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Faculdade de Ciências da Universidade de Lisboa

Seminar: History of Ecology.

Disciplines, Debates & Disciplinary Transformations

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Organizer: Pier Luigi Pireddu

Faculty of Science, University of Lisbon (FCUL).

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Room: 8.2.06.

Workshop Aims and Objectives

The goal of this workshop is to unite scholars who approach the history of ecology – and the evolution of the discipline itself – from a variety of perspectives. At its core lies the recognition that *ecology*, even when studied as a historical phenomenon, encompasses multiple domains of expertise, each warranting its own focused investigation. Case studies might examine, for example, the rise of limnology (the study of lakes) or marine ecology (the study of seas), or more narrowly defined inquiries into plant and animal populations in situ.

Viewed historically, these different traditions form a rich context that traces ecology's emergence and institutionalization over time. Beyond simply mapping its historical trajectory, however, questions about conceptual content and the intellectual trends that have shaped – and sometimes reshaped – the field underlie the workshop. While a two-day event cannot exhaust every topic, it can showcase both the depth already explored and the many promising avenues still awaiting contextualization. This considers empirical approaches based on case studies (e.g., limnology, marine ecology) as well as more conceptual analyses of the history of ecology. Nevertheless, a compelling aspect lies in plurality, understood as multiple subfields and conceptual lineages.

International interest in the history of marine ecology – evidenced by a wealth of scholarship to date – is mirrored in this workshop's program. Alessandra Passariello, Carlos A. Assis, Cristina Brito, Nina Vieira, Patrícia Carvalho, and Pablo Lima Hernández will each discuss this rich tradition from distinct perspectives. Cristina Brito will present on the ERC 4-OCEANS project, while Alessandra Passariello leads a deep dive into marine benthic bionomy. Carlos A. Assis offers a broad overview of marine ecology's evolution in the twentieth century, a period also examined by Pablo Lima Hernández. Finally, Patrícia Carvalho, Nina Vieira, and Cristina Brito turn to whales as iconic subjects, tracing their cultural and scientific significance in Portugal in the 18th century, while Louise Merquiol, through art historical research, claims to reconstruct aquatic biodiversity in Italian Early Modern.

A second focal block examines the history of plant ecology, another key strand of the workshop. Antoine Dussault critiques individualism in phytosociology, a theme that has long animated ecological debates. Fabrice Roux then explores the analogy between plant communities and living organisms, revisiting foundational concepts introduced by Frederic Clements – particularly the idea of *plant formations*. Ignacio García follows with a case study of Portugal, showing how phytosociology emerged in the early twentieth century through figures like José Malato Beliz. From a conceptual point of view, and on the analogy between ecological systems and organisms, Ghyslain Bolduc discusses the issue by referring to Immanuel Kant's contribution to the natural sciences. Finally, Gonçalo Martins broadens the discussion by investigating ecology's connection with

Nazism, while Pier Luigi Pireddu considers the discovery of plankton a pivotal historiographical moment and situates limnology and marine ecology within the same historical framework.

Together, these strands form a comprehensive framework of the topics and issues that have shaped ecology's emergence as a scientific discipline. While there are undoubtedly many more facets to explore, this workshop is not intended to impose limits; rather, it aims to illuminate the approaches and narratives that historical analysis can reveal and to open new avenues for future inquiry.

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At the origin of marine benthic bionomy: from auto-ecology to syn-ecology

Abstract. In 1959 the two French zoologists Jean-Marie Perès and Jacques Picard published what is now considered a milestone in marine ecology, the *Manuel de Bionomie benthique de la mer Méditerranée*. The tradition of benthic bionomy aimed at explaining standard patterns of associations between species (ecological communities) as a function of different environmental parameters (such as light, humectation and temperature). Differing from the contemporary tradition of "Experimental ecology" which mostly developed in the United States and in the American context, the tradition of marine benthic bionomy mostly circulated among research institution from all over the Mediterranean basin. The aim of this contribution is to reconstruct the late 19th and early 20th century origins of this research tradition: we will first provide an analysis of the occurrences and meanings of the term 'bionomy' in late 19th and early 20th century scientific literature, showing how this concept had a predominantly auto-ecological meaning (i.e. it referred to the relationship between an individual species and its preferred habitat). We will then attempt to trace a conceptual genealogy that explains how the concept of 'bionomy' turned from auto-ecology to synecology and became an indication of the relationship between associations of species and their preferred habitat.

