Syllabus, Spring 2013
Integrative Biology 187
Human Biogeography of the Pacific

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Overview of the Course

Modern *Homo sapiens* began crossing the water barrier of Wallacea into Australia and Near Oceania during the Pleistocene, at least 40,000 years ago. Ultimately, populations of *H. sapiens* spread all the way across the Pacific to colonize virtually every habitable island. This course examines this remarkable history of human dispersal and expansion from the perspectives of archaeology, biogeography, and evolutionary ecology. *H. sapiens*, like any other species, faced problems of dispersal, colonization, and potential extinction, and adapted in a variety of ways to the diversity of insular ecosystems encountered. For humans, it is necessary to use a dual evolutionary model that takes into account cultural evolution and transmission, as well as biological evolution of human populations. In addition, the course explores the impacts of human populations on the isolated and fragile natural ecosystems of oceanic islands, and the reciprocal effects of anthropogenic change on human cultures.

Prerequisites

Either Bio 1B, General Biology, or Anthro 1, Biological Anthropology, are recommended as a prerequisite, or evidence that the student has mastered an equivalent set of basic concepts in evolution and ecology.

Course Format and Readings

The course consists of lectures combined with in-class discussion of readings, following the topical outline given below. There is no single textbook, however readings will be assigned on a weekly basis, and will be posted on b-Space. It is your responsibility to check the b-Space site regularly for weekly announcements regarding reading assignments, which may be subject to change. The readings are supplementary to the lectures; many of them are case studies drawn from the primary scientific literature.

Requirements and Grading

Attendance at lectures and participation in classroom discussions is expected. Much of the course content will be presented in the lectures; these will be integrated with the readings during the in-class discussions. Lectures will NOT be posted on b-Space. If

you don't plan to attend the lectures then I would advise against taking the course. There will be two mid-term exams, which together will account for 60% of your grade (30% for each mid-term). The final 40% of your grade will be based on a written take-home examination. This written take-home exam will consist of one or more essays in which you will integrate and synthesize the major concepts covered in the course.

TENTATIVE SCHEDULE OF LECTURES AND READINGS

Jan. 22: Introduction to the Class

Discussion of the course content, requirements, review of syllabus.

Jan. 24: Islands as Model Systems; Theory of Island Biogeography

Discussion of the concept of islands as "model systems" and presentation of key theoretical concepts in island biogeography.

Jan. 29: The Pacific World: Tectonic, Climatologic, and Biogeochemical Factors

Overview of the major geologic, climatic, and biogeochemical factors that influence patterns of natural and human biogeography and biodiversity in the Pacific.

Jan. 31: Biogeographical Patterns in the Pacific

Biogeographical patterns in marine organisms, vascular plants, terrestrial gastropods, insects, and birds across the Pacific. Effects of distance from source area, geologic age of islands, dispersal mechanisms, disharmony in island biotas, high endemism on oceanic islands, and loss of competition and relative vulnerability of island taxa

Feb. 5: Entry of Humans Into Near Oceania

Distinctions between Near and Remote Oceania and review of current evidence for human entry into the Western Pacific (Australia, New Guinea, and Bismarck Archipelago) during the Pleistocene.

Feb. 7: GUEST LECTURE

Feb. 12: Human Expansion Into Remote Oceania

Review of current evidence for human expansion beyond Near Oceania into Near Oceania ca. 3300-3100 BP; the Lapita phenomenon. The Lapita expansion will be considered in terms of different models of colonization strategy.

Feb. 14: Human Biological Variation in the Pacific

The human populations of the Pacific exhibit enormous phenotypic and genetic diversity. We will examine the history of attempts to understand this variation and what it means for human phylogeography in the Pacific, with an emphasis on the most recent mtDNA and Y-chromosome analyses.

Feb. 19: Pacific Linguistic Variation and Phylogeography

Linguistic variation is amenable to a phylogenetic (or cladistic) analysis and offers models for human phylogeography that can be compared with those generated from bioanthropology and archaeology.

Feb. 21: FIRST MID-TERM EXAM

Feb. 26: Commensal Animal Distribution as Proxies for Human Movements

When humans dispersed across the Pacific they carried with them various animal species, both domesticates (pig, dog, chicken) and other commensals such as rats, landsnails, and insects. Recent analyses of a number of these commensal species have provided proxies for human dispersal patterns.

Feb. 28: Human Dispersal to Marginal Polynesia and the Americas

The last stage in human dispersal across the Pacific occurred after about A.D.800 and involved the settlement of marginal Eastern Polynesia including Hawai'i, Easter Island (Rapanui), and New Zealand. It is increasingly apparent that Polynesians also reached South America.

