Proposal form for a SYNTHESIS project

SECTION A – BASIC INFORMATION

• **Acronym of the project submitted:** DISCAR

• **Title of the project:**
Population consequences of human DISturbance on small CARnivores

Principal Investigator #1 (PI#1)[1]:
• LAST NAME: GIMENEZ
• First name: Olivier
• E-mail: olivier.gimenez@cefe.cnrs.fr
• Organization (e.g. name of university): CNRS
• Country: FRANCE

Principal Investigator #2 (PI#2):
• LAST NAME: RUETTE
• First name: Sandrine
• E-mail: sandrine.ruette@ofb.gouv.fr
• Organization (e.g. name of university): OFB
• Country: France

• **Summary** (max 3000 characters)**:**

Context. Conservation and the sustainable use of biodiversity and ecosystem services largely depend on the successful management of ecological populations, which in turn depend on our knowledge and our ability to understand and predict how the structure and dynamics of ecological populations respond to changes in their environments.

Rationale and aim. Despite its importance, the quantification of the effects of anthropic pressures on biodiversity is difficult and rarely undertaken because of the lack of species-specific ecological data and/or human pressures and activities, and the complexity and lack of transfer of analytical methods needed to evaluate these long-term consequences. The DISCAR (DIS = disturbance, CAR = carnivores) project aims at providing an operational framework with analytical tools for assessing the impacts or population consequences of human pressures, and showcasing it with case studies in applied conservation.

Case study. In DISCAR, we will use small carnivores in French mainland and overseas territories as a case study to assess the population consequences or impacts of human pressures on animal populations. Why small carnivores? Because these species hold important roles in ecosystems, such as influencing ecosystem structure and providing numerous ecosystem services, including pest/disease control and seed dispersal. Small carnivore species also respond to ecosystem

[1] The projet must have two PIs with shared responsabilities. One of the PI (called PI#1) **must be affiliated to a French research institution**. The other PI (called PI#2) can be **from any institution worldwide**.

perturbation in a fast, measurable, and interpretable way and therefore can be used as sentinels of global change.

Objectives. DISCAR will connect the fields of bioenergetics and demographic modeling in an integrated framework to assess human pressures on biodiversity, and to characterize then predict the impacts on small carnivores. DISCAR will identify key parameters underlying coupling between pressures and impacts, and will make recommendations for stakeholders in terms of monitoring and mitigation strategies.

Work packages. We will i) assemble a unique dataset on small carnivores including their ecology, bioenergetic requirements, demography and human pressures, ii) quantify and characterize the impacts of interacting pressures on populations, and iii) forecast the fate of populations to assess their viability under various scenarios of pressures and mitigation to help devise sound conservation strategies.

Consortium. To achieve these objectives, we have gathered international experts in ecological modelling and small carnivores who will develop and transfer an analytical framework for quantification, characterization and prediction of the impacts of pressures on populations.

• **[FR] Résumé** (max 3000 characters)**:**

Contexte. La conservation et l'utilisation durable de la biodiversité et des services écosystémiques dépendent de la gestion des populations écologiques, qui dépend à son tour de nos connaissances et de notre capacité à comprendre et prévoir comment la structure et la dynamique de ces populations répondent aux changements de leur environnement.

Justification et objectif général. Malgré son importance, la quantification des effets des pressions anthropiques sur la biodiversité est difficile et rarement entreprise. Nous manquons de données pertinentes sur les espèces, les pressions et activités humaines. Les méthodes analytiques nécessaires pour évaluer ces conséquences à long terme sont complexes et manquent de transfert. Le projet DISCAR vise à fournir un cadre opérationnel avec des outils analytiques pour évaluer les impacts ou les conséquences sur les populations des pressions humaines, et à l'illustrer à l'aide d'études de cas en conservation appliquée.

Étude de cas. Dans DISCAR, nous considérerons les petits carnivores de France métropolitaine et d'outre-mer comme étude de cas pour évaluer les conséquences ou les impacts des pressions humaines sur les populations animales. Pourquoi les petits carnivores ? Parce que ces espèces jouent un rôle important dans les écosystèmes, notamment en influençant la structure des écosystèmes et en fournissant de nombreux services écosystémiques, dont la lutte contre les parasites/maladies et la dispersion des graines. Les espèces de petits carnivores répondent également aux perturbations des écosystèmes d'une manière rapide, mesurable et interprétable et peuvent donc être utilisées comme sentinelles des changements planétaires.