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A classical ecological controversy's French variant: The Zurich-Montpellier phytosociology school and its "individualist" critics

Abstract. A classical controversy in early plant ecology is that which opposes proponents of a holist or organicist view of communities to proponents of an individualist view (e.g. Simberloff 1980; Barbour 1996; Eliot 2011; Singh and Zobel 2022). While its best-known variant is indeed the one that involves American ecologist Frederic Clements and his fiercest critic Henry Gleason, historical discussions of ecology often allude to variants of this controversy involving ecologists from other countries (e.g. Ponyatovskaya 1961; Whittaker 1962; Alexandre and Génin 2012, chap. 6). One of these variants, to which only scarce attention has so far been paid, occurred in France. It opposes Zurich-Montpellier phytosociologists Josias Braun-Blanquet and Jules Pavillard, to their

"individualist" critics Félix Lenoble and L'Abbé P. Fournier. A peculiarity of this French variant of the controversy is that, while it features Braun-Blanquet and Pavillard's ideas as targets of an "individualist" critique—one similar to the one addressed to Clements by Gleason—the two phytosociologists appear at the same time to have been staunch Clements's critics. In particular, there are passages in their writings that are highly critical of Clements's analogy between plant formations and organisms (Drouin 1991a, 139–40; 1991b, 114; 1994; Wilson, Agnew, and Roxburgh 2019, 228–29). In this presentation, I will, drawing on previous discussions of Zurich-Montpellier phytosociology (e.g. Nicolson 1989; Acot 2008; Géhu 2010), analyse this French variant of the "holism-individualism" controversy, with the aim of explaining how Braun-Blanquet and Pavillard could both reject Clements's "organicist" analogy and be subject to an individualist critique. The solution I will propose will draw on nuances brought to the analysis of the Clements/Gleason debate by historian of ecology Malcolm Nicolson (1990).

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A Kantian Episode in the History of Ecology: From Emil Ungerer's Holism to Cornelis Jacob van der Klaauw's thinking on the unity of ecological systems

Abstract. The contribution of Immanuel Kant's critical philosophy to 19th century natural sciences such as morphology, embryology and physiology has been well documented and debated by scholars in recent decades. But Kant's ideas may also have played an unexpected role in addressing a central question of early 20th century ecology: are ecological systems similar to organisms, and to what extent? Taking up Kant's discussion of natural purposiveness, Dutch ecologist Cornelis Jacob van der Klaauw (1935) developed an account of multispecies systems as wholes that, however, differ significantly from organisms. Although these systems exhibit a network-like unity which results from contingent teleological relations between their parts, they differ from organisms in that they are not themselves purposes of nature, i.e. self-organizing wholes whose parts interact as if they were developing in accordance with the purpose of the whole. In this presentation, we will first analyse Emil Ungerer's use and criticism of Kant's ideas on natural teleology (1922), particularly in his analysis of plant self-regulation (1926). References to Ungerer's work are ubiquitous in van der Klaauw's work on Kant's teleology and theoretical ecology, and we will show how Ungerer guided him in his reading of Kant's Critique of Teleological Judgement. In particular, we will explore the idea that Kant's discussion of natural teleology enables van der Klaauw to elaborate his ecological

holism as a middle way between ecological organicism and a reductionistic view of ecological systems.

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Does the Braun-Blanquet plant association count as a living organism?

Abstract: In the vegetation science of the early twentieth century, the main task of geographical botany was to describe the plant cover in terms of elementary units. Derived from this, the organicist analogy of Frederic Clements in North America gave an ontological status to the "plant formation", a large-scale physiognomic unit that this author assimilated to a growing organism. Challenging this idea, Josias Braun Blanquet of the European School of Plant Sociology (SIGMA) considered that the concept of "plant formation" was of little interest, preferring the small-scale "plant association" defined by "characteristic species" as the operational concept. Consequently, he developed a vivid criticism of Clements' organic metaphor. In the meantime, however, he formulated a somewhat similar analogy, qualifying his plant association as a "social organism". We suggest that this contradiction was the result of conflicting pressures between his perceived need to challenge Clements's 'plant formation' and the context of the time in biology and sociology, where the assimilation of a heterogeneous collection of parts into a unified organised whole as an organism was widely accepted. The main features of the social organism represented by Braun-Blanquet's plant association are described here, with a focus on the heuristic interest of this analogy for nature conservation, a project that was at the core of Braun-Blanquet's scientific activity.

