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Evocentric conservation in protected areas: a pioneering strategy in the Port-Cros National Park

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Abstract. Although awareness of environmental issues is increasing, human activities continue to place unprecedented pressure on ecosystems. In response, many countries have committed to protecting 30% of land and sea by 2030 under the Global Biodiversity Framework of the Convention for the Biological Diversity. However, effective conservation requires more than legal protection; it demands clear goals, sufficient resources, and the engagement of local stakeholders. The concept of values in conservation is vital, encompassing instrumental, intrinsic, and relational values of nature, which influence the reasons and methods of conservation. The International Panel for Biodiversity and Ecosystem Services (IPBES) emphasizes the importance of understanding and balancing these values, reflecting on human roles and impacts on biodiversity. The evocentric approach, proposed by Sarrazin and Lecomte (2016), underlines the aim to integrate short- and long-term human needs with respect for other species' evolutionary trajectories. The evocentric approach emphasizes evolutionary responsibility, aiming to reduce the human evolutionary footprint and maintain biodiversity's adaptive potential. By doing so, it provides a comprehensive framework for conservation that respects both human and non-human evolutionary processes. Port-Cros National Park (PCNP) in France has adopted this approach, becoming the first protected area to do so. The PCNP's scientific strategy for 2023-2032 aims to align conservation efforts with evolutionary principles, considering the broad impacts of human activities on evolution. Evolutionary processes, both microevolution and macroevolution, define and shape biodiversity. Human activities have significantly influenced these processes, often leading to rapid evolutionary changes and sometimes species extinctions. Therefore, conservation efforts must consider these evolutionary impacts to effectively mitigate human-induced disruptions at these scales. The PCNP's scientific strategy highlights the need to balance active restoration with allowing natural processes to occur. The PCNP aims to reduce human impact by setting degrees of intervention, focusing on maintaining ecological functions and evolutionary dynamics. This strategy addresses immediate and long-term conservation needs, considers stakeholder interests, and promotes "naturalness gradients" to manage human activities. Prioritising conservation targets according to the evolutionary responsibility of the PNCP towards the biodiversity existing within its territory, identifying and reducing pressures on evolutionary processes, and involving local stakeholders in this evocentric strategy will be the next challenges for PNCP and any other protected area which would seek to follow its pioneering strategy.
Keywords: evolution, evocentrism, microevolution, macroevolution, biodiversity, environmental ethics, strategic planning.

Résumé. **Conservation évocentrée dans les aires protégées : une stratégie pionnière dans le Parc national de Port-cros**. Bien que la sensibilisation aux enjeux environnementaux soit en augmentation, les activités humaines continuent de mettre une pression sans précédent sur les écosystèmes. En réponse, de nombreux pays se