Objectifs. DISCAR fera le lien entre la bioénergétique et la modélisation démographique dans un cadre intégré pour évaluer les pressions humaines sur la biodiversité, et caractériser puis prédire les impacts sur les petits carnivores. Nous identifierons les paramètres clés qui sous-tendent le couplage entre les pressions et les impacts, et ferons des recommandations aux parties prenantes en termes de surveillance et de stratégies de mitigation.

Lots de travail. Nous travaillerons à i) construire un unique jeu de données sur les petits carnivores, rassemblant des informations sur leur écologie, leurs besoins bioénergétiques, leur démographie et

les pressions humaines subies, ii) quantifier et caractériser les impacts des pressions anthropiques en interaction sur les populations, et iii) projeter le futur des populations afin d'évaluer leur viabilité dans le cadre de divers scénarios de pressions et de mitigation, dans la perspective d'aider à concevoir des stratégies de conservation.

Consortium. Pour atteindre ces objectifs, nous avons réuni des expertes et experts en modélisation écologique et sur les petits carnivores qui développeront et transféreront un cadre analytique pour la quantification, la caractérisation et la prévision des impacts des pressions sur les populations.

• **List five keywords** that explain your project**:**
Carnivores - Animal demography - Bioenergetics - Bayesian statistics - Impact assessment

Response to the evaluation panel's review

We thank the evaluation panel for the review of our proposal.

The comments were: "Additional explanations on the Population Consequences of Disturbance (PCoD) framework would be helpful to assess more explicitly the questions that will be addressed in the project (e.g. give precise examples of potential outputs of this approach and how these could be used).".

We have addressed these comments by i) adding a new figure depicting the PCoD framework and giving more details, see page 6, and ii) by illustrating potential outputs of the approach using the lynx and otter as case studies, see page 10.

SECTION B – PROJECT

Note: the projects will be evaluated according the following criteria (i) **Relevance** of the project with the objectives of the call (ii) **Scientific excellence** and innovative nature of the project (iii) Quality of the **working group** (iv) **Faisability** of the working program (v) Methods of **disseminating** and making available knowledge and data (vi) Capacity of the project to provide indicators and practices to be avoided or enhanced to preserve biodiversity and (vii) Quality of **deliverables** for stakeholders.

1/ Description of the project: Maximum of 3500 words divided into the 3 items below, which should address the scientific content, the synthesis aspect, the feasibility of your planned project and the dissemination.

- **Context and objectives** - short description of the state of the art, scientific rationale, statement of the objectives, working hypotheses and their relevance to the call.

Context

Human activities have modified the dynamics of many natural populations either directly by exploitation or habitat fragmentation/destruction, or indirectly by modifying climate, to an unprecedented extent over the last decades (Worm et al. 2006; Rockström et al. 2009). As a consequence, the natural rate of species extinction has accelerated considerably, and these anthropogenic changes to the biosphere have raised strong concerns about the loss of biodiversity, the so-called 6th mass extinction (Ceballos et al. 2015; IPBES 2019) and the ecosystem services they provide (Díaz et al. 2018). Conservation and the sustainable use of biodiversity and ecosystem services now largely depend on the successful management of ecological populations, which in turn depend on our knowledge and our ability to understand and predict how the structure and dynamics of ecological populations respond to changes in their environments (IPBES 2022).

Scientific rationale and aim

Within the above context, the DISCAR (DIS = disturbance, CAR = carnivores) project aims at providing an operational framework with analytical tools for assessing the impacts or population consequences of human pressures, and showcasing it with case studies in applied conservation. This has been a long-term objective for academics, decision makers and managers (Wilson et al. 2020), and also a requirement for environmental impact assessment under the European Union (European Habitats Directive 92/43/EEC).

Despite its importance, the quantification of the effects of pressures on biodiversity is difficult and rarely undertaken because of three main reasons. 1. There is often a lack of relevant data on species and/or human pressure and activities. 2. The analytical methods needed to evaluate these long-term consequences are complex and have only been recently developed, with little efforts for transfer to stakeholders outside of the academic world. 3. It is increasingly clear that human pressures do not act in isolation, but multiple stressors are rarely considered together, and interacting (possibly cumulative) impacts are usually ignored (Pirotta et al. 2022).

In DISCAR, we will use small carnivores (Carnivora <21.5 kg; Do Linh San 2022) in France as a case study to assess the population consequences or impacts of human pressures on animal populations. Why

small carnivores? Because these species hold important roles in ecosystems, such as influencing ecosystem structure and providing numerous ecosystem services, including pest/disease control and seed dispersal (Marneweck et al. 2021; Wright et al. 2022). Small carnivores species also respond to ecosystem perturbation in a fast, measurable, and interpretable way and therefore can be used as sentinels of global change (Marneweck et al. 2022).

