Curso de campo en técnicas de prospección de poblaciones de vertebrados terrestres

Anfibios

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PEDECIBA 1986 - 2016

CURE Centro Universitario Regional del Este

UNIVERSIDAD DE LA REPÚBLICA URUGUAY

¿Por qué debería conocer a los anfibios?

Por aprotes económicos, funciones ecosistémicas, estética y ética.

(Noss and Cooperrider 1994; Groom *et al.* 2006)

Establecer la pregunta y los objetivos del estudio

¿Dónde y cuándo**?** Definiendo la escala espacial y temporal del estudio

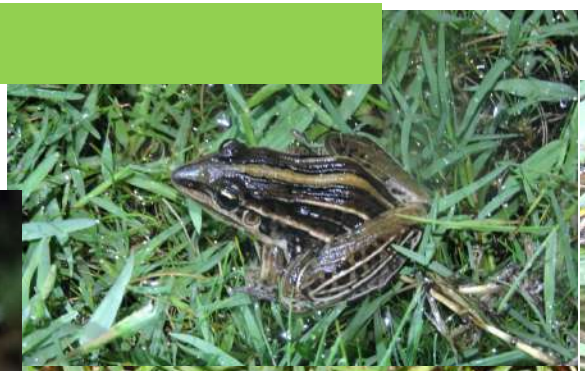
¿Cuánto**?** Definiendo el tamaño de la muestra

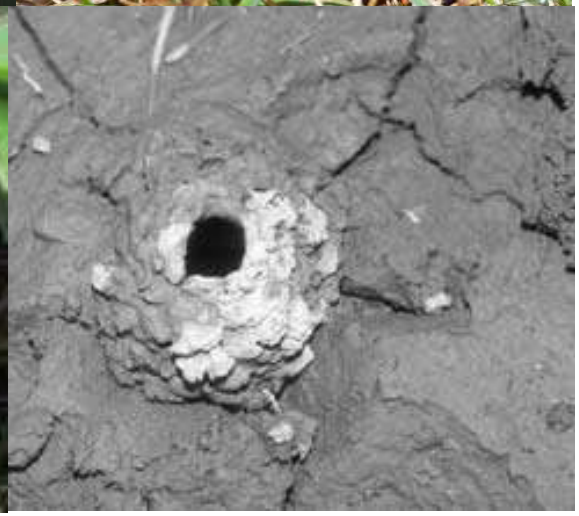
Muestra representativa de la población
Número de réplicas de las unidades experimentales (individuos, poblaciones, especies, parches de hábitat, entre otros)

- **Inventarios de fauna**: describir y/o cuantificar la fauna de una localidad, líneas de base
- **Monitoreos de fauna**: describir y/o cuantificar cómo varía en el tiempo la fauna de una localidad

Relevamiento de la diversidad

1- Oviposturas y embriones





Relevamiento de la diversidad

1- Oviposturas y embriones

Colecta y mantenimiento de oviposturas

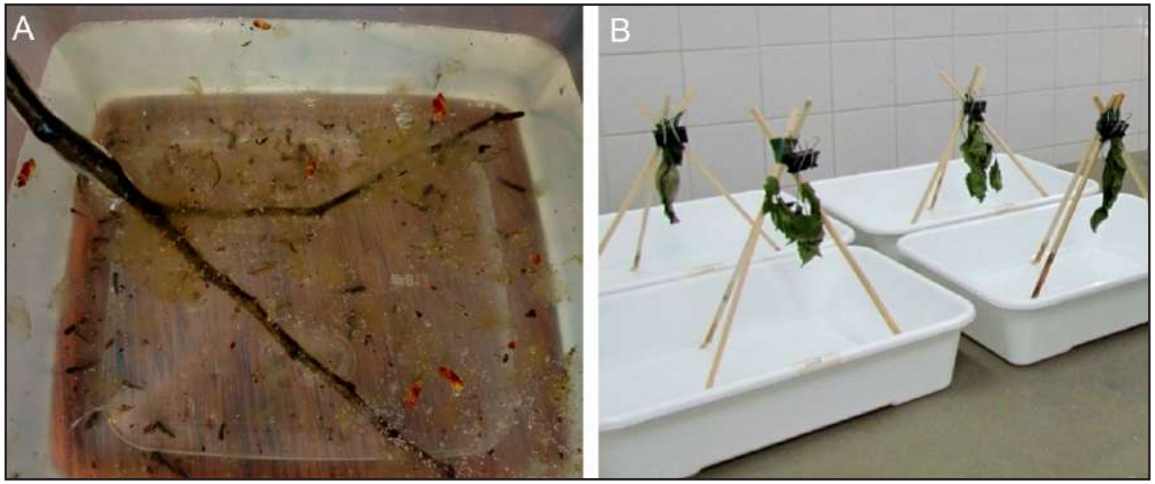
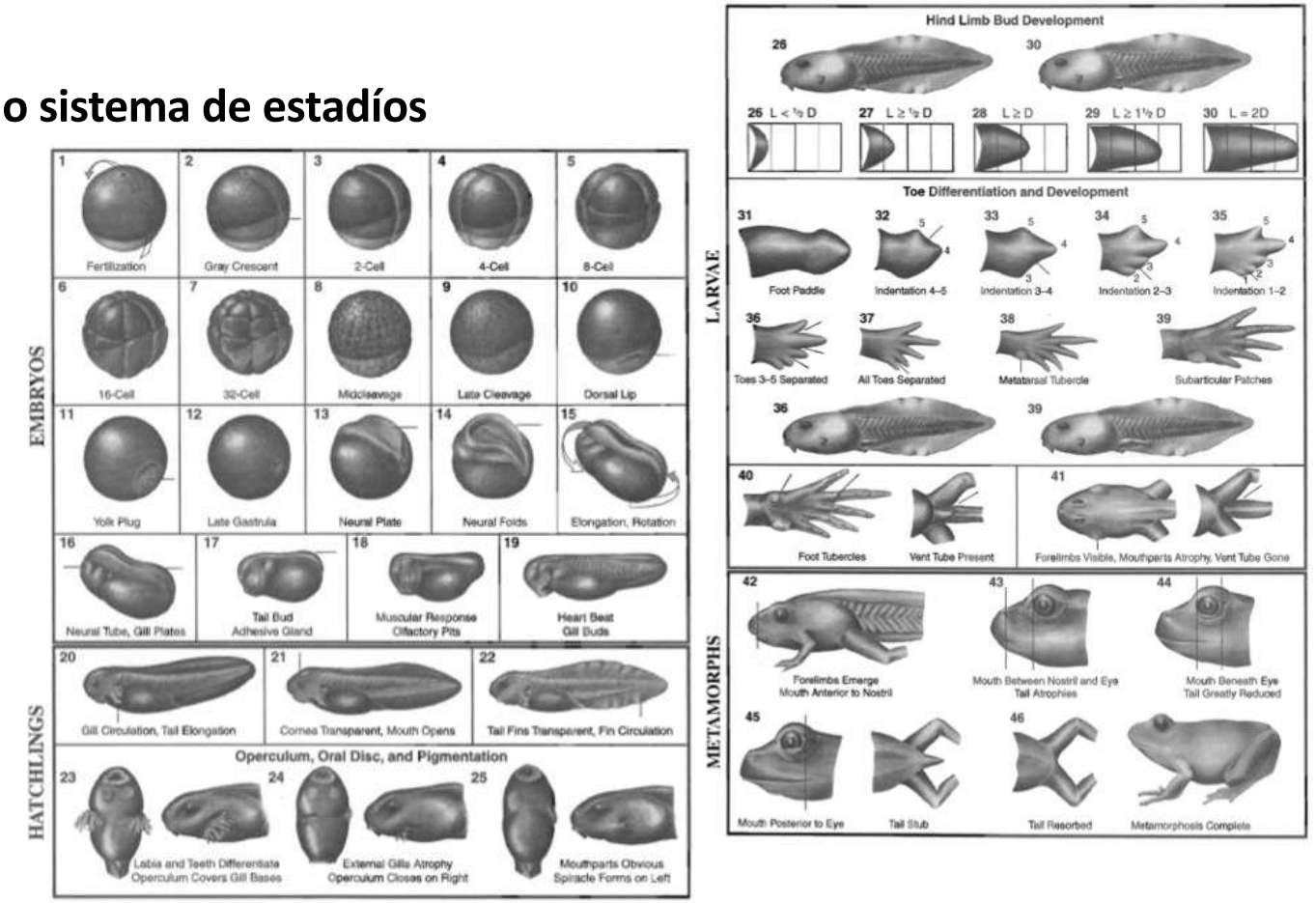
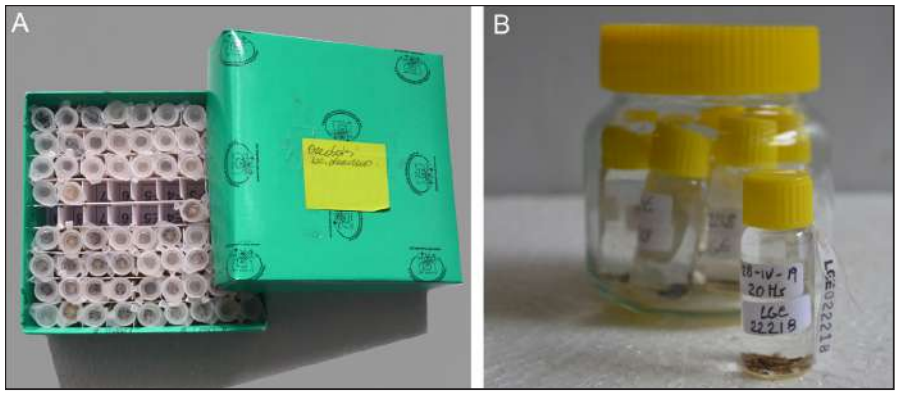


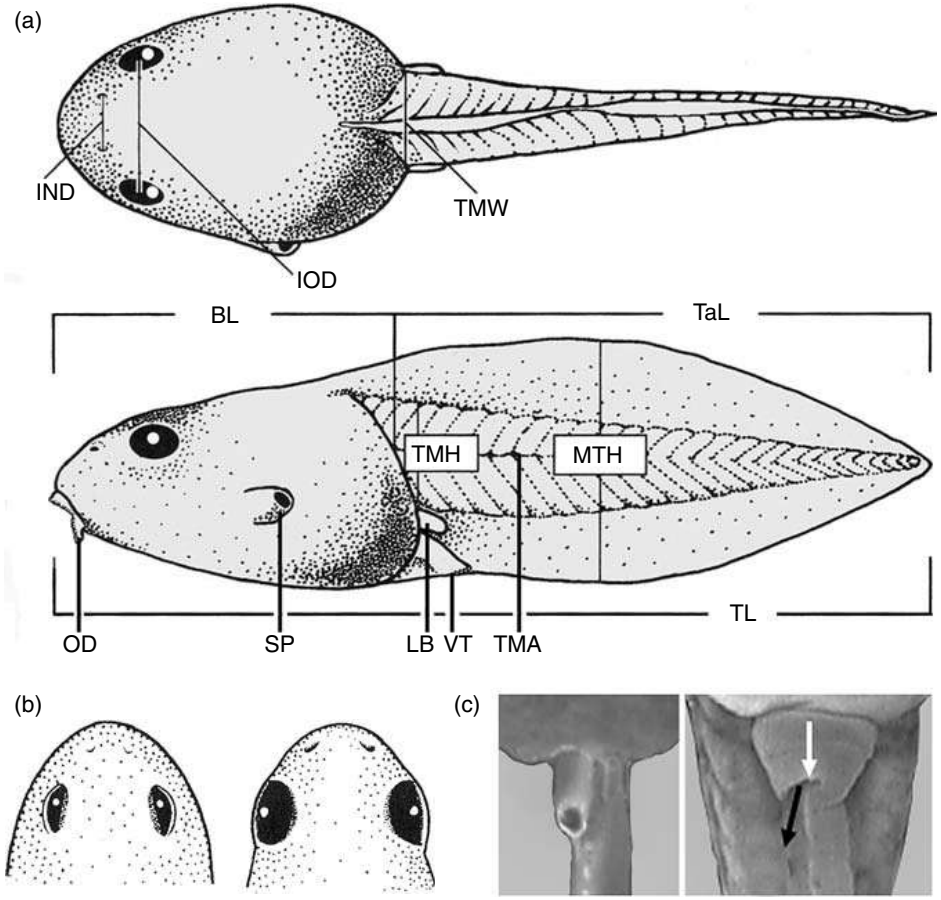
Tabla de Gosner (1960) o sistema de estadíos

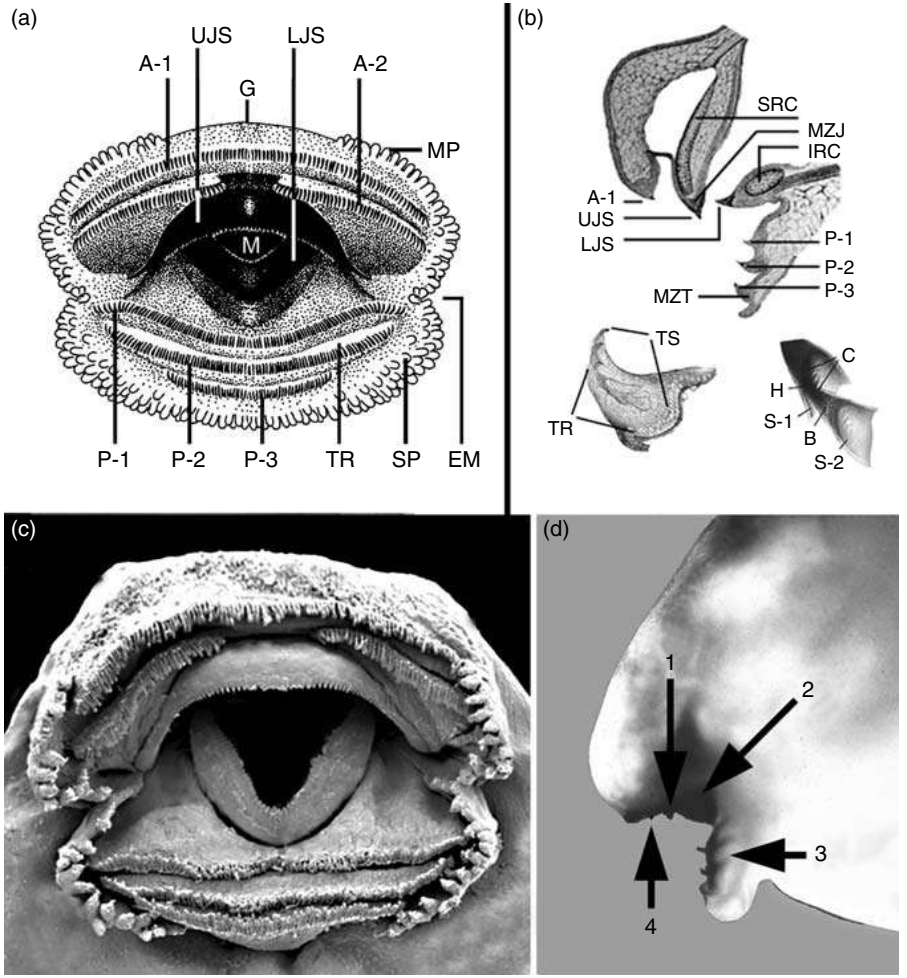


Morfometría de renacuajos



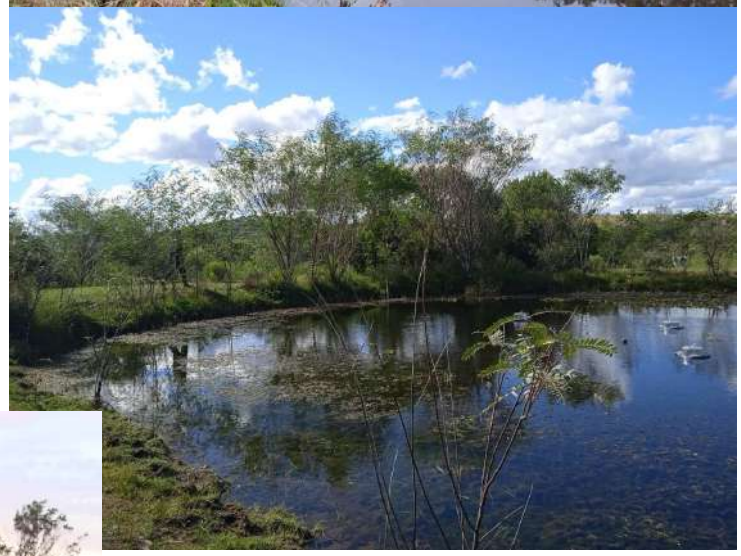
Morfometría de renacuajos

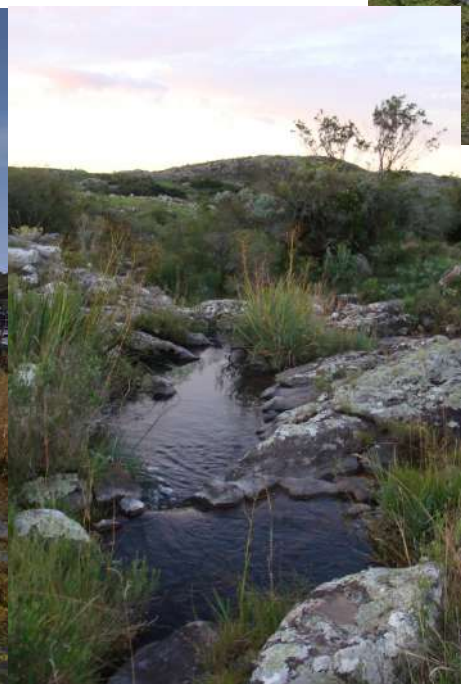




2- Colecta de renacuajos

Del estadío 25 de Gosner
branquias externas son reabsorbidas
Hasta el 41 de Gosner
erupción de los miembros anteriores en el clímax metamórfico





