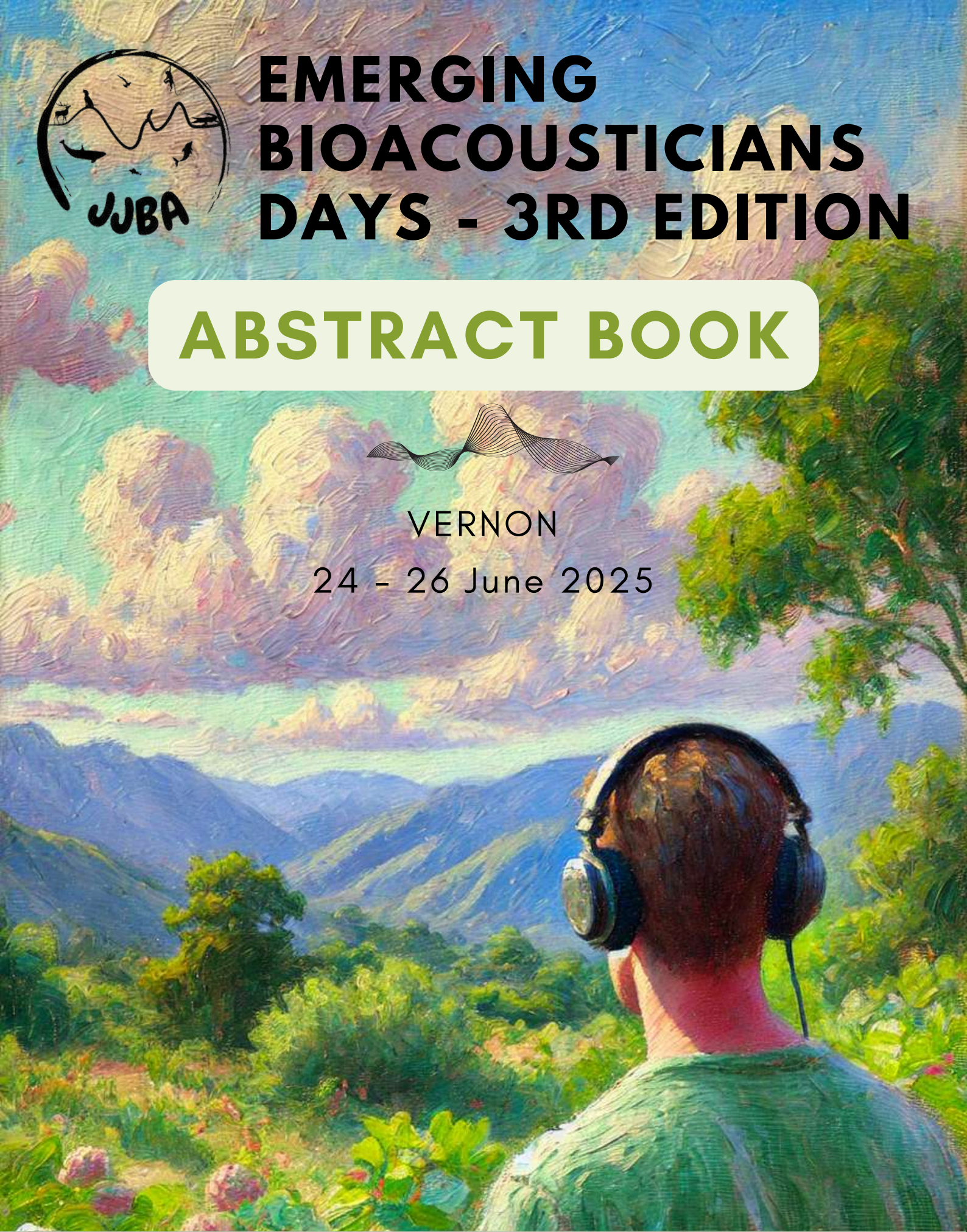
EMERGING BIOACOUSTICIANS DAYS - 3RD EDITION

ABSTRACT BOOK

VERNON

24 - 26 June 2025



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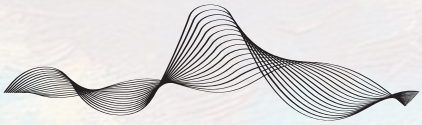
WELCOME!



The idea of organizing days bringing together young researchers in bioacoustics was born in 2021. After two years of work, the first Emerging Bioacousticians Days took place in June 2023 in Saint-Étienne and the second edition held in 2024 in Brest. This year's third edition takes place in Vernon, Normandy.

Over the past decades, research in bioacoustics has experienced significant growth. Bioacoustics is a scientific discipline at the interface between physical acoustics and animal biology.
Originally stemming from the study of animal behavior, bioacoustics has diversified and remains profoundly multidisciplinary today. It draws upon various scientific fields such as biology, mathematics, physics, psychology, linguistics, computer science, and engineering.
The Emerging Bioacousticians Days aim to highlight the richness, diversity, and quality of the work produced by young researchers in bioacoustics. The convivial and constructive atmosphere fostered during this conference will help promote interactions among young researchers and encourage interdisciplinary dialogue.

ORGANISING COMMITTEE

The organizing committee for the 3rd Emerging Bioacoustician Days consists of members from the ALBA association (Association Ligérienne de Bioacoustique). This dedicated team is responsible for planning and executing the event, ensuring a successful and enriching experience for all participants.

Patrick KAGERER, President ,University of Iceland
Marianne SARFATI, Vice-president Royal Holloway University of London
Justine GIRARDET, Treasurer, University of Toulon, LIS Laboratory, CIAN, France and University of Pavia, Italy
Loanne PICHOT, Secretary, UMRAE, Gustave Eiffel University-CEREMA Rouen
Salomé Martin-Marin, Astrolabe Expedition, Brest, France
Lorena BOISSEAU, Estación Biológica de Doñana- CSIC, Seville, Spain
Lucie JEAN-LABADYE, Sorbonne University, Paris, France
April HOUWELING, Simon Fraser University, Canada

PROGRAM

	Tuesday June 24	Wednesday June 25	Thursday June 26
09H00 - 09H15	WELCOME	Smart listening: Developing Bioacoustics tools	Acoustic Monitoring
09H15 - 09H30			First notes: Novel Characterizations & Repertoires
09H30 - 09H45			
09H45 - 10H00	Ecoacoustics in a changing world I		
10H00 - 10H15		Break 15'	
10H15 - 10H30	Break 15'	WORSHOP	
10H30 - 10H45	Ecoacoustics in a changing world II		Break 30'
10H45 - 11H00			
11H00 - 11H15			Acoustic Monitoring
11H15 - 11H30	Break 15'		
11H30 - 11H45	Sound in Space: geographic variation		
11H45 - 12H00			
12H00 - 12H15	LUNCH	LUNCH	LUNCH
12H15 - 12H30			
12H30 - 12H45			
12H45 - 13H00			
13H00 - 13H15			
13H15 - 13H30			
13H30 - 13H45	PLENARY SESSION Jeppe Have Rasmussen	PLENARY SESSION Michelle Spierings	PLENARY SESSION Corentin Troussard
13H45 - 14H00			
14H00 - 14H15			
14H15 - 14H30			
14H30 - 14H45	Break 15'	Break 15'	GOODBYE
14H45 - 15H00	Sound in Time: Acoustic Niches and Temporal Patterns	Perception and Production of Sounds	
15H00 - 15H15			
15H15 - 15H30			
15H30 - 15H45			
15H45 - 16H00	Break 15'		
16H00 - 16H15	SFECA	Break 15'	
16H15 - 16H30	Poster	GENERAL MEETING ALBA	
16H30 - 16H45			
16H45 - 17H00	Fondation de la mer		
17H00 - 17H15	Poster		
17H15 - 17H30			

TUESDAY JUNE 24

09H00	Welcome		
09H15			
09H30			
09H45	Cowans Amber	Using Passive Acoustic Monitoring and AI to Explore Responses of Forest Birds to Human Recreation in Scotland	Ecoacoustics in a changing world I
10H00	Minguet Raphael	A Deep Learning-Based Pipeline for Analyzing the Effects of Agricultural Practices on Bird Communities using acoustic data	
10H15	Break 15'		
10H30	Phan Olivier	Road noises persist in Alpine soundscapes over kilometers	Ecoacoustics in a changing world II
10H45	Roulet Yoann	Assessing effects of part-night lighting on green urban areas communities using passive acoustic monitoring	
11H00	Bodson Corentin	Investigating Mismatch and Asynchrony of Birds of the French Alps under climate change: a dynamic acoustic species distribution model (D-aSDM) approach.	
11H15	Break 15'		
11H30	Kwak Minkyung	Neighbours or Strangers?: Relationship between geographic and individual variation in Yellowhammer songs	Sound in Space: geographic variation
11H45	Singh Prabhjeet	Exploring geographic variation in non-songbird vocalisations	
12H00	LUNCH		
12H15			
12H30			
12H45			
13H00			
13H15			
13H30	PLENARY SESSION Jeppe Have Rasmussen		
13H45			
14H00			
14H15			
14H30	Break 15'		
14H45	Fouin Elise	Habitat use and foraging behavior study on Kerguelen islands' Commerson's dolphins' population	Sound in Time: Acoustic Niches and Temporal Patterns
15H00	Maucourt Léo	Chorus activity in a nocturnal aggregation area of green sea turtles *Chelonia mydas*	
15H15	Garcia de Oliveira Eliziane	Balearic Soundscapes: Investigating Acoustic Patterns and Environmental Drivers in Island Ecosystems	
15H30	Moore Ruby (ONLINE)	Testing the Effects of Reproductive Character Displacement on the Breeding Ecology of Sympatric Compared to Allopatric Populations of Upland Chorus Frogs (*Pseudacris feriarum*)	
15H45	Break 15'		
16H00	SFECA		
16H15	Escobar Agathe, Aguillon Samantha, Li Sixue, Turone Vittoria, Xavier Forte, Duchamp Axelle, Laute Amelie, Monge Inès, Tiberghien Marion, Volle Tifany, Dantin Lilou, McCafferty Sarah		
16H30			
16H45	Fondation de la mer		
17H00	Leroux Camille, Le Gal Anne-Sophie, Santos Pedro, Toro Gomez Maria Paula, Angonin Céline, Prévot Philémon, Elisa Belhassen, Bonelli Bianca, Touchais Arthur, Buisson Marie-Lou, Gidl Hannah		
17H15			

WEDNESDAY JUNE 25

09H00	Bernard Corentin	Data-driven Sampling Strategies for Fine-Tuning Bird Detection Models	Smart listening: Developing Bioacoustics tools
09H15	Biscarat Maud	Directional Regions Of Interest number for soundscape analysis	
09H30	Marshall-Hawkes Ruari	Modeling acoustic detectability using simulated data to improve BirdNET species abundance estimates	
09H45	Tisserant Maëlle	Enhancing Automatic Detection and Identification of Small Mammals Through Sound	
10H00	Break 15'		
10H15 10H30 10H45 11H00 11H15 11H30 11H45	WORKSHOP		
12H00 12H15 12H30 12H45 13H00 13H15	LUNCH		
13H30 13H45 14H00 14H15	PLENARY SESSION Michelle Spierings		
14H30	Break 15'		
14H45	De Witasse Thezy Aude	Categorical and semantic perception of the meaning of call-types in zebra finches	Perception and Production of Sounds
15H00	Eveillard Flavie	Categorical rhythms in the group singing of the indris.	
15H15	Morandi Ilaria	Can You hear me now? The limits of individual Yellowhammer song recognition	
15H30	Salis Ambre	No effect of note order on the response of coal tits to conspecific, heterospecific and artificial mobbing calls	
15H45	Valet Antoine	The role of grunt variants in chimpanzee vocal communication	
16H00	Break 15'		
16H15 16H30 16H45 17H00	GENERAL MEETING ALBA		