sont engagés à protéger 30 % des terres et des mers d'ici 2030, conformément au « Global Biodiversity Framework » de la Convention sur la Diversité Biologique. Cependant, une conservation efficace nécessite plus qu'une simple protection légale : elle exige des objectifs clairs, des ressources suffisantes et l'engagement des parties prenantes locales. Ainsi, la question des valeurs en conservation est essentielle et influence les raisons et les méthodes de conservation. Le Panel International sur la Biodiversité et les Services Écosystémiques (IPBES) souligne l'importance de comprendre et d'équilibrer ces valeurs, en reflétant les rôles et impacts humains sur la biodiversité. Dans ce contexte, l'approche évocentrée, proposée par Sarrazin et Lecomte (2016), souligne l'objectif d'intégration des besoins humains à court et à long termes avec le respect des trajectoires évolutives des autres espèces. L'approche évocentrée vise à réduire l'empreinte évolutive humaine et à maintenir le potentiel adaptatif de la biodiversité. Ce faisant, elle propose un cadre global de conservation qui respecte à la fois les processus évolutifs des humains et des autres espèces. Le Parc national de Port-Cros (PNPC) en France est le premier espace protégé à adopter cette approche. La stratégie scientifique du PNCP pour 2023-2032 vise à aligner les efforts de conservation sur les principes évolutifs, en tenant compte des impacts globaux des activités humaines sur l'évolution. Les processus évolutifs, tant la microévolution que la macroévolution, définissent et façonnent la biodiversité. Les activités humaines ont considérablement influencé ces processus, entraînant souvent des changements évolutifs rapides et parfois des extinctions d'espèces. Par conséquent, les efforts de conservation doivent prendre en compte ces impacts pour atténuer efficacement les perturbations induites par les activités humaines à ces échelles. La stratégie scientifique du PNPC souligne la nécessité de trouver un équilibre entre la restauration active et le laisser-faire des processus naturels. Le PNPC vise à réduire l'impact humain en définissant des degrés d'intervention et en se concentrant sur le maintien des fonctions écologiques et des dynamiques évolutives. Cette stratégie, qui répond aux besoins de conservation à court et à long termes, prend en compte les intérêts des parties prenantes et promeut des « gradients de naturalité » pour gérer les activités humaines. Établir des priorités dans les objectifs de conservation en fonction de la responsabilité évolutive du PNCP vis-à-vis de la biodiversité vivant sur son territoire, identifier et réduire les pressions sur les processus évolutifs, et impliquer les acteurs locaux dans cette stratégie évocentrée seront les prochains défis du PNCP et de toute autre aire protégée qui souhaiterait suivre sa stratégie pionnière.
Mots-clés : évolution, évocentrisme, microévolution, macroévolution, biodiversité, éthique environnementale, planification stratégique.

Introduction

Despite increasing awareness of global environmental challenges among civil society, policymakers, and economic stakeholders, human activities continue to exert unprecedented pressure on ecosystems. Among a diversity of responses, many countries have committed to creating and expanding protected areas, particularly through international agreements like the Global Biodiversity framework of the Convention for Biological Diversity, signed by parties in 2022. This framework targets 30 percent of land and sea surfaces under protection status by 2030. However, merely establishing protected areas is insufficient, as the reality is far more complex. First, conservation issues must also be addressed outside protected areas. Second, regulations on protected areas can vary significantly in their restrictiveness towards harmful human activities and in their overall conservation ambitions. Third, the local implementation of political decisions is challenging and requires

substantial material and human resources to achieve actual protection of an area. Lastly, effective solutions to these challenges are most likely to be found when the vision and purpose of conservation are clearly defined, shared, and accepted by local stakeholders and people living in, using or simply visiting the protected area.

In this context, the question of values has been a critical concern in conservation since its early beginnings as a practice and research field. Understanding these valuations is crucial for determining the purposes and the means of conservation actions. The history of environmental ethics highlights the richness of this debate and the strength of the controversies surrounding biodiversity values. In summary, human valuation of nature can be broadly categorized as instrumental, intrinsic, or relational (e.g. Larrère, 2010; Beau, 2019). These categories are non-exclusive and encompass a wide diversity of concepts and meanings among numerous cultures worldwide. In other words, do we protect nature to fulfil immediate or future human needs, to improve the quality of immaterial links between living things and/or for inherent worth of other biodiversity entities? This pressing concern was investigated by extensive research in environmental ethics and compiled by the International Panel for Biodiversity and Ecosystem Services in its recent assessment report on the diverse values and valuation of nature (IPBES *et al.,* 2022).

Balancing these arguments requires addressing the crucial questions of how human beings desire to relate to non-human species and what consequences these entail for people and for these non-human species. While answers can be found in personal and social experiences and histories, it may be relevant to embrace a larger picture of the trajectories of human societies among the trajectories of non-human species. The breadth of this picture is the breadth of evolution. Evolution, in its Darwinian sense, has been the core concept underlying conservation biology since its earliest presence in the academic arena, with a major concern for the evolutionary consequences of human actions on biodiversity (e.g. Soulé and Wilcox, 1980; Soulé, 1985;). Since then, a growing concern for immediate human needs, identified as ecosystem services (Reid *et al.,* 2005) or more recently as nature contribution to people (Díaz *et al.*, 2018), has made this evolutionary dimension of conservation more implicit, though it has never completely disappeared from conservation aims and strategies (Génissel, submitted). In that context, Sarrazin and Lecomte (2016) argued for the potential of an evocentric approach to conservation with two main arguments: **(i)** it may constitute a systemic framework combining human short- and long-term needs and the respect for the evolutionary trajectories of non-human species ' and **(ii)** it may

contribute to understand the transition that such respect may represent at the level of evolution itself.