Objectives

Despite their potential to serve as relevant indicators for environmental impact assessments, a framework for assessing the effects of disturbance from human activities on small carnivores is still lacking. Here, we will i) assemble a unique dataset on small carnivores in French mainland and overseas territories including their ecology, bioenergetics requirements, demography and human pressures, ii) quantify and characterize the impacts of interacting pressures on populations, and iii) forecast the fate of populations to assess their viability under various scenarios of pressures and mitigation to help devise sound conservation strategies. To achieve these objectives, we have gathered international experts in ecological modelling and small carnivores who will develop and transfer an analytical framework for quantification, characterization and prediction of the impacts of pressures on populations.

Relevance to the call.

Our proposal is relevant to the first two objectives of the call in that DISCAR i) will propose an analytical workflow and synthetize ecological data on species and human pressures to quantify and predict the impacts on small carnivores, ii) will highlight, through a sensitivity analysis of both demography and bioenergetic components, key physiological, behavioral and/or demographic parameters in the coupling between pressures and impacts, with the aim to build relevant indicators and make sound monitoring and management recommendations.

- **Proposed activities** - brief description of methods and why they are appropriate, work packages, tasks, milestones.

Conceptual framework

To assess the effects of disturbance from human activities, we will adopt the Population Consequences of Disturbance (PCoD) framework that describes how disturbances – referred to here as pressures – can lead to changes in population dynamics (e.g., long-term decline or oscillations in population size) due to disturbance-induced changes in behavior or physiology affecting fitness through individuals' health and vital rates (survival, growth, reproduction, recruitment) (New et al. 2014). This framework was developed for use with invertebrates and marine mammals, but has, surprisingly, been rarely applied to terrestrial mammals. PCoD experts for marine mammals have joined the DISCAR consortium, which will allow us to build on their experience and practical guidance for model development. As recommended by the evaluation panel, we now provide additional explanations on the PCoD framework in Figure 1.

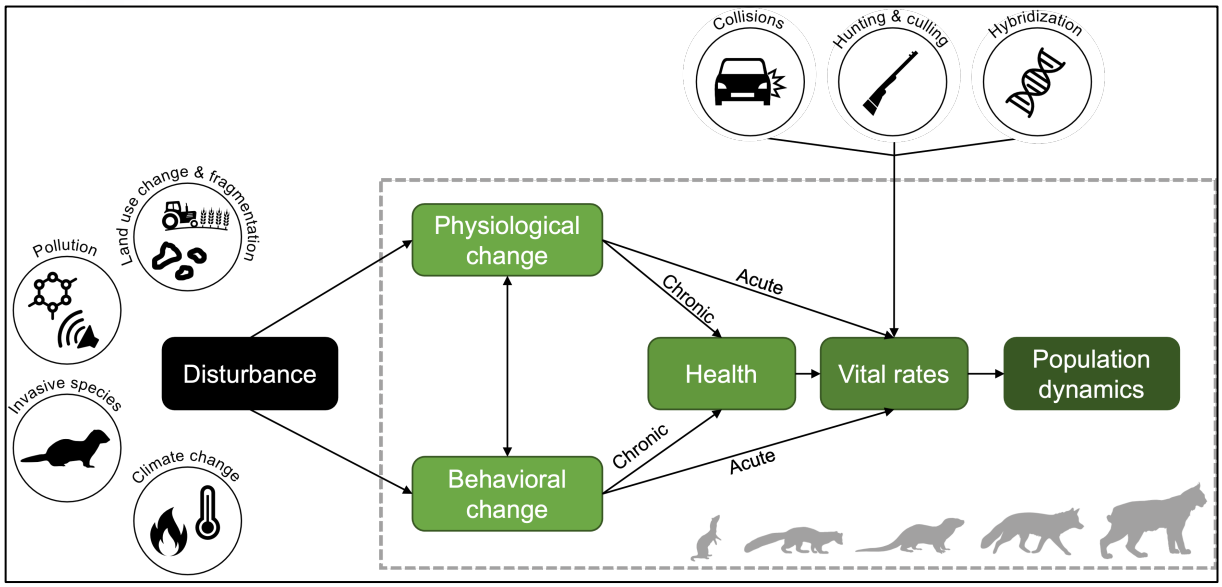


***Figure 1**: Conceptual diagram of the Population Consequences of Disturbance (PCoD) framework, illustrating how disturbance to an individual translates to population level effects through linkages with behavior, physiology, and health. Health encompasses a wide variety of metrics, but in many applications is related to energy stores. Additional factors that directly affect vital rates can also be incorporated into PCoD models, such as car collisions, hunting and culling, and hybridization with invasive species.*