Técnicas de muestreo activo

- **Redes**
- **Cajas trampa**
- **Encuentros visuales**

Técnicas de muestreo pasivo

- **Redes simples (bollas y plomos, ancho de maya)**
- **Trampas de embudo (nasa)**

3- Relevamiento de postmetamorfos (juveiles o adultos)

Técnicas de muestreo activo

- **Muestreo por encuentros visuales**

Supuestos:
i) todos los individuos de las distintas especie tienen la misma probabilidad de ser encontrados.
ii) cada individuo es detectado una única vez en la búsqueda.

3- Relevamiento de postmetamorfos (adultos)

Técnicas de muestreo activo

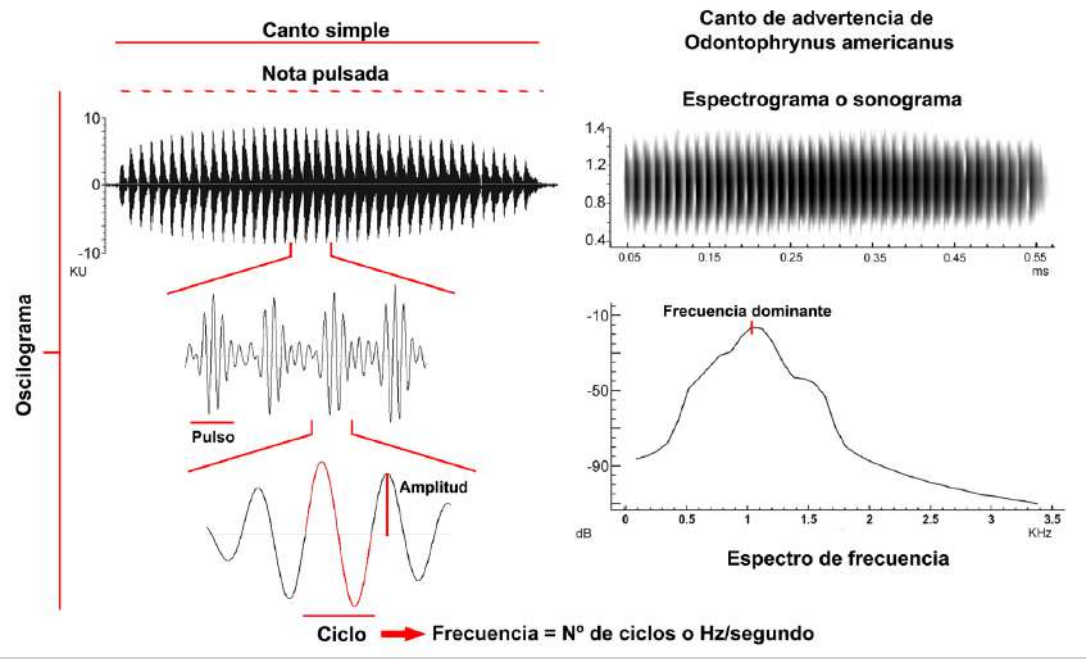
- **Muestreo por registros auditivos**

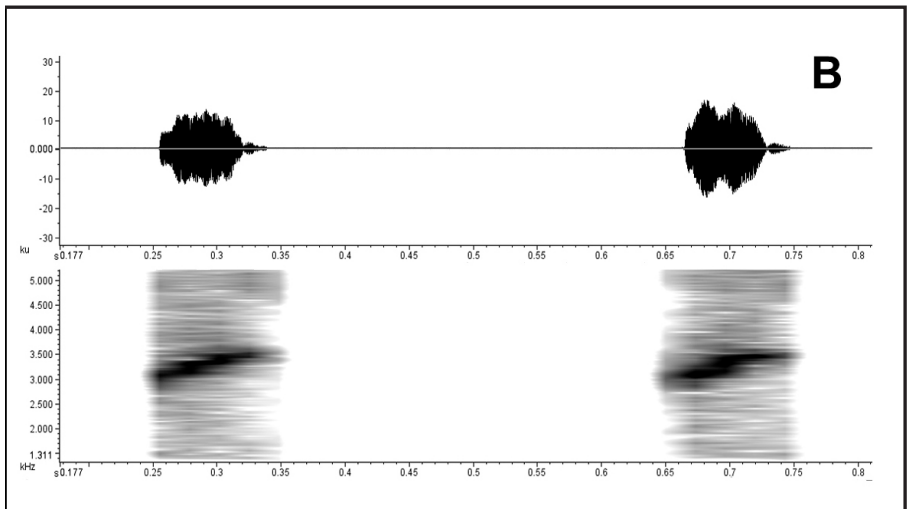
  Canto especie-específico

  a) Muestreo auditivo
  Categorías de abundancia
  - Ocacional
  - Raro
  - Común
  - Abundante

  b) Registros sonoros

3- Relevamiento de postmetamorfos (adultos)

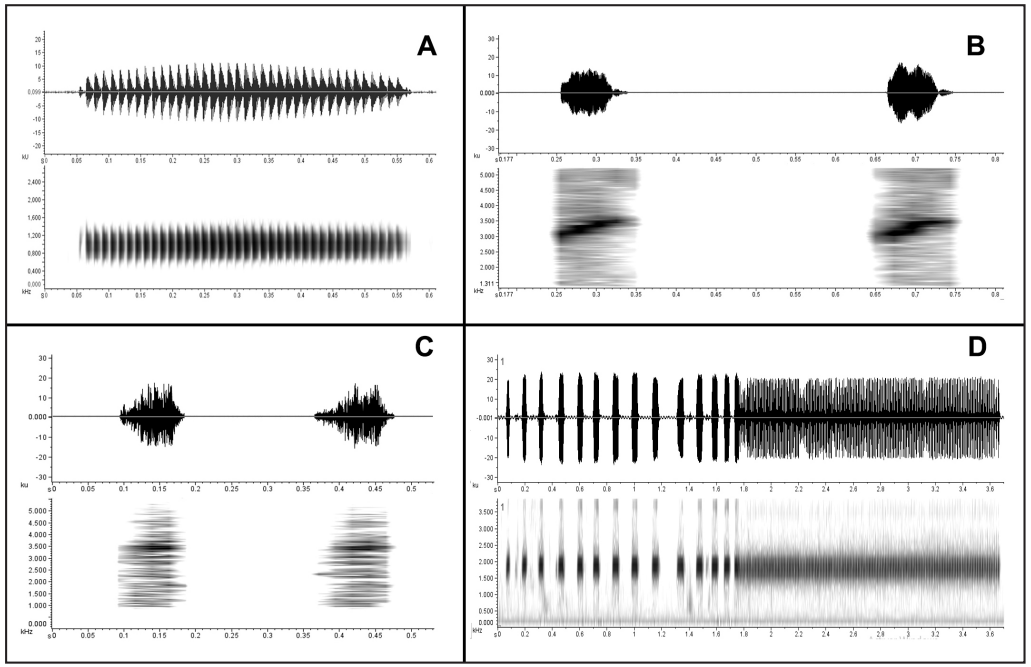




Información del canto

Tasa de canto (temporal)
Duración del canto (temporal)
Frecuencia dominante (espectral)

3- Relevamiento de postmetamorfos (adultos)



Oscilograma

Espectrograma

(A) canto simple pulsado de *Odontophrynus americanus*

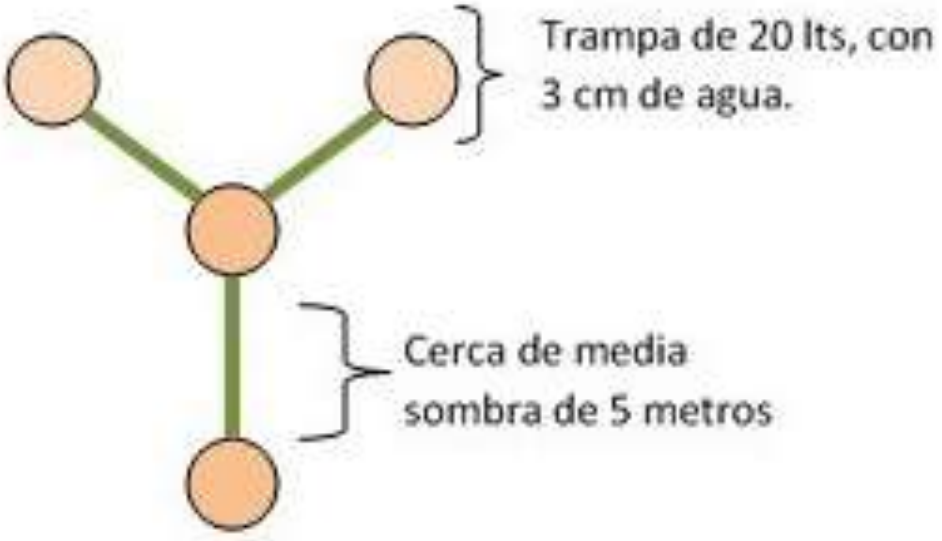
(B) serie de dos **cantos simples tonales** de *Leptodactylus latinasus*

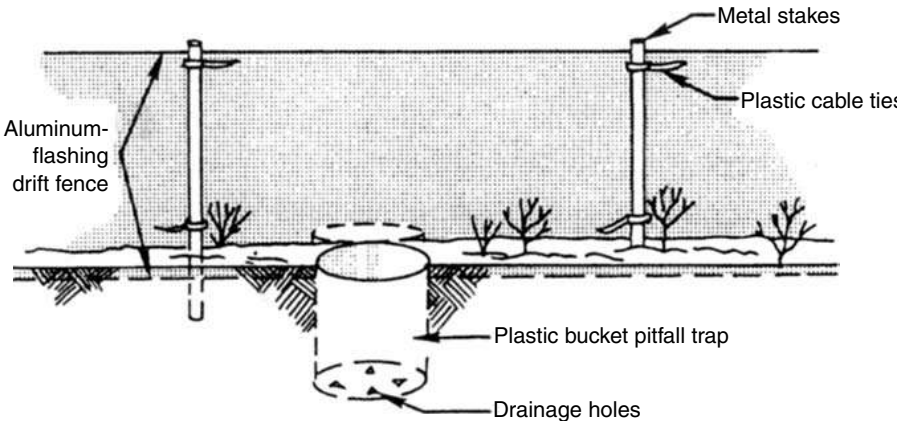
(C) serie de dos **cantos simples pulsátiles** de *Scinax nasicus*

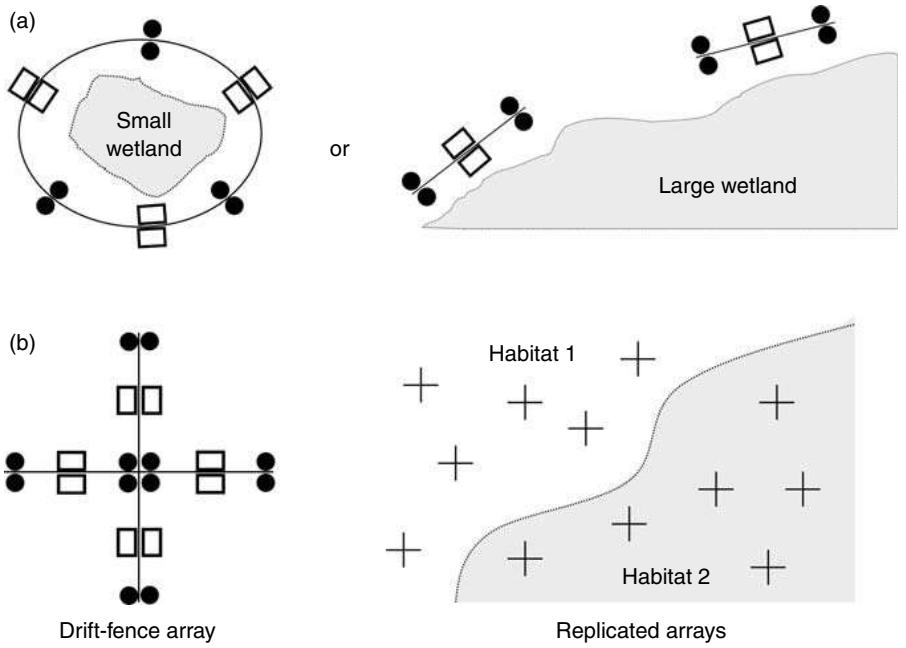
(D) canto compuesto o complejo de *Melanophryniscus stelzneri*, **con series de notas tonales** en la primer mitad del canto y **un tren de pulsos** en la segunda mitad.