THURSDAY JUNE 26

09H15	Grenga Flavia	Distributed Acoustic Sensing for real-time monitoring of fin whales and marine acoustic pollution in the Western Ionian Sea	Acoustic Monitoring
09H30	Fergelot Inès	First acoustic catalogue of stereotyped calls from killer whales (*Orcinus orca*) in the Crozet Archipelago	First notes: Novel Characterizations & Repertoires
09H45	Mengarelli Alice	The whistles of the Ligurian common bottlenose dolphins: acoustic characterisation and signature whistle catalogue attempt	
10H00	Aarini Ghosh	Passive acoustic monitoring (PAM) of Ensiferan calling diversity in a sub-tropical forest of North-east India.	
10H15	Mejia-Tovar Diego	Vocal behavior of migratory new world warblers in wintering areas (Colombia)	
10H30	Break 30'		
10H45			
11H00	Aguilera Fanny	Density-dependent effects on hunting bats flight behaviour under lit and unlit condition : a 3D flight path reconstruction study for conservation	Acoustic Monitoring
11H15	Mariton Léa	The sound of wings beating: combined use of eco-acoustics and deep learning to monitor pollinators in agricultural environments	
11H30	Hammoudi Alexandre	The contribution of ecoacoustics to the protection of a critically endangered rainforest species, the African forest elephant (*Loxodonta cyclotis)*	
11H45	Guinet Pauline	Vol de Nuit : using AI and citizen science to monitor nocturnal bird migration	
12H00	LUNCH		
12H15			
12H30			
12H45			
13H00			
13H15			
13H30	PLENARY SESSION Corentin Troussard		
13H45			
14H00			
14H15			
14H30	Goodbye		

INVITED SPEAKERS

Jeppe Have Rasmussen

Postdoc

University of Copenhagen

Tuesday 24

jeppe.rasmussen@bio.ku.dk

From Clicks to Moans: How Bioacoustics Keep Me Guessing Which Species I'm Studying Today

Jeppe Have Rasmussen received his PhD in bioacoustics from the University of Southern Denmark (SDU) in 2018 and has since worked at the intersection of bioacoustics and artificial intelligence in Germany, the USA, and Norway. His research spans a wide range of species—from farm animals such as pigs to marine mammals like whales—and he was featured in the documentary "If Pigs Could Talk," recently broadcast across Europe, including in France.

Earlier this year, he published an article in Science exploring how AI and bioacoustics can revolutionize the monitoring of animal populations. He is currently based at the University of Copenhagen on a grant from the Carlsberg Foundation and will continue his research there with support from the Independent Research Fund Denmark.

This talk will highlight some of the most compelling projects he has been involved in and demonstrate how bioacoustics enables research that spans both continents and species

INVITED SPEAKERS

Michelle Spierings

Assistant professor

Leiden University

Wednesday 25

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The Biological Basis of Musicality: A Comparison Between Primates, Songbirds, and Parrots

What are the biological roots of musicality, and how can we study its evolution? In this talk, I present a comparative approach to understanding musicality by examining key cognitive and perceptual traits—such as rhythm, pitch perception, and vocal learning—across primates, songbirds, and parrots. These species offer complementary insights into the evolutionary underpinnings of complex auditory behaviours, including those shared with human music and language. I will illustrate how we investigate these traits using a combination of zoo-work, controlled experiments in the lab, and a large-scale citizen science initiative. This multi-method approach allows us to identify which components of musicality are evolutionarily conserved, which may have arisen through convergent evolution. By tracing shared capacities across species, we can update our hypothesis on the biological foundations of musicality.

INVITED SPEAKERS

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Corentin Troussard

Science & Industry Sales Manager

RTSYS

Thursday 26

Underwater Acoustics in the Age of AI and Robotics: Toward Permanent Ocean Surveillance

Corentin Troussard [1] , Laurent Dufrechou [1] , Pierre-Alain Tremblin [1] , Samuel Antoine [1]

[1] RTSYS, Caudan, France,

With the global awareness of the need to make our energies cleaner, marine constructions, especially offshore, have multiplied in recent years, and we can expect to see these numbers increase even more rapidly. The presence of marine mammals during offshore infrastructure works (pile driving, drilling, dredging) is now a major environmental concern, as it's been proven that they could be severely harmed by exceeding noises. In order to safeguard species and their natural habitats, local legislations impose a cap on sound levels caused by all offshore activities, as well as an obligation to monitor the presence of individuals in the work zone. Wind farms developers, therefore are required to measure, monitor, and mitigate noise caused by building work, and, today, underwater noise monitoring regulations are enforced in most countries as a means of protecting aquatic life. Distance from the shore and duration of the projects require more and more autonomous solutions. Expert in underwater acoustics and drones since, RTSYS has perfected the onboard processing and communication capabilities of its acoustic buoys and underwater vehicles to make it the ideal allies for this type of monitoring. Specific software have been developed in close collaboration with end-users to facilitate analysis and understanding of the indicators while remaining accessible to newcomers in acoustics thanks to simple indicators. Allowing real-time visualization of noise level information, the software enable contractors to immediately adapt the power of their machines to best comply with the standards. In parallel, embedded artificial intelligence-based algorithms are able to detect, and classify, the presence of a large range of marine mammals.

WORKSHOPS

APPLIED BIOACOUSTICS

Responsable orga team, Michael Maggs (1), Andy Hill (2)

(1) Frontier Labs

(2) Open Acoustic Devices

Bioacoustics, ecoacoustics, and passive acoustic monitoring have proven to be highly effective methods for biodiversity monitoring in both underwater and terrestrial environments. This workshop aims to give its participants some practical skills and knowledge related to bioacoustics, as such it will feature two presentations.

In its Hitchhiker's Guide to Sound Localisation Michael Maggs will demonstrate how to run an acoustic localisation experiment and process the results. The presenation will cover: recorder setup, array configuration (recorder separation and positions), testing, and processing and mapping of the results. We encourage you to bring your own laptop, as software and example data will be provided, however it is not necessary.
Following him, Andy Hill, co-founder of OpenAcoustics, will introduce audiomoth and demonstrate how to use these devices.

AI AND BIOACOUSTICS

Jeppe Have Rasmussen (1)

(1) University of Copenhagen

Bioacoustics ,the study of nature's sounds, has long been a powerful tool for studying wildlife. With the rise of artificial intelligence, particularly deep learning, the potential of this field has expanded dramatically. By applying advanced AI algorithms to bioacoustic data, researchers can now identify and monitor species with greater accuracy, even in environments where visual observation is difficult, such as dense forests or deep oceans.
This capability is especially critical as we face the sixth mass extinction. AI-enhanced monitoring offers new hope for conservation by providing deeper insights into the presence, behavior, and well-being of endangered species. Beyond detection, AI also opens doors to understanding animal communication and emotional states, thanks to its ability to autonomously identify and prioritize key acoustic features.
Recent technological advances have made these tools more accessible than ever. In this hands-on workshop, participants will be introduced to the fundamentals of deep learning and guided through the process of training their own AI model to recognize specific sounds—no coding required. This session will equip you with practical skills and a glimpse into the future of animal monitoring and welfare.

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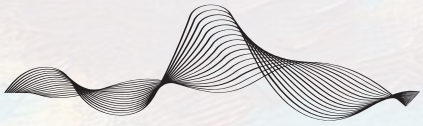

Ecoacoustics in a changing world I

Ecoacoustics in a changing world II

Sound in Space: geographic variation

Sound in Time: Acoustic Niches and Temporal Patterns

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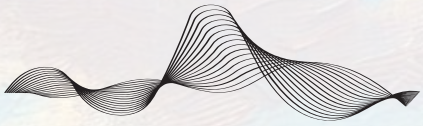

Smart listening: Developing Bioacoustics tools

Perception and Production of Sounds

First notes: Novel Characterizations & Repertoires

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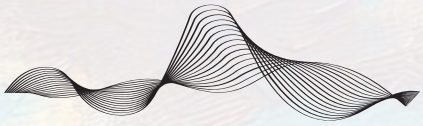

Acoustic Monitoring

Poster session part 1

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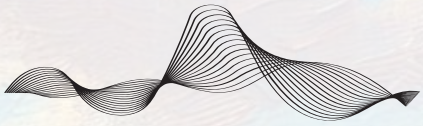

Poster session part 2

Using Passive Acoustic Monitoring and AI to Explore Responses of Forest Birds to Human Recreation in Scotland

Cowans Amber (1), Chris Sutherland (1), Xavier Lambin (2), Kenny Kortland (3)

(1) University of St Andrew

(2) University of Aberdee

(3) Scottish Forestry

Understanding how human recreation influences wildlife activity and interactions is key to effective conservation and land management, as sensitive species may adjust their behaviour to minimise human contact. We conducted a landscape-scale passive acoustic monitoring experiment in Cairngorms Connect - the UK's largest habitat restoration project - to investigate how forest bird communities respond to varying levels of recreational activity. Using autonomous recording units deployed both on and off hiking trails, we collected over 13,000 hours of acoustic data. Bird species were identified using BirdNET, an open-access AI tool for automated bird sound recognition. This enabled us to compare species-specific call rates and community composition across a gradient of human use, quantified through fine-scale Strava-derived recreation data. Our approach demonstrates the value of combining remote sensing and artificial intelligence to scale up biodiversity monitoring and detect subtle behavioural responses to human disturbance. We provide methodological guidance for working with the continuous confidence scores generated by classification algorithms like BirdNET, including strategies to account for false positives and false negatives in ecological models. By integrating AI tools into ecological workflows, we improve the efficiency and scale of wildlife monitoring, offering valuable insights for conservation practitioners aiming to process large volumes of acoustic data. Our results demonstrate that some bird species exhibit clear shifts in acoustic activity in response to recreation, with potential consequences for community structure in shared landscapes, and provide key insights for forest managers balancing ecosystem restoration with growing recreational use in protected areas.

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A Deep Learning-Based Pipeline for Analyzing the Effects of Agricultural Practices on Bird Communities using acoustic data

Minguet Raphael (1), J. Moiroux (1), T. Delattre (2), F. Lescourret (2)

(1) IMBE avignon

(2) INRAE avignon

With the emergence of low-cost recording devices, passive acoustic monitoring has become increasingly popular and widely used in ecological studies. To process the large volumes of data generated, several deep learning algorithms have been developed. Among them, BirdNET offers a promising solution for studying bird communities through acoustic recordings. This study aimed to develop an analysis pipeline that accounts for potential biases affecting BirdNET's performance. We also applied this pipeline to assess the impact of agricultural practices on reproductive bird communities and species-specific vocal activity in apple orchards.

We recorded two weeks of acoustic data during spring in 60 commercial orchards in southern France using SMmini recorders. The recordings were analyzed with BirdNET. Due to the high number of species detected, the first step involved filtering the species list to define a core bird community—removing false positives while retaining rare but reliably detected species.

Next, we evaluated BirdNET's precision for each species within this community. This revealed variable performance across species, with high accuracy for some (e.g., European robin) and poor results for others (e.g., blue tit). As an intermediate step, we tested the influence of environmental factors—such as anthropogenic noise—on BirdNET's reliability.

After accounting for detection biases, we calculated two metrics: species richness at the community level and daily vocal activity per species, based on BirdNET detection counts.

This analysis revealed that to refine richness estimates, we had to apply filters based on species-specific vocal activity to exclude transient species. Despite these adjustments, interpreting species richness remains challenging and should be done with caution. In contrast, species-level vocal activity appears to be a more reliable metric for assessing ecological effects—though still subject to environmental influences on detectability.

