students to gain knowledge of the characteristics of the aid and rural development sector in southern Madagascar. This includes exposure to the realities of food insecurity, nutrition, sanitation, agricultural outreach and intensification, while ensuring students maintain a critical perspective on the impacts and self-sustaining nature of the aid industry.

Site Visits: Rural Village Stay in the hinterland of Ambovombe, data collection in rural villages around Fort Dauphin.

Readings

Heurtebize G (2000) Rencontre avec l'Androy, unpublished manuscript.

Freudenberger KS (2010) Rapid Rural Appraisal and Participatory Rural Appraisal: A Manual for CRS Fieldworkers and Partners, Catholic Relief Services, Baltimore.

Ellis F (2000) Rural Livelihoods and Diversity in Developing Countries, Oxford University Press, Oxford. (Chapter 2 (pp28-51): A Framework for Livelihood Analysis).

Moyo D (2009) Dead Aid: Why Aid is not working and how there is another way for Africa, Penguin, London.

Module 6: People and Plants: Ethnobotany, Bioprospecting

The relationships between people and plants in Madagascar are extremely diverse and complex. This module introduces students to a range of the human uses of plants in Madagascar across scales, habitat types and management systems. Topics covered include: traditional medicine, subsistence agriculture and cash cropping, construction and fuelwood as well as the search for pharmaceutical products from nature. The economic and environmental sustainability of plant use is explored through a detailed case study of the charcoal market in the Fort Dauphin region, and a site visit to a sustainable bamboo charcoal plantation in the nearby Manantantely area. Students are encouraged to maintain a critical perspective when considering human uses of plants, understanding the significance of local livelihoods, and governance and management of plants as well as the potential for exploitative and neocolonial uses of Malagasy plants through forms such as land grabbing and biopiracy.

Site Visits: Plant Nursery at Domaine de la Cascade and Startle Manantantely Sustainable Charcoal Plantation

Readings

Golden CD et al (2012) Rainforest Pharmacopeia in Madagascar Provides High Value for Current Local and Prospective Global Uses, PLoS ONE 7(7): e41221. doi:10.1371/journal.pone.0041221

Martin G J (1995) Ethnobotany: A Methods Manual, Chapman and Hall, London.

Neimark BD and Tilghman LM (2014) Bioprospecting in a biodiversity hotspot: The political economy of natural products drug discovery for conservation goals in Madagascar, pp271-298 in Scales IR (ed) Conservation and Environmental Management in Madagascar, Earthscan, London.

Module 7: Marine Biodiversity: Coastal Ecology and Management

This module complements the content already covered by the fisheries and marine policies unit. Madagascar is important within the western Indian Ocean region in term of its marine biodiversity, while traditionally the terrestrial fauna and flora received much focus from the conservation community, the last decade has seen a remarkable growth in marine conservation programs with the establishment of new marine protected areas and a great deal of attention from researchers and NGOs. Lectures, readings and site visits initiate students in the diversity of marine species from the mangrove, intertidal and coral reef zones, as well as the trends and systems established for the their monitoring and management. A special focus is placed on learning about the community based marine protected areas being established by NGOs and local communities in the Tulear area and how these interact with Malagasy customs and local livelihood and governance systems.

Site Visits: Specific site visits vary by semester: Rose Garden Marine Reserve, Ifaty; Ambondrolava Mangroves; Vangaindrano Ampatsinakoho Oceanographic Station, IHSM Marine Museum Tulear; Libanona Peninsula Fort Dauphin.

Readings

Andriamalala G and Gardner CJ (2010) L'utilisation du *dina* comme outil de gouvernance des ressources naturelles : leçons tirés de Velondriake, sud-ouest de Madagascar, Tropical Conservation Science Vol.3 (4):447-472.

Cooke A (2012) Madagascar: A Guide to Marine Biodiversity, Wildlife Conservation Society, Antananarivo.

Harris A (2007) "To live with the Sea" Development of the Velondriake Community - Managed Protected Area Network, Southwest Madagascar, Madagascar Conservation and Development, Volume 2 (1):43-49.

Module 8: Lemurs of Madagascar: Evolution, Ecology and Conservation

The lemurs are undoubtedly emblematic of the uniquely adapted and endemic fauna of the island. There are currently 111 species of lemur recognized, many of them found only in small isolated forests. The ecological niches and roles as pollinators, seed dispersers, indicators and flagship species for conservation are explored through lectures and a lemur ecology field course. The evolutionary history of lemurs and contestation of the true diversity of lemurs and their unique adaptations are also covered. The course introduces students to a series of fundamental methods used in the study and monitoring of lemurs: The development of ethograms and behavioral study, the study of lemur home range and habitat preferences and the use of population census activities through transect walks provides students with insights into key methods used by primatologists and conservation biologists. Students meet and discuss with local stakeholders to understand traditional beliefs and taboos about lemurs, and the roles, costs and benefits of local actors in managing protected areas.

