EXEMPLO DE PROVA DE SELEÇÃO DE MESTRADO

NORMAS DE APLICAÇÃO DA PROVA ESCRITA

1. A prova tem duração de 04 (quatro) horas;

2. Há uma tolerância máxima de 15 (quinze) minutos para iniciar a prova; se houver atraso no início da prova, o tempo será compensado, cumprindo o prazo definido no item 1;

3. As respostas devem ser escritas em **caneta azul ou preta**. Responda **cada questão em sua respectiva folha**. O verso de cada folha poderá ser utilizado. Caso o candidato necessite, folhas suplementares deverão ser fornecidas exclusivamente pelo(s) examinador(es).

4. O candidato **NÃO** deve escrever seu nome na prova e deve colocar seu **CPF** em **TODAS as folhas**; **PROVAS COM O NOME DO CANDIDATO NÃO SERÃO CORRIGIDAS, IMPLICANDO NA ELIMINAÇÃO DO MESMO.**

5. Se houver necessidade de se ausentar da sala, o candidato será acompanhado por uma pessoa indicada pelo examinador.

ATENÇÃO

As três primeiras questões são OBRIGATÓRIAS e duas outras são de livre escolha. NÃO devem ser respondidas mais de cinco questões (somente as cinco primeiras respostas serão corrigidas e consideradas). Cada questão vale 2,0 (dois) pontos.

Comissão de Seleção do Mestrado
Coordenador do Programa de Pós-Graduação em Ecologia
UFPA/EMBRAPA

Exame de seleção para o mestrado do PPG em Ecologia – 2017
CPF: ___________________________________
QUESTÕES OBRIGATÓRIAS (questões 1, 2 e 3)

Questão 1 (obrigatória) – A partir do texto abaixo e usando seus conhecimentos, responda às seguintes questões:
A) De acordo com o texto, mudanças em idades avançadas no organismo podem ter efeitos aparentemente negativos no fitness. Explique o conceito de fitness em um contexto biológico/evolutivo.
B) Explique, de acordo com o texto, quais as três teorias apresentadas sobre a evolução da senescência.

"Organisms change during their lifetimes in many ways, sometimes permanently as with most aspects of body growth and development, but sometimes temporarily, as with seasonal leaf loss and replacement, growth and regression of gonads, pre-migratory and pre-hibernation accumulation of fat reserves, or development of thicker fur or down in response to decreases in temperature. The predictability and reversibility of such change is of great interest to biologists, and we seek to understand how change is controlled and what fitness advantages it confers. Changes that occur in old age, generally referred to as ageing or senescence, are particularly fascinating, since these progressive and irreversible changes impair rather than improve performance, with apparently negative effects on fitness. Understanding the evolution and persistence of senescence therefore poses a particular challenge. Senescence has captured the attention of evolutionary biologists for more than a century. The German biologist August Weissman, who developed the germ plasm theory of inheritance distinguishing germ line and somatic cell lineages, proposed that senescence benefits the population by removing old, unproductive individuals. However, since senescence as explained by Weissman cannot benefit the individual, it should be selected against except in the special circumstances where kin or group selection can pertain. Moreover, because Weissman's hypothesis presupposes the existence of senescence, it cannot explain its origin. Currently, there are three main, albeit related, theories for the evolution of senescence.
The first can be traced to Haldane and Medawar, who suggested that, because individuals die of causes that are not connected to senescence ("extrinsic factors"), the force of selection declines with age in proportion to Fisher's reproductive value, which measures the contribution of an individual to future generations. Medawar supposed that deleterious mutations expressed at older ages would accumulate in populations and reduce the survival and reproductive success of older individuals. Williams extended this idea in a second theory by proposing the existence of antagonistically pleiotropic genes that have deleterious effects in old age, but are nonetheless favoured because of their contributions to the survival and fecundity of younger individuals. According to this second hypothesis, senescence is considered as a consequence of positive selection on genetic factors that happen to have negative effects later in life. The third theory for the evolution of senescence, developed by Kirkwood and termed the 'disposable soma theory', is centred on trade-offs in the allocation of limiting resources to self-maintenance and other activities, particularly reproduction . In this theory, decline in function results from unrepaired damage to molecules, cells, and tissues as a result of life processes, particularly the harmful byproducts of normal metabolism and the stress imposed by reproduction and other factors; this damage therefore accumulates with age."