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Ecology, Holism and National Socialist Ideology

Abstract: There is an important debate in ecology, concerning holism and reductionism, which has framed the discussions about explanation and prediction of ecological phenomena. This controversy is about the relationship between wholes and their parts. It might be argued that holism is not much more than the principle that “the whole has priority over the parts”, whatever this priority means, and a set of reservations about any form of reductionism or individualism. Within a holistic posture we are assuming a specific ontology (a worldview), methodology (a research strategy), and epistemology (a way of knowing). A striving towards connectedness with the totality of life, with nature itself, and

a specific nature into which the German volk would have been born, were all ideological aspects with the deepest meaning for the essence of National Socialist thought. Such a holistic perspective on the connection between the Germans and their natural "living space", which then constituted a sacred wholeness, had its roots in a neo-Romantic interpretation of the decline of the West and the ways to save the Germans from it, advanced by some German intelligentsia at the turn of the twentieth century. The importance of wholeness was thus seen as a path to revitalize a mechanized, individualized, and soulless society, in which organisms and human beings were being reduced to machines. Wholeness was therefore embraced as an effort to civilize, spiritualize, aestheticize, and rehabilitate life. In this presentation, I will consider whether Nazism deliberately appropriated and defended some useful holistic metaphors to propagandize its “Blood and Soil” worldview with some ecological flavour. Perhaps there is no inherent affinity between holistic ideas and those of Nazism. This ecological sensibility that resonated in the Third Reich was perhaps only a path that did not line up with that of racism and nationalism.

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The Plankton Discovery: Historiographical Insights into the Emergence of Limnology and Marine Science

Abstract: This paper explores how the discovery of plankton represented a historiographical moment that profoundly shaped limnology and marine science. In the late 19th and early 20th centuries, European and North American researchers began to unravel the complexity of plankton, which not only provided a window into the structure of aquatic ecosystems but also stimulated disciplinary innovations. Tracing the evolution of plankton research, this study demonstrates how early quantitative and observational methods catalysed the development of distinct but interconnected frameworks in marine and freshwater ecology. Central to this analysis is a comparative investigation of seminal figures such as Victor Hensen, whose coining of the term “plankton” unified several research agendas, and pioneers including Michael Sars, Georg Ossian Sars, and François-Alphonse Forel. Their work laid the foundation for subsequent studies that have expanded our understanding of plankton's ecological roles – from trophic dynamics and material cycles to biogeochemical processes. The panel discusses how debates over the phylogenetic classification, distribution, and migration of plankton have led to methodological innovations that have fostered a broader ecological

perspective. The momentum generated by plankton research not only advanced the individual fields of limnology and marine science but also established a shared conceptual framework within the history of ecology. This approach emphasises that the early interdisciplinary exchanges between limnologists and oceanographers were fundamental to the formation of modern ecological thinking. Ultimately, it is argued that the "plankton moment" was a critical point that redefined the boundaries of aquatic science, encouraging a more integrated study of marine and freshwater environments and offering new insights into the formation of ecological paradigms. This discussion contributes to the historiography of science by framing the discovery of plankton as a catalyst for disciplinary transformation and a milestone for contemporary ecological research.

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The development of Marine Ecology in the 20th century: stimuli and constraints.

Abstract. The acquisition of new knowledge originates from one of two types of stimuli: the need to solve practical problems or the casual observation of details that arouse curiosity and compel its satisfaction through further observations and the integration of more information. The second type of circumstances led to the emergence of Ecology when, throughout the 18th century, the contemplation of the perfection of the divine work led some naturalists to understand that nature functions as a complex system, whose elements are interconnected by relationships of interinfluence and interdependence. The understanding of how such a system works, however, was very slow, so much so that, at the beginning of the 20th century, Ecology was only just beginning to take its first steps. At that time, curiosity alone, combined with the lack of technology and the appropriate analytic methods, did not allow for rapid development. Furthermore, the harshness of the marine environment for our species greatly limited the explorable extent of that environment. Since the mid-20th century, the increased visibility of human impact on the environment, which motivated the awakening of the environmentalist movement, the need to understand the functioning of ecosystems in order to assess the consequences of human impact on them, and the development of appropriate technologies and methodologies, led Ecology to evolve rapidly and to become what it is today.