Site Visits: Varies by semester but will include at least two of: Kianjavato Ahmensen Field Station, Ranomafana and Isalo National Parks, Zanavo Community Forest, Berenty Reserve.

Readings

Schwitzer C, Mittermeier RA, Davies N, Johnson S, Ratsimbazafy J, Razafindramanana J, Louis Jr. EE, Rajaobelina S (eds). 2013. Lemurs of Madagascar: A Strategy for Their Conservation 2013–2016. Bristol, UK:IUCN SSC Primate Specialist Group, Bristol Conservation and Science Foundation, and Conservation International. 185 pp.

Sterling EJ and Bynum N (2013) Primate Ecology and Conservation A Handbook of Techniques, Oxford University Press, Oxford.

Mittermeier RA, Louis Jr EE, Rachrdson M, Schwitzer C, Langrand O, Rylands AB, Hawkins F, Rajaobelina S, Ratsimbazafy J, Rasoloarison R, Roos C, Kappler PM, MacKinnon J (2010) Lemurs of Madagascar, 3rd Edition, Conservation International Tropical Field Guide Series, Arlington.

Muldoon KM, Goodman SM (2015) Primates as Predictors of Mammal Community Diversity in the Forest Ecosystems of Madagascar. PLoS ONE 10(9): e0136787. doi:10.1371/journal.pone.0136787

Ballhorn DJ, Rakotoarivelo FP, Kautz S (2016) Coevolution of Cyanogenic Bamboos and Bamboo Lemurs on Madagascar. PLoS ONE 11(8): e0158935. doi:10.1371/journal.pone.0158935

Tattersall I (2013) Understanding species-level primate diversity in Madagascar, Madagascar Conservation and Development Volume 8(1):7-11.

Assignments

Biodiversity and Natural Resource Management Seminar Assignments

Botanical Methods Study	20%
Lemur Ecology Study	20%
Student Led Discussion	20%
Natural Resource Issues Portfolio	30%
Effort and participation	10%

Botanical Methods Study: Students work with Malagasy counterparts from the *Centre Regional Universitaire de l'Androy* to gain practical field experience in collecting botanical data. Methods focus on species discovery and minimum area, inventories using Gentry plots, Point Center Quarter (PCQ) for habitat and species association, vertical forest structure using Gauthier's method, and herbarium collection methods. Feedback given on an oral presentation in French on analysis performed on data collected is incorporated into the written report, also in French.

Lemur Ecology Study: Assignment: Students are divided into three groups in order to facilitate learning of each of three scientific field techniques. Each group will perform population density estimates, habitat use, and time allocation of *Varecia variegata* and *Prolemur simus* during field study in Kianjavato. Students present their analyses orally in French. Feedback is then incorporated into the written report, also in French.

Natural Resource Issues Portfolio: Each student investigates and develops a theme of their choice over the first six weeks of the program. The goal is to use a variety of field techniques, including participant observation, structured and key stakeholder surveys, and Participatory Rural Appraisal methods to gather information on a chosen natural resource in urban and rural settings. The value of each technique is assessed in the process of weaving together pertinent facets about Madagascar's peoples and environments

that optimizes academic and experiential learning from seminar classes, field excursions, the village stay, home stay, interviews and publications. Students present findings in a carefully constructed analysis paper backed by appropriate literature.

Student Led Discussion: Students work in groups to facilitate discussion on contemporary resource issues. The goal of the assignment is for students to understand, appreciate and critically reflect on pressing issues in marine resources management and conservation. Context and scale are critical to examining themes involving multiple stakeholders. A synthesis of issues and questions is presented in French, followed by a discussion in English penetrating into issues that also draw off of students practical experiences over the first two months of the semester.

Grading Scale: The grading scale for all classes is as follows:

94-100%	A
90-93%	A-
87-89%	B+
84-86%	B
80-83%	B-
77-79%	C+
74-76%	C
70-73%	C-
67-69%	D+
64-66%	D
below 64	F

Grading Criteria
All grades assigned will take into account the students´ special circumstances and challenges they face as foreign students. An "A" grade for an assignment entails superior (not just "very good") performance in terms of structure and organization of assignments, analysis, logical argumentation and consistency, and the provision of factual, numerical and/or historical evidence. In terms of Class Participation, an "A" grade refers to full attendance, punctuality, attentive listening and active engagement in all academic seminar lectures, discussions, field trips and other activities. It also means polite and respectful behavior. The level, frequency, and quality of the students' participation will be monitored and taken into account.

Disability Services: Students with disabilities are encouraged to contact Disability Services at disabilityservices@sit.edu for information and support in facilitating an accessible educational experience. Additional information regarding SIT Disability Services, including a link to the online request form, can be found on the Disability Services website at http://studyabroad.sit.edu/disabilityservices.

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