(Fonte: P. Monaghan; A. Charmantier, D. H. Nussey and R. E. Ricklefs (2008). The evolutionary ecology of senescence; Functional Ecology 22, 371–378)

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QUESTÕES OBRIGATÓRIAS (questões 1, 2 e 3)

Questão 2 (obrigatória) – Após a leitura do texto abaixo, responda às seguintes questões:
A) Qual a principal pergunta científica que os autores propõem para investigar os acontecimentos na região em estudo?

B) Qual a hipótese do estudo e qual a premissa em que a autora se baseou para formulá-la?

"The Pangandaran Nature Reserve (PNR) includes one of the remaining lowland forests in Indonesia, West Java province. This 530-ha peninsula is connected to the mainland of Java by a narrow isthmus and offers a suitable location to conserve many rare flora and fauna such as *Rafflesia patma*, the long-tailed macaque (*Macaca fascicularis*), the silver leaf monkey (*Trachypithecus auratus sondaicus*), several species of deer and banteng (*Bos javanicus*). This rich biota attracts many visitors. Most areas of the reserve are covered by forest, including a Barringtonia asiatica formation in coastal areas and secondary forest dominated by *Rhodamnia cinerea*, *Vitex pinnata*, *Dillenia excelsa*, and *Cratoxylum formosum* in inland areas. The tree height averages 25 m, and the tallest tree (*Dialium indum*) reached 46 m (Sumardja and Kartawinata 1977, Kool 1993). In addition, PNR included five artificial grazing sites that covered about 57 ha because the nature reserve started as a game reserve for ungulates in 1921. The sites were initially grassland that was dominated mainly by *Imperata cylindrica* (Sumardja and Kartawinata 1977). They have been under different management regimes since 1921 (no weed control for 30 to 55 years, and weed control at different intervals) in an effort to maintain the initial grassland condition. Many studies have described changes in grasslands and abandoned land after shifting cultivation or forest fires in several areas of Southeast Asia, and particularly Indonesia, which has the largest total area of Imperata grassland after deforestation (Garrity et al. 1997). Yassir et al. (2010) studied in *Imperata grassland* in East Kalimantan after fires under different soil conditions. However, there have been no studies of Indonesian grasslands managed for grazing over several decades, except for a study of the vegetation composition and carrying capacity for buffalo (*Bubalus bubalis*) and goats (*Capra hircus*) in the Taman Jaya grassland of Ujung Kulon National Park (Simbolon et al. 1986). The processes that occur under grazing pressure and under human efforts to maintain grasslands for several decades might differ from those that occur after shifting cultivation because the nature of the disturbance is very different. Thus, our purpose in the present study was to clarify that occurs at grazing sites by comparing sites under different management regimes."

(Fonte: Rosleine D, Suzuki E. 2012. Tropics 21 (3): 91-103.)

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QUESTÕES OBRIGATÓRIAS (questões 1, 2 e 3)

Questão 3 (obrigatória) – O artigo de Gucker et al. (2009) trata dos efeitos de atividades agrícolas sobre a estrutura e o funcionamento ecossistêmico de riachos do Cerrado brasileiro, conforme indicado no trecho abaixo:

"Effects of agricultural land use on the physical and chemical template of streams and their biological community should affect stream ecosystem function, e.g. processes involved in whole-stream carbon and nutrient metabolism. Indeed, agricultural impacts on nitrification and denitrification, as well as ammonium (NH4+), nitrate (NO3)), phosphate and organic carbon processing have been reported. Agricultural streams typically exhibit higher areal rates and lower flux-specific efficiencies of denitrification and nitrification than pristine streams as a result of changes in concentrations of NH4+ and NO3), respectively, as well as concentrations of dissolved O2, DOC and benthic POC (Kemp & Dodds, 2002; Inwood, Tank & Bernot, 2005, 2007). Similarly, whole-stream nutrient uptake rates of agricultural streams appear to be higher and flux-specific uptake efficiencies lower than those of pristine streams (Bernot et al., 2006). However, the degree to which increases in areal uptake of dissolved inorganic nitrogen (DIN) are due to increases in dissimilative or assimilative biotic activity remains unclear (Bernot & Dodds, 2005)."