Técnicas de muestreo pasivo

Trampas de caída o nasas + cercos de deriva





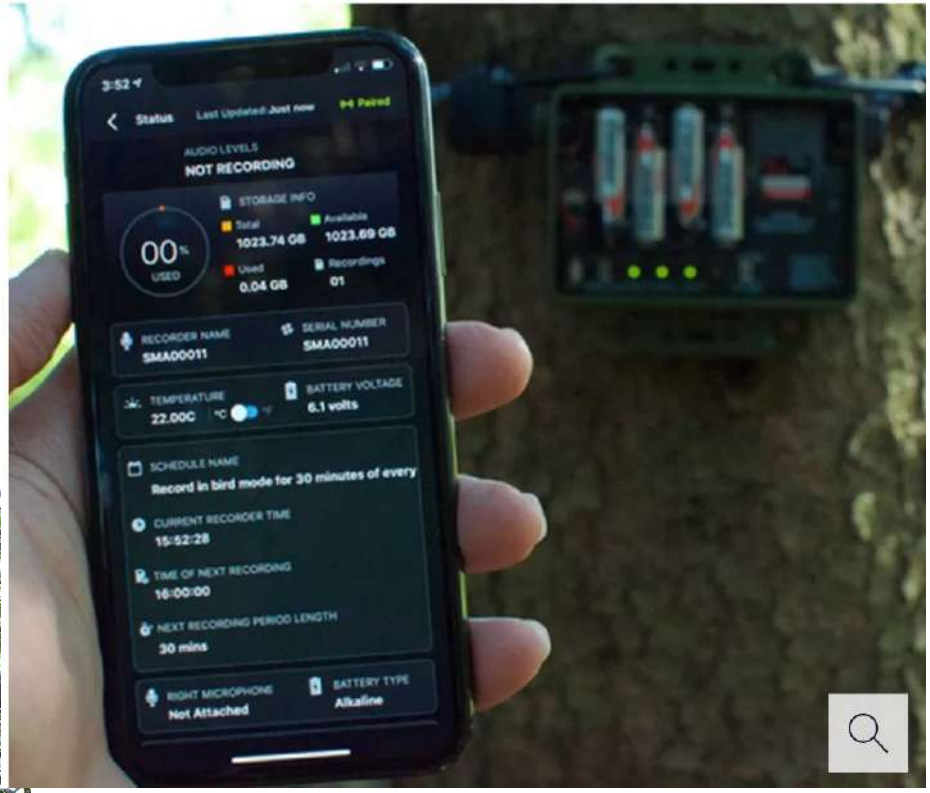


Siendo trampas de vida deben ser vevisadas con frecuencia

Cubiertas y refugios artificiales

Monitoreo o muestreo acústico pasivo (MAP)

grabadores digitales automatizados



Programación/Horarios de los Grabadores Digitales Automatizados

Tasa de Muestreo (Sampling Rate, 16000 Hz)

Gasto de baterías y almacenamiento

Permite:

- Muestreos a largo plazo
- Sincrónicos espacialmente
- Grillas y transectas

Equipos costosos

Manejo de la información

Ecological Indicators 132 (2021) 108305

Contents lists available at ScienceDirect

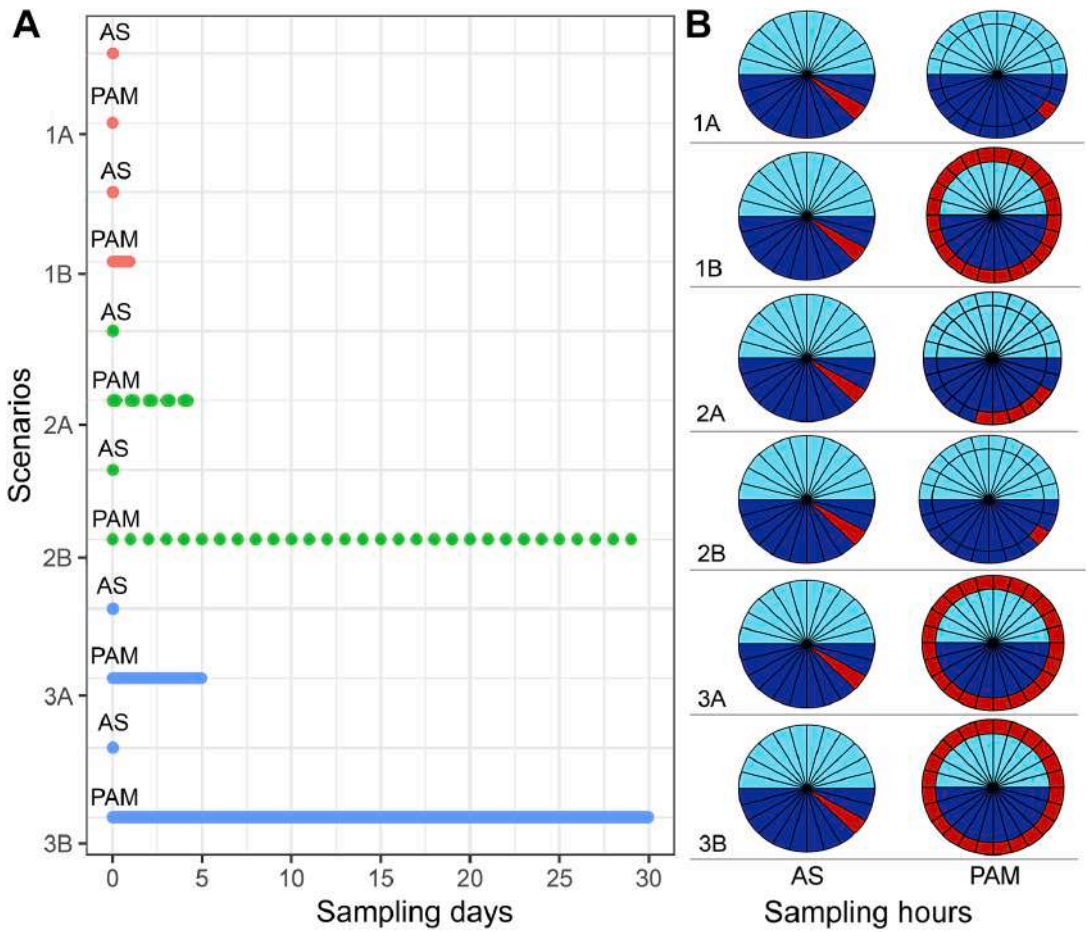
Ecological Indicators

journal homepage: www.elsevier.com/locate/ecolind

Original Articles

Active or passive acoustic monitoring? Assessing methods to track anuran communities in tropical savanna wetlands

Isabella Melo [a,b,1,*], Diego Llusia [c,d], Rogério Pereira Bastos [a,b], Luciana Signorelli [b,1]



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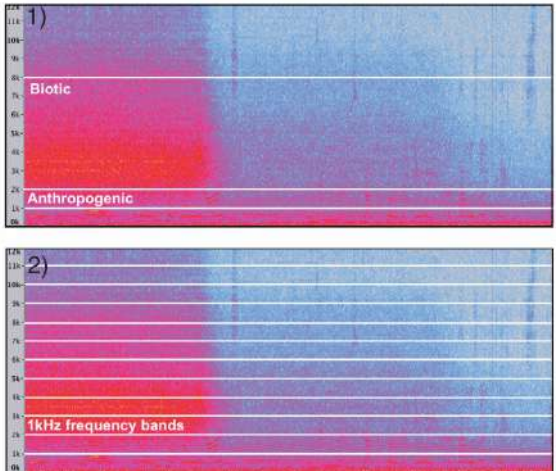


Bioacústica
Comprende el estudio de la comunicación animal

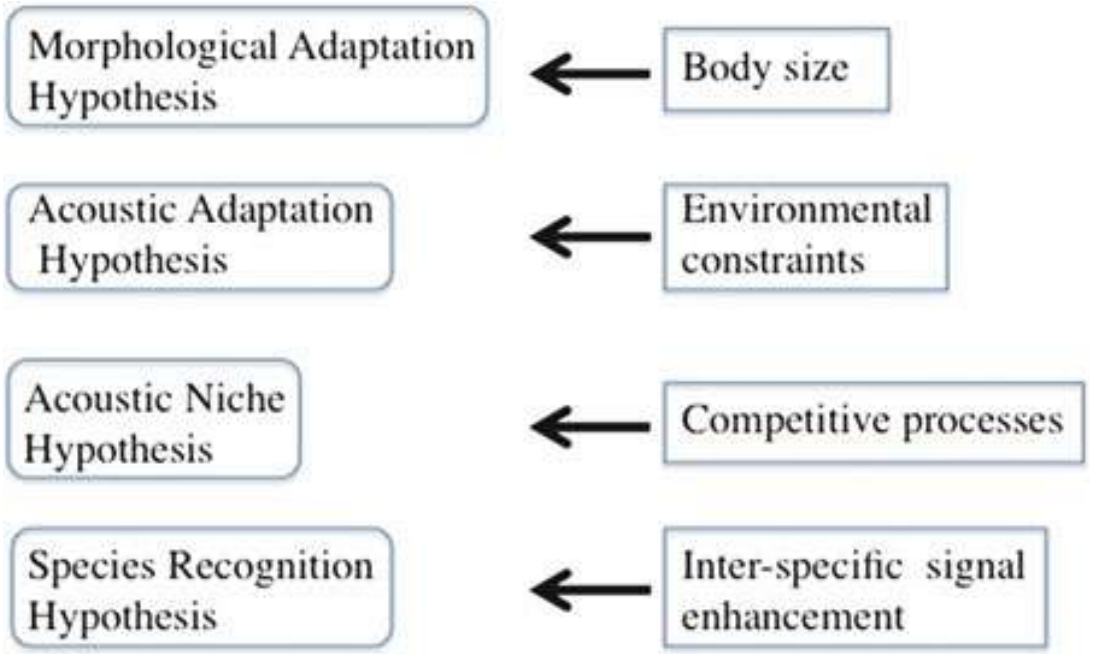
Ecoacústica
Comprende todos los aspectos que vinculan a los organismos y el ambiente a través del sonido

Paisaje acústico:

