

RESEARCH STATEMENT

RICHARD R. LAWLER

I am a biological anthropologist with expertise in behavioral ecology, population genetics, and demography. If I had to apply a single name to what I do, I would suggest “population biologist” in that I mostly tend to study a single evolving population rather than engage in comparative/interspecific studies. Broadly, I am interested in the ecological and behavioral processes that influence patterns of genetic and phenotypic variation in wild primate populations. In this regard, I tend to focus on population-level parameters (e.g., means/variances of trait values, selection coefficients, survival probabilities, etc.) rather than collect longitudinal behavioral data on specific individuals or social groups. My research incorporates fieldwork, laboratory work, and computational methods. As I discuss below, I currently focus on a species of lemur as a model system; however, my research is not motivated by a taxon but by particular research questions that emanate from the major areas within evolutionary ecology: population genetics, behavioral ecology, demography, and evolutionary morphology.

I obtained a B.A. in Anthropology from the University of Illinois, Urbana-Champaign. Dr. Paul Garber was a major influence on my career and at Illinois I focused on general anthropology as well as primate socioecology. I then went on to get a M.A. in Anthropology at Southern Illinois University, Carbondale. I studied under Dr. Susan Ford and while at Carbondale I focused on primate systematics and evolution, primate anatomy, and primate locomotor behavior. From Carbondale, I went on to get a M.Phil. and Ph.D. from Yale University. I worked closely with Drs. David Watts, Alison Richard, and Margaret Riley. At Yale, I studied primate behavioral ecology, population genetics, and evolutionary theory. After receiving my Ph.D., I obtained a National Science Foundation Fellowship in Bioinformatics to study demography with Dr. Hal Caswell at the Woods Hole Oceanographic Institution.

I have conducted research on howling monkeys and titi monkeys, but most of my research concerns a wild population of lemur, Verreaux’s sifaka (*Propithecus verreauxi verreauxi*). This population resides at Beza Mahafaly Special Reserve, southwest Madagascar. The study site was set up by Drs. Alison Richard (University of Cambridge) and Robert Sussman (Washington University) in collaboration with Malagasy scientists. I am part of research team that studies various behavioral, ecological, and evolutionary aspects of this evolving population. What is unique about this study, now going into its 24th year, is that our team is able to capture and release our study subjects—this is not the norm in wild primate studies. The data we collect on this population is ever-increasing and contains information on demography, morphology, ecology, reproduction, hormones, genetics, and behavior. These data come from individually marked-animals that are captured, measured and released on an annual basis; the marked animals are systematically recensused in order to provide information on survival, growth, inter-group movements, and reproduction. As of September 2008, we have captured, measured, marked and released over 680 animals.

CURRENT RESEARCH INTERESTS AND PROJECTS

Behavioral strategies of reproduction.

I am interested in elucidating the behavioral and morphological factors that create variation in male reproductive success in primates. Substantively, I have found that sifaka males engage in a substantial amount of extragroup reproduction, which lowers the opportunity for sexual selection. Further, an analysis of paternity in conjunction with morphological data has shown that stabilizing selection plays a key role in male-male competition. On-going work includes combining paternity information with observations on paternal care and male hormone profiles (in collaboration with Drs. Diane Brockman and Pat Whitten, UNC-Charlotte and Emory University, respectively).

Lawler RR (2009) Monomorphism, male-male competition, and mechanism of sexual dimorphism. *J. Hum Evol.* 57: 321-325.

Lawler RR. (2007) Fitness and extra-group reproduction in male Verreaux's sifaka (*Propithecus verreauxi verreauxi*). *American Journal of Physical Anthropology* 132: 267-277

Lawler RR, Richard AF, Riley MA. (2005) Intrasexual selection in Verreaux's sifaka (*Propithecus verreauxi verreauxi*). *Journal of Human Evolution.* 48: 259-277

Demography, Conservation, and Life History Evolution.

I am a member of a long-term, community-based conservation program in southwest Madagascar. We train local Malagasy in conservation research and we also are working on projects that seek to politically empower local villages in terms of infrastructure. On the analytical side, I have become interested in demographic modeling, and in particular, the use of matrix population models. I have learned these techniques from Dr. Hal Caswell and other colleagues at the Woods Hole Oceanographic Institution, where I did my post-doctoral research. We have just completed an extensive demographic analysis of sifaka population dynamics using information on females. I currently have a N.S.F. grant that will examine the heritability and genetic correlations among life history traits in sifaka.

Lawler RR (submitted) Demography of wild primate populations. *Yearbook of Physical Anthropology*.

Lawler RR (2011) Historical demography of a wild lemur population (*Propithecus verreauxi*) in southwest Madagascar. *Population Ecology.* 53: 229-240.

Lawler RR, Richard AF, Dewar RE, Schwartz M, Ratsirarson J, Caswell H. (2009) Demography of a wild lemur population stochastic rainfall environment. *Oecologia* 161: 491-504.

Population and quantitative genetics.