Description of methods

To implement the PCoD framework, several approaches from the fields of bioenergetics and demography are usually combined (Keen et al. 2021) in a mechanistic model that propagate the effect of pressures, through physiological and behavioral changes, to impacts on vital rates and demography. We will be focusing on the female portion of the population, modeling physiological and behavioral decisions in the face of multiple stressors and the resulting impacts on offspring success and population dynamics (Keen et al. 2021).

The modelling approach will be driven by data availability, ranging from fully-parameterized individual-based (Martin et al. 2012) to structured-population models (Klanjscek et al. 2006; Salguero-Gómez et al. 2016; Smallegange et al. 2017). Full PCoD models (New et al. 2014) will be used, as well as interim PCoD models (King et al. 2015) in which expert knowledge is used to cope with the lack of data and critical parameter uncertainties (Pirotta et al. 2018). We will resort to Bayesian approach to fully propagate uncertainty (Boersch-Supan & Johnson 2019). When data are not available, we will extrapolate from other species, use expert judgments, proxy relations, or informed assumptions. The Bayesian hierarchical approach is particularly suited for this purpose (Kindsvater et al. 2018).

Work packages, tasks and milestones

To address our objectives, the DISCAR project will be articulated around three work packages (WPs) and paced by five 1-week meetings. We refer to Tables 2 and 3 for deliverables and milestones, and the articulation between WPs and meetings.

In WP1, we will build the DISCAR dataset. We will gather bioenergetic and demographic parameters from the literature (energy intake, number of offspring, survival, etc.), create a table of species traits

from the literature (body size, home range, etc.) and create a table of human pressures for the species considered. In terms of pressure, we will consider anthropogenic noise, pollutants, extraction of biotic and abiotic resources (e.g., mining, local fishing effort, farming, unintended harvesting) and disturbance from human presence (recreation activities, road traffic). We will pay particular attention to document differences in sampling scale, size, and intensity in datasets.

We will cover a wide range of species so that we can assess the impacts of various possibly interacting pressures (Table 1). On day 1 of the project, we will be able to work on several species for which experts in the consortium have extensive experience (including Eurasian lynx, Eurasian otter, red fox, European mink and Beech/Stone marten) and most data are already available. These species will serve as proof-of-concept for other species. Other species will be selected that differ slightly in their biology or life history, so that we can examine how similar stressors might (or might not) impact species differently. Note that we acknowledge the potential for human pressures to also have positive impacts which could be both good and bad in terms of species management (e.g. red foxes and anthropogenic food sources increasing survival and then population becoming too large, or human shield effect meaning safe place from predation for a small, vulnerable carnivore and then population increasing). With the diversity of species included in DISCAR, we expect responses to go possibly in both directions.

Table 1: List of the 23 wild species of small carnivores occurring in French mainland and overseas territories, with relevant human activities and associated pressures for a few species (IPBES framework). This list was obtained by matching the INPN list of carnivores with the list of small carnivores (<21.5kg) in (Marneweck et al. 2022), and excluding invasive exotic species. Data on species ecology and pressures are given in section B-3 below.

Latin name	French common name	English common name	Human activities and pressures
Lutra lutra	Loutre d'Europe	Eurasian otter	Linear Infrastructure -> Land use (habitat fragmentation, collisions), Energy -> Pollution
Lynx lynx	Lynx boréal	Eurasian lynx	Linear Infrastructure -> Land use (habitat fragmentation, collisions)
Vulpes vulpes	Renard roux	Red fox	Linear Infrastructure -> Land use (habitat fragmentation, collisions), Hunting and culling-> Direct exploitation
Mustela lutreola	Vison d'Europe	European mink	Energy -> Pollution, Land use (habitat degradation and loss), Invasive species (American mink)