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Road noises persist in Alpine soundscapes over kilometers

Phan Olivier (1), Camille Desjonquères (1)

(1) Laboratoire d'Ecologie Alpine (LECA), Grenoble, France

From 2019 to 2023 in Savoie, France, the traffic on mountain pass roads increased by 10% and more than 15% for motorbikes. The complex topography and particular meteorology in mountain environments suggest that road noises may have varying effect on mountain soundscapes compared to flat open fields. This specificity of mountain environments suggests the necessity to evaluate the impact of road noises on non-urban soundscapes and its effects on local biodiversity. This study focuses on evaluating the exposition of Alpine environments to road noises. We recorded audible sounds from 24 mountain plots across the French Alps in the ORCHAMP observatory project. Using Passive Acoustic Monitoring, we collected 1 min. recordings every 15 minutes for a total of 148,776 minutes from May to October 2022. The distance from each plot to the closest named road ranges from 60 to 7530 meters. First, we annotated the presence and the estimated source of road noises on a stratified subsample of 1110 minute-files dived over plots, months and daytime. To extend the detection of road noises to the complete ORCHAMP dataset, we compare the audio classification results from several supervised models upon Contrastive Language-Audio Pretraining audio embeddings (CLAP, Wu et al, 2022), as well as a zero-shot audio pretrained models. Road noises can affect soundscapes on ranges up to 5km, taking account of topography, in woodland and open areas. 10% of the annotated soundscapes are affected by road noises and up to 70% of the time on one of the plots closest to the road. We obtained classification models with reasonable performances allowing us to estimate the global exposition to road noises of alpine soundscapes. Further investigations will explore any potential effects of road noise on local biodiversity such as calling behavior.

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Assessing effects of part-night lighting on green urban areas communities using passive acoustic monitoring

Roulet Yoann (1), Sébastien Gallet (1), Xavier Dauvergne (1)

(1) Univ Brest, Laboratoire Géoarchitecture, Brest, France

Artificial light at night (ALAN) can have harmful effects on ecosystems, whether on fauna or flora, on behavior or physiology. In particular, it can alter food webs, migratory flows and reproductive behavior. It has been shown that there are changes in physiology even at very low levels of intensity and in behavior even with red or warm white light. Thus, to reduce these impacts, it is recommended to prioritize lighting only where and when needed. The effects of part-night lighting have mainly been tested at species level, on few taxa and contexts and they do not appear to reduce the harmful effects, and may even have more negative effects than full night lighting. It is necessary to explore these light pollution reduction actions on other taxa and at community level in green urban areas (GUA). The aim of this study is to evaluate the effects of part-night lighting by methods used to assess ecosystems diversity but not in the context of ALAN's effects studies: passive acoustic monitoring.

Study took place in 18 French GUAs. Half of them were illuminated by public lighting until 23:00 at the latest and the other half throughout the night. On each site, each month, from April to August, more than 120 hours of audible sounds were continuously recorded. Turning off public lighting should reduce the activity of crepuscular and diurnal fauna and thus reduce the acoustic diversity. However, these metrics must be the same between GUAs before public lighting is turned off.

Acoustic indices will be used and species identification will be performed on birds and orthopterans. Interactions with anthropogenic noises, light (intensity, color and sky radiance) and the landscape properties will also be studied. Context, methods and first results will be presented.

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Investigating Mismatch and Asynchrony of Birds of the French Alps under climate change: a dynamic acoustic species distribution model (D-aSDM) approach

Corentin Bodson (1,2), Camille Desjonquères (1)

(1) Laboratory for Alpine Ecology, Grenoble, France (LECA)

(2) National Museum of Natural History, Paris, France (MNHN)

Species respond in varying ways to climate change, resulting in mismatches in spatial distributions and asynchronies in phenology among interacting organisms, with consequences at all levels of ecological organisation. In mountainous regions, the rapid pace of environmental change amplifies the need to monitor and predict these spatio-temporal shifts.

Our study focuses on the co-occurrence and synchrony of bird species' vocal activity in the French Alps, aiming to investigate: (i) spatial and temporal distribution of birds' acoustic activity; (ii) shifts in distribution and phenology under different Shared Socioeconomic Pathways (SSPs) and how these might be influenced by ecological function; (iii) potential mismatches and asynchrony among co-occurring species today.

We studied ten bird species likely to co-occur and interact through competition for food resources. Using Passive Acoustic Monitoring (PAM) with high temporal resolution and BirdNET identification, we retrieved presence-absence points of bird calls across five altitudinal gradients of the ORCHAMP observatory project. We computed the Weighted Mean Dates (WMD) of activity enabling comparisons intra- and interspecific phenologies across space. Additionally, we built dynamic acoustic species distribution models (D-aSDMs) to model the monthly calling suitability across the French Alps depending on temperature, precipitation, wind speed, solar radiation and photoperiod. These aSDMs were further filtered with classic SDMs derived from GBIF occurrence data to refine calling probabilities and avoid aberrant predictions.

Our results suggest instraspecific spatio-temporal structuration with individuals at higher elevations having later WMDs, thus singing later in the year. Furthermore, first aSDMs align with SDMs and species' ecology. We are optimizing both classic and acoustic distribution models to ensure accuracy of predictions and to project calling probabilities throughout the year under different SSP scenarios.

Ultimately, this project aims to assess current and future spatio-temporal overlap between species, providing valuable insights into how climate change may alter ecological interactions in the French Alps.

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Neighbours or Strangers ? : Relationship between geographic and individual variation in Yellowhammer songs

Kwak Minkyung (1), Lucie Diblíková (1), Pavel Pipek (1,2), Jan Kouřil (1), Paweł Szymański (3), Adam Petrusek (1), Tereza Petrusková (1)

(1) Department of Ecology, Faculty of Science, Charles University, Prague, Czechia
(2) Department of Invasion Ecology, Institute of Botany, Czech Academy of Sciences, Průhonice, Czechia
(3) Department of Behavioural Ecology, Institute of Environmental Biology, Faculty of Biology, Adam Mickiewicz University, Poznań, Poland

Birdsong plays a key role in mate attraction and territory defence, often conveying essential information about the singer. Songs are also used to identify the origin of individual, which lead to song variations among populations, such as dialects. Despite the uniqueness of song culture evolution—balancing individuality and geographic variability—these aspects are rarely studied together. The Yellowhammer (Emberiza citrinella) is a common farmland passerine, mostly sedentary, including the population in Czechia and Poland. Its song consists of two parts: initial phrase, variable among individuals and a conservative dialect phrase. The dialect is shared locally, and its distribution and types has been well documented through the citizen science project 'Dialects of Czech Yellowhammers' (DCY). Unlike dialects, a single male can only sing a certain combination of initial phrases, sharing some phrase types. Our study investigates the relationship between the shared initial phrase types and their geographic distribution. Along with DCY recordings for broader assessment, songs were recorded from two localities, Vizina, Czechia, and Swieca, Poland, for detailed local assessment. Phrase similarities were quantitatively measured using a dynamic time-warping algorithm and then compared with geocoordinates and dialect types. Results showed that more sharing occurs within localities than between distant males, and no clear pattern was found between sharing and dialect distribution. More than 80% of the males within locality had at least one shared phrase, some shared multiple types but non shared its complete repertoire with other males. This supports the possibilitiy of individual recognition based on repertoires in Yellowhammers, providing insights to adaptations of acoustic monitoring within species. Our study reveals patterns of song distribution and shed light on song culture transmission across populations in Yellowhammers.

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Exploring geographic variation in non-songbird vocalisations

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In birds, vocalizations play a fundamental role in mediating social and reproductive behaviours including species recognition, territoriality, group membership, and courtship. While the capacity for vocal learning is well-established in Oscine songbirds, vocal learning has also been documented in a few suboscines, parrots and hummingbirds. However, the majority of non-songbird species are presumed to acquire vocalizations innately, with minimal to no learning. Consequently, in contrast to the vocal dialects exhibited by songbirds inhabiting wide geographical ranges, the differences among populations in 'non-songbird' species with cosmopolitan distributions are expected to be clinal and consistent with the isolation-by-distance (IBD) hypothesis.

This study investigates vocal variation in a selection of non-Passerine species with wide geographic distributions, in order to assess the extent to which observed vocal differences conform to IBD expectation. Using a comparative approach and drawing upon analysis of vocal recordings from eight non-Passerine orders, we explore whether population-level vocal differences in complex vocalizations of species that are not thought to learn reflect geographic gradients.

Preliminary trends indicate that vocal variation may not be fully explained by spatial heterogeneity alone and suggest more complex dynamics. Our findings can appraise the possibility of underappreciated vocal plasticity in taxa not traditionally associated with vocal learning, and may have broader implications for understanding the evolutionary pathways of avian acoustic communication. This work contributes to the growing interest in vocal variation beyond the classical songbird model, and aims to provide new insights into the diversity and evolution of avian vocal behavior.

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Habitat use and foraging behavior study on Kerguelen islands' Commerson's dolphins' population

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Commerson's dolphins (Cephalorhynchus commersonii) occur in two geographically isolated populations: one along the coasts of South America (C. c. commersonnii) and the other around the Kerguelen islands in the Indian Ocean (C. c. kerguelensis). Due to their geographical isolation and morphological differences, these populations have been considered distinct subspecies. However, ecological knowledge of the Kerguelen population remains limited, and dedicated studies are needed.
Passive acoustic monitoring (PAM) is widely used to investigate cetacean occurrences and habitat use. Commerson's dolphins emit only high-frequency echolocation clicks (> 100 kHz) which can be used as a proxy of their presence and behavior. In this study, acoustic data were collected using fully automated passive acoustic monitoring instruments equipped with click detectors (C-PODs, Chelonia Limited), designed to detect narrow-band, high-frequency clicks (NBHF) produced by Commerson's dolphins. Acoustic monitoring was conducted over a period of 6 years at 4 sites across the Gulf of Morbihan. Detection-positive minutes per hour (DPM) were used as a metric of acoustic presence. Additionally, detections were classified to identify feeding buzzes, enabling analysis of foraging behavior.

To identify patterns in acoustic activity, generalized additive models (GAMs) were applied, examining the influence of lunar, tidal, diel, and seasonal factors. The four sites were also compared to assess spatial variation in habitat use across the bay.

Results revealed consistent acoustical activity and occurrence of Commerson' dolphins across both years and seasons. A strong diel pattern was observed, with increased acoustic activity at night as well as a seasonal occurrence of the species. This study highlights the occurrence and distribution of Commerson's dolphins in the Gulf of Morbihan and demonstrates the effectiveness of passive acoustic monitoring to improve knowledge of this poorly studied species.

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Chorus activity in nocturnal aggregation area of green sea turtles Chelonia mydas

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Green sea turtles Chelonia mydas have the ability to hear and produce sounds under water, some of which occur in specific contexts. Green turtles have been observed aggregating after sunset, potentially engaging in some form of coordinated sound production while resting on the seagrass bed. This acoustic behaviour, which is widespread and studied among animals, is known as chorus. Nonetheless, it has never been reported in marine turtles, and more generally in non-avian reptiles at the exception of one species of tortoise. To confirm the occurrence of chorus in green turtles, we performed acoustic surveys within a feeding area where juvenile green turtles aggregate at night. Our findings demonstrated that the source of the choruses corresponds to the nocturnal group resting area, supporting the assumption that green turtles produce these long-lasting sequences of rumbles. These choruses could provide a collective strategy by warning a potential predator to their aggregation behaviour.

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Balearic Soundscapes: Investigating Acoustic Patterns and Environmental Drivers in Island Ecosystems

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Ecoacoustics - the study of ecosystem sounds - has gained significant attention in recent years, offering valuable insights into biodiversity, ecosystem health, and the impacts of climate change. However, key questions remain about the spatiotemporal drivers of soundscape patterns, which are crucial for ecosystem-level environmental monitoring.

The Balearic Ecoacoustics project aims to establish the first comprehensive soundscape database for the Balearic Islands, with a focus on understanding the relationship between environmental variables and the acoustic communities (niches) of birds. Data will be collected from Mallorca and surrounding smaller islands—Cabrera, Na Redona, and Dragonera—representing a range of conservation statuses and island sizes. The primary focus will be on vocalising birds, with continuous recording over two-week periods at each site, starting in April 2025.

This project will investigate how factors such as island size and conservation status influence birds' use of acoustic niches. Specifically, we will: i) identify bird calls using a multi-species detection algorithm and manual verification, ii) map the acoustic niche of each species at both temporal and spectral levels, iii) analyse how feeding guilds and closely related species partition the acoustic space, and iv) explore how environmental factors affect this partitioning.