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The 4-OCEANS Project and the Blue Humanities

Abstract. Societies have historically depended on and have been shaped by marine organisms and ecosystems, through which relationships have been built at ecological and cultural levels over millennia. These mutual interactions have ensured the subsistence of humans and the resilience capacity of societies based on a sustainable use of the oceans, but also caused deep impacts on ecosystem composition, structure and function due to overexploitation, leading to habitat degradation, species endangerment and extinction. The 4-OCEANS project aims to assess the importance of marine life for human societies during the last two millennia, up to the age of intensive fishing under steam-power, arguing that the harvest of marine resources played a critical, but as yet underappreciated and poorly understood, role in global history. We will focus on the transdisciplinary approach of the Blue Humanities that allows to combine multiple perspectives and methods to address historical trends of changes on ecosystems, sociocultural developments, impacts and the resulting consequences for marine populations. Within this dynamic field of research, we include both marine environmental history and historical marine ecology, and a series of species or populations can be analysed from whales to manatees and dugongs. Using documentary, iconographic, cartographic sources and material evidence, to address past distributions, human practices and impacts on the ocean and its animals, is possible to understand current environmental issues related to ocean conservation. Cultural products offer a sense of the importance of these animals to humans and the past and current state of interactions established. Analysing data from catches for Portugal, and the former colonial territories, we can draw a story of sequential use of targeted species. Putting data together, we get an all-encompassing perspective on the historical, economic and cultural value of large whales up to the present day.

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When the whale surfaces: the Portuguese 18th-century sources for the history of whales.

Abstract. Whales are iconic animals. Throughout the history they have inspired different feelings among the people that interacted with them, from curiosity to fear, from respect to empathy. These

aquatic mammals were first considered as fish and many times described as monsters, while being an important resource for food, lighting and pharmacies. It was only the 10th edition of the taxonomic classification of Linnaeus that placed them in their own Mammalia category apart from fishes, providing different audiences a scientific name which was of great importance for the construction and circulation of knowledge about cetacean species. Before that, information about these animals, about species morphology, habitat, behaviour, feeding habits or abundance, was already available in different types of historical and cultural supports. These ranged from natural history observations, letters, travellers' accounts, newspapers, poems and visual sources, as drawings or paintings. Strandings descriptions are one of the sources for collecting information about whales and other monstrous fishes, as they allowed a more detailed observation of the animals, their size, morphology and biology. Focusing on whales' observations, strandings and on knowledge production in 18th century Portugal we will approach two different sources: the Portuguese unpublish manuscript *Piscilegio Lusitano* (c. 1750) and the *Gazeta de Lisboa Occidental newspaper* (1723). The information contained in these sources is empirical and revels a strong naturalist interest - it includes new observations (sightings and strandings), new practices (e.g. hunting techniques, and uses of extracted products), and details about anatomy, animal behaviours and inter-species' interactions. Our analyses will show how historical data contribute to understand the corpus of science of the time and how new knowledge was acquired and appropriated by the society at multiple levels, from the interest in the natural world to metaphors for cultural realities.

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Ecology, Flora, and Nature in Malato Beliz's Thought.

Abstract. This paper explores how the emergence of phytosociology represented a historiographical moment that shaped botany and ecological studies in Portugal. In the 1930s, Spanish, French, German, and Swiss researchers began to contact Portuguese botanists and share the possibilities of phytosociology, a science of plant communities organized according to a hierarchy based on an elementary unit: the plant association. Historically, the word phytosociology was coined in 1896 by Paczoski (Poland). The first accurate definition of plant association was given in 1910, during the International Congress of Botany in Brussels, by rapporteur Charles Flahault: "An association is a plant community of specific floristic composition with uniform physiognomy and consistent

ecological growth conditions." This new science offered fresh opportunities for diagnosing territorial ecological value and preserving landscapes. Tracing the emergence of phytosociology in Portugal from the 1930s, this study demonstrates how quantitative and cartographical methods catalyzed the development of separate but interrelated frameworks. Essential to this analysis is a comparative study of seminal experts such as Josias Braun-Blanquet (1884–1980), José Vicente Malato Beliz (1920–1983), and David Gomes Crespo (born 1932).