Mustela erminea	Hermine	Stoat	Energy -> Land use (habitat degradation), Direct exploitation
Martes foina	Fouine	Beech/Stone marten	Linear Infrastructure -> Land use (habitat fragmentation, collisions) Culling ->Direct exploitation
Mustela nivalis	Belette d'Europe	Least weasel	Energy -> Land use (habitat degradation)
Mustela putorius	Putois d'Europe	European polecat	Energy -> Pollution, Land use (habitat degradation and loss), Invasive species (American mink)
Martes martes	Martre des pins	Pine marten	Linear Infrastructure -> Land use (collisions)
Felis silvestris	Chat forestier	Wildcat	Land use (grassland loss, collisions) Hybridization with domestic cat
Genetta genetta	Genette commune	Common genet	Linear Infrastructure -> Land use (collisions)
Meles meles	Blaireau européen	European badger	To be determined
Leopardus pardalis	Ocelot	Ocelot	To be determined
Leopardus wiedii	Margay	Margay	To be determined
Leopardus tigrinus	Oncille	Oncilla	To be determined
Herpailurus yagouaroundi	Jaguarondi	Jaguarundi	To be determined
Speothos venaticus	Chien des buissons	Bush dog	To be determined
Nasua nasua	Coati roux	Ring-tailed coati	To be determined
Potos flavus	Kinkajou	Kinkajou	To be determined
Procyon cancrivorus	Raton crabier	Crab-eating raccoon	To be determined
Eira barbara	Tayra	Tayra	To be determined
Galictis vittata	Grand grison	Greater grison	To be determined
Lontra longicaudis	Loutre à longue queue	Neotropical otter	To be determined

In WP2, we will quantify and characterize the impacts of interacting (possibly cumulative) pressures on populations. This will require determining bioenergetic requirements and building life cycle and demographic models for all species considered. An innovative step will consist in integrating

bioenergetic and demographic models in a Bayesian framework. An important step for transfer will consist in building a Shiny application which will facilitate the adoption of our analytical framework by stakeholders without specific training in modeling. Working with several species from day 1 will bring generality to our approach, which will make the modelling framework together with its software implementation useful beyond small carnivores once developed. Finally, we will use our modelling framework to quantify the effects of pressures (impacts) and identify, through a sensitivity analysis, key physiological, behavioral and/or demographic parameters in the coupling between pressures and impacts. While in this WP we will zoom in on finer scale / individual level processes to assess effects and useful metrics, in the next WP we will scale up to population and forecast viability.

In WP3, we will forecast the fate of populations to assess their viability under various scenarios of pressures and mitigation. Specifically, we will build a range of pressure scenarios, and determine relevant mitigation strategies (e.g. construction of wildlife crossings, limitation of recreation activities, regulation of invasive species). To do so, we will interface with relevant stakeholders to co-build and ensure the relevance of our scenarios and strategies. Several members of our consortium have experience in organizing workshops for co-constructing biodiversity scenarios with stakeholders, and we will schedule a dedicated session on the topic during a training workshop we will organize to promote the PCoD framework in the stakeholder community. Lastly, we will assess the relative impacts of human pressures.

Table 2: Proposed tasks and milestones

		Year 1		Year 2		Year 3	
Task	**Title**	S1	S2	S1	S2	S1	S2
WP1	Assemble the DISCAR dataset						
Task 1	Determine which species/population to be studied						
Task 2	Gather bioenergetic and demographic parameters						
Task 3	Create a table of species traits						
Task 4	Create a table of human pressures						
WP2	Impacts of cumulative pressures on populations						
Task 5	Build bioenergetic model components						
Task 6	Build life cycle and demographic models						
Task 7	Integrate bioenergetic and demographic models						
Task 8	Develop Shiny app						
Task 9	Quantify impacts and perform sensitivity analyses						
WP3	Forecast population viability						
Task 10	Build a range of disturbance scenarios						
Task 11	Determine mitigation strategies						
Task 12	Forecast populations and assess viability						
Articulation between WPs and 1-week meetings		☺	☺	☺	☺	☺	☺

☺ Kick-off meeting and subsequent meetings; ☺ Training workshop

Table 3: Deliverables and milestones (see next section for details)

Project management	
Meeting #1 (kick-off)	Takes place 6 months after project starts
Meeting #2	Takes place 12 months after project starts
Meeting #3	Takes place 18 months after project starts
Meeting #4	Takes place 24 months after project starts
Meeting #5 (closing)	Takes place 36 months after project starts