(Fonte: Gucker, B., Boechat, I.G. & Giani, A. 2009. Impacts of agricultural land use on ecosystem structure and whole-stream metabolism of tropical Cerrado streams. Freshwater Biology 54, 2069-2085)

Abaixo segue uma figura com alguns dos resultados que os autores obtiveram:

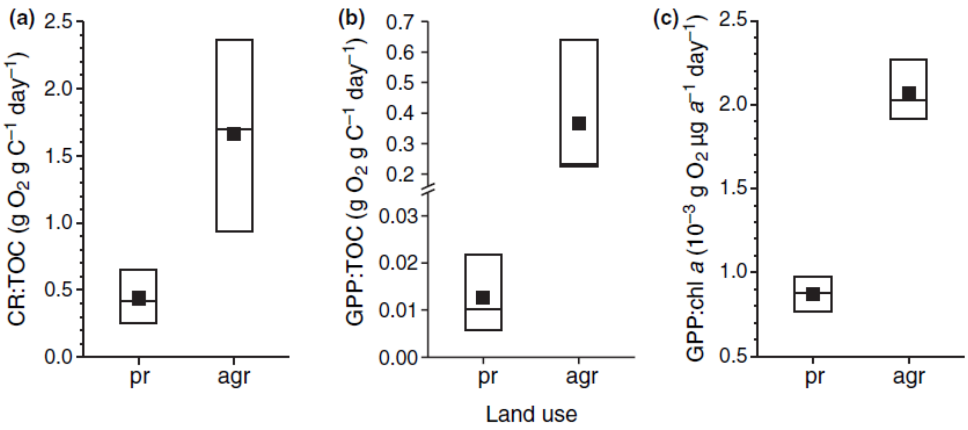

Fig. 5 Medians (cross bars), arithmetic means (filled squares) and ranges (boxes) of (a) benthic microbial biomass (BMB)-specific community respiration (CR : TOC), (b) BMB-specific gross primary production (GPP : TOC) and (c) benthic microbial Chl-*a* -specific GPP (GPP : Chl-*a*) in pristine (pr) and agricultural (agr) Cerrado streams.

De acordo com essa figura, responda às seguintes questões:
A) Qual foi a variável preditora avaliada e qual variável resposta apresentou menor variação em relação à média dentro de cada grupo de riachos avaliados?
B) É possível afirmar que, no bioma Cerrado, todos os riachos pristinos possuem menor produção primária bruta de biomassa microbiana do que riachos sob influência de agricultura? Por quê?

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QUESTÕES OPCIONAIS (questões 4, 5, 6 e 7)

Questão 4 (opcional) – Atualmente, a malária aviária limita as distribuições geográficas, abundâncias e biodiversidade de aves havaianas nativas. Leia atentamente o texto abaixo e responda as questões a seguir.
"A large proportion of the bird species that were once endemic (found nowhere else) to the Hawaiian Islands have become extinct in historical times. One major factor in their extinction is introduced diseases. The extinction of many low-elevation bird species before 1900 may have resulted from avian pox, in conjunction with extensive habitat clearing for agriculture and the introduction of rats, cats and pigs. A second wave of extinction in Hawaiian birds began in the early 1900s and was probably the result of avian malaria. At that time, native birds were relatively common only above 1500 m elevation, as they are today. Most introduced bird species occupy lower elevations, and so does the main malarial vector, the mosquito *Culex quinquefasciatus.* However, native Hawaiian birds are much more susceptible to malaria than the introduced birds are. Consequently, avian malaria occurs most often at intermediate elevations where the ranges of the vector and the most susceptible hosts overlap. The geographic range of many native bird species has been reduced to the highest-elevation forests, where *C. quinquefasciatus* mosquitoes are rare and avian pox does not occur. The roles of predators and diseases in the geographic ecology of plants and animals have been studied far less than their potential importance warrants. We should be aware that current geographic ranges of many species may be the result of limitations imposed by predators and diseases in the past."

