



UNIVERSIDADE FEDERAL DE SANTA CATARINA

PROGRAMA DE DISCIPLINA

DADOS DA DISCIPLINA
Tipo de disciplina a propor: <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Estágio Docência <input type="checkbox"/> Tese/Dissertação
Nome: <i>Integrating physiology from individuals to ecosystems, and applications under climate change scenarios</i>
Periodicidade de oferecimento da disciplina: <input type="checkbox"/> Anual <input type="checkbox"/> Semestral <input checked="" type="checkbox"/> Esporádica
Ano/Período a ser oferecida pela primeira vez: 2019/Novembro

CARGA HORÁRIA (Art. 35 da Res. 05/CUn/2010)		
Hora-aula total: 30	Número de crédito total: 2	
Especifique como será distribuída a carga horária da disciplina conforme orientado abaixo:		
Carga horária teórica: (1 crédito = CH 15)	Carga horária prática: (1 crédito = CH 45)	Carga horária teórico-prática: (1 crédito = CH 30)
CH 12	CH 18	
Alteração de disciplina: <input checked="" type="checkbox"/> Não <input type="checkbox"/> Sim: Código ou nome da disciplina a ser alterada: _____		
Nível a ser oferecida: <input type="checkbox"/> Mestrado <input type="checkbox"/> Doutorado <input checked="" type="checkbox"/> Mestrado e Doutorado		
Tipo de Disciplina (Art. 33 da Res. 05/CUn/2010)		
Mestrado: <input checked="" type="checkbox"/> Eletiva - <input type="checkbox"/> Obrigatória	Doutorado: <input checked="" type="checkbox"/> Eletiva - <input type="checkbox"/> Obrigatória	

Corpo Docente Responsável (Art. 33, § 2º da Res. 05/CUn/2010):
Dr Diego Barneche Rosado Lecturer in Marine Ecology College of Life and Environmental Sciences University of Exeter Penryn TR10 9FE, UK

Ementa:
Day 1: Introduction to size scaling: theory and practice In this lecture (CH: 3.5) we will go over the history of size scaling approaches in ecology, navigating through different theories and explanations proposed over the years, finishing with an overview of what is now known as the Metabolic Theory of Ecology. I will show examples of why size scaling matters in terms of energy acquisition, and reproduction. In the afternoon (CH: 4), we will go over practical examples in R on how to model size scaling with published datasets on fish metabolic rates and reproductive output. Links with fisheries management will be drawn from this exercise. We will also cover scientific reproducibility and version control using git and Github.
Day 2: Temperature dependence of physiological rates and functional traits: theory and practice In this lecture (CH: 3.5) we will go over the different approaches to measuring the temperature dependence of physiological rates and functional traits, mostly focused on photosynthetic and metabolic rates, and body size. We will go over theory, trying to understand the different



UNIVERSIDADE FEDERAL DE SANTA CATARINA

intrinsic and extrinsic factors that modulate temperature dependence of physiological rates and functional traits. An explicit link with physiological acclimation and adaptation, and the important of those phenomena to climate change, will end the theoretical section. In the afternoon (CH: 4) we will use R scripts to go over methods used to estimate the temperature dependence of physiological rates and body size, and what they mean in terms of future global changes and fisheries.

Day 3: Integrating metabolic rates across scales: theory and practice

This lecture (CH: 3.5) will focus on the mathematical basis and assumptions generally used to integrate physiological processes from the individual level all the way to populations, communities, and ecosystem levels. In doing so, we will cover the range of predictions that can be made with respect to changes in carbon recycling, and storage upon different scenarios of climate change. The afternoon practical lesson (CH: 4) will focus on translating mathematical equations to statistical models that can be applied to data in R.

Day 4: Integrating growth from individuals to ecosystems: theory and practice

This lecture (CH: 3.5) will focus on a novel branch of my own research programme, trying to integrate actual biomass production into scaling approaches across scales. In doing so, we will borrow concepts learnt during lessons 1–3 to understand how the temperature dependence of multiple physiological processes, when integrated, could mean in terms of ecosystem functioning under warming scenarios. Example datasets will be given in the afternoon (CH: 4) to integrate multiple physiological rates in R, and model their size and temperature dependence at different levels of populations and communities.

ÁREA DE CONCENTRAÇÃO

Mestrado: Biodiversidade, Teoria Ecológica, Matemática, Estatística.