Recently the Parc national de Port-Cros (Port-Cros National Park- PCNP), a terrestrial and marine protected area situated in Provence (France, Mediterranean), defined its scientific strategy with an explicit focus on an evocentric approach of conservation. This strategy underlines the scientific requirements within the PCNP and determines the priorities for diverse disciplinary actions including biology, ecology, economics, law, geography, history, sociology, etc. during the period 2023-2032, and for a long-term perspective (Peirache *et al.,* 2023). The defining of the PCNP strategy involved consultation and co-drafting by the scientific council and the administration of the PCNP, as well as representatives of the local inhabitants of the PCNP.

Although evolution had been identified as a concern for protected areas (e.g. Dudley, 2008; Day *et al.,* 2012), to our knowledge, this pioneering strategy is the first to embed the entire vision of a protected area, and particularly a national park, within an evocentric approach. This represents an original opportunity to link such emerging concepts to practical implementation, connect researchers to field workers, and act as a bridge between conservation scientists, decision-makers and inhabitants.

In this perspective, we elaborate on the evocentric conservation approach through its implementation in a protected area. We explore the stakes, objectives, and opportunities associated with this approach. To do so, we detail the evocentric approach itself*,* analyse the evocentric dimensions of the scientific strategy of the PCNP, and propose ways to address and implement such strategy that could inspire the management of a wide range of protected and potentially non-protected areas worldwide.

Evocentric approach of conservation

In the following, we consider evolution, and evolutionary processes, in their Darwinian sense. As a reminder, in this context, evolution is an inherent process in life that drives local changes in life forms over time and generates the global diversity of life (Gould, 1980). At the complex scales of biodiversity, it encompasses two main dimensions: microevolution and macroevolution. Microevolution refers to the gradual, genetic-based and heritable changes in biological and cultural traits within a species. These changes determine individual fitness, i.e, the ability of a particular genotype to produce more offspring or of higher reproductive value in the next generation relative to other genotypes, through all processes affecting its survival and reproduction. These changes are driven by four evolutionary mechanisms: mutations in gene

sequences, genetic drift (random changes in allele frequencies across generations), gene flow between populations, and natural selection. Macroevolution deals with speciation, extinctions of species, phylogenetic relationships and the resulting diversity of life over larger temporal scales. In many ways, macroevolution is the integrative result of microevolution processes. Evolution thus concerns all levels of biodiversity, from genes, individuals, and population to community and ecosystems, including humans. Evolution accounts for functional processes, from flows of matter and energy to intra- and interspecific interactions that shape constraints and opportunities for coevolution. Evolution also concerns cultural processes. Indeed, cultural transmission exists elsewhere than human beings, the potential for cultural processes at least partly relies on a biological support and is subject of evolution, and culture feeds back into biological processes and evolution (Whiten, 2019).

Beyond basic evolutionary ecology, increasing data availability, technical ability, and concept development have enabled scientists to understand previously unsuspected processes. Evidence for rapid or contemporary evolution (Hendry and Kinnison, 1999; Carroll *et al.,* 2007) and the related eco-evolutionary dynamics (Hendry, 2023) demonstrates that microevolution occurs at shorter timescales than previously thought, with rapid impacts on ecological processes and biodiversity (Ellner *et al.,* 2011). Human impacts on the evolution of the livings are diverse and can be observed at macroevolutionary and microevolutionary levels. For several thousand years, humans have influenced evolution by driving species to extinction, for instance in mammals (Andermann *et al.,* 2020) and birds (Cooke *et al.*, 2023). Humans have also directed the evolutionary trajectories of some species in order to obtain resources or animal labour. Initially, unintentional but intensive trait selection led to the speciation process in domesticated populations (Sullivan *et al.,* 2017). Today, advancements in molecular tools pave the way for increased impacts on evolutionary processes and patterns through genetic editing and the use of targeted biocidal agents. For example, these tools can cause the development of resistance (Lecomte and Sarrazin, 2016). By changing ecological niches, generating pollution, modifying habitats, exploiting species, disrupting climatic processes, and introducing exotic species, humans have continuously and significantly influenced evolutionary processes and patterns. Human activities may now be the primary driver of evolution on the planet (Otto, 2018; Pelletier et Coltman, 2018; Palumbi, 2001). The concept and metrics of a human “evolutionary footprint” introduced by Genissel (2024) might contribute to defining and quantifying this impact. The “evolutionary footprint” is defined as the effect of a driver, for instance human species, by means of evolutionary driving factors, for instance fishery activities, on the microevolutionary and