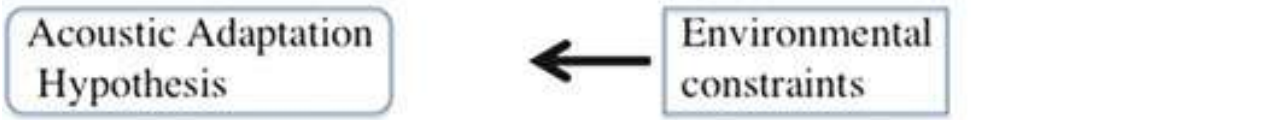
Biofonías
Antropofonías
Geofonías

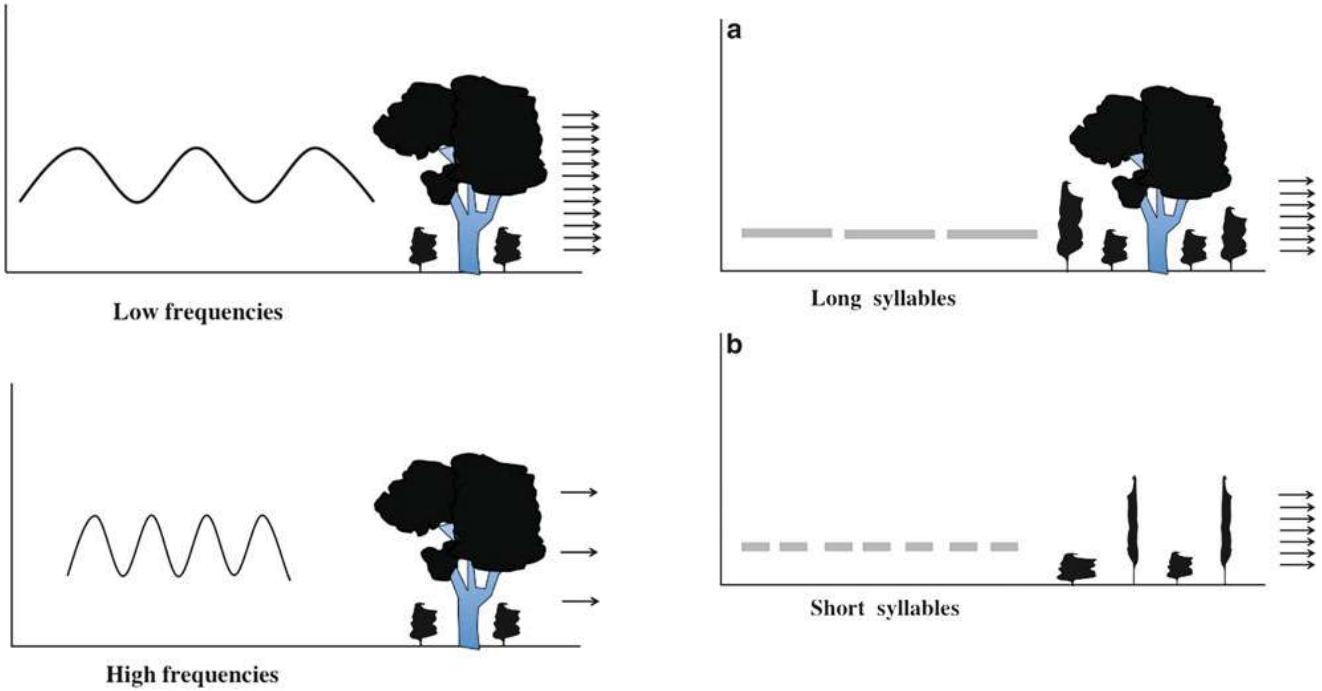
Ecoacústica

Algunas hipótesis ecológicas



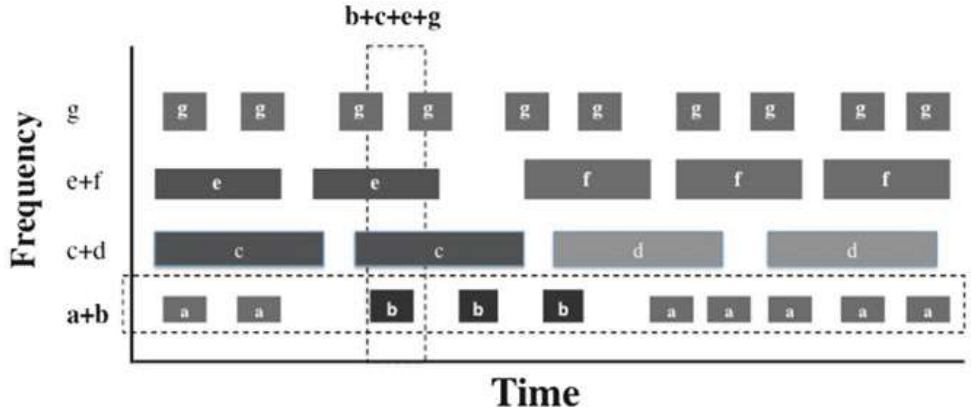
Ecoacústica

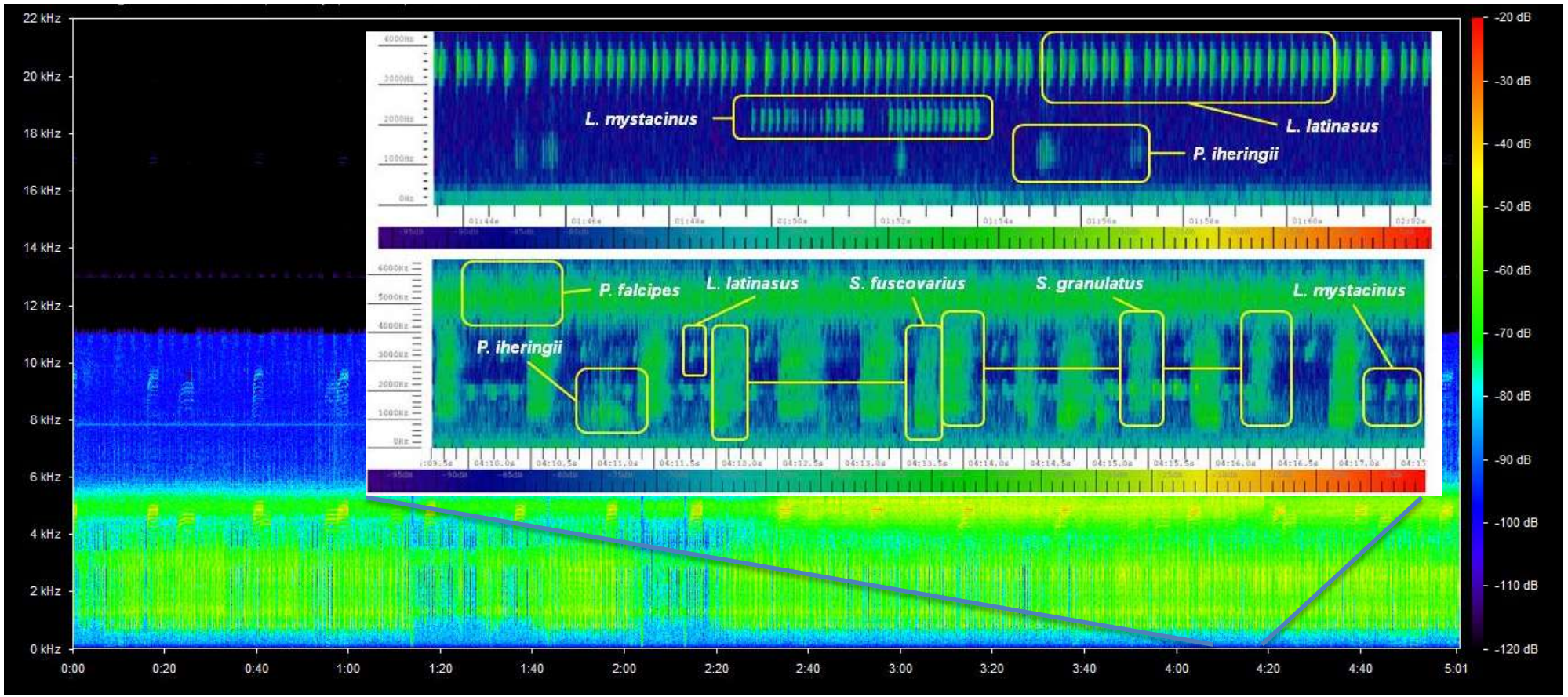




Acoustic Niche Hypothesis

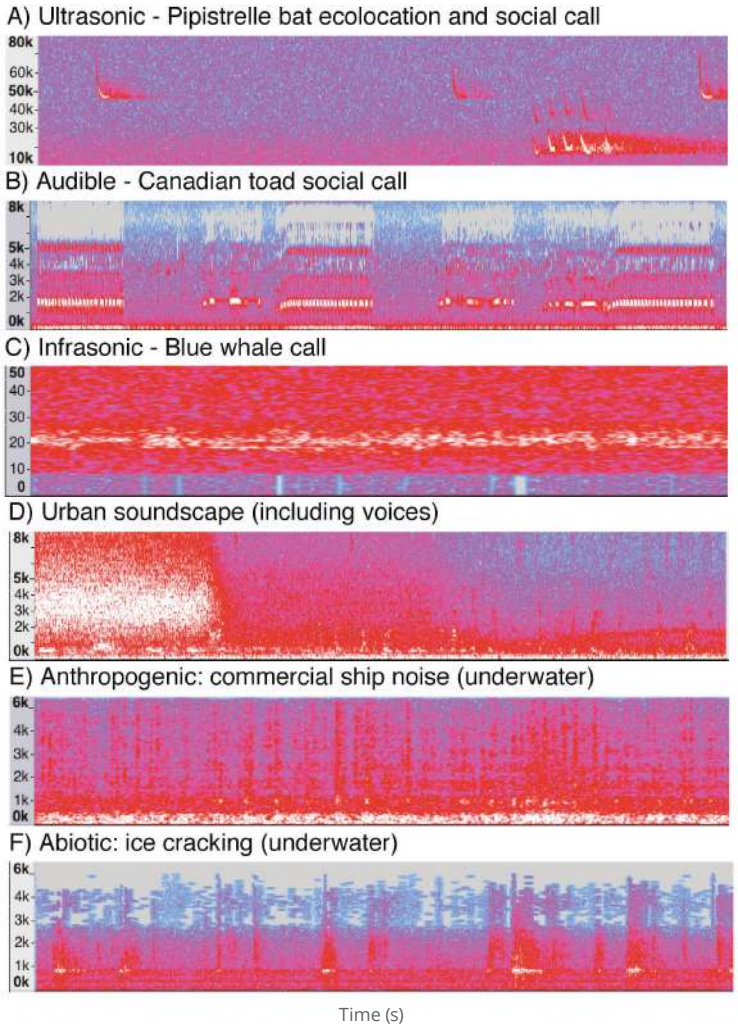
← Competitive processes

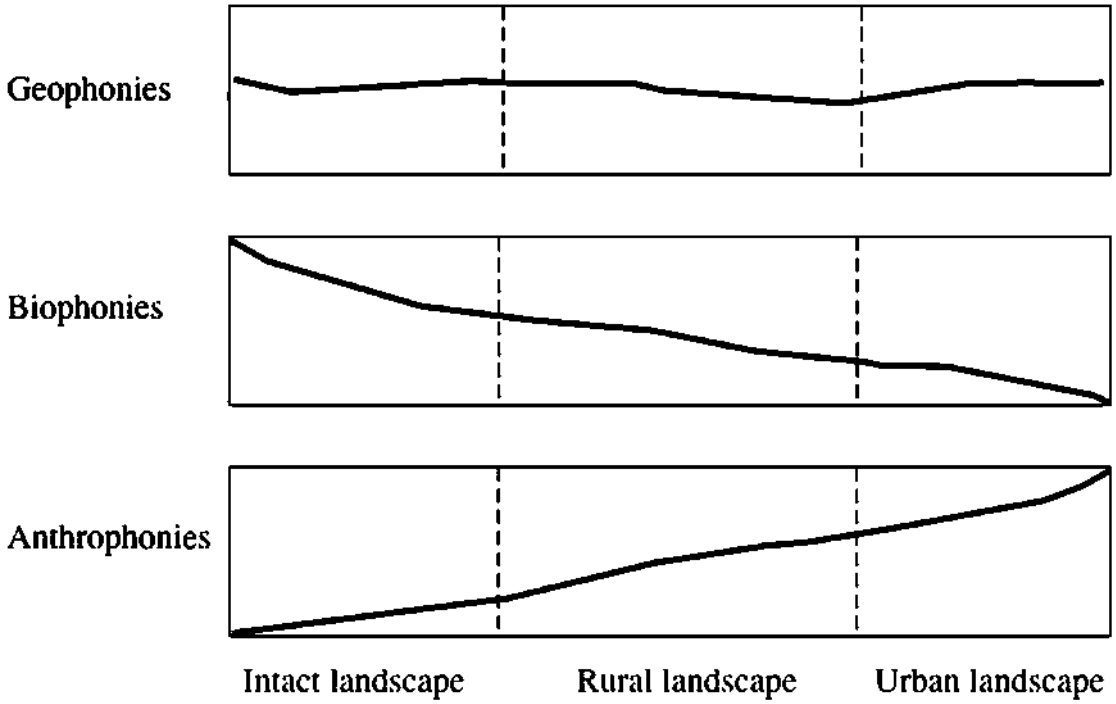




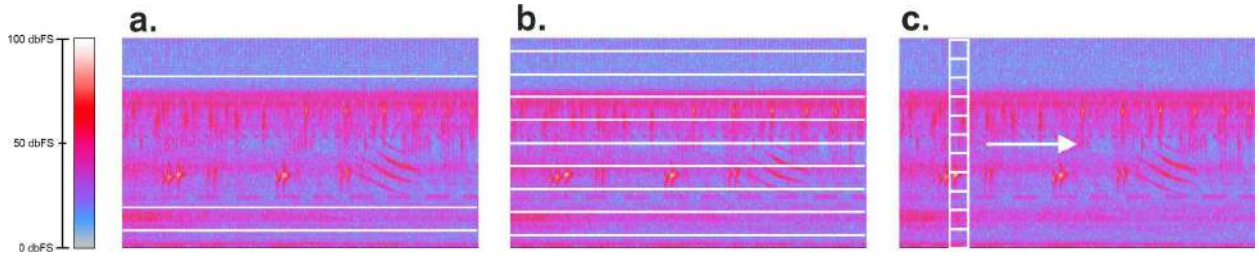
Ecoacústica

Paisaje acústico





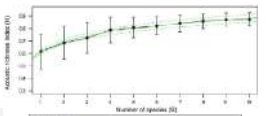
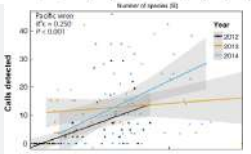
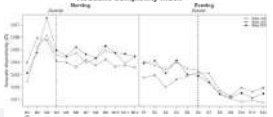
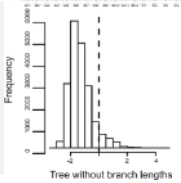
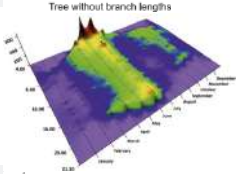
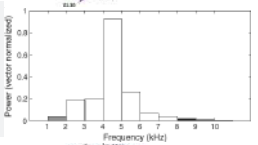
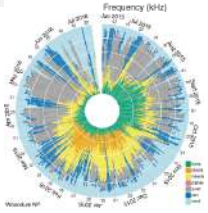
Índices acústicos



BIOLOGICAL REVIEWS
Cambridge Philosophical Society
Biol. Rev. (2022), pp. 000–000.
doi: 10.1111/brv.12890

Acoustic indices as proxies for biodiversity: a meta-analysis

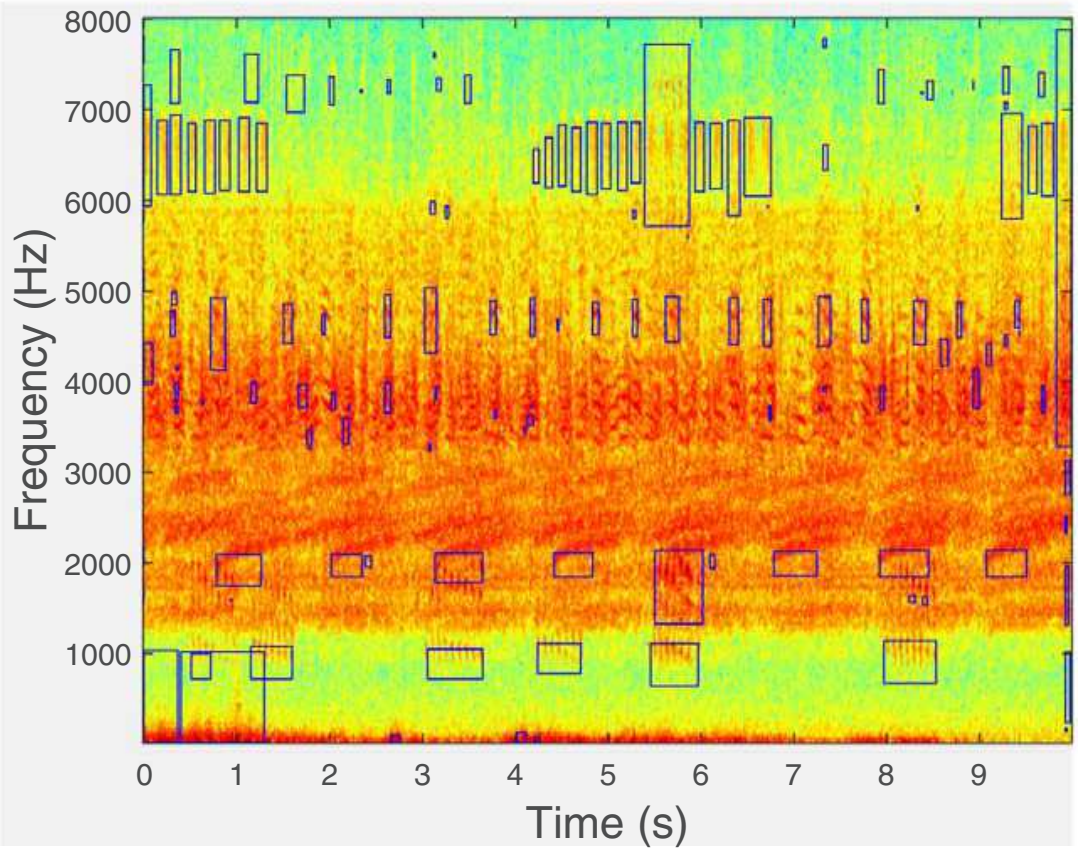
Table 1. Main applications of acoustic indices on the assessment of biodiversity and ecosystems

Study parameter	Application	Representation	Example
Species richness	Surrogate of the number of signalling species from passive acoustic recordings, used to determine the diversity of local communities		Sueur *et al.* (2008)
Abundance of sounds	Surrogate of the number of specific types of sounds or signals produced by a given species or animal chorus (identified or unidentified taxa), used to determine the intensity of acoustic activity		Pieretti *et al.* (2011); Buxton *et al.* (2016)
Species composition	Estimation of the similarity of soundscapes among communities or periods over time, used to identify changes in species composition or habitat structure		Sueur *et al.* (2008); Depraetere *et al.* (2012)
Overall biological diversity	Surrogate of biological aspects of animal communities other than species richness (e.g. phylogenetic or functional diversity), used to represent a global overview of biological diversity		Gasc *et al.* (2013*b*)
Acoustic activity patterns	Description of temporal and spatial patterns of acoustic activity of species or communities, used to compare species' calling phenology		Farina *et al.* (2013)
Soundscape composition	Determination of the relative contribution of sound sources (e.g. anthrophony and biophony) to soundscapes, used to describe their structure and dynamics		Kasten *et al.* (2012); Gage & Axel (2014)
Soundscape visualisation	Visual representation of long time series of audio data, used to identify acoustic events and describe their structure and dynamics		Phillips *et al.* (2018); Towsey *et al.* (2018)

(Continues on next page)

Soundscape Ecology

Clasificación de sonidos



Acoustic Template Detection in R

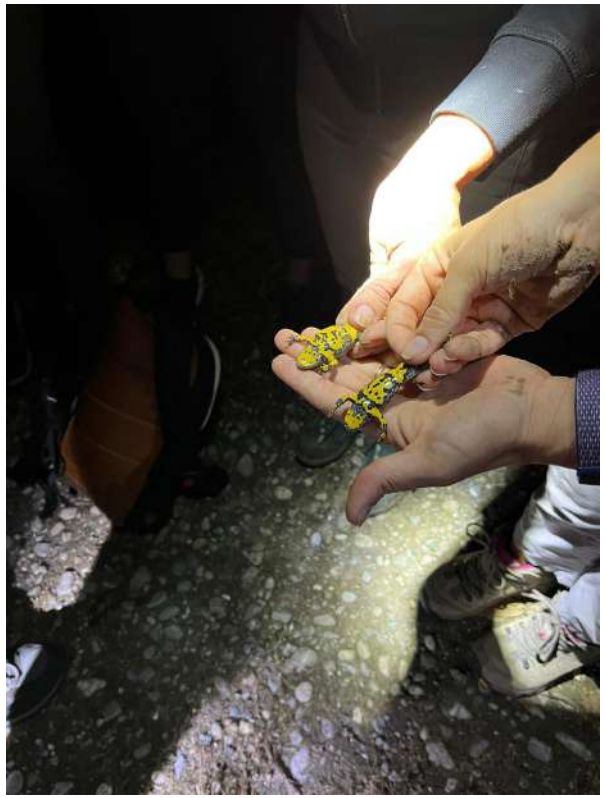
Documentation for package 'monitoR' version