Regarding the sifaka population, I am interested in how behavioral patterns influence the genetic structure of primate populations and vice versa. My substantive research in this area involves looking at how patterns of mating and dispersal shape genetic variation within and among social groups in terms of their influence on genetic structure and effective population size. I am also interested in multivariate selection analysis (this is the quantitative genetics aspect of my research), in which data on some measure of fitness and data on some aspect of the phenotype are combined in order to measure the strength

of selection acting on particular traits. Additional “non-sifaka” projects include an on-going study of ring-tail lemur population genetics and paternity and an on-going comparative project on the genetics of lemur color-vision.

- Parga JA, Sauther ML, Cuzzo FP, Youssef Jacky IA, Lawler RR (submitted) Genetic evidence for a population bottleneck in wild ring-tailed lemurs (*Lemur catta*) from southwestern Madagascar. *American Journal of Physical Anthropology*.
- Lawler RR, Blomquist G. (2010) Multivariate selection theory in Primatology: Basic theory and applications in primatology. *Open Anthropology Journal* 3: 206-229
- DiFiore T, Lawler RR, Gagneaux P (2010) Molecular primatology. In: CJ Campbell, A Fuentes, KC MacKinnon, M Panger, SK Bearder (eds.) *Primates in Perspective* (2/e) Oxford University Press, Oxford. pp 390-416.
- Lawler RR. (2008) Testing for a historical population bottleneck in wild Verreaux’s sifaka (*Propithecus verreauxi verreauxi*) using microsatellite data. *American Journal of Primatology*. 70: 990-994.
- Lawler RR, Richard AF, Riley MA. (2003) Genetic population structure of the white sifaka (*Propithecus verreauxi verreauxi*) in southwest Madagascar. *Molecular Ecology* 12: 2307-2317.
- Lawler RR, Richard AF, Riley MA. (2001) Isolation and screening of microsatellite loci in a wild lemur population (*Propithecus verreauxi verreauxi*). *American Journal of Primatology*. 55: 253-259.

Primate locomotion and evolutionary morphology.

I maintain an interest in the study of primate movement in the wild. In particular, I am interested in how young sifaka develop locomotor coordination. Sifaka move about their habitat by leaping between vertical tree trunks—this behavior entails a fair amount of coordination and poses a challenge for newly locomotor-independent sifaka. I am studying this problem from various angles including behavioral sampling of movement in the wild, analysis of growth patterns of limbs, and population genetic methods, such as calculating the heritability and strength of selection that acts on hand, feet, and other body parts that contribute to movement. I have also studied locomotion (and prehensile tail use) in South American primates.

- Wunderlich RE, Lawler RR, Williams AE. Field and experimental approaches to the study of locomotor ontogeny in *Propithecus verreauxi*. (2011) In: D’Aout, K. and Vereecke, E.E. (eds) *Studying Primate Locomotion: Linking in situ and ex situ Research*. New York, Springer.
- Lawler RR. (2008) Morphological integration and natural selection in a wild lemur population. *American Journal of Physical Anthropology* 136: 203-214
- Lawler RR. (2006) Sifaka positional behavior: Ontogenetic and quantitative genetic approaches. *American Journal of Physical Anthropology*. 131:261-271
- Lawler RR, Ford SM, Wright PC, Easley SP. (2006) Locomotor behavior of *Callicebus brunneus* and *Callicebus torquatus*. *Folia Primatologica*. 77:228-239
- Lawler RR, Stamps C. (2002) The relationship between tail use and positional behavior in *Alouatta palliata*. *Primates*. 42:147-152
- Lawler RR, Wunderlich RE, Rolian C (in prep.) Ontogenetic and functional covariance structure of postcranial traits in Verreaux’s sifaka.
- Lawler RR (in prep.) Statistical issues and methods in the analysis of wild primate locomotion. for *American Journal of Primatology*

Other projects.

I am also involved in various other projects. Some of these projects are completed and others are just underway. These projects include patterns of co-twinning in prosimians and new world monkeys, theory of group formation and feeding ecology, “chemical ecology” of lemurs, and conservation issues in wild primates. Some published or planned publications are the following:

Lawler RR (2011) Feeding competition, cooperation, and the causes of primate sociality: A comment on the model proposed by Sussman et al. *American Journal of Primatology* 73: 84-90.

Linder JM, Lawler RR (in prep.) Factors influencing primate abundance in Cameroon.

Bradley BJ, Lawler RR, McGrew WC (in prep.) Fitness of female co-twins in stepsirrhines and platyrrhines.

Sussman RW, Richard AF, Ratsirarson J, Sauther ML, Brockman DK, Lawler RR, Cuzzo FP (submitted) Beza Mahafaly Special Reserve: A research site in southwestern Madagascar. Edited volume on long-term field primatology research.

Cuzzo FP, Sauther ML, Yamashita N, Lawler RR, et al. (2008) A comparison of salivary pH in sympatric lemur species (*Lemur catta* and *Propithecus verreauxi*) at Beza Mahafaly Special Reserve, Madagascar: Investigating feeding ecology, dietary chemicals, and primate tooth wear. *American Journal of Primatology* 70: 363-371.

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FUTURE PROJECTS THAT I’M CURRENTLY PLANNING

- A molecular and chromosomal study of aging in sifaka
- Neutral models of morphological evolution in sifaka and other primates
- An examination of the demographic history of sifaka using autosomal, sex-linked, and uniparentally inherited markers
- A textbook on primate behavioral ecology and anatomy