macroevolutionary trajectories of biological entities, for instance fish population in an area, within a given time scale. On the one hand, the microevolutionary footprint is the evolutionary divergence in adaptative and non-adaptative traits and genetic diversity in a population under a driver's evolutionary pressure. On the other hand, the macroevolutionary footprint measures the effect of the driver on the phylogeny of a taxon through speciation and extinction. The "evolutionary footprint" provides an indicator of the intensity of the evolutionary impact of a driver, based on quantitative measure of a biological variable within a specific temporal and spatial scale. The metrics are those commonly used in conservation, for instance to measure the different types of genetic diversity, the change in morphology, physiology, etc. and the impact of extinction on phylogenetic diversity or evolutionary distinctiveness loss.

The evolutionary footprint concept aims to measure human impacts on evolutionary trajectories. Since conservation strategies aim to reduce the anthropogenic impact on biodiversity, it would be pertinent to assess their contribution in reducing the human evolutionary footprint. Indeed, conservation efforts themselves may exert an evolutionary impact when trying to reduce human impact. Ecological restorations, species and ecosystems protections, conservation translocations, rewilding initiatives, and de-extinctions efforts are not evolutionary neutral (Sarrazin, 2010; Lecomte and Sarrazin, 2020; Sarrazin and Lecomte, 2021; Sarrazin *et al.,* 2022). They are often implicitly dedicated to mitigating or reversing the evolutionary disruption caused by human activities. But they may incidentally increase it when they focus on purely anthropocentric ends, are concerned only with functional processes, or aim at speeding short-term adaptive response to global changes (Robert *et al.*, 2017; Thévenin *et al.*, 2018; Lecomte and Sarrazin, 2020). In conclusion, the human impact on evolution is a complex issue. Biological systems undergo evolution with or without human presence, and humans, as a species among others, inevitably interact with other species. However, the unprecedented influence of humans on the evolutionary trajectory of life is a major phenomenon on the scale of natural history with potentially deep consequences on the short and long term for both humans and non-human species. This is why evolution should not be overlooked when considering conservation actions and, on a larger scale, interactions between people and nature.

In order to explore a range of interactions between people and nature in an evolutionary framework, Sarrazin and Lecomte (2016) identified five basic scenarios considering the ultimate aims of conservation and various levels of concern for the evolutionary consequences of human developments, particularly in the context of

the ‘Anthropocene’, which, even if it has been officially rejected as a geological era, remains a useful idea of a major planetary transition (Zalasiewicz *et al.*, 2022). These scenarios address evolutionary issues in both anthropological and biodiversity dimensions.

First, renouncing conservation would lead to a *blind Anthropocene*. Abandoning attempts at biodiversity conservation would result in a runaway consumption of biodiversity resources, causing major evolutionary impacts on other living things. This scenario would stem from the lack of transition in most current human behaviour and societies.

Second, conservation may arise from anthropocentric concerns for ecosystem services or nature’s contribution to people. Relying on instrumental and relational values, this approach might benefit the short- or long-term material and immaterial dimensions of human fitness and well-being. For instance, conservation can be pursued for the resilience of future human generations, prioritising human fitness and the maintenance of long-term provisioning and regulating ecosystem services.