Key outcomes include identifying the factors that shape acoustic space use, shedding light on the relationship between biodiversity and Acoustic Indices. The resulting soundscape database will be accessible to the research community for further studies. In addition, a complementary project focusing on Orthopteran diversity in the islands is planned, expanding the scope of acoustic research in the region.

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Testing the Effects of Reproductive Character Displacement on the Breeding Ecology of Sympatric Compared to Allopatric Populations of Upland Chorus Frogs (Pseudacris feriarum) (ONLINE)

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Within the southeastern United States are two species of the genus Pseudacris found to hybridize: Pseudacris feriarum and P. nigrita (Lemmon 2009). Hybrids of these species are less fit, and hybrid males are partially sterile (Lemmon 2010). Due to these traits of maladaptive hybridization, the mating signals of P. feriarum have been selected on by females to differ from P. nigrita, which has additionally resulted in females being more particular about which conspecific males they choose (Lemmon 2009). The divergent preferences of P. feriarum females have caused males to evolve more energetically costly calls (Lemmon 2009). Considering that mating signals for male anurans is their most energetically costly activity performed (Wells 2007), I predict that greater energetic costs to P. feriarum male signaling could potentially lead to a decrease in the nightly duration of male signaling time, a shortening of the length of the annual breeding season, and/or increased intensity of breeding on the active nights (i.e., more dense choruses).

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Data-driven Sampling Strategies for Fine-Tuning Bird Detection Models

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Passive Acoustic Monitoring (PAM) has emerged as a promising tool for collecting ecological data, particularly in the context of bird population monitoring. Bird species can be automatically identified from their vocalizations using pre-trained models, such as BirdNET. The performance of these models can be significantly improved through fine-tuning with annotated samples recorded in the specific acoustic conditions in which the microphones are deployed.

However, PAM collects vast amounts of data, and annotating bird vocalizations requires specialized expertise. As a result, only a very small portion (such as 0.01%) of the recordings can be effectively labeled. Selecting the most relevant samples to annotate in order to maximize performance in model fine-tuning remains a significant challenge.

In this work, we investigate active sampling strategies based on model predictions and acoustic signal properties. Specifically, we leverage the maximum prediction score and uncertainty of the pre-trained model BirdNET to identify samples with the highest potential for improving model precision. As a complementary strategy, the most relevant acoustic indices are assessed through reverse correlation and used to identify important samples that may have been missed by the pre-trained model, reducing bias.

We evaluate this approach using a dataset consisting of soundscape recordings with annotated bird vocalizations (WABAD), to which we have incorporated environmental noise, simulating passive recordings with low bird call occurrence. Different sampling strategies, using the model-based parameters and the selected acoustic indices, are used to select a limited number of training samples and the performances after model fine-tuning are compared.

This methodology allows us to identify the most effective annotation strategy and addresses the challenge of improving detection model performance with limited annotation resources in large-scale passive acoustic monitoring.

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Directional Regions Of Interest number for soundscape analysis

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To determine the state of biodiversity in a natural environment, soundscape analysis offers diagnostic tools through the calculation of acoustic indices such as the Regions Of Interest (ROIs) number, the acoustic diversity index or the acoustic richness index. Typically, soundscapes are captured using Passive Acoustic Monitoring devices, mostly composed of a monophonic microphone. The signals are then analysed to extract acoustic indexes. However, in the case of monophonic signals, the Directions Of Arrival (DOA) of the various acoustic events are lost. DOA estimation becomes possible when using a microphone array associated with beamforming techniques. In this work, a Spherical Microphone Array (SMA) using Spherical Harmonics (SH) beamforming is used to extract monophonic signals for many DOAs. The ROIs number can then be calculated for each DOA, enabling the generation of ROIs number maps. Two situations are studied:

- A simulated soundscape described over the SHs, composed of two plane waves in free field at different DOAs: a nightingale (biophonic source) and a stream (geophonic source).
- The soundscape reconstructed using a loudspeaker array and captured by a SMA.

ROIs number maps are generated as well as the ROIs number for a monophonic signal extracted from the SMA using the 0-th order SH. The directional analysis performs better than the monophonic approach where the two signals are superimposed. We find in the DOA of the nightingale the same ROIs number as if the free field monophonic signal of the nightingale alone was used, showing the interest of the spatial filtering. Furthermore, we observe that in the DOA of the stream, the ROIs number is not larger than the one extracted from the monophonic signal, underlining the possible localization only of biophonic sources. Finally, the analysis of a sound recording in a natural environment is presented.

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Modeling acoustic detectability using simulated data to improve BirdNET species abundance estimates

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Machine learning methods such as BirdNET have transformed passive acoustic monitoring (PAM) by enabling large-scale detection and classification of bird vocalizations. These detections can serve as proxies for species abundance through vocalization rate estimates, yet variations in acoustic detectability across sites can introduce significant biases. Previous studies have assessed acoustic detectability using playback experiments, rangefinders, extensive manual validation, and other methods that are difficult to scale. We address this challenge by leveraging simulated data to model the relationship between BirdNET confidence scores and signal-to-noise ratio (SNR) in an automated, species- and site-specific manner. Then, by analysing detections within the PAM data to estimate both vocalization and background noise amplitudes (and subsequently derive SNR), our method characterizes how noise conditions affect detection probabilities, thereby estimating acoustic detectability with minimal manual validation. Finally, we combine the estimated detectability with vocalization rates to predict species abundance. We demonstrate the utility of our approach on datasets with co-located recorders and in-person surveys, providing a scalable framework for improving abundance estimates in large-scale PAM studies.

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Enhancing Automatic Detection and Identification of Small Mammals Through Sound

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Vigie Chiro is a nationwide citizen science programme in France that involves the systematic recording of ultrasonic signals at night by volunteer observers. The programme was originally designed to monitor bat populations. Vigie Chiro has now accumulated 110,000 nights of recording and includes the AI-powered identification software Tadarida (Bas et al., 2017). Tadarida is used to identify bat and orthoptera species on the programme's ultrasonic recordings, enabling large datasets to be processed. However, small mammals also emit ultrasound. They are therefore recorded as by-catch in this programme. Moreover, our ability to identify small mammals from sound has recently improved thanks to advances in bioacoustics (Newson et al., 2020; Newson et al., 2023).

Thus, this study aims to enhance the detection and identification of small mammal species, in particular Eulipotyphla and Rodentia, on ultrasonic recordings. To do this, we are evaluating the performance of Tadarida, an algorithm based on a random forest, on recordings of small mammals and are working on improving the accuracy of its results, using a large dataset from the Vigie Chiro programme.

Preliminary results reveal over 20,000 small mammal detections over 10 years (with a probability >50%), covering a vast area of France. Moreover, it now seems possible to automatically distinguish 20 species of rodents and insectivores, including the protected species Muscardinus avellanarius and Neomys fodiens in France.

This nationwide study has the potential to enhance our understanding of small mammal habitats, distribution, and population dynamics. Moreover, these findings are promising and suggest that bioacoustics could serve as a non-invasive alternative to traditional trapping methods for studying small mammals.

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Categorical and semantic perception of the meaning of call-types in zebra finches

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Vocal communication in social animals involves the production and perception of various calls that ethologists categorize into call-types, based on their acoustical structure and the behavioral context of production. Whether animals perceive these categories and associate distinct meanings to them remains unknown. The zebra finch, a gregarious songbird, uses approximately 11 call-types to communicate hunger, danger, social conflict, and establish social contact and bonding. Using auditory discrimination tasks, we show that the birds discriminate and categorize all the call-types in their vocal repertoire. In addition, systematic errors were more frequent between call-types used in similar behavioral contexts than could be expected from their acoustic similarity. Thus, zebra finches organize their calls into categories and create a mental representation of the meaning of these sounds. In order to understand how that mental representation is created, we conducted electrophysiological recordings while the birds were performing a discrimination task. We find that sparse ensembles of neurons reflect this semantic space, giving insights into the emergence of meaning in the avian brain.

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Categorical rhythms in the group singing of the indris

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Animal vocalizations share common features with human music and culture. Among them, rhythm categories were recently revealed in animals' communicative displays. Rhythm plays a crucial role in communication, mating, and survival. The simplest rhythm, isochrony, consists of consecutive intervals of equal durations and has been observed in birds' courtship songs, but also in Hylobatidae, Pitheciidae, and Indriidae singing primates' choruses and duets. The rhythmic investigations of those collective behaviors usually consist of the analyses of individuals' song contributions. However, whether rhythmic coordination occurs within the group displays remains unknown. In my research, I looked at the emerging song rhythm of these group performances following a holistic approach by focusing on notes and silences. To do so, I registered and analyzed the long-distance advertisement calls of Madagascar's only singing lemur, the Indri (Indri indri), and looked for the presence of small integer ratios (1:2,1:1,2:1). My colleagues and I discovered that Indri's chorus exhibits an isochronous rhythm. At the same time, individuals' contributions also present two additional patterns. This follows the idea that the simplicity and predictability of isochrony may facilitate coordination between singers by allowing them to adjust rhythm. These new findings provide valuable insight into the evolutionary pressures shaping collective singing displays and shed light on the biological origins of rhythmic features in human music.

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Can You hear me now? The limits of individual Yellowhammer song recognition

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Individual acoustic monitoring (IAM), based on the analysis of vocal cues potentially offers a non-invasive alternative to traditional mark-recapture methods. Combined with passive acoustic monitoring (PAM), it could open new perspectives on fundamental ecological questions. However, only a few studies examined how identity signatures degrade with distances and in different environments which is essential for refining IAM and passive acoustic monitoring techniques in the field. In this study, we focused on how distance affects the acoustic structure of Yellowhammers' (Emberiza citrinella) songs searching for the maximum distance at which they might still be detected and assigned to a particular individual. We played back the songs of 10 Yellowhammer males (20 songs per individual, representing their entire repertoire) in two different environments (forest, grassland). We re-recorded the songs using Audiomoth devices along a 200m transect (6.5m, 12.5m, 25.0m, 50.0m, 100.0m, 150.0m and 200.0m). We estimated the signal-to-noise-ratio (SNR) to describe the degradation of acoustic signals. Songs were assigned to a particular individual, based on the catalogue of song types and visual inspection of spectrograms by two observers. We assessed agreement between two observers using Cohen's Kappa coefficient. We used a generalized linear mixed model (GLMM) to analyze the influence of habitat, distance, and SNR on ID assignments. Our findings indicate that individual recognition is still possible up to ca. 100 meters, which corresponds well with the territory size of the birds. We further found some differences in song transmission between the two habitats. This suggests that environmental factors play a role in determining the active space of bird songs. This work can also be used to plan future passive acoustic monitoring research on individuals in Yellowhammers.

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No effect of note order on the response of coal tits to conspecific, heterospecific and artificial mobbing calls

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Most Parid species produce specific, order-constrained mobbing calls. These calls elicit responses from both conspecifics and heterospecifics, with evidence indicating that such responses occur only when the calls are organised in this specific order. One notable exception is the coal tit (Periparus ater), a species that employs similar types of notes, yet does not exhibit clear order constraints within its mobbing sequences. Despite this apparent absence of order constraints, a recent experiment has demonstrated that coal tits may be sensitive to the order of notes in heterospecific calls. Therefore, the relative significance of note order in conspecific and heterospecific communication among coal tits remains unclear. We conducted a playback experiment to examine the effects of note order (natural coal tit order, typical Parid order, and reversed order) and species identity (conspecific, familiar heterospecific - the great tit, Parus major, or artificial notes) on coal tit mobbing responses. Our findings indicate that coal tits exhibited a strong response to conspecific calls, regardless of the order of the notes; conversely, they displayed little to no response to heterospecific calls and artificial notes, irrespective of note order. A similar pattern was observed when assessing the general community response. This unexpectedly low response to familiar heterospecific calls may be attributable to a reduced density of great tits in the area we tested: ecological factors, such as community composition, may influence heterospecific mobbing behaviours and the subsequent biological interpretations of playback experiments. This study also underscores the necessity of conducting comparative research on closely related species to evaluate the potential generality of findings, such as strong order constraints recently observed in great tits and Japanese tits.