WILDLIFE ACOUSTICS

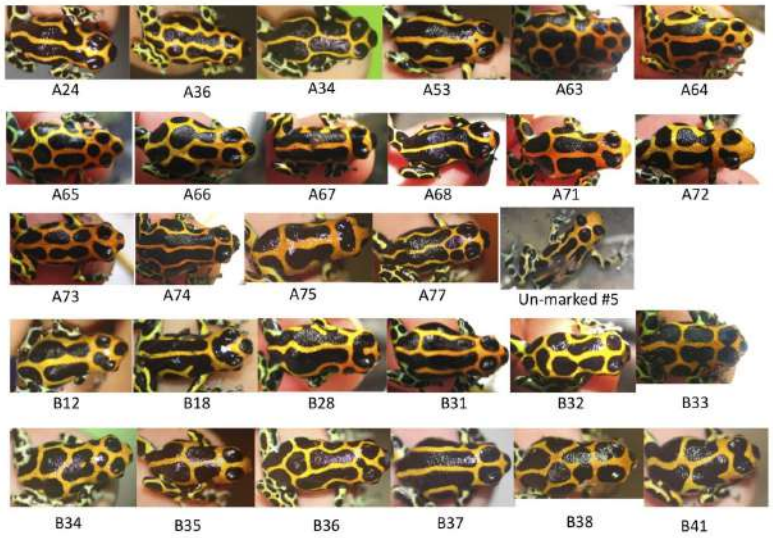
Kaleidoscope Pro 5

Identificación y marcaje de individuos

1.Técnicas de identificación por manchas y patrones de la piel

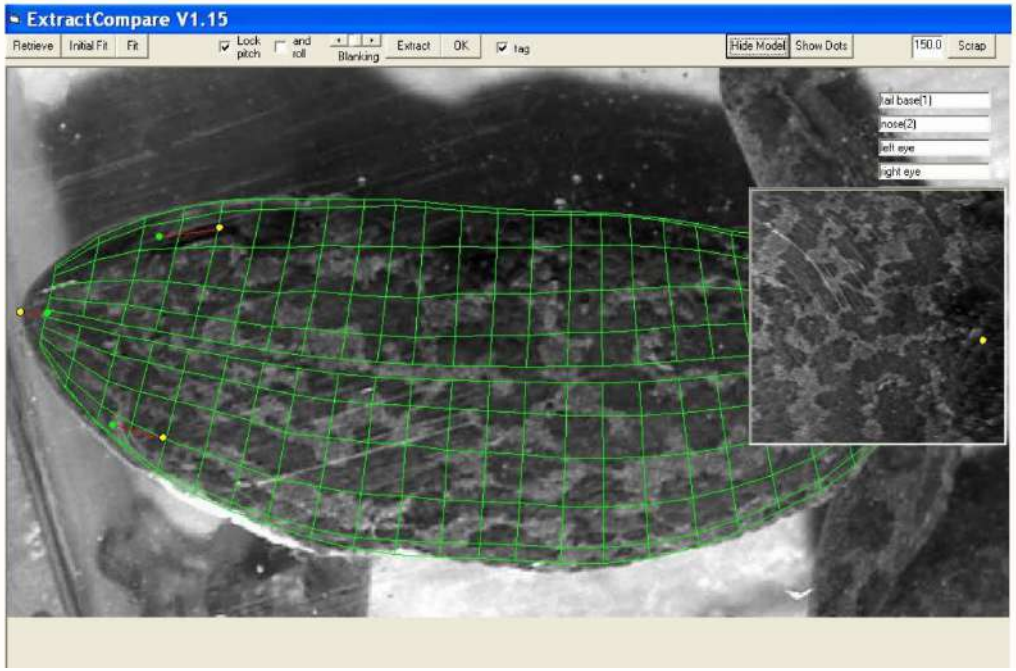


Bombina variegata



EXTRACT COMPARE - FROG

The picture on this page illustrates the process of scanning patterns from photos of chorus frogs. By fitting a 3D surface model to the image our programs capture a pattern that is unaffected by the camera angle or posture. They then go on to compare the new pattern with previous patterns stored in a library and display the most likely matches. Suitable images may be from researchers or tourists and the resulting database of match results can be used to provide the usual benefits of mark/recapture studies: monitoring of population size and other parameters, determining the fate of individual animals, encouraging cooperation between different research groups. The programs will also match images of a live animals to images of skins and can thus be used to help in tracing their



FREE SOFTWARE DOWNLOAD

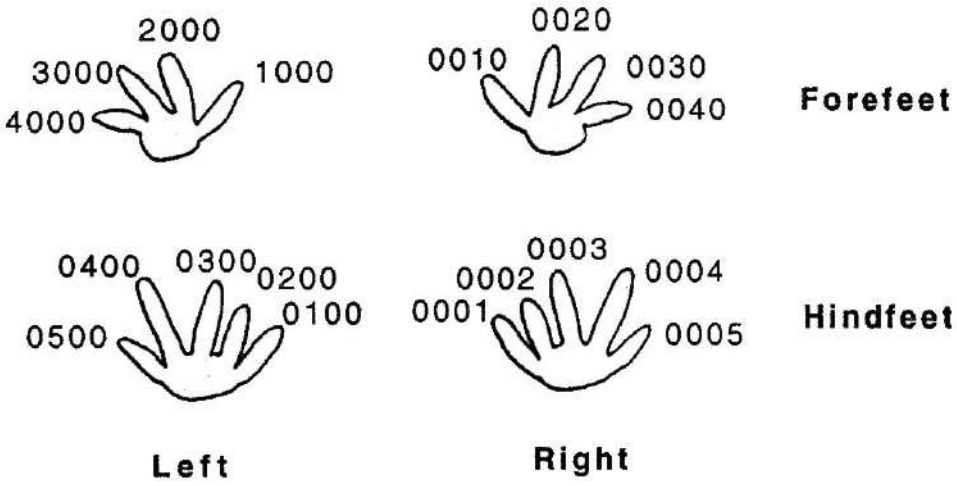
To try out the software first unzip the following "frog_demo_folders.zip" file to your c: drive, where it will make a "c:\frog_demo\" folder with a number of subfolders containing sample images and pattern extracts. The "c:\frog_demo\" folder will also contain an Access database called "frog_demo.mdb" and a "Usage_notes.doc" explaining the process of entering new images, extracting patterns from those images and comparing the patterns to the library in order to search for earlier images of the same animal.

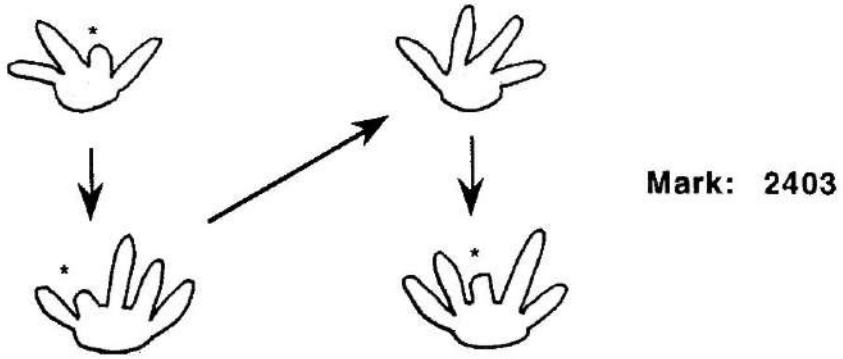
Then open the "ExtractCompare_install.zip" file and double-click the "setup.exe" program. Please answer "yes" to retain any files that would otherwise be overwritten by older files.

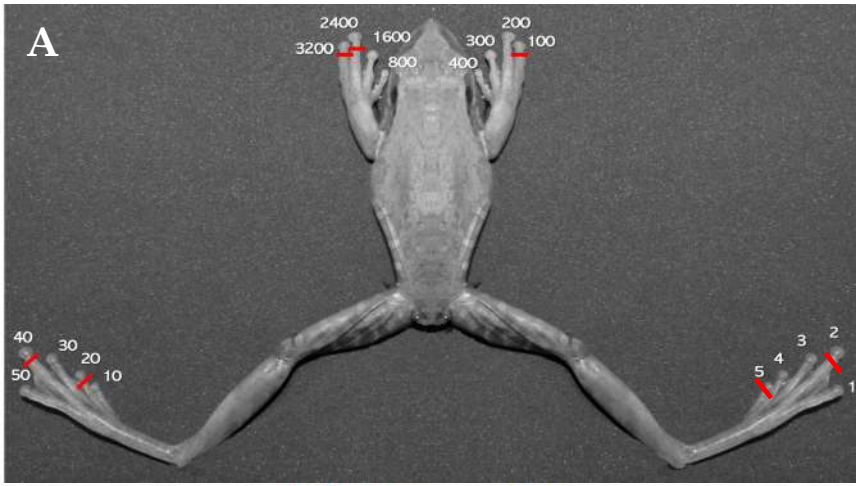
When installation is complete click on "ExtractCompare" in the programs list or the "Extract/Compare" button in the "frog_demo.mdb" database. Then please follow the steps in "Getting started" section of the "Usage_notes.doc" document to see how the sytem is run to search a catalogue

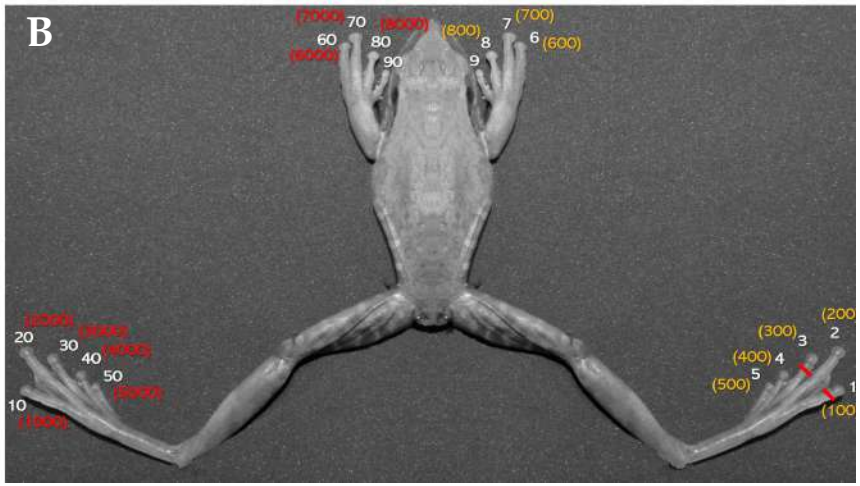
Técnicas de marcado

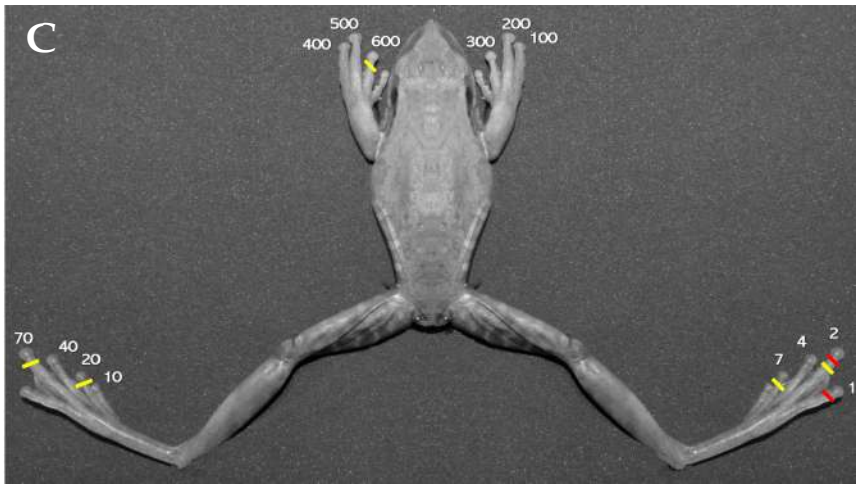
1. Corte de falanges





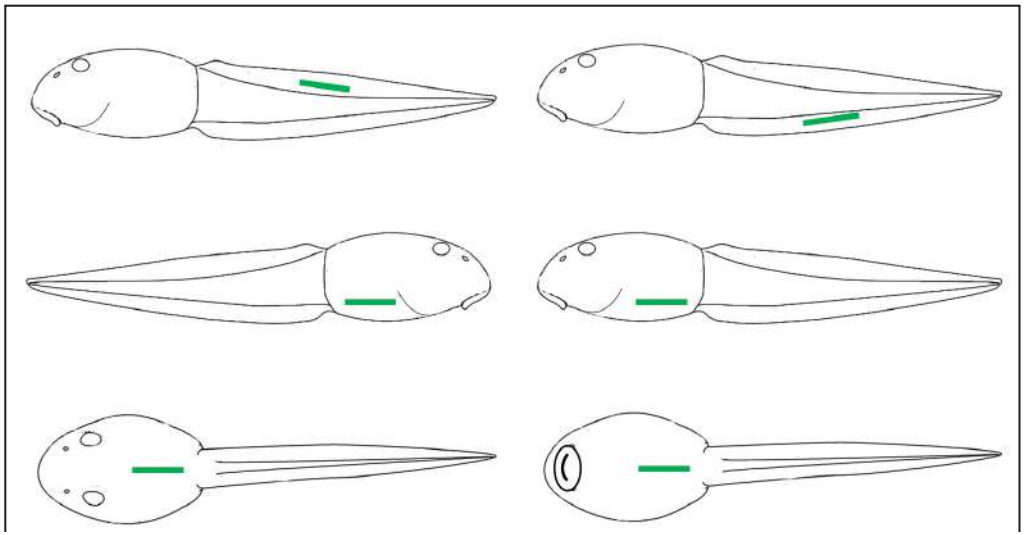




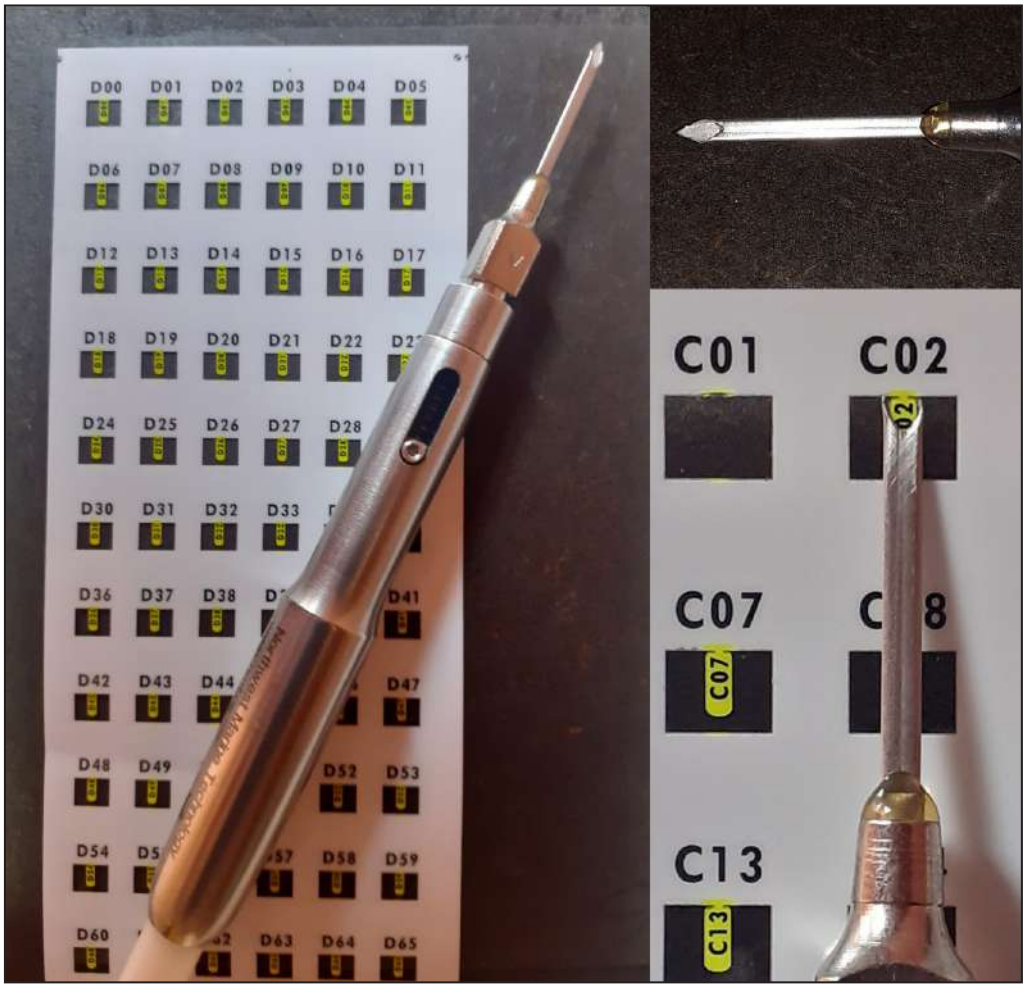


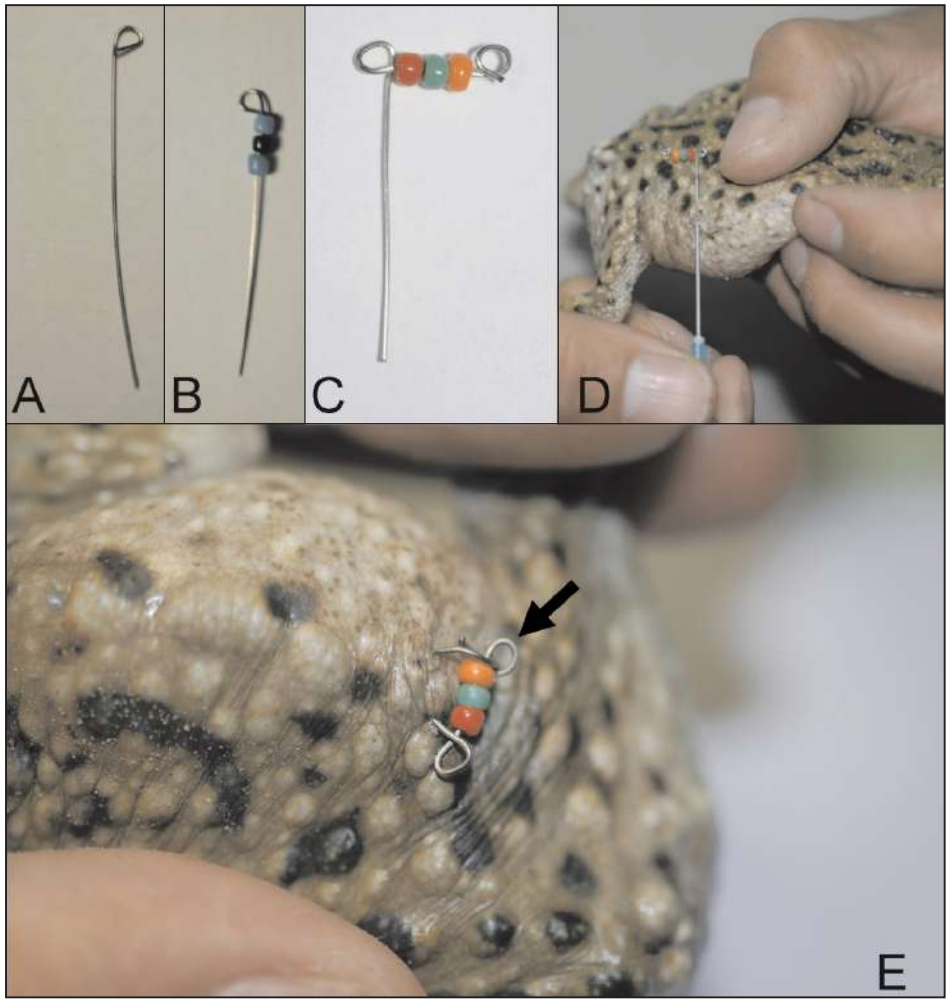
Etiquetas electrónicas pasivas internas (Passive Integrated Transponder, PIT)