Third, another scenario focuses on the immediate well-being of humans, sticking to short-term provisioning and cultural ecosystem services, including cultural landscapes, as well as scenic wilderness.

A fourth anthropocentric scenario aims at the well-being of future human generations, intrinsically valuing both human well-being and fitness, and may correspond to mainstream sustainable development goals (Sarrazin and Lecomte, 2021). This scenario entails the conservation and restoration of scenic wilderness as well as long-term provisioning, regulating and cultural ecosystem services. However, all these scenarios result in a *deliberate Anthropocene* and accept the global stewardship of human beings over other living beings. They involve significant transitions in human development and may partly reduce the human evolutionary footprint, but only incidentally for living beings whose evolution is not directly or indirectly affected by human needs.

In a last scenario, human societies explicitly value human fitness and well-being but also respect the evolutionary trajectories of non-human species. This scenario strongly emphasizes evolutionary processes, even in anthropized landscapes, including wildness outside of so-called wilderness areas. It goes beyond sustainable development goals development (Lecomte and Sarrazin, 2020) in a deliberated attempt to overcome the Anthropocene. This involves a major transition for human evolution itself (Penn, 2003; Clarke, 2014) aiming to significantly reduce its evolutionary footprint on other living beings. To underline the explicit evolutionary dimensions, including both human evolution and the respect of

evolutionary trajectories of other living beings, Sarrazin and Lecomte (2016, 2017) proposed to distinguish this approach from anthropocentric, biocentric and even ecocentric ethics, and define it as “evocentrism”. Evocentrism inherits from broad values of ecocentrism with a focal on the temporal/evolutionary impacts and perspective. Evocentrism pushes for a change in the definition of the focal finality, but the outcomes in terms of conservation actions and priorities should mainly align. Human evolution itself, in evocentrism, enters the debate and adds new elements from ecocentrist reflexion. Evocentrism has the purpose of reminding and re-centring evolution in conservation and instead of replacing the principles of ecocentrism, it instead reinforces them.

While this scenario, like the previous ones, may seem somewhat oversimplified and even caricatured, human societies are rich in values and diversity. Individual and groups may vary greatly in ethical values depending on culture, history, circumstances, and even stage of life. Many societies may have already conceptualized and even implemented ethics like evocentrism under different labels. The evolutionary transition involved here may thus already have some conceptual and practical dimensions. Nevertheless, this scenario would mark a significant milestone in environmental history. Indeed, the evocentric approach to conservation underlines a potential major transition at the scale of evolution itself, representing the first instance of a species voluntary extending its consideration for other species beyond its own evolutionary interest.

Historically, conservation has been rooted in evolutionary principles (Soulé and Wilcox, 1980) and has thus been all but fixist (Robert *et al.,* 2017), even if this may not always be apparent. While concern for evolution has not disappeared, more immediate and anthropocentric interests have often taken precedence. Evocentric conservation calls for a re-rooting of conservation principles in their initial values and making them explicit. This call is part of pre-existing work, with authors promoting the integration of evolution in conservation for more than twenty years (Hendry and Kinnison, 1999; Kinnison *et al.,* 2007), albeit with various goals. For instance, Faith’s concept of evosystem services attempted to integrate evolution into the anthropocentric and economic-oriented conservation that emerged in the 2000’s. (Faith *et al.,* 2010). Similarly, a focus on evolutionary or adaptive potential has generated significant scientific interest (e.g. Eizaguirre and Baltazar-Soares, 2014), often dedicated to the ability of populations and species to face global changes without explicit concern for the ethical roots and consequences of this adaptation. Milot *et al.* (2020) questioned the various meanings of evolutionary potential and their relative contributions to very different conservation ends. The consideration

of evolution in conservation reached two important milestones recently. First, the IPBES assessment for values and valuation of nature advocated for restoring the consideration for intrinsic values of biodiversity at the same level as instrumental or relational ones (IPBES, 2022). Second, the importance of maintaining the genetic diversity and adaptive potential of species was highlighted in the Goal A of the global biodiversity framework of the CBD (2022) as follow: '*The genetic diversity within populations of wild and domesticated species, is maintained, safeguarding their adaptive potential*.'