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The role of grunt variants in chimpanzee vocal communication

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Human language is uniquely characterized by its flexibility and combinatorial complexity, allowing speakers to generate an unlimited array of meanings from a finite set of sounds. Understanding the evolutionary roots of this capacity requires investigating whether non-human primates exhibit comparable combinatorial processes. One key obstacle is the limited understanding of how the acoustic structure of single calls compares when produced alone versus within sequences. For example, are the acoustic features of a call in a sequence more similar to a single call from the same context than to one from a different context? In chimpanzees, many single calls exhibit context-specific acoustic variants—calls that are structurally similar but acoustically distinct, and which elicit different responses from receivers. These variants likely serve to expand the communicative repertoire and may function as building blocks within sequences. However, it remains unclear if and how these variants are integrated into sequences, and whether such integration affects their acoustic form or meaning. As chimpanzees produce both flexible sequences and context-specific call variants, they provide a promising model to study this question. In this study, we acoustically analyzed grunts produced by wild chimpanzees in two distinct contexts: feeding and greeting. Using the ANIMAL-SPOT deep learning classifier, we successfully distinguished between these context-specific grunts with an accuracy of 80%. This suggests that subtle but consistent acoustic differences exist and may be preserved across communicative structures. We will next apply this method to explore further contrasts—between panted and regular grunts, between single grunts and those in sequences, and between infant and adult grunts—offering deeper insight into the structure and flexibility of chimpanzee vocal communication.

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First acoustic catalogue of stereotyped calls from killer whales (Orcinus orca) in the Crozet Archipelago

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The study of cetacean acoustics has become an essential tool for investigating a wide range of species across oceans. This non-invasive method allows researchers to detect patterns of occurrence that cannot be directly observed, expanding possibilities for marine research including passive acoustic monitoring (PAM). However, documenting the acoustic repertoire for each species including range and variability of signals used is an essential first step.

Killer whales (Orcinus orca) rely on a sophisticated communication system that includes clicks, buzzes, whistles, and stereotyped (or pulsed) calls. The latter are stable over time, and form dialects that may be unique to each population, or social group. While dialect differences have been demonstrated for Northern Hemisphere populations, acoustic studies on Southern Hemisphere killer whales remain limited, particularly in subantarctic regions. This applies for the Crozet killer whale population, which, despite long-term monitoring, are still poorly acoustically known.

This study presents a catalogue of pulsed calls from different social groups of Crozet killer whales population. Acoustic and visual data were collected during Patagonian toothfish (Dissostichus eleginoides) longline fishing operations with which killer whales interacted at various sites across the archipelago in January 2024. From the 2,398 pulsed calls identified, only high-quality ones were retained, using an innovative method combining automatic SNR calculation and visual examination. Preliminary results reveal a structured acoustic repertoire characterized by recurring sound patterns potentially specific to certain social groups. Spectral and temporal comparisons with calls from other populations suggest distinctive acoustic signatures, potentially reflecting cultural or ecological specificity. This catalogue lays the groundwork for further studies on the acoustic diversity of this population and could support future studies on dialect evolution.

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The whistles of the ligurian commun bottlenose dolphin : Acoustic characterisation and signature whistle catalogue attempt

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The Pelagos Sanctuary, a Special Protection Area of Mediterranean Importance (SPAMI), is dedicated to the conservation of marine mammals and their habitats in the Mediterranean. Among its inhabitants is the common bottlenose dolphin (Tursiops truncatus Montagu, 1821), a species of Community interest listed in the annexes II and IV of the Habitats Directive and a target of the Marine Strategy Framework Directive (MSFD). Given the intense human activity within the Sanctuary, monitoring this dolphin population is essential for its long-term sustainability.

Acoustic monitoring is a promising tool for studying cetaceans in the wild. The bottlenose dolphin shows a complex acoustic repertoire, including whistles: narrowband and frequency-modulated sounds used in intraspecific communication. Notably, their whistle repertoire includes Signature Whistles (SWs), which are individually modulated sounds that convey the emitter's identity. The aim of this study was to describe the whistles acoustic variability of the Ligurian geographical unit of common bottlenose dolphins. Fieldwork was conducted in 2023 from May to October in 23 sea trips between Genoa and La Spezia. We collected acoustic recordings on board inflatable boats provided by Acquario di Genova, during encounters with dolphins. We performed spectrographic annotations of the acoustic recordings with Praat software, and extracted several spectro-temporal parameters with PamGuard software from identified whistles. Thus, we established a SWs catalogue using the SIGID (SIGnature IDentification) method. SIGID is based on the tendency of SWs to be usually emitted in bouts: it uses temporal criteria, identifying the whistles with a similar frequency contour occurring within 1-10 s of each other. Our study provide an acoustic characterisation and the catalogue of SWs types of this geographical unit. It also lays the groundwork for a passive acoustic capture-recapture method based on SWs as proxies for individual presence.

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Passive acoustic monitoring (PAM) of Ensiferan calling diversity in a sub-tropical forest of North-east India

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Ensiferans are a group of nocturnal insects belonging to the order Orthoptera, known for producing advertisement mating calls using stridulatory organs on modified forewings. These calls, typically made by males, are species-specific and serve as indicators of forest health. In biodiverse ecosystems like the subtropical forests, caller density is high, and ecological constraints such as intra- and interspecific competition, masking interference, and predation pressure can influence calling behavior. These pressures lead to variation in call structures and differences in call type composition and acoustic space use across seasons, which may help callers develop more effective communication systems and avoid the “cocktail party problem”—where overlapping signals hinder the ability to distinguish individual calls. Passive Acoustic Monitoring (PAM), a non-invasive and cost-effective technique, is widely used for long-term monitoring in vertebrate taxa, yet rarely applied to terrestrial invertebrates. In this methodological study, we employed PAM to quantify acoustic diversity, acoustic space use, separation of different call types, seasonal calling patterns, and seasonal variation in call type composition among nocturnal Ensiferan callers. Year-round recordings were conducted using AudioMoth devices in the Khasi Hills of Meghalaya, part of the Indo-Burma Biodiversity Hotspot, at a 48 kHz sampling rate. Acoustic samples were processed using Raven Pro software. We identified 33 distinct call types, each differing in spectral, temporal, or both parameters. Principal Component Analysis revealed fine-scale separation of call types. While there were seasonal shifts in call types, overall call type composition remained stable. Acoustic Space Use (ASU) analysis indicated greater use of lower frequency bands and seasonal variation in spectral occupancy. This foundational study is the first of its kind in Northeast India and demonstrates the potential of PAM in studying invertebrate soundscapes. Future directions include developing a call database and applying machine learning for automated caller identification.

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Vocal behavior of migratory new world warblers in wintering areas (Colombia)

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Vocal behavior in birds is closely linked to their ecological needs and life history strategies. In migratory species, these behaviors can vary drastically between breeding and non-breeding grounds. In the new world, boreal migratory warblers (Passeriformes: Parulidae) breed in North America, where they must establish territories, attract mates, build nests, and raise offspring. In contrast, during the non-breeding season in South America, these birds primarily focus on survival and molt, without engaging in reproductive activities. These ecological differences are expected to shape the expression and function of vocal behavior.

This project investigates the vocal behavior of boreal migratory warblers in their South American wintering grounds, specifically in Colombia. Using a combination of passive and active acoustic monitoring techniques—including AudioMoth autonomous recorders and directional microphones—I recorded over 200 hours of bird vocalizations across two natural reserves. Preliminary analysis, conducted with tools such as Raven Pro, the BirdNET algorithm, and the WarbleR package in R, reveals vocal activity patterns among approximately ten warbler species. These findings will be compared to published data from the breeding grounds to assess changes in vocalization rates, types, and temporal patterns.

By examining how migratory warblers adjust their vocal behavior in response to the ecological context of their non-breeding environment, this study contributes to our understanding of the flexibility and adaptive significance of avian communication strategies.Final analyses and conclusions will be completed by June and the time of the conference.

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Density-dependent effects on hunting bats flight behaviour under lit and unlit condition : a 3D flight path reconstruction study for conservation

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In conservation biology, studies on the impact of human activities on chiropterans often lack the functional and behavioural metrics necessary to describe the mechanisms behind observed responses. Addressing these gaps is essential for developing effective operational recommendations. When human activities, such as light pollution, alter the spatio-temporal availability of food resources, most studies focus on species responses in terms of abundance or community composition. However, this approach provides an incomplete picture, failing to capture more subtle changes, such as reduced feeding success due to shifts in the balance of competition and facilitation among individuals. Insectivorous chiropterans are particularly relevant for studying inter-individual behavioural interactions and identifying the mechanisms driving the consequences of anthropogenic pressures on biodiversity. Using 3D flight path reconstruction systems on echolocation calls of wild bats, we sampled hundreds of flight trajectories across approximately 40 sites in France for several species, each site exhibiting a gradient in foraging intensities and bat densities. We extracted information on key flight behaviours (e.g. flight speed, flight path) and prey capture attempts identified through acoustic signatures. We tested the hypothesis of optimal foraging theory, which predicts an increase in prey capture success as the number of conspecifics increases (due to facilitation), followed by a decrease when conspecific density becomes too high (due to competition), considering both lit and unlit sites. Additionally, we hypothesised that the lit areas would present a greater number of conspecifics than the unlit sites, potentially excluding other species from feeding grounds due to excessive competition.

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Distributed Acoustic Sensing for real-time monitoring of fin whales and marine acoustic pollution in the Western Ionian Sea

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Anthropogenic noise represents a growing threat to marine biodiversity, particularly for species relying on acoustic signals for key ecological functions. The VONGOLA (Visual and nOise-eNhanced AI Analysis for Marine Biodiversity Monitoring, Observation, and LeArning) project aims to advance bioacoustic methodologies for marine life monitoring and acoustic pollution assessment. A central component of this initiative is the application of Distributed Acoustic Sensing (DAS) technology, which repurposes fiber-optic cables as high-resolution acoustic monitoring networks. In this study, a DAS system was integrated into a 42 km electro-optical cable of INFN-LNS, extending to 2100 m depth in the Western Ionian Sea, offshore Catania. The primary objective is real-time acoustic detection and monitoring of the Mediterranean fin whale (Balaenoptera physalus) population using DAS technology. By tracking whale movements and analyzing interactions with maritime traffic, this research identifies spatial and temporal overlaps between cetaceans and vessels. Furthermore, the development of real-time detection algorithms for both cetaceans and ships using live-streaming DAS data aims to mitigate ship-strike risks and support conservation efforts. Within the VONGOLA project, two hydrophone-based shallow-water observatories have been designed and are under construction: a real-time cabled system off Reggio Calabria and an autonomous observatory in the Plemmirio Marine Protected Area. Hydrophone recordings, complemented by video monitoring and chemical-physical CTD (Conductivity, Temperature, and Depth) measurements, offer a multidimensional perspective on underwater acoustic environments. Data collected in VONGOLA will show the potential of advanced bioacoustic technologies in marine biodiversity monitoring and conservation strategies, contributing to a broader understanding of underwater noise impacts on ecosystems.

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The sound of wings beating: combined use of eco-acoustics and deep learning to monitor pollinators in agricultural environments

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Insect pollinators are increasingly exposed to threats (e.g., climate change, land-use change, pesticides) and their documented decline can have dramatic consequences for biodiversity and ecosystem functions. Given that 35% of world's food crop production comes from crops that depend on pollinators, human food security is also under threat. It is therefore essential to monitor pollinator activity to adopt management practices that respect biodiversity in agricultural landscapes. Compared with traditional monitoring methods, passive acoustic monitoring enables non-lethal, large-scale datasets to be collected. However, analysing such a vast amount of data, while little is known about the acoustics of insect pollinators, is a major challenge.