Implante visible de elastómeros (Visual Implant Elastomer, VIE)



Implantes visuales alfanuméricos (Visual Implant Alphanumeric, VIA)

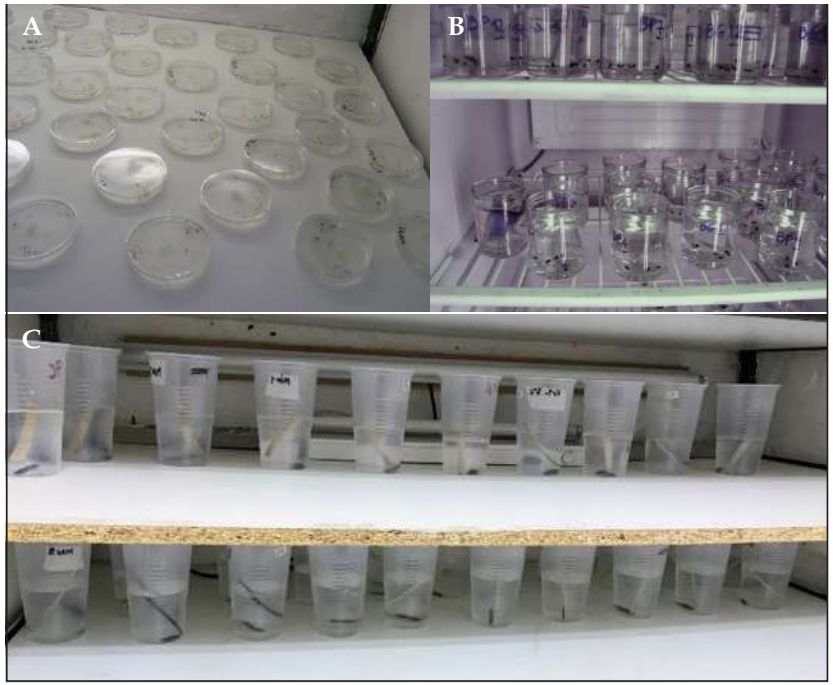




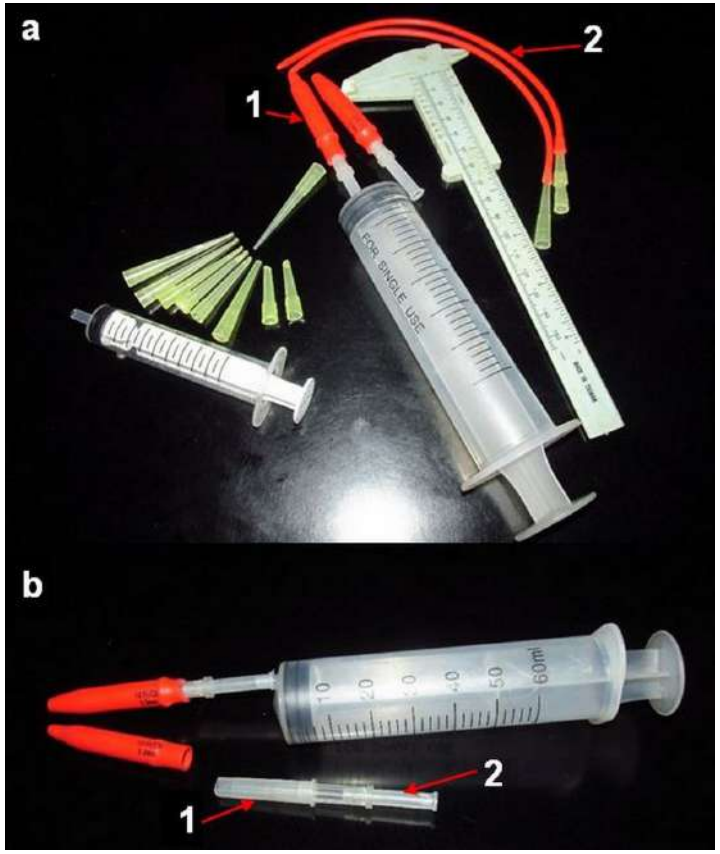
Cinturones y piercings

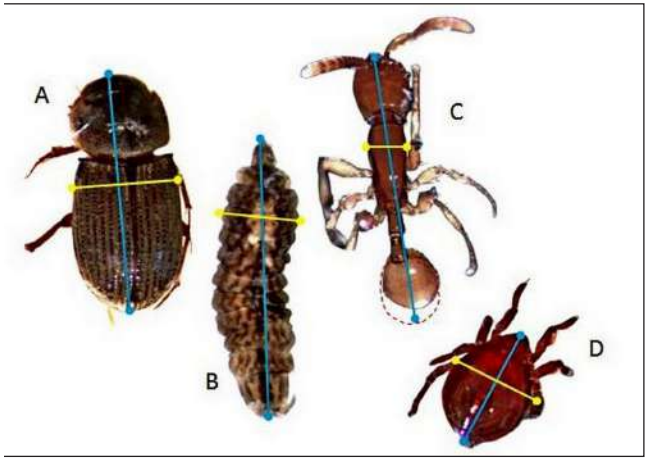
Color	Primera perla	Segunda perla	Tercera perla (multiplicador)
Negro	0	0	0
Marrón	1	1	10
Rojo	2	2	100
Naranja	3	3	1000
Amarillo	4	4	10000
Verde	5	5	100000
Azul	7	7	1000000
Violeta	8	8	10000000
Gris	9	9	100000000
Blanco	10	10	1000000000

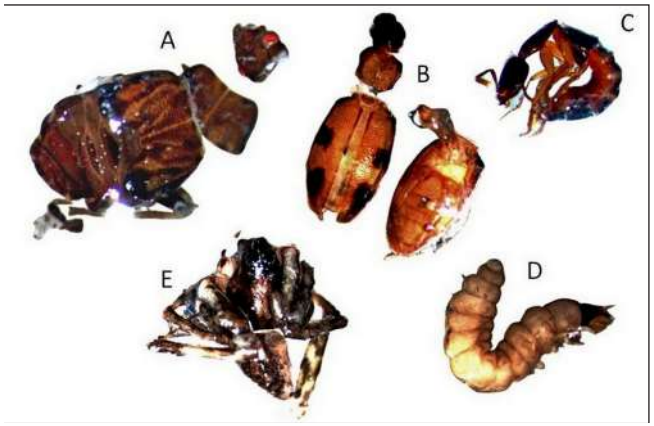
Estudios en microcosmos



Estudios de dieta







Manipulación de organismos:

- Uso de guantes lavados

Capturas:

- obtener la mayor cantidad de información posible de cada individuo (medidas morfométricas, peso, material genético…)
- Información del ambiente (sustrato, meteorología)
- depositar en colecciones científicas
- Eutanasia (técnico acreditado por la CHEA) utilizando anestésicos


Línea de trabajo:
Comprender la estructura en tiempo y espacio y funcionamiento de comunidades de anuros

Algo de lo ya hecho…

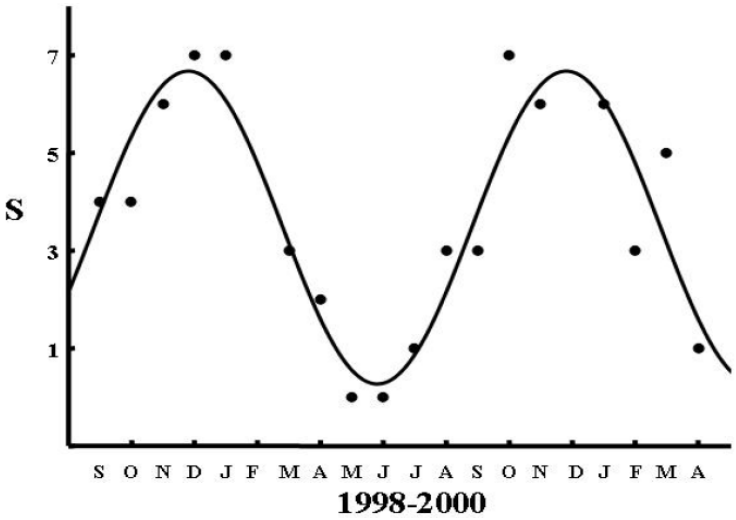
Table 2. Ranks of relative abundance for each species of the anuran assemblage at Espinas Stream, Maldonado, Uruguay, from September 1998 to April 2000. 1 = one calling male, 2 = two or three calling males, 3 = more than three calling males with calls being distinguishable from each other, 4 = chorus, S = number of species calling, A = sum of the estimated abundances of all active species, Nº = number of different months where the species was registered (in a 12 months scheme).

	1998				1999										2000				
Species	S	O	N	D	J	M	A	M	J	J	A	S	O	N	J	F	M	A	N°
Hypsiboas pulchellus	4	2	4	4	4	4	4			4	4	3	3	3	4	1	4	2	10
Pseudis minuta	2	2	3	2	2	4	1				3	1	3	3	2	1	1		8
Physalaemus gracilis	4	4	4	4	3						1	4	4	4	3		1		7
Scinax granulatus	1		3		1								4	2	1				4
Leptodactylus latinasus		1	1										3	4	3	1			4
Leptodactylus ocellatus			3	2	4	1							3						5
Leptodactylus gracilis													1	2	2				3
Elachistocleis bicolor				2	2												2		3
Odontophrynus americanus				2													4		2
Rhinella gr. *granulosus*				4	4														2
S	4	4	6	7	7	3	2	0	0	1	3	3	7	6	6	3	5	1	
A	11	9	18	20	20	9	5	0	0	4	8	8	21	18	15	3	12	2	

North-Western Journal of Zoology Vol. 4, No. 1, 2008, pp.29-41
[Online: Vol.4, 2008: 07]

Calling activity patterns in an anuran assemblage: the role of seasonal trends and weather determinants

Andrés CANAVERO[1,2,*], Matías ARIM[2,3], Daniel E. NAYA[3],
Arley CAMARGO[2,5], Inés da ROSA[2] and Raúl MANEYRO[2,4]

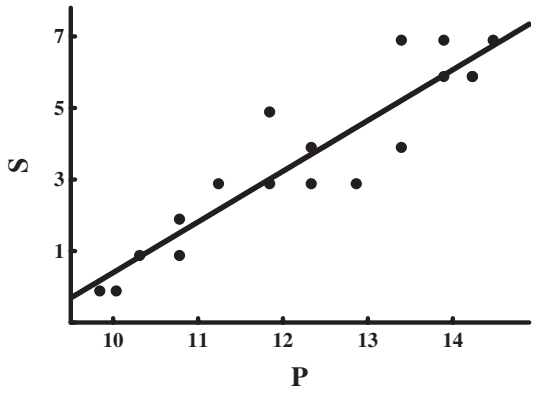


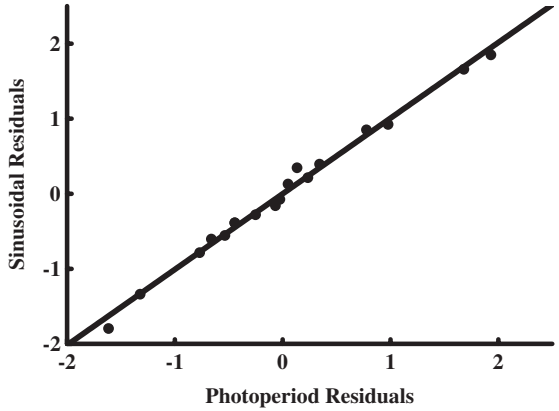
Journal of Natural History
Vol. 43, Nos. 45–48, December 2009, 2975–2984

Taylor & Francis
Taylor & Francis Group

Clues supporting photoperiod as the main determinant of seasonal variation in amphibian activity

Andrés Canavero[a,b]* and Matías Arim[b,c]





JOURNAL OF NATURAL HISTORY
2021, VOL. 55, NOS. 31–32, 1941–1955
https://doi.org/10.1080/00222933.2021.1975838

Taylor & Francis
Taylor & Francis Group

Calling phenology of anurans in a tropical rainforest in South Mexico: testing predictive models

Diana Laura Fuentes-de la Rosa[a], Leticia Margarita Ochoa-Ochoa[a] and Andrés Canavero[b]

