

Programa Analítico de Disciplina

BAN 669 - Métodos Filogenéticos Comparativos

Departamento de Biologia Animal - Centro de Ciências Biológicas e da Saúde

Catálogo: 2026

Número de créditos: 4

Carga horária semestral: 60h

Carga horária semanal teórica: 3h

Carga horária semanal prática: 1h

Semestres: II

Ementa

Interpretando e manipulando árvores filogenéticas
Os métodos comparativos em filogenias
Sinal filogenético
Modelos de evolução e correlação entre caracteres

Conteúdo

Unidade	T	P	To
1. Interpretando e manipulando árvores filogenéticas 1. Interpretando árvores filogenéticas 2. Tipos de árvores filogenéticas 3. Otimização de caracteres utilizando parcimônia 4. Programas de manipulação de árvores	7h	0h	7h
2. Os métodos comparativos em filogenias 1. Os métodos filogenéticos comparativos 2. Questões abordadas pelo métodos filogenéticos comparativos	10h	0h	10h
3. Sinal filogenético 1. Definição básica de sinal filogenético 2. Métricas para o cálculo do sinal filogenético	12h	0h	12h
4. Modelos de evolução e correlação entre caracteres 1. Movimento Browniano e processo Ornstein-Uhlenbeck 2. Modelos para caracteres discretos 3. Método dos mínimos quadrados generalizados filogenéticos 4. Modelos "MK" 5. Estimativa do estado ancestral 6. Teste de Pagel 7. Taxas de evolução 8. Outros modelos	16h	0h	16h
5. Métodos comparativos utilizando o R 1. Introdução básica ao R 2. Introdução à filogenias no R 3. Exercício - Movimento Browniano	0h	15h	15h

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4.Exercício - PGLS			
5.Exercício - Ajustando modelos de caracteres contínuos			
6.Exercício - Reconstrução de estados ancestrais			
Total	45h	15h	60h

Teórica (T); Prática (P); Total (To);

BAN 669 - Métodos Filogenéticos Comparativos

Bibliografias básicas

Descrição	Exemplares
Baum, D. (2008). Trait evolution on a phylogenetic tree: Relatedness. <i>Nat. Educ</i> , 1, 191.	0
Blomberg, S. P., Garland Jr, T., & Ives, A. R. (2003). Testing for phylogenetic signal in comparative data: behavioral traits are more labile. <i>Evolution</i> , 57(4), 717-745.	0
Brooks, D. R., & McLennan, D. A. (1991). <i>Phylogeny, ecology, and behavior: a research program in comparative biology</i> . University of Chicago Press.	0
Diniz Filho, J. A. F. (2000). <i>Métodos filogenéticos comparativos</i> . Editora Holos.	0
Felsenstein, J. (1985). Phylogenies and the comparative method. <i>The American Naturalist</i> , 125(1), 1-15.	0
Fritz, S. A., & Purvis, A. (2010). Selectivity in mammalian extinction risk and threat types: a new measure of phylogenetic signal strength in binary traits. <i>Conservation Biology</i> , 24(4), 1042-1051.	0
Garamszegi, L. Z. (2014). <i>Modern phylogenetic comparative methods and their application in evolutionary biology: concepts and practice</i> . Editora Springer.	0
Harvey, P. H., & Pagel, M. D. (1991). <i>The comparative method in evolutionary biology</i> . Oxford University Press.	0
Revell, L. J., & Harmon, L. J. (2022). <i>Phylogenetic comparative methods in R</i> . Princeton University Press.	0
Sereno, P. C. (2007). Logical basis for morphological characters in phylogenetics. <i>Cladistics</i> , 23(6), 565-587.	0

Bibliografias complementares

Descrição	Exemplares
Freckleton, R. P., Harvey, P. H., & Pagel, M. (2002). Phylogenetic analysis and comparative data: a test and review of evidence. <i>The American Naturalist</i> , 160(6), 712-726.	0
Harmon, L. J., Losos, J. B., Jonathan Davies, T., Gillespie, R. G., Gittleman, J. L., Bryan Jennings, W., ... & Mooers, A. Ø. (2010). Early bursts of body size and shape evolution are rare in comparative data. <i>Evolution: International Journal of Organic Evolution</i> , 64(8), 2385-2396.	0
Kamilar, J. M., & Cooper, N. (2013). Phylogenetic signal in primate behaviour, ecology and life history. <i>Philosophical Transactions of the Royal Society B: Biological Sciences</i> , 368(1618), 20120341.	0
de Queiroz, K. (1996). Including the characters of interest during tree reconstruction and the problems of circularity and bias in studies of character evolution. <i>The American Naturalist</i> , 148(4), 700-708.	0
Maddison, W. P., & FitzJohn, R. G. (2015). The unsolved challenge to phylogenetic correlation tests for categorical characters. <i>Systematic Biology</i> , 64(1), 127-136.	0
Martins, E. P. (2000). Adaptation and the comparative method. <i>Trends in Ecology & Evolution</i> ,	0

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15(7), 296-299.	
Pagel, M. (1999). Inferring the historical patterns of biological evolution. <i>Nature</i> , 401(6756), 877-884.	0
Pagel, M., & Meade, A. (2006). Bayesian analysis of correlated evolution of discrete characters by reversible-jump Markov chain Monte Carlo. <i>The American Naturalist</i> , 167(6), 808-825.	0
Revell, L. J. (2013). Two new graphical methods for mapping trait evolution on phylogenies. <i>Methods in Ecology and Evolution</i> , 4(8), 754-759.	0
Swanson, M. T., Oliveros, C. H., & Esselstyn, J. A. (2019). A phylogenomic rodent tree reveals the repeated evolution of masseter architectures. <i>Proceedings of the Royal Society B</i> , 286(1902), 20190672.	0

Syllabus

BAN 669 - Phylogenetic Comparative Methods

Departamento de Biologia Animal - Centro de Ciências Biológicas e da Saúde

Catalog: 2026

Number of credits: 4
Total hours: 60h
Weekly workload - Theoretical: 3h
Weekly workload - Practical: 1h

Period: II

Content

Reading and manipulating phylogenetic trees
Phylogenies and the comparative methods
Phylogenetic signal
Models of characters evolution and correlation

Course program

Unit	T	P	To
1. Reading and manipulating phylogenetic trees 1. Reading phylogenetic trees 2. Types of phylogenetic trees 3. Parsimony-based character optimization 4. Tree manipulation softwares	7h	0h	7h
2. Phylogenies and the comparative methods 1. Phylogenetic comparative methods 2. Questions tackled by the phylogenetic comparative methods	10h	0h	10h
3. Phylogenetic signal 1. Basic definition of phylogenetic signal 2. Metrics for estimating phylogenetic signal	12h	0h	12h
4. Models of characters evolution and correlation 1. Brownian Motion and Ornstein-Uhlenbeck process 2. Models for discrete characters 3. Phylogenetic generalized least squares 4. MK models 5. Ancestral state estimations 6. Pagel's test 7. Rates of evolution 8. Other models	16h	0h	16h
5. Comparative methods in R 1. Basic introduction to R 2. Introduction to phylogenies in R 3. Exercise - Brownian Motion	0h	15h	15h

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4.Exercise - PGLS			
5.Exercise - Fitting models for continuous characters			
6.Exercise - Ancestral state reconstruction			
Total	45h	15h	60h

Theoretical (T); Practical (P); Total (To);

BAN 669 - Phylogenetic Comparative Methods

Fundamental references	
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