Doutorado: Biodiversidade, Teoria Ecológica, Matemática, Estatística.

METODOLOGIA

Theoretical lectures will be delivered using powerpoint interingled with media.

Practical lectures will be delivered using the RStudio programming environment, and version control using git and GitHub.

FORMA DE AVALIAÇÃO

N/A

BIBLIOGRAFIA BÁSICA

West GB, Brown JH, Enquist BJ (1997) A general model for the origin of allometric scaling laws in biology. *Science*, 276: 122–126.

West GB, Brown JH, Enquist BJ (2001) A general model for ontogenetic growth. *Nature*, 413: 628–631.

Gillooly JF, Brown JH, West GB, Savage VM, Charnov EL (2001) Effects of size and temperature on metabolic rate. *Science*, 293: 2248–2251.

Brown JH, Gillooly JF (2003) Ecological food webs: High-quality data facilitate theoretical unification. *PNAS*, 100: 1467–1468.

Brown JH, Gillooly JF, Allen AP, Savage VM, West GB (2004) Toward a metabolic



UNIVERSIDADE FEDERAL DE SANTA CATARINA

theory of ecology. *Ecology*, 85: 1771–1789.

Allen AP, Gillooly JF, Brown JH (2005) Linking the global carbon cycle to individual metabolism. *Functional Ecology*, 19: 202–213.

Yvon-Durocher G, Allen AP (2012) Linking community size structure and ecosystem functioning using metabolic theory. *Philosophical Transactions of the Royal Society B*, 367: 2998–3007.

Trebilco R, Baum JK, Salomon AK, Dulvy NK (2013) Ecosystem ecology: size-based constraints on the pyramids of life. *Trends in Ecology and Evolution*, 28: 423–431.

Barneche DR, Kulbicki M, Floeter SR, Friedlander AM, Maina J, Allen AP (2014) Scaling metabolism from individuals to reef-fish communities at broad spatial scales. *Ecology Letters*, 17: 1067–1076.

Barneche DR, Kulbicki M, Floeter SR, Friedlander AM, Allen AP (2016) Energetic and ecological constraints on population density of reef fishes. *Proceedings of the Royal Society B*, 283: 20152186.

Barneche DR, White CR, Marshall DJ (2017) Temperature effects on mass-scaling exponents in colonial animals: a manipulative test. *Ecology*, 98: 103–111.

Barneche DR, Allen AP (2018) The energetics of fish growth and how it constrains food-web trophic structure. *Ecology Letters*, 21: 836–844.

Barneche DR, Burgess SC, Marshall DJ (2018) Global environmental drivers of marine fish egg size. *Global Ecology and Biogeography*, 27: 890–898.

Barneche DR, Robertson DR, White CR, Marshall DJ (2018) Fish reproductive-energy output increases disproportionately with body size. *Science*, 360: 642–645.

Audzijonyte A, Barneche DR, Baudron AR, Belmaker J, Clark TD, Marshall CT, Morrongiello JR, van Rijn I (2019) Is oxygen limitation in warming waters a valid mechanism to explain decreased body sizes in aquatic ectotherms? *Global Ecology and Biogeography*, 28: 64–77.

JUSTIFICATIVA DO DOCENTE PARA A OFERTA DA DISCIPLINA

This discipline will be offered as part of the Visiting Professor – PPGECO/PrInt CAPES Programme.

Data: 09/08/2019

Assinatura do Docente
Responsável pela disciplina



UNIVERSIDADE FEDERAL DE SANTA CATARINA

DELIBERAÇÃO DO COLEGIADO PLENO (Art. 13, inciso III, da Res. 05/CUn/2010)

() Não Aprovado () Aprovado
Nível para oferta: () Mestrado () Doutorado () Mestrado e Doutorado
Data da Reunião: ____/____/____

Encaminhe-se à CÂMARA DE PÓS-GRADUAÇÃO

Assinatura do Presidente do Colegiado Pleno

CRIAÇÃO DA DISCIPLINA (Registro no CAPG)

Nome da Disciplina:

Código:

Carga horária:

Hora-aula semanal: ____ créditos Número de crédito total: ____ horas/aula

Carga horária teórica:	Carga horária prática:	Carga horária teórico-prática:
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Nível: () Mestrado () Doutorado () Mestrado e Doutorado

Tipo de disciplina:

Registro no sistema feito em: ____/____/____ Por: _____