Despite most conservation literature lacking consideration of evolution by comparison to the literature of general ecology, the goals and means of conservation actions are often compatible with an evocentric approach, and rarely opposed to it (Génissel, 2024) This is why the conceptual development of evocentrism is expected to promote more clarity in conservation objectives and allow for explicit positions regarding evolution among actors who are partly, but implicitly, prepared for this change. This new approach requires proper methods, metrics, indicators and operational implementation to orient conservation in this direction and to get the support of stakeholders.

Port-Cros National Park: Scientific strategy

Port-Cros National Parc (PCNP) in Provence, France, designed its scientific strategy for the next decade in light of evocentric conservation principles. This pioneering and ambitious proposal reveals a widening of conservation interests to encompass all dimensions of life, including the evolution of non-human species and its crucial importance for the future. The new approach undertaken by the PCNP reflects a deeper understanding and awareness of evolutionary mechanisms that support biodiversity and ecological function and the pressures they face.

The scientific board of the PCNP defined guiding rules and operational implementations. Their ultimate goal, according to evocentric principles, is to "promote scenarios where a significant part of ecosystems evolves as free as possible from human constraints". However, making those scenarios possible requires, in the shorter term, conservation actions for restoring biological processes, reducing or eliminating anthropic drivers, or replacing those drivers with less impactful practices, for instance lower impact fishing practices. This apparent dichotomy is a necessary process and paves the way for reconsidering the interaction between humans and non-human species and the sharing of space and resources in the long-term.

One of the main challenges for the managers mentioned early in the strategy is to determine the degree of human intervention, considering the interests of all stakeholders (Peirache *et al.*, 2023; see also Boudouresque *et al.,* 2020, 2021). For instance, the scientific board questions the limits of active restoration of ecosystems, especially when it could lead to the loss of cultural or landscape heritage. This is especially relevant for French national parks and reserves, whose history is deeply rooted in the preservation of cultural heritage and even artistic landscapes, as in the case of the very first reserve of Fontainebleau (Lecomte and Sarrazin, 2024; Luglia, 2021).These questions are crucial when considering the future of human interactions with ecosystems and, from an evocentric perspective, the balance between human fitness and well-being and the fitness of non-human species. Historically, humans have unintentionally co-evolved and co-constructed ecosystems with other species. Restoring ecosystems to re-establish evolutionary processes disrupted by severe human-induced factors does not preclude the maintenance of human activities that have gradually shaped ecosystems. However, the distinction between good practice and bad practice is not as clear-cut as it might seem, and the effects of scale further complicate the issue. In this sense, the park inevitably faces conflicting purposes, especially considering that preserving that *material and immaterial elements of the park identity* (including land and sea-use practices) and being *an area of protection and scientific reference* are both legal demands for French national parks (Loi de 2006, article 3 de l'arrêté du 23 février 2007).

The question of restoration itself must be carefully considered. Despite restoration ecology, as a science, and ecological restoration, as a practice, having been documented and strategically argued for decades with the defining of global standards for good practice (Gann *et al.,* 2019), the definition of the ends and means of restoration, and the recurrent appeal for restoration references offer the potential for controversies in this complex action. Indeed, restoring past ecosystem states lost due to human activities can seem hard to justify from an evolutionary perspective and with a good understanding of the reality of ecosystem functioning and near-future changes. The ecological and landscape components that stakeholders sometimes call for protection or restoration, which are the legacy of functional dynamics and even co-evolution between humans and other species, are bound to change drastically under global change, leading them to legitimately question the relevance of such restoration efforts. In this sense, the PCNP scientific committee emphasizes the lack of solid evidence for decision-making, and the importance of doubt and humility in the face of these uncertainties (Peirache *et al.*, 2023).