(Fonte: Krebs, C. J. The Ecological World View. 2008. CSIRO Publishing, Collingwood, Austrália).

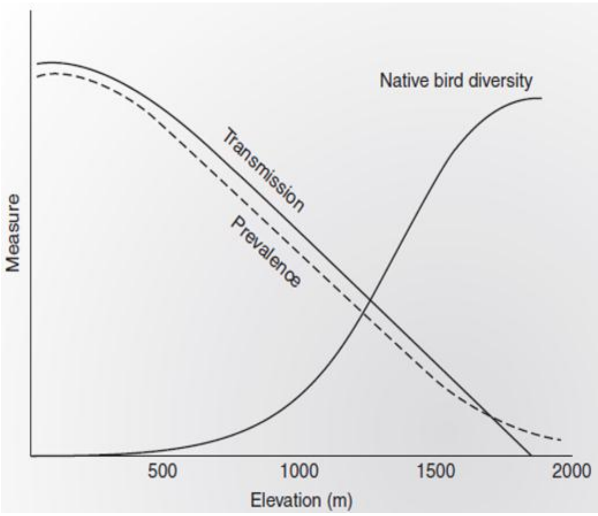

Figure. Schematic representation of avian malária (*Plasmodium relictum*) prevalence, vector transmission, and native bird diversity along na elevation gradiente on Mauna Loa and Kilauea Volcanoes, Hawaii. (modified from Van Riper et al., 1986, *Ecological Monographs*, **56**, 327-344.)

A) Segundo o gráfico, qual o efeito da altitude na transmissão de malária e na diversidade de aves nativas em ilhas do Hawaii?
B) Baseando-se no texto, explique por que a malária aviária ocorre mais frequentemente em altitudes intermediárias, enfatizando os fatores que reduzem a transmissão da doença em altitudes baixas e elevadas.
C) Qual deve ser a relação entre as distribuições geográficas da malária aviária e das aves nativas havaianas caso a hipótese de que a malária é um fator determinante na distribuição destas aves seja verdadeira?

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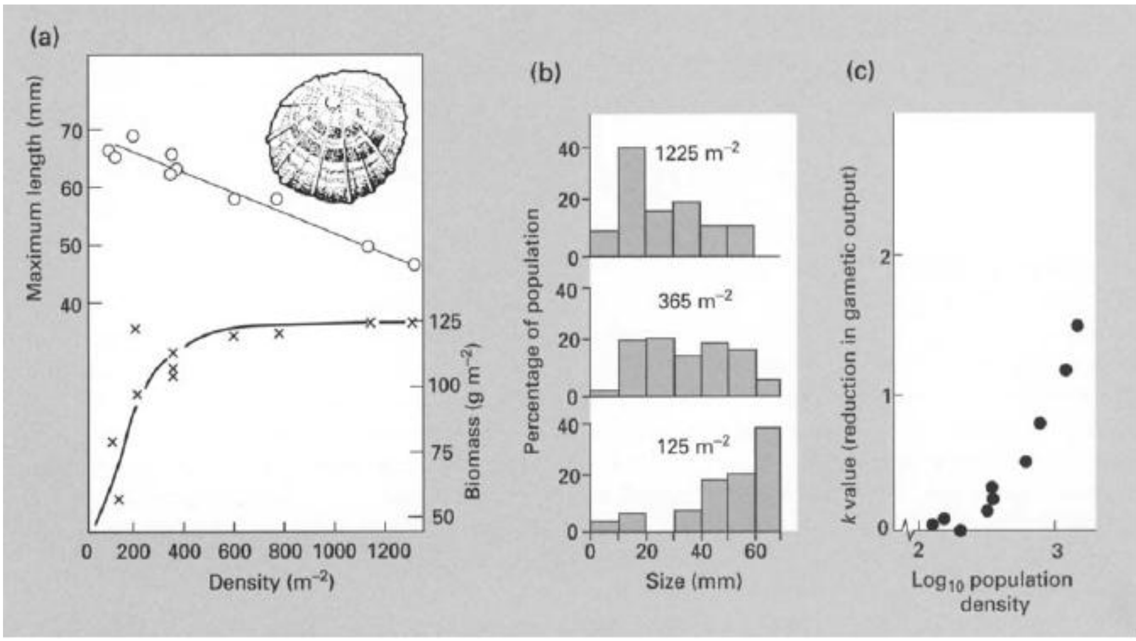
QUESTÕES OPCIONAIS (questões 4, 5, 6 e 7)