We used acoustic data collected in sunflower (Helianthus annuus) and rapeseed (Brassica napus) fields to assess whether deep learning tools could solve this issue. We labelled a variety of sound events (< 2 kHz), including pollinator wingbeat sounds. The resulting dataset was divided into a training and a testing dataset. With the former, we retrained the BirdNet convolutional neural network (CNN) to detect pollinators, regardless of species. We evaluated its performance with the second dataset, obtaining promising results. By clustering the embeddings of this CNN, we hope to characterise functional acoustic diversity in sunflower fields (where Honeybees (Apis mellifera) account for 72 to 97.8% pollinator visits) and rapeseed fields (where the diversity of insect pollinators is greater). Visual observations made during the acoustic recordings will serve as a basis for comparison with species diversity.

Our results highlight the potential of eco-acoustics and deep learning as large-scale monitoring tools to study and preserve insect pollinators in agricultural landscapes. They stress the need for annotations at species/functional group level, while the next big step would be to link abundance and diversity to pollination service.

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The contribution of ecoacoustics to the protection of a critically endangered rainforest species, the African forest elephant (Loxodonta cyclotis)

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The African forest elephant (Loxodonta cyclotis) is critically endangered, facing threats such as poaching and logging. Conservation efforts aim to mitigate these pressures, but monitoring this species remains particularly challenging due to its highly mobile nature and the dense rainforest habitat it occupies. Given the need for extensive data to assess human impacts, bioacoustics combined with deep learning presents a promising solution for informing conservation strategies. This is especially relevant in Gabon, where 88% of the land is covered by the rainforests of Central Africa.

We thus used passive acoustic monitoring to assess poaching pressure and its potential impact on elephant behaviour in Southwest Gabon. We deployed recorders at four sites (two stations per site) representing different types of habitats and level of human activities: forest and forest clearing/bai within the Moukalaba-Doudou National Park, and logging concession and village surroundings within and around the protected area. This will allow us to compare our results between non protected and protected areas.

We collected data from July 2024 to February 2025, representing >4800 hours of recording. First, we used a convolutional neural network (CNN) to detect gunshots within our recordings and provide an estimate of poaching pressure across our sites. A second step will involve training and deploying another CNN to detect different elephant vocalisations.

This study shows that bioacoustics coupled with deep learning could help to gain deeper insights into the behaviour of forest elephants, particularly in relation to anthropogenic pressures. Such approaches could also be extended to other protected species to assess the anthropogenic pressures they are subject to. This could benefit from larger-scale deployments involving a higher number of recorders.

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Vol de Nuit : using AI and citizen science to monitor nocturnal bird migration

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A significant proportion of the birds that migrate across European skies do so at night. Traditional migration monitoring methods rely mainly on visible migration counts, which are impossible as soon as it gets dark. Fortunately, a large proportion of nocturnal migrants vocalize during migratory flights. In these conditions, bioacoustics and continuous sound recording at night allow to obtain accurate species-specific data on nocturnal migratory movements on a national scale. Launched in 2024, Vol de Nuit is a citizen science program designed to study nocturnal bird migration using passive acoustics. Currently, dozens of experienced birdwatchers across France are taking part, placing recorders near their homes several nights a week and then manually scanning the recordings to find bird vocalizations. Participation in this type of study is limited by the level of expertise and time required to analyze complete nights and identify nocturnal flight calls (NFC). The use of automatic NFC identification algorithms would make it possible to overcome these two problems and thus open up access to the program to a wider audience, multiplying the spatial and temporal coverage of Vol de Nuit. To this end, we are currently evaluating the performance of three NFC identification algorithms (BirdNET, Perch and Chirpity) in detecting and identifying NFCs in various contexts. Preliminary results suggest that these algorithms perform well in quiet conditions, but struggle in noisier contexts, which are very common during night migration.

We are now in the process of correcting the biases associated with the use of these algorithms for nocturnal migration monitoring and will study some of the factors impacting the detectability of nocturnal migrants with acoustics, such as altitude of flight or atmospheric conditions.

ract

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Interindividual and intergroup differences in context-dependent vocalizations in carrion and hooded crows

Interindividual and intergroup differences in context-dependent vocalizations in carrion and hooded crows

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Communication is key to successful social interactions. In birds, sound is one of the primary communication channels, allowing for broad and rapid signal propagation and facilitating interactions between individuals. Vocal communication, thus, plays a central role in the social structuring of gregarious species. Corvids are highly suitable models for studying vocal communication due to their advanced cognitive capacities and complex social life. Given their high complexity and variability, the vocalizations of corvid species remain understudied, and little is known about contextual and interindividual variations – despite extensive research into their social and cognitive abilities. Here, we investigated the influence of age, sex, social hierarchy, and group size on interindividual and intergroup differences in vocalizations. In particular, we expected (1) juveniles to exhibit a larger vocal diversity than adults; (2) male and female vocalizations to differ in frequency and duration; (3) dominant individuals to vocalize more than subordinates; and (4) larger groups to display more vocal diversity. We recorded 13 carrion (Corvus corone) and hooded crows (Corvus cornix) housed at the Haidlhof Research Station (University of Vienna). Birds were of varying ages (7 adults and 6 juveniles) and sexes (7 females, 6 males) and housed in three groups of different sizes (2,4, and 7 individuals). Data were collected over a 10-week period, three times per week. We present our results with a focus on differences in the frequencies and durations of vocalizations at both individual and group levels and discuss our findings in light of the cognitive and behavioural foundations of vocal communication in birds. These findings advance our understanding of context-dependent vocalizations, highlighting the role of individual differences and group composition in corvid communication.

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Poster

- Tuesday June 24 -

Can birds find silence ? Birds in soundscapes of roads and renewable infrastructures

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In response to the emergency of climate change, a massive development of renewable energy is observed in France. However, studies report negative effects of renewable energy on flying fauna. These effects have been studies individually meanwhile theses infrastructures are located in a landscape already fragmented, especially by roads. The objective of this project is (i) to study individual and cumulative impacts of renewables infrastructures on bats and bird's activity and behaviour, (ii) to identify the most impacted species/guilds or life-history traits, (iii) to assess the magnitude of effects depending on the landscape context, and (iv) to characterize the noise emitted by infrastructures. We selected the most common infrastructures including onshore wind farm, ground mounted solar farm, and noisy roads. We will sample grids of 5 km² in semi-natural environments, representative of the different combinations (8 replicate for each) of infrastructures: only roads, road/wind farm, road/solar farm, and road/wind/solar farm. We will place 8 passive recorders in each grid, targeting woodland edge. For birds, we will sample 15 days during nesting (April-May), and for bats, when both adults and juveniles are active (August) for 4 nights. Recorders will be placed at a distance gradient from a given infrastructure, as well as a cross-gradient from multiple infrastructures. Then, we will analyse vocalisations using automatic species detection. For birds, we will evaluate the degree of habitat use, the relative abundance, and behaviour and habitat use changes. For bats, we will evaluate the degree of habitat use, and will quantify the foraging activity. Finally, we will characterise the noise emitted by wind farms and roads and analyse these effects on bats and birds. All these results will be implemented into a decision-support tool, accessible for stakeholders, in allow the simulation of cumulative effects of infrastructure during project development.

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Exploring the vocal learning ability of pale spear-nosed bats (Phyllostomus discolor)

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In speech acquisition, humans must employ vocal learning, making this a key trait for the understanding of the biology and evolution of speech and language. Bats are emerging as a key model system for the study of vocal learning behaviour and its mechanistic underpinnings given their social nature, accessibility and vocal learning abilities. This study mainly builds on a stepwise automated training regime to explore the vocal learning behaviour of bats using a captive colony of pale spear nosed bats (Phyllostomus discolor) as a study species. This automated training regime uses self-built automated boxes to check the performance of bats inside and deliver the reward to bats if they finished tasks successfully. The training is divided into five main phases, designed to gradually teach bats to modify the fundamental frequency of their own vocalizations in response to playback with altered fundamental frequency. The study can help us further provide evidence for the vocal production ability of the P. discolor and provide an automated training method for test bats' vocal learning ability in the future.

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Vocal repertoire and acoustic cues to individuality in the Northern Rockhopper penguin (Eudyptes moseleyi)

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Northern Rockhopper penguins (Eudyptes moseleyi) are highly vocal seabirds. Despite this, a description of their vocal repertoire is currently unavailable. Here, we studied the vocal behaviour of this species and assessed the presence of acoustic cues in individuality across the different vocal types. We collected audio and video recordings from an ex-situ colony at the Two Oceans Aquarium (Cape Town, South Africa) consisting of wild rescued individuals and their offspring. We combined the visual inspection of spectrograms with spectro-temporal acoustic analyses based on a source-filter theory approach. Our results showed that the vocal repertoire of the Northern Rockhopper penguin is made of three discrete vocal types: agonistic calls, used to manage aggressive interactions, contact calls, produced to maintain acoustic contact among group members when visually isolated, and finally, the ecstatic display songs uttered by single birds for territorial defence and mate attraction. Moreover, we demonstrated that all vocal types encode acoustic cues to the individual identity of the emitter. Studying the vocal repertoire of penguins is crucial for gaining a deeper understanding of their social behaviour and may also play a key role in developing passive acoustic monitoring tools for this endangered species, thereby contributing significantly to its conservation.

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Poster

- Tuesday June 24 -

Vocal Activity and Nesting Patterns of African Penguins at Stony Point, South Africa

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Human activities such as overfishing and habitat degradation, along with climate change, are harming seabird populations. The African penguin (Spheniscus demersus), a critically endangered species breeding along southern African coasts, has suffered a sharp population decline in recent decades. Non-invasive monitoring is vital to assess conservation efforts and limit human disturbance in the remaining colonies.

We used a Passive Acoustic Monitoring (PAM) system to study vocal activity during the breeding season at the Stony Point penguin colony in South Africa from February to April 2024. Ten Autonomous Recording Units were placed systematically across three habitats in the Nature Reserve to collect audio recordings. We also conducted a visual census, counting nests in 20x20 meter grid areas to measure nest density.

From 5,488 hours of audio, we calculated a Vocal Activity Rate (VAR) index for each sampling point, based on the number of ecstatic display songs per time unit. The shrub habitat had the highest nest density, with 66% of all nests observed. We found a clear positive correlation between the number of active nests and the VAR, showing that vocal activity reflects breeding activity.

Our study showed that PAM excels in densely vegetated areas where visual surveys struggled due to obstructions. While traditional methods missed some nests, PAM detected penguin vocal activity, overcoming these limitations.

This research highlights the value of non-invasive tools like PAM for monitoring African penguin colonies and suggests their potential for wider use in seabird conservation.

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Influence of vessel noise on the at-sea behavior of Harbour Seals (Phoca vitulina)

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In recent decades, the intensification of marine traffic has led to a global increase in underwater noise pollution. This anthropogenic noise overlaps with the hearing range of many marine species, disrupting key functions such as navigation, communication, and foraging, and has been shown to cause a range of adverse effects, including metabolic, physiological, and behavioral changes. Marine traffic is generally concentrated in coastal waters, leading to dense vessel activity and an increase in low-frequency noise levels in these areas. Yet, coastal zones are crucial habitats for many marine species. Harbour seals (Phoca vitulina), which inhabit coastal environments, may be particularly vulnerable to such disturbances. Understanding how noise exposure affects their movement and behavior is essential to inform effective conservation strategies.Therefore, this study aims to evaluate behavioural parameters before, during, and after vessel passes, in order to assess the impact of ship noise on their behaviour. To do so, GPS/GSM tags were deployed on 14 individuals from a local population in the Baie des Veys, in northwestern France, from November 2023 to June 2024. Underwater noise was then modeled using Automatic Identification System (AIS) data combined with the seals' GPS positions, providing estimates of vessel-generated sound levels across the study period. A before–during–after approach will be used to investigate changes in behavior in relation to specific high-intensity noise events (proxy for vessel passes), identified through modeled acoustic peaks. Behavioral metrics will be compared between the three phases to detect potential disruptions or modifications associated with noise exposure. As the study is still ongoing, results will be presented upon completion of the 6-month internship conducted as part of a second-year master's degree.