Since 1950, the Elvas group led by Malato Beliz contributed to the application of phytosociology in Portugal and its colonies and to the improvement of its methodologies, such as field relevés and vegetation mapping. Their work laid the foundation for successive studies that have expanded the understanding of vegetation distribution and ecological roles. This paper discusses how debates over vegetation cartography have led to methodological innovations that fostered a broader ecological perspective. The momentum generated by national phytosociology pioneers not only advanced the individual fields of forest botany but also established a shared conceptual framework within the histories of botany, agronomy, forestry, and nature conservation.

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Co-production and management of the Mediterranean Sea: historical and philosophical perspectives

Abstract. The widespread analytical categories of the ‘technoscientific’, the ‘technopolitical’ and the ‘envirotechnical’, have been foregrounded by STS, historical and philosophical scholarship to advocate for a complex picture of how science, technology, politics and the environment have been co-produced at a planetary scale since the rise of environmental science and governance in the 1970s (Edwards, 2010; Jørgensen et al., 2013; Sörlin & Wormbs, 2018). In this paper, I propose the co-productionist approach as an insightful lens to look at how these dynamics played out at regional scales by delving into the history of marine pollution studies and management in the Mediterranean Sea over thelast third of the 20 th century. If the societal worries of rampant marine pollution played a crucial role in the forging of the first international agreements on the protection of the environment, the issue was even more pressing in the Mediterranean Sea, a semi-enclosed basin surrounded by highly populated coastal areas where tourism and other industrial activities were growing at unprecedented rates. The Mediterranean states, gathered around the United Nations Environmental Programme (UNEP), realized the only way to level down pollution of their common sea was international cooperation in marine research and regulation and signed a Mediterranean Action Plan

(MAP) in this regard (Haas, 1990). This geopolitical state of affairs set the stage for the emerging paradigm of marine systems ecology to take hold among an early nascent community of Mediterranean marine ecologists. International cooperative research dedicated to the making of cutting-edge ecological models of the basin was envisaged as a sound remedy to estimate the fate and number of pollutants. I argue that the science of marine ecology, the environing of a polluted Mediterranean and the political regulations to mitigate the situation were co- created. Additionally, I draw an epistemological lesson from this story which might be relevant for philosophers of experimentation (Hacking, 1983; Radder, 2003). When dealing with field sciences that, because of lack of reproducibility, are reliant upon the knowledge produced by upon large-scale interventions in ecosystems, be it intentional or the result of man-induced changes, the concept of experimentation on natural systems turns blurry and might be conflated with the management thereof. I contend that management of ecosystems, and the practice of performing natural experiments by scientists and policymakers, should count as a distinct way of experimental practice.

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From canvas to ecosystem: reconstructing Italy's aquatic biodiversity through art

Abstract. Our study explores how Italian still life paintings from the Early Modern period (16th-18th centuries) can serve as visual archives of past aquatic biodiversity in the Mediterranean. Based on art historical research, each artwork is attributed to a known painter, dated, and geographically situated. Depicted aquatic species are identified as precisely as possible by taxonomic experts, and presence-absence data are then analysed using ecological methods to track temporal and geographic variations. This research offers insights not only into historical biodiversity but also into the socio-ecological interactions of the period. To be represented in art, a species must pass through two filters: a technical filter, shaped by fishing methods, transport and preservation; and a socio-cultural filter, reflecting the tastes, symbols and culinary preferences of the artist and patron. Once these filters are accounted for, paintings reveal ecological patterns shaped by climate change, human pressures, and biogeographic shifts. As observed across Europe, including in Flemish painting, we identify a marked shift over these three centuries from the depiction of freshwater to marine species. This transition corresponds with improved access to marine products, the drying of wetlands and evolving culinary traditions. Correcting for these filters, spatial and temporal trends in species representation align with archaeological, historical and biological evidence. Special attention is given to emblematic and vulnerable Mediterranean species - such as sturgeons and cryptic barbel or pike species - whose

decline is visible in later historical records. Ultimately, this study highlights art as a unique visual archive, linking cultural and ecological histories. It provides valuable insights for biodiversity conservation and ecosystem restoration by revealing long-term ecological dynamics and the human factors driving change.