Questão 5 (opcional) – A partir do texto e da figura abaixo, responda às seguintes questões:
A) Explique de que forma e por quê cada um dos atributos populacionais de *Patella cochlear* avaliados por Branch (1975) se alteraram em relação à variação da densidade.
B) Levante uma hipótese para explicar a afirmação contida na última sentença do texto abaixo.

"The limpet *Patella cochlear* is a gastropod that lives in rocky substrates and whose settlement is positively related to wave action. At sites with low wave action, algae flourish and therefore hamper *P. cochlear* settling leading to lower densities of this gastropod. Branch (1975), studying *Patella cochlear* in South Africa, observed sharped variations in the density between sites, which ranged from 125 to 1225 m^{-2}. This author determined other population features for different sites, apart from density estimate, namely: maximum individual length (○), biomass (g m^{-2}) (×), relative length frequency distribution (size: mm), and k values, which indicates the reduction in gametic output (●). If on one hand the author observed marked variations in density between sites, on the other hand, density had low changes over time at each site."



(Fonte: Begon, M., Mortimer, M. & Thompson, D.J. 1998. Population ecology: a unified study of animals and plants. 3nd ed. Blackweel Science, United Kingdom)

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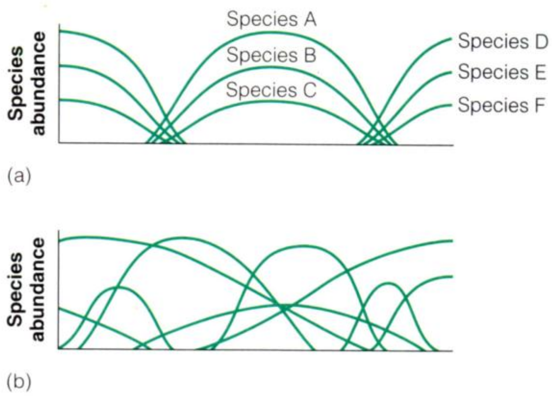
QUESTÕES OPCIONAIS (questões 4, 5, 6 e 7)

Questão 6 (opcional) – Baseado no texto abaixo e considerando seus conhecimentos prévios sobre ecologia de comunidades, responda às seguintes questões:
"As the discipline of ecology emerged from its biogeographic origins in the early 1900s, two strikingly polar views on the nature of plant communities vied for recognition, and the conflict established a precedent for ecological thought today. Initially, the view of Frederic Clements was ascendant with most ecologists accepting the idea that "*The community is an organic entity. As an organism the community arises, grows, and dies. Furthermore, each community is able to reproduce itself, repeating with essential fidelity the stages of its development . . . comparable in its chief features with the life history of an individual plant.*" (Clements, F. E. 1916. *Plant Succession*. Washington, DC: The Carnegie Institution, Publication 242). This holistic perspective, however, was replaced in the middle of the 1900s by new ideas promoted by Henry Gleason. In this new individualistic world view, the community ''*is merely the resultant of two factors, the fluctuating and fortuitous immigration of plants and an equally fluctuating and variable environment . . . not an organism, scarcely even a vegetational unit, but merely a coincidence*'' (Gleason, H. A. 1917. *The structure and development of the plant association*. Bulletin of the Torrey Botanical Club 44: 463–481)."