Nevertheless, when scientific knowledge justifies it, the principle of precaution does not preclude active restoration measures. An evocentric view of restoration focuses on reducing the human evolutionary footprint on non-human species, thus restoring their ability to undergo evolutionary processes (mutation, selection, migration, and genetic drift) beyond the direct and indirect forcing of human management. Evocentric conservation is at first a matter of scale on which humans impact the evolutionary trajectory of other living beings. It therefore strongly depends on the spatial and temporal scales and intensity at which their populations suffer human selective pressure and disruptions. There are cases where it is necessary to re-establish diversity, abundances, and those connectivities essential for ecological and evolutionary processes, in order for an ecosystem to function and for species to evolve as they did before, or should do beyond, the initial human impact. Examples include invasive species management, conservation translocation of highly threatened species (even if mostly avoided in PCNP), and landscape restoration and rewilding. In this context, controversies over rewilding in France have led many institutions and stakeholders to prefer the term “free evolution” as proposed by the Parc national des Cévennes to conserve its old forests ecosystems (Debaive *et al.,* 2022). However, this “free evolution” has been mostly understood as a respect for natural dynamics and ecological successions, which may be partly compatible with evocentrism but may remain relatively short-sighted towards truly evolutionary processes (Sarrazin *et al.*, 2022). Some anthropic activities are strong evolutionary drivers and should be prioritised. Since its creation, the PCNP has targeted a reduction of the fishing intensity, which has often been demonstrated as a strong evolutionary driver (Boudouresque, 2013).

Regulations in the heart of the park reduce or eliminate severe constraints with no-take, no-hunting, no-trespassing and no-wake zones (Fig.1). More recently, due to increasing pressure from mass tourism, the PCNP has taken measures to limit the number of tourists visiting the islands during the summer season.

The scientific strategy aims to reduce anthropic forcing, including conservation actions, for maintaining ecological functions and evolutionary dynamics. Any management actions undergo a validation process according to the “ERC” sequence (*Eviter-Réduire-Compenser,* i.e. Avoiding, Reducing, Offsetting) which is strongly supported by French law, despite the fact that offsetting strategies and their limits remain controversial (e.g. Weissgerber *et al.,* 2019). Its justification must be proportionate to the stakes and potential short, middle, or long-term impact compared to a no-action scenario. The "increasing naturalness" or "naturalness gradient" terminology has been established as an applied management principle from

strong protection areas towards adjacent areas (villages on the islands). It is called the "decreasing anthropic footprint". For this terminology and the other concepts mentioned above, the PCNP may, if necessary, propose an alternative vocabulary.

These objectives satisfy the fundamentals of the evocentric approach and highlight an important point: conservation actions themselves have an impact that should be considered and evaluated in term of quantitative and qualitative reduction of impact at short and long term. We suggest using the evolutionary footprint framework (Génissel, 2024) to conceptualize the terminology of decreasing anthropic footprint and increasing naturalness.

Overall, aiming for the complete disappearance of human impact on the evolutionary trajectories of other species makes no sense in a context where any biotic interaction can be an evolutionary driver. However, the exceptional intensity of this impact can often be reduced to standard ranges of change in natural history. The PCNP strategy adequately promotes restraint as a guiding principle for managing human activities.

Figure 1. Mitigating mass tourism impacts on ecosystem processes by restricted access areas in the national park of Port-Cros, Var, France. Photo © Thibaut Genissel.

Potentialities and future of evocentric conservation in the Port-Cros National Park

The PCNP embodies conservation challenges in many ways. It encompasses marine, continental, and insular environments, spanning from islands under total protection to a densely urbanized coastline, and experiences seasonal mass tourism. Economic activities include resource exploitation, mainly fishing and agriculture, alongside the presence of endemic species on the islands.

The PCNP is integrated into multiscale networks, including the cross-border sanctuary for marine biodiversity Pelagos, the Mediterranean (MedPan), and French protected areas, all of which harbour rich and unique biodiversity patterns. The Mediterranean basin is recognized as a global biodiversity hotspot and is particularly vulnerable to climate change. Europe is notably projected to experience more pronounced warming than the global average (C3S and WMO, 2025). Thus, initiating investigations into how ecological and evolutionary processes will respond to these changes is crucial, as well as implementing conditions that allow those processes to occur freely despite significant human pressures. It is however necessary to remember once again that evocentric conservation does not aim to restore adaptive potential to simply face global changes, but it ultimately aims to assess and reduce these global changes as evolutionary drivers and eventually help other than human beings to face their urgent crises without profound evolutionary consequences.