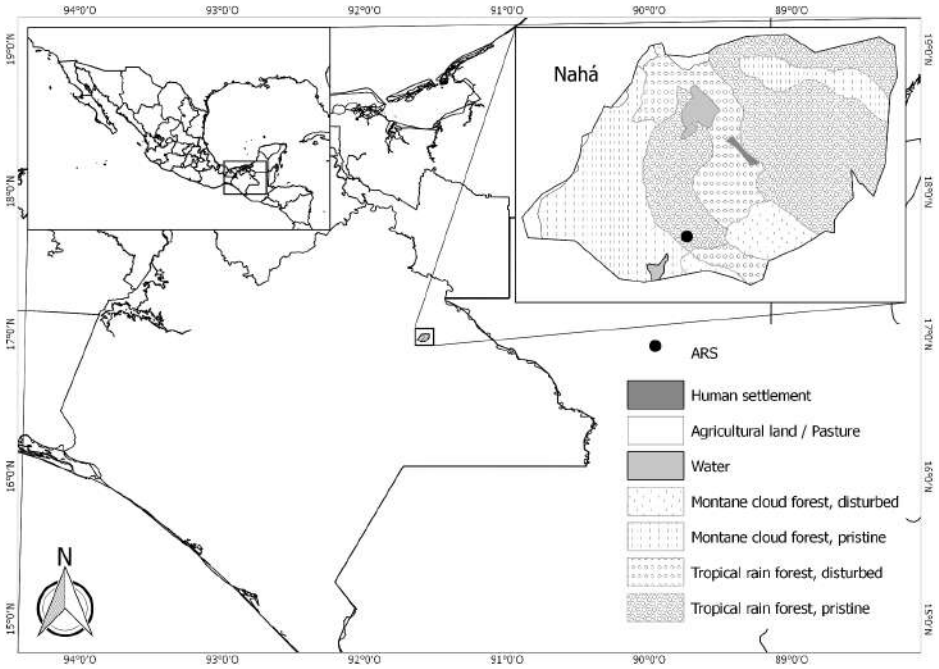
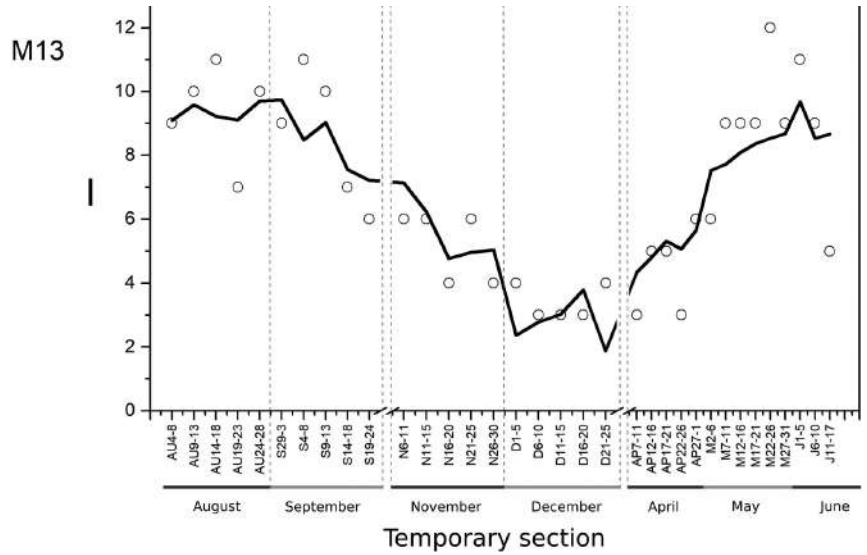


Figure 1. Study site location and land use, natural protected area of Nahá, Ocosingo, Chiapas, México.



$$I \sim Ime + Iamp * \sin(2\pi(t + c)/72) + D * R_a + E * DW$$

LOS ANUROS COMO MODELO DE ESTUDIO DE FENOLOGÍAS
FENOLOGÍAS DE CANTO

Table 2. Ranks of relative abundance for each species of the anuran assemblage at Espinas Stream, Maldonado, Uruguay, from September 1998 to April 2000. 1 = one calling male, 2 = two or three calling males, 3 = more than three calling males with calls being distinguishable from each other, 4 = chorus, S = number of species calling, A = sum of the estimated abundances of all active species, Nº = number of different months where the species was registered (in a 12 months scheme).

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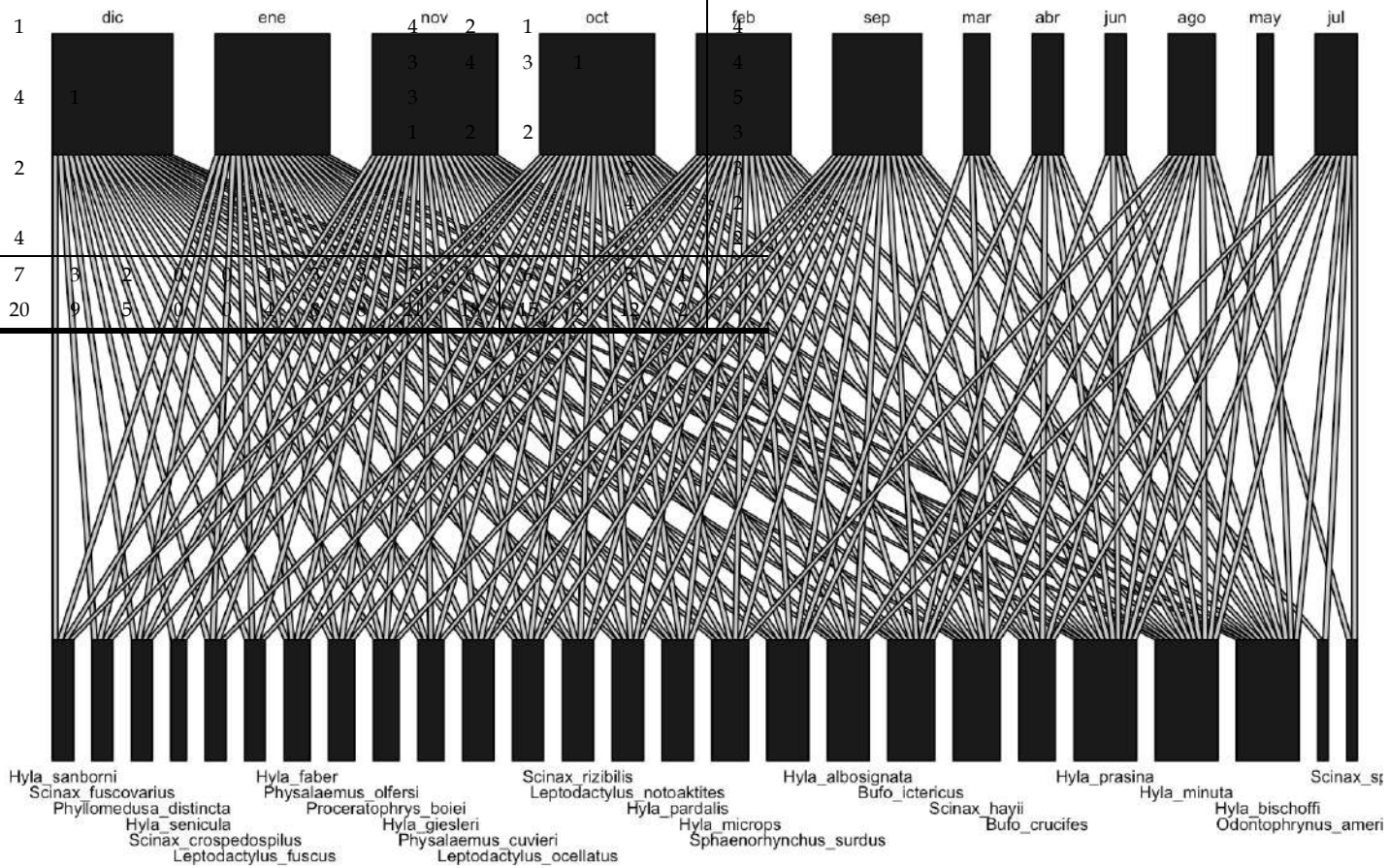
Hypsiboas pulchellus	4	2	4	4	4	4	4			4	4	3	3	3	4	1	4	2	10
Pseudis minuta	2	2	3	2	2	4	1				3	1	3	3	2	1	1		8
Physalaemus gracilis	4	4	4	4	3						1	4	4	4	3		1		7
Scinax granulatus	1		3		1								4	2	1				4
Leptodactylus latinasus		1	1										3	4	3	1			4
Leptodactylus ocellatus			3	2	4	1							3						5
Leptodactylus gracilis													1	2	2				3
Elachistocleis bicolor				2	2											2			3
Odontophrynus americanus				2												4		2	3
Rhinella gr. *granulosus*				4	4													2	3
S	4	4	6	7	7	3	2	0	0	1	3	3	5	5	5	3	3	1	
A	11	9	18	20	20	9	5	0	0	4	8	8	20	18	15	7	12	2	



Austral ECOLOGY A Journal of ecology in the Southern Hemisphere

Austral Ecology (2019) **44**, 1451–1462

Phenological modularity in amphibian calling behaviour: Geographic trends and local determinants

ANDRÉS CANAVERO,[1,2]* MATÍAS ARIM,[2] FERNANDA PÉREZ,[3] FABIAN M. JAKSIC[1,3] AND PABLO A. MARQUET[3,4,5]

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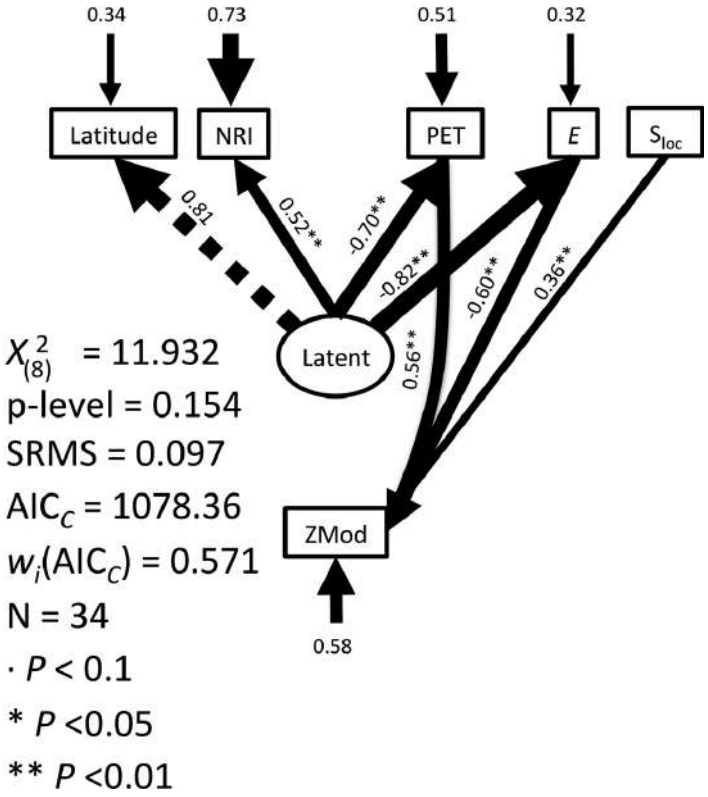
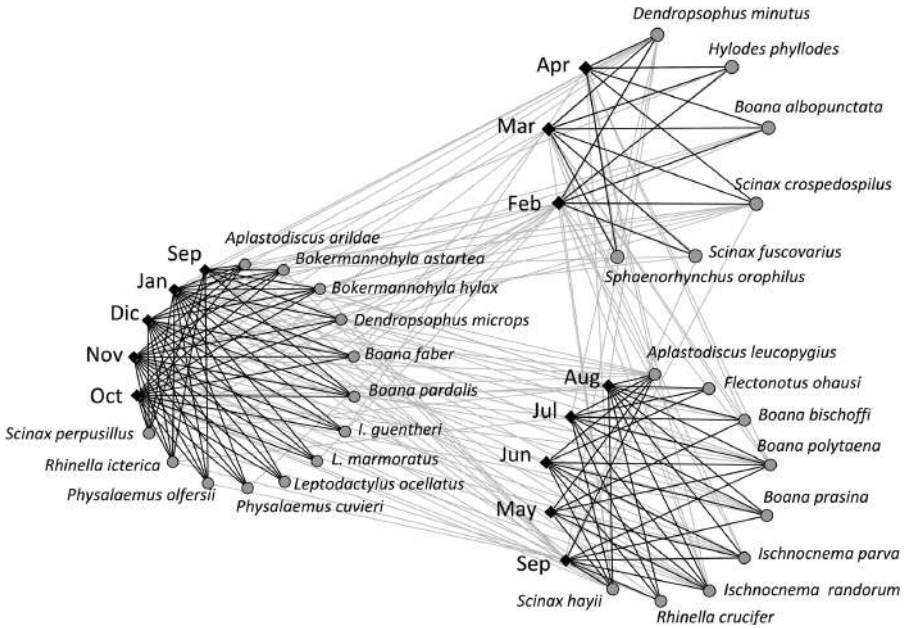




ECOGRAPHY

Research

A metabolic view of amphibian local community structure: the role of activation energy

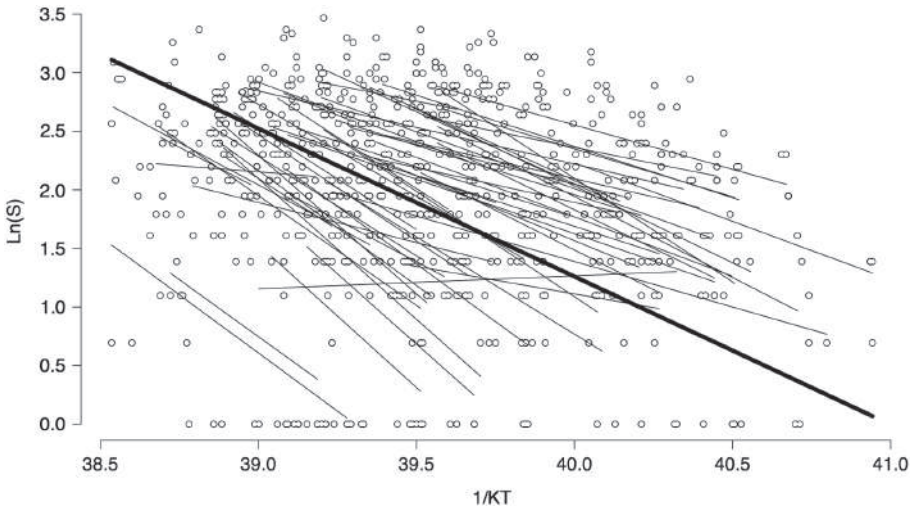
Andrés Canavero, Matías Arim, Fernanda Pérez, Fabián M. Jaksic and Pablo A. Marquet

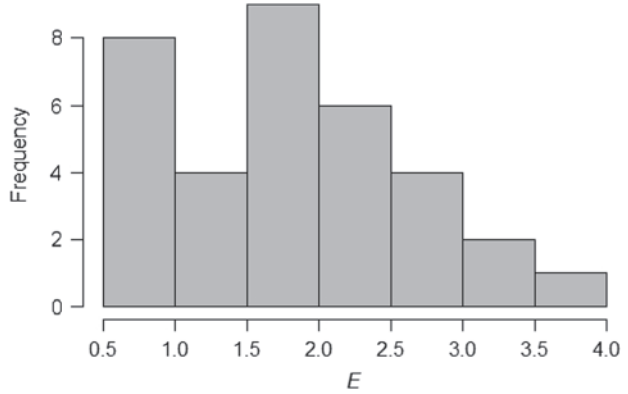
A. Canavero (acanavero@gmail.com) and F. M. Jaksic, Center of Applied Ecology and Sustainability (CAPES), Depto de Ecología, Pontificia Univ. Católica de Chile, Santiago, Chile. AC also at: Centro Univ. de Rivera, Univ. de la República, Rivera, Uruguay. – M. Arim and AC, Depto de Ecología y Gestión Ambental, Centro Univ. Regional Este, Univ. de la República, Maldonado, Uruguay (CURE). MA also at: Facultad de Ciencias, Univ. de la República Uruguay, Montevideo, Uruguay. – F. Pérez, P. A. Marquet, AC and FMJ, Depto de Ecología, Facultad de Ciencias Biológicas, Pontificia Univ. Católica de Chile, Santiago de Chile, Chile. PAM also at: Inst. de Ecología y Biodiversidad (IEB), Santiago, Chile, and The Santa Fe Inst., Santa Fe, NM, USA.