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Humpback whale song and odontocete whistles at the site of a proposed port in northeast Iceland

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Finnafjörður is a small fjord in northeast Iceland, where the planned construction of a large port has the potential to meaningfully change the marine soundscape and ecosystem. Currently wind and rain dominate the underwater soundscape and anthropogenic sound sources are limited making the soundscape relatively pristine. In this study, we used one year (2021/22) of passive acoustic recordings to characterize the acoustic presence of cetaceans in this pre-construction soundscape. We performed a detailed manual analysis of the data and detected regular humpback whale and odontocete vocalizations. Humpback whale social calls were detected occasionally throughout the year. In winter between mid-December and mid-February humpback whale song was present nearly continuously with increasing and decreasing variety of vocalizations at the beginning and end of the singing period. Whistles and echolocation clicks of odontocetes were detected occasionally throughout the year. The most commonly observed odontocetes in the region are white-beaked dolphins. This study is the first description of cetacean presence in Finnafjörður. As a baseline the results can be used to inform noise management during port construction, and to monitor future changes of cetacean occurrence in the region.

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Underwater soundscape near Mayotte Island : a noisy environment for marine mammals

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Baleen whales use low frequencies to communicate over long distances in the ocean. The distance at which a whale can perceive a sound depends on both fixed and variable elements, such as bathymetry and ambient noise. During the preindustrial era, ambient noise consisted mainly of biophonic sources (animal sounds) and geophonic sources (seismic and volcanic activity, landslides, cryospheric activity, sea-state, etc.). Now, as the soundscape increasingly results from human activities, its impact on cetacean behavior needs to be assessed, in particular the effect of acoustic masking of whale communication by antrophophonic sources. The impacts of such masking have been well described and can range from simple avoidance of noisy areas to a decrease in reproductive rates, migration failures, or even strandings. In 2020, four autonomous hydrophones were moored near the eastern coast of Mayotte Island (Mozambic channel, Indian Ocean) to study the seismic and volcanic activity resulting from the new-born underwater volcano Fani Maoré.
The MAHY (MAyotte HYdrophones) network effectively captured the earthquakes and lava flows produced by the volcano while also recording whale sounds and anthropogenic noises
(vessel traffic, seismic and quarry shots). Thanks to this passive acoustic monitoring, the MAHY network provided new insights into knowing the whale populations and species inhabiting Mayotte Island's waters. Whale sounds have already been studied to describe these populations and their vocalizations. The goal of this multidisciplinary work is now to explain some of the low-frequency sounds recorded, as well as to describe the impacts of geophony and anthropophony on the underwater soundscape of Mayotte Island and on its baleen whale populations. A multimodal approach combining AIS data, deep-learning model detections and noise level time series will give insight into the importance of masking on cetacean communication and its impact on their presence around Mayotte.

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Can birds find silence ? Birds in soundscapes of roads and renewable infrastructures

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Climate change, driven by anthropogenic greenhouse gas emissions, requires urgent global action. The development of renewable energy infrastructures, such as wind turbines and ground-mounted solar farms, is a key strategy to limit its impacts. However, these infrastructures, often associated with existing networks like roads, can strongly affect wildlife, especially species with large home ranges such as birds. Among these impacts, anthropogenic noise is often overlooked, despite its increasing presence in natural soundscapes. Moreover, studies assessing the cumulative effects of roads and renewable energy infrastructures on biodiversity remain scarce. To address this gap, we deployed eight acoustic recorders at the forest edge for two weeks in April and May, across four 5 km² grid types (n=4 replicates) : (1) Roads alone ; (2) Roads + solar farms ; (3) Roads + wind turbines ; (4) Roads + wind turbines + solar farms. Recorders were placed along distance gradients from infrastructures and cross-gradients where multiple infrastructures co-occur. They were programmed to record continuously during the dawn chorus, then alternately (1 minute on / 4 minutes off) during the day, allowing the study of temporal variations in soundscapes, noise disturbances, and bird species activity patterns. Recordings will be analyzed using acoustic indices, providing quantitative proxies for biodiversity, measuring dimensions such as biophony, geophony, and anthrophony. These indices allow rapid assessment of soundscape complexity and anthropogenic disturbance over time and space. This study aims to better understand how the growing development of energy infrastructures, combined with road networks, modifies bird soundscapes and activity patterns. These results are essential to inform sustainable energy planning and mitigate the impacts of cumulative infrastructure-related disturbances on wildlife.

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Lifetime changes of vocal repertoires in the black redstart, Phoenicurus ochruros: a longitudinal field study

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Oscine songbirds learn to sing mainly by imitating conspecific adults. Song learning programs are diverse, while some species can only learn during early life, others can learn new songs throughout their lives. However, there is a lack of longitudinal studies in this area. To address this gap, we investigated the lifelong evolution of male vocal repertoires and sharing in a migratory population of territorial black redstarts over eight consecutive seasons (2015-2022). Males defend breeding territories in scattered building patches, with microdialects observed among different clusters. Our study followed 25 males during their first breeding season and 24 across at least two breeding seasons. Most males maintained stable repertoires over their lifetime while those who shared only a few or no strophes with their neighbours when they first settled, changed their repertoires through addition and selective attrition of strophes and syllables' gradual modification. These changes led to an increased level of song sharing with neighbours. Thus, black redstarts adapt their songs to their social environment during the first breeding season and through their lifetime. Our results support a continuum view of song plasticity as well as the necessity of long-term studies to understand the variability of song learning processes.

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Poster

- Tuesday June 24 -

SEGAMAS: a Serious Game for Marine Mammals Survey and machine learning underwater acoustic scenes for cetacean studies

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Studying cetaceans is a complex task, due to the inaccessibility of the marine environment and low visibility. Passive acoustics is a very promising non-invasive solution. Nowadays, detection and classification of recorded species are carried out automatically and with good accuracy, in particular using AI methods. However, using such methods to locate animals is still imprecise, due to the insufficiency of ground truth data on their actual movements. SEGAMAS, is a complete model of subsea acoustic scenes. It is an end-to-end AI approach based on a machine learning model to go directly from raw emissions to source positioning. The major issue is the lack of real data. To overcome this, the model includes a homemade ray-tracing model named CIANray and the generation of realistic cetacean trajectories, inspired by [1, 2]. CIANray provides the received signal and the paths taken by the rays from the emitted signal and bathymetric, oceanographic and ambient noise data. With the generated cetacean trajectories, these data will be used to train Transformers AI models [3], able to reconstruct the trajectory of a sound source from a simple recording. The objective of this model will be useful in the study of cetaceans, to simulate reel scenes, analyze comportment, avoid collisions with ships, and to better design and position our sensors. Validations will be conducted on ground truth 3D tracking of Physeter macrocephalus.

[1] Parrott ea (2010), 3MTSIM: An agent-based model of marine mammals and maritime traffic to assist management of human activities in the Saint Lawrence Estuary, Canada, Int. Whaling Commission

[2] Chouchane, ea (2012), Splitting method for spatio-temporal sensors deployment in underwater systems, EvoCOP

[3] Ashish, ea (2017), Attention is all you need, in Advances in Neural Information Processing Systems

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Striped dolphin whistling behaviour shows similarities with signature whistles in Bottlenose dolphins

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Various forms of communication exist within the animal kingdom which facilitate conspecific interactions. Repeated, stereotyped vocalisations in particular have raised many questions regarding their function. Signature whistles are individually distinctive recognition calls that encode identity information in bottlenose dolphins. To date, there have been no dedicated studies on the potential for these to occur within the vocal repertoire of striped dolphins (Stenella coeruebalba), nor have repeated whistles been documented extensively thus far. This study investigates the whistling behaviour of striped dolphins to determine if any comparisons can be made between repeated vocalisations in this species and signature whistles in BND. 7hrs and 6mins of towed hydrophone array recordings collected during the HICEAS 2017 NOAA cruise were scanned for repeated whistle types (RWTs). A subset of visually identified RWTs were evaluated for stereotypy via an inter-observer reliability test (IORT) where three experienced volunteers grouped 75 whistles into as many categories as they felt appropriate based on similarities in the frequency contour. Of the 2751 whistles extracted, 608 (22%) were RWTs, spanning 58 categories. Fleiss kappa found 83% agreement across categorisation of 16 RWTs by three independent observers in an IORT (kappa=0.833, z=47.3). 8 RWTs displayed patterns of emission comparable with BND signature whistles, using thresholds laid out by Janik et al., 2013. This study has shown that not only do striped dolphins exhibit highly stereotyped whistles within their vocal repertoire but that some (~13.7%) may function as signature whistles. However, since thresholds laid out for identifying these were intended for a different species, more research must first be conducted before we can confirm that RWTs in striped dolphins hold the same potential.

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A long-term project to evaluate the impacts of ground-mounted photovoltaic plants on birds

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In the context of transition from fossil to renewable energies to reduce our greenhouse gas emissions and our dependance to a finite supply, the REPowerEU plan aims to double the amount of electricity generated from solar energy between 2022 and 2025 and then triple it between 2022 and 2030. However, knowledge on the impacts of ground-mounted photovoltaic plants (PV) on biodiversity and specifically on birds remains very scarce. Recently, it has been shown that they can positively impact birds when installed in landscape of low quality for this taxa such as intensive agriculture. Yet, the impact of PV on birds in habitats of higher quality remains to be investigated.

In this project, we aim to determine the potential effects of PV installed in forests on bird community at a large temporal scale (5 years). Specifically, we will evaluate whether the effects of PV on birds vary depending on the age of the PV, their size and the row distance between panels by deriving ecoacoustic indices and gathering data on bird species richness, abundance, and community composition. We expect these effects to strongly depend of the habitat specialization of the species.

We selected 15 PV located in forests in the South-East part of France. Birds will be acoustically monitored every year from March to August between 2024 and 2028, with passive recorders located (i) at the center of the PV, (ii) at its edge and (iii) in forest (control site). Furthermore, the impact of PV on birds will be investigated using passive acoustic sampling through a before-after control-impact study design at 5 sites under construction located within forested areas.

Our work will allow to improve knowledge on interactions between PV and birds, provide recommandations on PV design and propose a monitoring protocol for birds to implement in environmental impact assessment.

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From ears to algorithms: comparing human and AI-based bird detectability

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The rapid expansion of solar parks is raising concerns about their impacts on biodiversity, as habitat modification through soil artificialisation and microclimatic changes beneath panels can affect local plant and animal communities. Assessing these effects requires extensive, multi-site monitoring, yet such studies remain scarce due to the significant time and effort they demand. Passive Acoustic Monitoring (PAM) offers a non-invasive, continuous approach to tracking bird communities, but its effectiveness for regulatory assessments remains limited by the defects of automated recognition. Our ENVOLtaïque Ouest project (2025-2029) focuses on the complementarity of PAM and field surveys to assess bird responses to solar parks. We hypothesize that parks can increase bird richness and abundance in homogeneous agricultural landscapes, by introducing structural heterogeneity. Conversely, in bocages and wastelands, parks may reduce diversity. To test our hypotheses, we will combine PAM and field monitoring of 25 solar parks in western France, 15 built and 10 planned, over a five-year period. These parks cover various latitudes, habitats, and structural characteristics, such as surface area, panel height, and inter-row spacing. Bird species identification will be based on the BirdNET-Analyzer deep learning algorithm, with manual verification and comparison with field observations. We will calculate α-acoustic diversity indices to assess the regularity, richness, and heterogeneity of acoustic communities, and implement clustering algorithms to correlate acoustic patterns with park features. By comparing the detectability of birds by humans and by AI, particularly for rare and vulnerable species, we aim to highlight methodological complementarities and prospects for future development. Ultimately, our project should help improve biodiversity monitoring and guide the integration of AI into future regulatory impact assessments.