The long scientific tradition of the PCNP is a strong asset for the implementation of an evocentric approach. Since its creation in 1963, the park has witnessed significant changes in ecological dynamics and evolutionary processes. Species populations have been increasing, and taxa that had vanished due to over-exploitation have come back. Thanks to more than 50 years of scientific history (Boudouresque *et al.*, 2013, 2020, 2021), the long-term monitoring of population traits and human pressures, especially fishing, provides an opportunity to evaluate the human evolutionary footprint in the park and the stakes of its reduction.

The territory of the park is inhabited by a permanent human population and visited by many seasonal tourists. The sense of belonging to a territory with exceptional biodiversity and a particular status provides an opportunity to investigate the degree of acceptance of evocentric values.

We hope that the initiative of the PCNP, through its scientific strategy, may serve as a catalyst for similar initiative in other territories. At the French level, this scientific strategy can highlight the concern for the evolutionary consequences of a protected area's management beyond the explicit targets of the national strategy on protected areas (SNAP, 2021).

Evocentric approach in protected areas: defining guidelines

The leading principles of evocentric conservation in a protected area can be defined as: first, avoiding local anthropogenic extinction of populations, species, or communities as every evolutionary loss is irreversible and should be prevented and second, avoiding strong

local and global directional selection pressures that could lead to irreversible trait changes and eventual extinction.

Several points arise in this context. Conservation of species that evolve and coevolve inherently involves ecosystem preservation. Prioritising the restoration of evolutionary degrees of freedom begins with reducing pressures rather than intensifying evolutionary processes. The burden of proof in conservation has traditionally lain in demonstrating negative impacts and we recommend shifting this burden towards providing evidence that management actions or any form of exploitation are not excessively harmful or constraining evolutionary dynamics. Additionally, emphasis should be placed on processes rather than states, and on evolutionary potential, beyond the short-term viability of biological systems.

Refocusing conservation on evolution participates in the development of an interdisciplinary, even transdisciplinary, approach. It particularly calls for more explicit debates about evolution between ecology and social sciences Life sciences, particularly functional and evolutionary ecology, evolution, systematics, palaeontology, genetics, molecular and cellular biology, earth sciences, and humanities and social sciences are necessary to consider ecosystems, including protected areas, agricultural and urban ecosystems, with an evolutionary perspective. This would shed light on the evolutionary consequences of implementing conservation with associated concepts such as ecosystem services, nature's contribution to people, and human actions such as nature-based solutions and adaptations to climate change.

As a perspective, three main approaches may contribute to an evocentric management of any protected area. First, an assessment of the evolutionary responsibility of the territory should allow the identification of taxa and populations whose evolution is likely to significantly depend on the management of the territory. Levels of endemism, connectivity, and representativeness of intraspecific diversity may help to identify evolutionary significant units, 'edge taxa' (Isaac *et al.,* 2007), and thus prioritise conservation and restoration efforts. Significant elements of ecoregions in their evolutionary dimension should also be considered (Olson et Dinerstein, 1998: PNF, 2015). Second, conservation, restoration, and management efforts should be assessed according to their potential evolutionary consequences on the local biodiversity through their expected effects on mutation, selection, migration and/or genetic drift. Last but not least, the principles, aims and means of such an evocentric approach should be explicitly proposed, discussed, and co-constructed in with practitioners, local inhabitants and visitors. This would allow the evaluation of its possible local application and its potential as leverage for transformative change

(*sensu* IPBES, 2019) and contribution to a major transition in the co-evolution of human and non-human species from local to global scales. Obviously, evocentric conservation limited to the local scale of a protected area is a tiny element in the face of the global human evolutionary footprint. But the example of its innovative conservation practices might throw a powerful light on such ethical, operational and, by the end, evolutionary innovation in our respect for the very nature of non-human species.

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