(*Fonte: Callaway R.M., 2009. Facilitation and the organization of plant communities. In: The Princeton Guide to Ecology [Ed.: S. A. Levin], Princeton University Press, pp. 282-283.*)

As figuras abaixo apresentam a distribuição de várias espécies ao longo de um gradiente ambiental (representado no eixo x).



A) Observando as Figuras (a) e (b), identifique e explique qual delas é compatível com as ideias de Frederic Clements e qual é compatível com as ideias de Henry Gleason.

B) Sobre a natureza das comunidades, assinale as colocações abaixo como verdadeiras (V) ou falsas (F). Nas colocações consideradas como falsas (F) identifique e corrija as sentenças para que se tornem verdadeiras.
(   ) Uma comunidade é formada por populações de uma espécie que habitam uma mesma área em um determinado tempo.
(   ) Para ser considerada uma comunidade, todas as espécies que habitam uma determinada área devem interagir entre si.
(   ) A composição de uma comunidade em determinada área pode ser determinada por filtros ambientais, como por exemplo, a salinidade, exposição às ondas ou dessecação.
(   ) Segundo F. Clements, uma comunidade é considerada uma unidade fundamental que pode ser vista como um super-organismo.
(   ) De acordo com H. Gleason, as comunidades são formadas por agrupamentos de espécies que interagem fortemente entre si, formando grupos de espécies que podem ser individualizadas ao longo de gradientes ambientais.

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QUESTÕES OPCIONAIS (questões 4, 5, 6 e 7)

Questão 7 (opcional) – Após a leitura do texto abaixo, responda às seguintes questões:
A) Lendo o texto, podemos perceber que ele trata da emissão de quais gases?
B) Dentre os gases citados no texto, um deles é considerado como o principal causador do efeito estufa responsável pelo aquecimento global. Cite que gás é este e explique como a agricultura e a criação de gado podem aumentar a quantidade deste gás na atmosfera.
C) Quais as sugestões que os autores dão para a diminuição da emissão dos gases de efeito estufa pelas atividades agrícolas?

"Agricultural lands occupy 37% of the earth's land surface. Agriculture accounts for 52 and 84% of global anthropogenic methane and nitrous oxide emissions. Agricultural soils may also act as a sink or source for CO_2, but the net flux is small. Many agricultural practices can potentially mitigate greenhouse gas (GHG) emissions, the most prominent of which are improved cropland and grazing land management and restoration of degraded lands and cultivated organic soils. Lower, but still significant mitigation potential is provided by water and rice management, set-aside, land use change and agroforestry, livestock management and manure management. The global technical mitigation potential from agriculture (excluding fossil fuel offsets from biomass) by 2030, considering all gases, is estimated to be approximately 5500–6000 Mt CO_2-eq. yr^{-1}, with economic potentials of approximately 1500–1600, 2500–2700 and 4000–4300 Mt CO_2-eq. yr^{-1} at carbon prices of up to 20, up to 50 and up to 100 US$ t CO_2-eq.$^{-1}$, respectively. In addition, GHG emissions could be reduced by substitution of fossil fuels for energy production by agricultural feedstocks (e.g. crop residues, dung and dedicated energy crops). The economic mitigation potential of biomass energy from agriculture is estimated to be 640, 2240 and 16 000 Mt CO_2-eq. yr^{-1} at 0–20, 0–50 and 0–100 US$ t CO_2-eq.$^{-1}$, respectively."

(Fonte:Pete Smith, Daniel Martino, Zucong Cai, Daniel Gwary, Henry Janzen, Pushpam Ku mar, Bruce McCarl, Stephen Ogle, Frank O'Mara, Charles Rice, Bob Scholes, Oleg Sirotenko , Mark Howden, Tim McAllister, Genxing Pan, Vladimir Romanenkov, Uwe Schneider, Sirint ornthep Towprayoon, Martin Wattenbach, Jo Smith. 2008. Phil. Trans. R. Soc. B 363, 789–813)