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Traffic reductions during COVID-19 lockdowns benefited species already tolerant of noise pollution: an acoustic analysis

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Anthropogenic noise is a highly pervasive but many times neglected pollutant worldwide. Noise from human activities is known to affect communication in wild animals, increase physiological stress and impact important biological dynamics such as breeding, space orientation and predator-prey dynamics. Because noise is most intense at lower frequencies of the power spectrum, species that communicate using lower frequencies and within narrower bandwidths are expected to be severely impacted because of “energetic masking” (i.e. the overlap of noise and vocalization frequencies). During the COVID-19 pandemic, anthropogenic activities were severely halted for many months worldwide, and reductions of human traffic were connected to increases in abundance of many bird species in North America. Because songbirds are a group of highly communicative species known to be impacted by current high levels of noise pollution, we tested if the verified abundance changes from pre-pandemic to pandemic periods were related with the frequency characteristics of species’ songs. Surprisingly, species expected to be more acoustically resistant to noise (i.e. vocalizing at high frequencies and within wider frequency bandwidths) were the ones that presented stronger abundance changes in counties/states of USA and Canada where traffic reductions were greater. Such results seem to indicate that current levels of noise pollution can also be negative towards so called "noise-tolerant" species and how traffic reductions verified during the COVID-19 pandemic were potentially not severe enough to impact counts of less-tolerant species.

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Anuraset: A dataset for benchmarking Neotropical anuran calls identification in passive acoustic monitoring

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Global change is altering ecosystems worldwide, significantly impacting the acoustic behavior of anurans. To address this challenge, we leveraged passive acoustic monitoring (PAM) to study and identify anuran species based on their vocalizations. In this work, we present a comprehensive, large-scale open dataset containing 27 hours of expert-annotated recordings, representing 42 anuran species from two Brazilian biomes. This dataset includes raw recordings, a reproducible experimental setup, and a baseline model addressing the fine-grained categorization of anuran calls. Our results showcase the potential of machine learning techniques to overcome the complexity of identifying species in neotropical soundscapes. However, we also highlight the unique challenges posed by these highly diverse and dynamic environments, which demand novel approaches and robust algorithms. In addition to presenting our findings, we aim to catalyze further research by fostering collaborations with herpetologists and conservationists, particularly from the Global South. By engaging researchers from biodiversity-rich and often underrepresented regions, we aspire to create more inclusive solutions that address local conservation priorities, to bridge the gap between ecological monitoring and actionable conservation policy, ensuring that advances in acoustic monitoring and artificial intelligence contribute meaningfully to mitigating the impacts of global change on vulnerable anuran populations.

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Comparing single to multi-task models on three bioacoustics classification tasks

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Datasets in bioacoustics are often collected to solve one specific task, and models making use of only one dataset are then developed to solve this task. As a result, many bioacoustics datasets varying in size and annotation types are currently not used together. Multi-task learning, in which a model is trained to simultaneously predict several tasks, seems like a promising approach to combine these datasets. In addition, multi-task learning pushes the model to concentrate on features that are common to all tasks, leading to more robust and generalisable features. Therefore, we conducted a study to compare single to multi-task approaches on three bioacoustics tasks: the species, individual, and vocalisation type classification. To achieve this, we trained a single or multi-task classification head on five datasets covering these three tasks. The head was developed on top of a fixed general audio encoder, the Audio Spectrogram Transformer. We also compared two strategies to weight the tasks during the training of the multi-task models. The first one is static weighting where the weights are manually set at the beginning of the training, while the second one is automatic weighting, where we make use of the GradNorm algorithm to dynamically tune the weights during training. We observed that multi-task training did not outperform the single task models, even with GradNorm. We will discuss the possible reasons for these results, and consider future strategies to address multiple tasks in bioacoustic deep learning.

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A high frequency recorder system for online CNN detection and classification of vocalizations

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Assessing the biodiversity and quantifying keystone species in an ecosystem has progressively moved from direct human observation and sampling to multi-source data collection using remote sensors, especially video and acoustic ones. Underwater and terrestrial acoustic recorders with low-power and long sampling periods characteristics are now common, allowing for the collection of large amounts of data to study. With the rise of data quantity came the ubiquitous use of AI models for vocalization detections and species identification. However systems found on the market seldom combine recording with online analysis due to the high power consumption needed for accurate AI models. Considering using embedded analysis tools directly in recording systems can be a key feature for some applications, we developed our own recorder as a system for combining low-power, high-quality recording with embedded efficient statistical and AI analysis models. Depending on the mission the recorder can also transmit real-time reports and alerts, minimizing the amount of data to process offline and allowing real-time responses to specific events. Through this platform we also hope to stimulate embedded low-power AI models development for bioacoustic research. Today the system can record audio data with up to 512kHz sampling frequency, a 24 bits resolution on up to 6 audio channels and host up to 20 different CNNs and several acoustic indices. Its power consumption is 1.5W at full power, which allows for several months long autonomous missions. We deployed these systems on several projects such on subsea systems: GIAS FEDER, SeaStMar FEDER, EUROPAM Biodiversa, and the WhaleWay missions, and also on earth with the Terraforma PIA4 project.

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Poster

- Tuesday June 24 -

Modeling underwater acoustic propagation in the Sainte Marie channel (Madagascar) to study vessel noise impact on Humpback whales.

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Underwater noise pollution, particularly from maritime traffic, poses significant concerns for marine mammals, as they primarily rely on acoustic signals for vital functions. Vessel noise is raising conservation concerns as it is responsible for vocalization masking, hearing damage, and physiological stress in cetaceans. Vessel noise's main sound energy is in low frequencies, which propagate over tens of kilometers underwater. However, modeling sound propagation in marine environments is challenging and requires location-specific parameters. Our study developed an acoustic propagation model for the Sainte Marie channel in Madagascar, a well-known humpback whale breeding ground. We conducted playback experiments in this shallow coastal environment during the consecutive 2023 and 2024 breeding seasons. The model incorporates water temperature profiles, salinity, seafloor composition, and channel bathymetry. Using Bellhop acoustic ray tracing software, we predicted underwater sound propagation and measured transmission loss patterns to understand how sound travels in this shallow water environment. We validated our model with recordings at the playback source and from multi-sensor tags deployed during experiments. We plan to refine this model during our August 2025 fieldwork by collecting additional horizontal and vertical sound propagation data. This research provides valuable insights into noise propagation during our experiments and will help us better understand vessel noise impacts on whales in shallow waters, improving our interpretation of whale responses and potential collision mechanisms.

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haracterization of the whistle emission of Tursiops Truncatus in the northern ionian sea, central Mediterranean sea

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The present study aims to investigate the acoustic behavior of Tursiops truncatus in the Northern Ionian Sea, Central Mediterranean Sea, focusing on the acoustic features of whistles in relation to group compositions and behavioral context. Furthermore, the presence of stereotyped whistles was investigated to identify the possible occurrence of signature whistles. The study area is characterized by intense anthropogenic activities such as marine traffic, trawling, military exercises, and offshore wind farms thus, passive acoustic monitoring (PAM) can be an important tool for studying the population dynamics and behavior of this and other cetacean occurring species. Acoustic data was collected aboard a 12-meter catamaran during standardized vessel-based surveys, resulting in 2 hours and 73 minutes of recordings. Firstly, the acoustic recordings were spectrographically analyzed in order to select whistles using the open-source software Praat, and the presence of the signature whistles was assessed using the SIGnature Identification (SIGID) criterion Janik et al., (2013). Then, for each whistle, the pitch contour was extracted using PAMGuard software to measure duration and frequency parameters (maximum, minimum, initial, and final). A total of 267 frequency-modulated narrow-band sounds were selected, and 6 whistle types ascribable to signature whistles were identified. This study provides new insight in the acoustic behavior of the species in an area where an intense anthropogenic pressure increases the conservation risk for the population.

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Poster

- Tuesday June 24 -

Social drivers and consequences of vocal production complexity during approach in chimpanzees

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In non-human primates, as in numerous taxa, vocal communication plays a central role in mediating social interactions. Various primate species tailor their vocal production to the identity of their social partners, with factors such as dominance rank, social relationships, and context influencing both the likelihood to vocalise and the type of vocalisation. However, most of this research has focused on the production of single call types, often overlooking the social drivers of combinatorial vocal production. Recent studies have shown that chimpanzees (Pan troglodytes), one of our closest living relatives, use vocal sequences in 30% of their vocal production, highlighting the importance of combinatoriality in their communication. Our study aims to investigate the social triggers of vocal sequence production in chimpanzees. We recorded the vocalisations and social behaviours of 19 adult chimpanzees in two social groups at Leipzig zoo during 30-min focal follow. We focused on vocalisations emitted during approaches, as this situation allows for clear identification of the vocalisation recipient. Based on c.a. 10 hours of focal observations for each chimpanzee, we will evaluate how the social and dominance relationships between the caller and the recipient influence the type of call used and the likelihood of producing vocal sequences — i.e., a sequence of at least two different call types — over single calls. Social and dominance relationships will be assessed using a combination of our own data and long-term data on grooming, proximity and aggression. Additionally, we will examine whether vocalising during an approach, the type of calls produced and the use of vocal sequences affect the social outcome of the approach. Specifically, we will evaluate if these vocal production features impact the likelihood of socio-positive and socio-negative interactions with the approached individual.

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Transformer for passive acoustic distance estimation of cetaceans

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Accessing the 3D tracks of sperm whales (Physeter macrocephalus) using noninvasive and easily implemented methods remains a significant challenge. Passive acoustics is a noninvasive technique commonly used to localize the source of clicks, but it typically provides more accurate range estimation with a large hydrophone array. Indeed, while azimuth and elevation can be reliably determined using Time Differences of Arrival (TDoAs), estimating range remains challenging with small-aperture arrays. However, most field data, particularly from the Mediterranean Sea, have been collected using such arrays. To improve the accuracy of range estimation with small aperture-arrays, we propose a novel approach based on neural networks.

Selected Transformer models extract information not only from TDoAs but also from the Time Difference Echo Surface and variations in azimuth and elevation. The models were trained using supervised learning on a generated dataset corresponding to very short trajectories, reflecting the typical behavior of sperm whales during foraging dives, and tested both on generated dataset and on sets of real data. First, the method was evaluated in straightforward cases involving a large hydrophone array: the 3D track of a single sperm whale recorded using ocean-bottom hydrophones in the Bahamas Tongue, as well as the tracks of four whales in the same area, and then compared with the estimated tracks from Giraudet et al. (2006) and Glotin et al. (2008).

The Transformer model achieves on simulations a mean absolute percentage error of less than 10% and a coefficient of determination higher than 0.95 in range estimation. In addition, the method was validated on the large hydrophone array datasets (Giraudet et al, Glotin et al). These promising results, combined with appropriate training, enable distance estimation on data recorded with a small-aperture array: one individual from the WhaleWay expedition in the Ligurian Sea.

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Who's calling ? Vocal individuality in carrion and hooded crows from the nestling to the fledgling stage

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In animals with complex social lives such as crows, individual vocal recognition can be a crucial aspect of acoustic communication. The distinct acoustic features underlying this recognition have been found to be present as early as during the nestling stage in other bird species. The extent of individual distinctiveness can differ throughout ontogeny, likely depending on the adaptive value of being recognised by voice. However, the factors underlying the development of vocal individuality in species of different life-histories are poorly understood.

Here, we recorded hand-raised carrion and hooded crows (Corvus corone and Corvus cornix) from ca. two weeks after hatching to two weeks after fledging to investigate the development of their vocal individuality. Calls stemmed from different behavioural contexts such as begging, resting and physical contact with their caretakers.

Using permuted discriminant function analyses, I show the presence of vocal individuality in calls from across different contexts in the nestling as well as the fledgling stage. Furthermore, calculation of Beecher's H suggests a possible shift in the level of individuality of begging calls with age, with the level being highest in the late nestling stage. Calls recorded in the nestling stage differed in their individuality depending on behavioural context.

My thesis represents the first investigation of the development of vocal individuality in carrion and hooded crows, thereby contributing to our understanding of the different life-history factors that can affect vocal individuality cues.

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