Mar. 5: Humans and Plant Distributions in the Pacific

As with commensal animals, human also carried plants from island to island across the Pacific. We will examine the distribution of several interesting plant species, including coconuts, the sweet potato, bottle gourd, and the Cordyline or ti plant, among others.

Mar. 7: Island Ecosystems and Socioecosystems

Island ecosystems differ from those of continents in several significant says. Among the key characteristics of insular ecosystems are their limited size, boundedness, isolation, and vulnerability to disturbance. When humans arrive and colonize these formerly pristine ecosystems, they create new "socioecosystems."

Mar. 12: Demographic Transitions and r/K Selection Strategies

Once islands were colonized by humans, their populations often expanded to relatively high density levels, although in some cases disease (especially malaria) or other control mechanisms kept populations at a relatively low density. Models of demographic transition on islands include exponential, logistic, and oscillating types. In response to changing density levels, island populations also developed cultural adaptations analogous to r/K selection strategies in island biota.

Mar. 14: Pacific Island Paleoecology

Island ecosystems are highly dynamic, both as consequence of long and short term natural processes (e.g., climate and sea level changes, tectonics, ENSO); the were typically subject to even more dramatic changes once colonized by human populations. In this topic we explore methods are available to reconstruction island ecologies both before and after human settlement, including sedimentary sequences, palynology, paleontology, and archaeological evidence.

The remainder of the course will be concerned with a series of specific island case studies, in which we will examine the dynamic development of their respective socioecosystems.

Mar. 19: Case Study: Tikopia

Our first case study involves the smallest island considered: Tikopia a Polynesian Outlier in Melanesia. At 4.5 sq km area, respectively, Tikopia was among the smallest islands permanently inhabited in Oceania. Tikopia managed to sustain a high density, permanent human population from 900 B.C, and is remarkable for its highly managed agro-ecosystems.

Mar. 21: SECOND IN-CLASS MID-TERM

SPRING BREAK: March 25-29

Apr. 2 and 4: Do Case Study Readings

Apr. 9: Case Study: Mangaia

The second case study focuses on an old, makatea (uplifted) type island with severe anthropogenic impacts. Mangaia exemplifies extreme vulnerability due to nutrient depletion of its 20 myr old land surface. A multi-disciplinary approach involving palynology, paleontology, and archaeology was used to unravel a 7,000 year long sequence of environmental change, one of the best documented in the central Pacific, including dramatic avifaunal extinctions.

Apr. 11: Case Study: Mo'orea

The third case study is the island of Mo'orea in the Society Islands of French Polynesia (where UC Berkeley also maintains a research station). Recent paleoecological investigations by a multi-disciplinary team have revealed significant changes in the island's vegetation and other biota, as well as major geomorphological transformations stemming from Polynesian land use.

Apr. 16: Case Study: Mangareva

In the southeastern Pacific, Mangareva is notable for its small islets surrounded by a huge lagoon-barrier reef ecosystem. Polynesian arrival around A.D. 900 resulted in rapid extinction of nesting seabird populations, with significant consequences of the islets' nutrient regimes and consequently for human land use.

Apr. 18: Case Study: Marquesas

The rugged, volcanic Marquesas Islands offer one of the most fascinating cases of the development of a complex socioecosystem marked in the late prehistoric period by a high degree of competition between the human populations of its islands (with endemic warfare and even ritual cannibalism).

Apr. 23: Rapanui

Easter Island or Rapanui is famous for its large stone statues, but it has also become a much argued over case study of human-environment interactions. Was Rapanui an instance of human "ecocide" or did the islanders actually manage their resources wisely as some have recently argued?

Apr. 25: Case Study: Hawaii

The Hawaiian archipelago is one of the largest mid-plate island chains in the Pacific, and has been intensively investigated by natural scientists for nearly two centuries. It exhibits classic patterns of adaptive radiation and speciation in such groups as landsnails, insects, vascular plants, and birds. Its biogeographic gradients provide a model system for nutrient limitation and cycling. The sequence of human colonization, anthropogenic impacts to the Hawaiian ecosystems, and cultural evolution of complex socioecosystems are major topics of current investigation.

Apr. 30: Case Study, New Zealand

In the case of Easter Island, Polynesians who came from a tropical island homeland had to adapt to near-continental scale islands with a subtropical to temperate climate. In southern New Zealand, the Polynesians came hunters-and-gatherers, and were responsible for deforestation of large regions and also for the extinction of the giant flightless *moa* birds.

May 2: Review Session

THE FINAL TAKE-HOME EXAM WILL BE DISTRIBUTED DURING CLASS. THE TAKE-HOME EXAM WILL BE DUE MON. MAY 13 BY 5 PM IN YOUR DROPBOX ON BSPACE.