Ecography
41: 388–400, 2018
doi: 10.1111/ecog.02336

Subject Editor: Alison Boyer
Editor-in-Chief: Miguel Araújo
Accepted 25 January 2017

In the context of the metabolic theory of ecology (MTE), the activation energy (E) reflects the temperature dependence of metabolism and organism performance in different activities, such as calling behavior. In this contribution we test the role of temperature in affecting local amphibian community structure, particularly the number of species engaged in calling behavior across a temperature gradient. Toward this aim, we compiled phenological calling activity for 52 Neotropical anuran communities. For each community we estimated the activation energy of calling behavior (E), finding values significantly higher than previous reports. A wide range of methodological issues with the potential to produce overestimated E-values were shown to have no significant effect on reported E-values, supporting a biological interpretation of their high values and of geographic trends. Further, a path analysis related variation in E among communities with communities' phylogenetic structure, local environmental conditions, richness, and seasonality. The decrease of activation energy at higher latitudes and less productive environments suggests that amphibians' activity could become more dependent of internal individuals' resources once external sources are reduced. The increase in phylogenetic attraction with latitude points to a rise in the role of niche conservatism and community filtering operating over conserved traits. Finally, flexibility in activation energy related to amphibians' calling could be an important and poorly recognized determinant of their thermal dependence. The temporal structuring of amphians' communities was related here with the interplay between ecological and evolutionary





1. Metacomunidades de anfibios en el Área Protegida Laguna Garzón

Lista de especies de anfibios de del Área Protegida Laguna Garzón

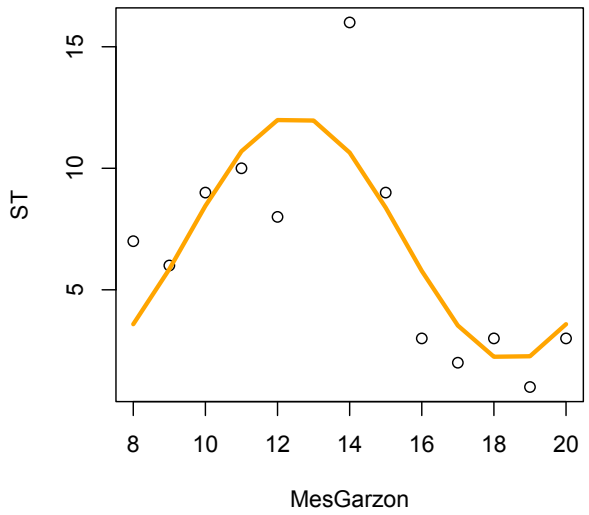
Familia Hylidae
1-*Boana pulchella*
2-*Scinax squalirostris*
3-*Scinax granulatus*
4-*Dendropsophus sanborni*
5-*Pseudis minuta*

Familia Leptodactylidae
6-*Leptodactylus* latrans
7-*Leptodactylus gracilis*
8-*Leptodactylus latinasus*
9-*Leptodactylus mystacinus*
10-*Physalaemus gracilis*
11-*Physalaemus biligonigerus*
12-*Pseudopaludicola falcipes*

Familia Bufonidae
13-*Melanophryniscus montevidensis*
14-*Rhinella gr. granulosus*
15-*Rhinella arenarum*

Familia Odontophrynidae
16-*Odontophrynus americanus*
17-*Odontophrynus maisuma*

Familia Microhylidae
18-*Elachistocleis bicolor*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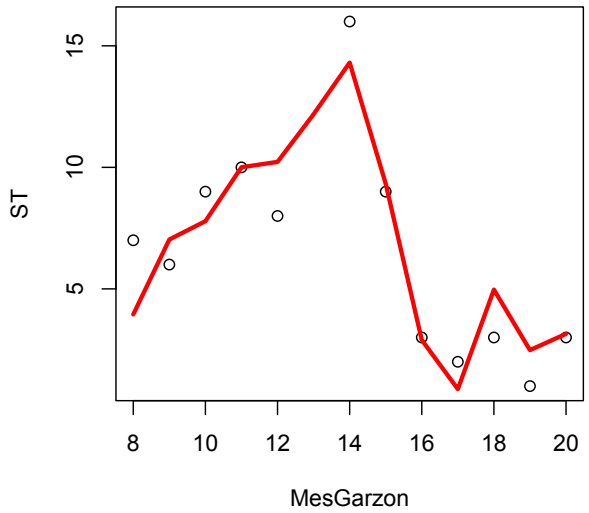
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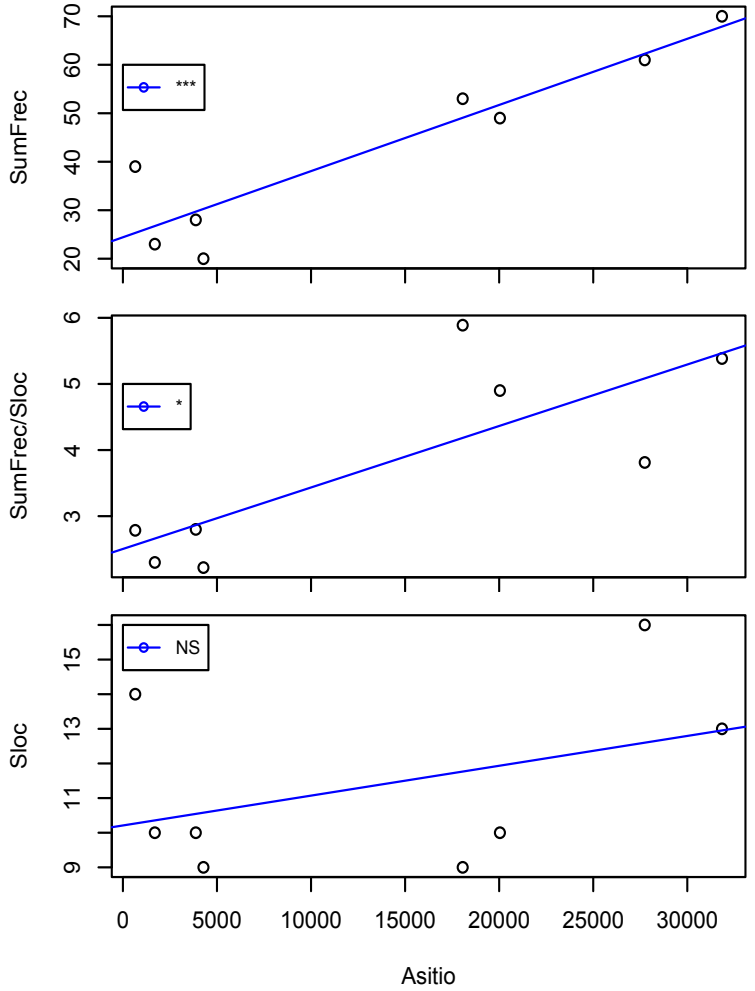
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50
60
70
SumFrec/Sloc
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5
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Sloc
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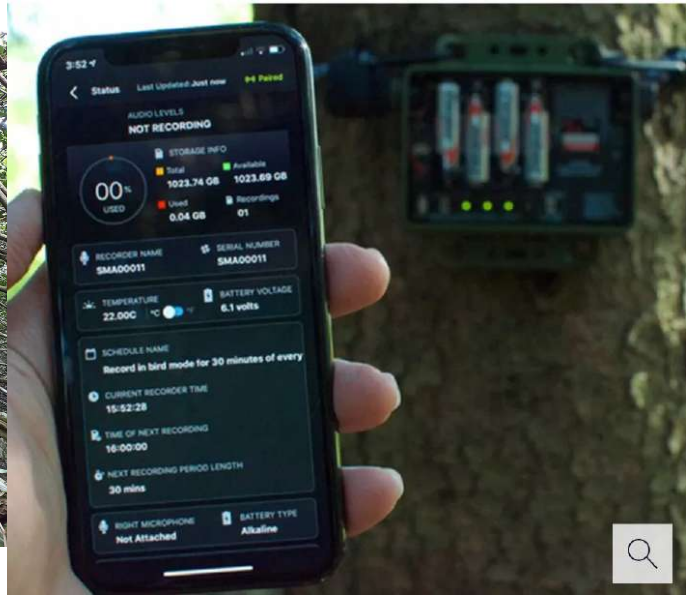
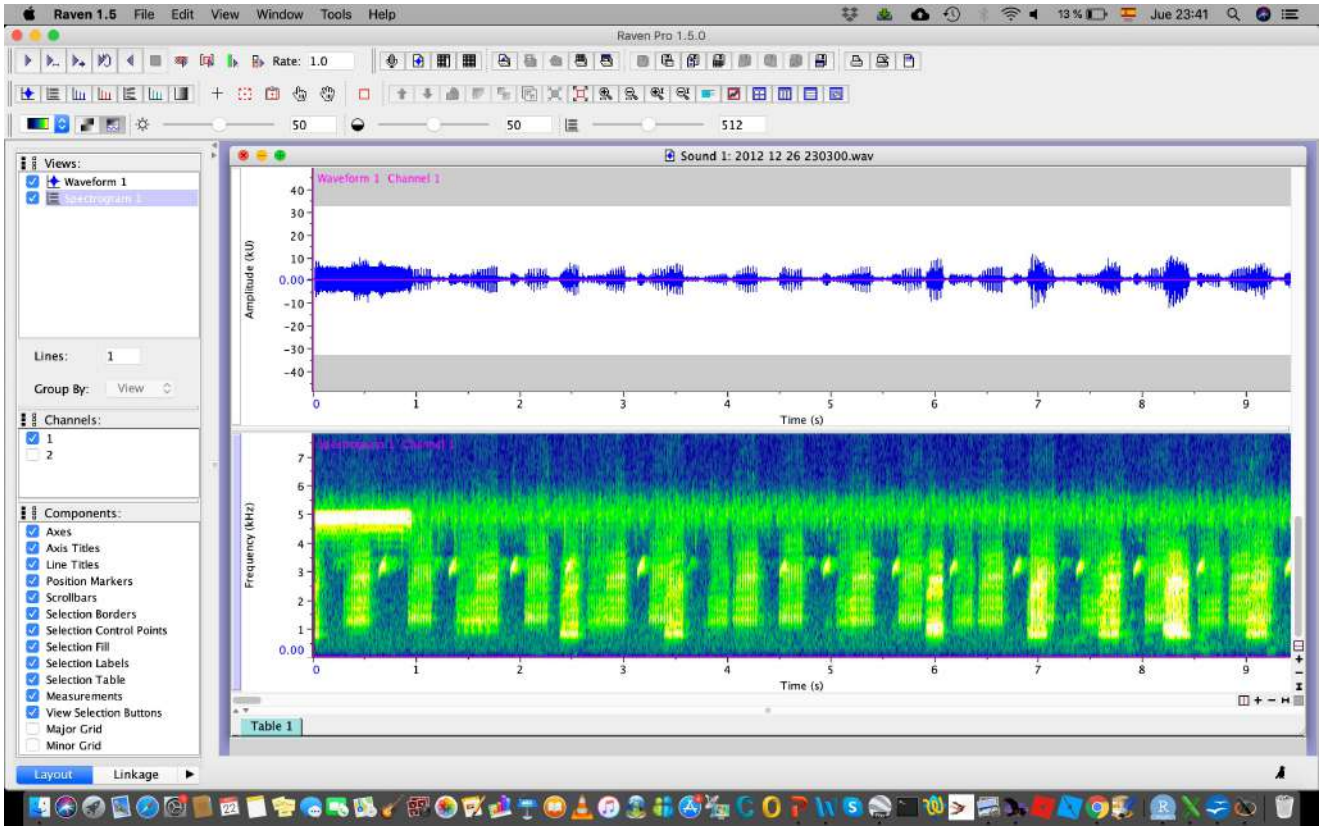
Asitio

2. Diversidad acústica en las áreas protegidas costeras





seewave

INTERACTIVE SOUND ANALYSIS SOFTWARE
RAVEN
The Cornell Lab of Ornithology
Bioacoustics Research Program

Soundscape Ecology

WILDLIFE ACOUSTICS
Kaleidoscope Pro 5

2. Diversidad acústica en las áreas protegidas costeras

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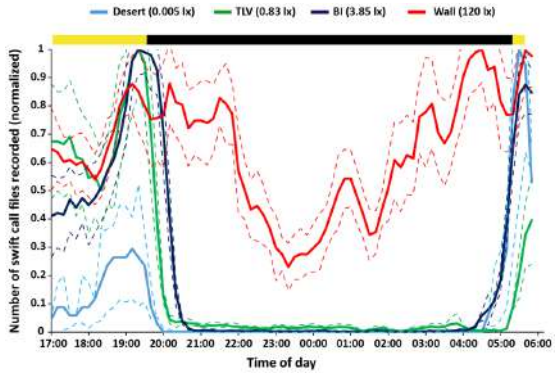
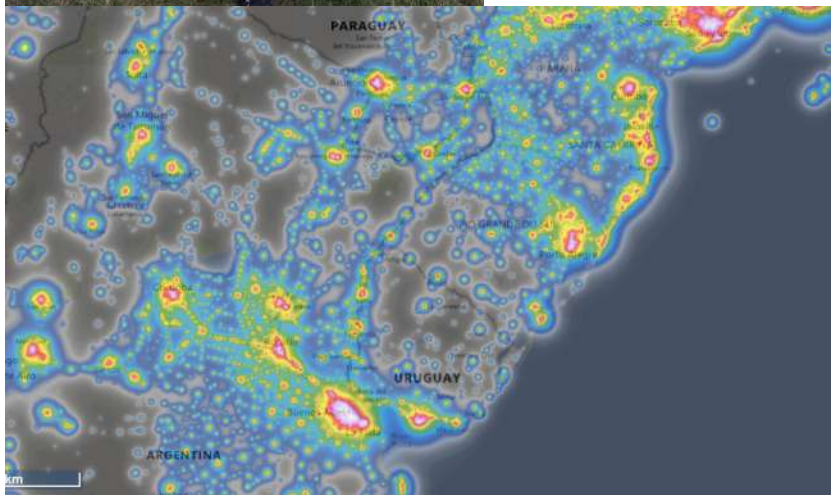
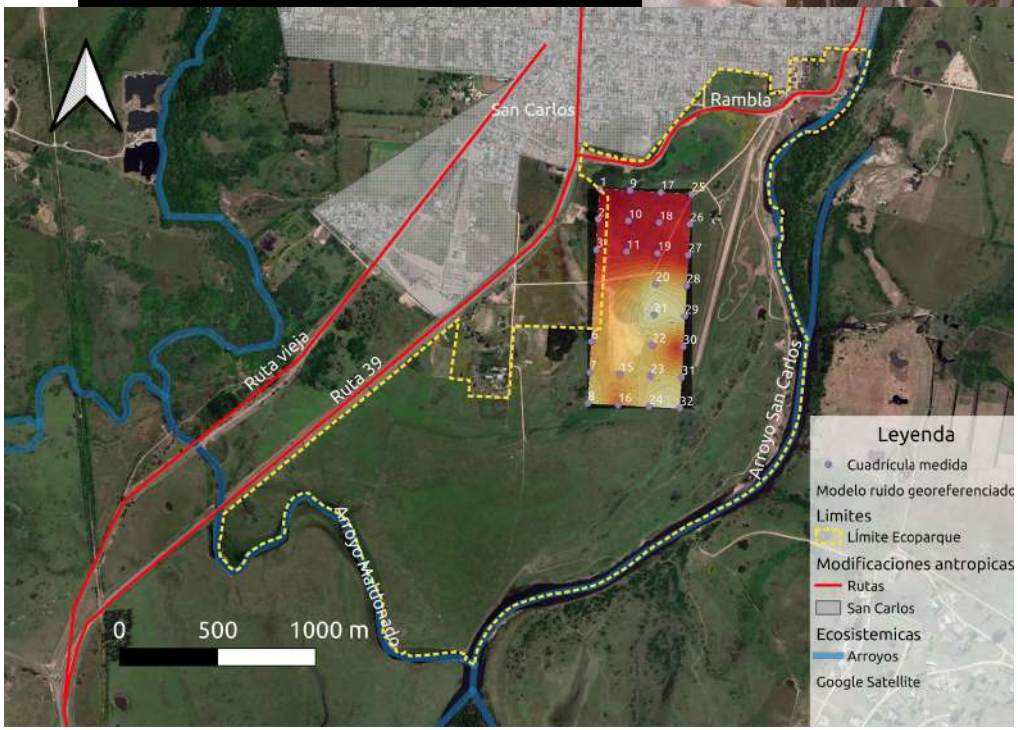
3. Monitoreo acústico de una metacomunidad de anfibios (Barra Grande, Laguna de Castillos, Rocha)
4. Efectos de la contaminación lumínica y sonora sobre sistemas biológicos: Las Brujas, Canelones; San Carlos, Maldonado







Manual de técnicas y protocolos para el relevamiento y estudio de anfibios de Argentina

Laura Pereyra
Eduardo Etchepare
Marcos Vaira
Editores