Website of the project (in French/English)	Operational within 3 months after project starts
WP1 DISCAR dataset	
R data package to distribute data with documentation (see section 8.1 at https://r-pkgs.org/data.html)	Beta version 12 months after project starts
Data paper	Submitted 12 months after project starts
WP2 Quantifying impacts	
Scientific publication	Submitted 24 months after project starts
Scientific presentations (talk or poster)	Submitted 24 months after project starts
Shiny app	Beta version 32 months after project starts
Policy brief	Submitted 26 months after project starts
WP3 Forecasting impacts	
Scientific publication	Submitted max 36 months after project starts
Scientific presentations (talk or poster)	Submitted max 36 months after project starts
Policy brief	Submitted 36 months after project starts
Broader deliverables	
International training workshop	Takes place 32 months after project starts
Popularization article	Submitted max 36 months after project starts
A post-doc trained, possibly Master students (hired on PIs funding)	Takes place 36 months after project starts

Examples of potential outputs of this approach and how these could be used

The **Eurasian otter** is a key example of a continent-scale recovery of a top predator. Due to persecution, accidental killing, and habitat deterioration/destruction, this species' distribution range has been in decline since the mid-20th century. Due to this sharp, widespread decline, the species is listed by the IUCN as Near Threatened. However, it is now recovering in most European countries. Several factors operating at various scales explain the past decline or scarcity of the Eurasian otter that still threaten to limit its current recovery dynamics. These include i) bioaccumulative toxic pollutants such as polychlorinated biphenyls (PCBs) that may contaminate otter body tissue and lead to reproductive disorders and ii) habitat degradation through agriculture or its impact on water management, which reduces wetland density and connectivity and affects otter distribution, and urbanization impacts on landscape and river networks is also known to affect otter distribution dynamics by increasing road casualties. In DISCAR and the PCoD framework, we will gather knowledge on the effects of pollution, land use change and fragmentation on otter physiology and behavior while accounting for mortality by collisions to forecast recolonization and species viability (see Figure 1). By ranking pressures through their impacts on population dynamics, we'll be able to inform the ongoing National Action Plan on the best conservation strategies (e.g. wildlife crossing, limitation of recreational activities).

The **Eurasian lynx** was eradicated in most of Europe between the 17th and 20th centuries. The main reasons for its disappearance were habitat degradation, human persecution and a decrease in prey availability. The species has recently recolonized parts of its historical range in Central and Western Europe thanks to different reintroduction programs which started in the 1970s. Although the species is considered as "least concerned" at the European level of the IUCN Red list, its status greatly differs from one population to another, even though they share similar threats, mostly habitat fragmentation, illegal killings and collisions with vehicles. In DISCAR and the PCoD framework, we will gather knowledge on the effects of land use change and fragmentation on lynx physiology and behavior while accounting for mortality by collisions to forecast species viability (see Figure 1). By ranking pressures

through their impacts on population dynamics, we'll be able to inform the ongoing lynx National Action Plan on the best conservation strategies (e.g. wildlife crossing, limitation of recreational activities).

European Wildcat populations are classified as 'Least Concern' by the UICN, declining in some parts of its geographical range and recovering in others. The species has been legally protected by the EU and national laws since 70s. The French population is one of the largest populations in Europe, which has been recolonizing during the last decades. Several threats to wildcat populations have been identified, such as human persecution and activities, habitat loss and hybridization. The presence of forested areas, providing shelters, have been shown to favor wildcat presence as well as open areas (scrublands, meadows, pastures) which are home for preys. This suggests that the presence of both shelters and preys are more crucial for habitat suitability than habitat type itself. Forest fragmentation seems to be another important landscape feature which has been shown to negatively impacts wildcat presence. Similarly, human infrastructures and presence appear to be avoided. In DISCAR and within the PCoD framework, we will gather knowledge on the effects of land use change and fragmentation on wildcat physiology and behavior while accounting for hybridization to forecast recolonization and species viability.

The European pine marten and the stone marten are the most similar sympatric carnivores in Europe taking into account phylogenetic relationships, morphology, foraging behavior and activity pattern. Their distributions overlap across a large part of continental Europe, with the pine marten having a more northern range. Throughout its range, stone marten is considered as a habitat generalist due to its ability to exploit human-dominated areas, from rural areas where buildings, especially barns, are frequently exploited, to big cities, where it can rest in attics and roof spaces of inhabited buildings, and in green areas. In contrast, pine marten is usually described as a forest specialist (coniferous, deciduous, or mixed forests) using arboreal structures such as cavities or squirrel nests for resting. However, the presence of pine martens has now been well documented in landscapes where forests are not the dominant habitat type. Both species co-exist over a large area, and, when syntopic both species seem to exhibit different habitat use and selection, with stone martens more frequently associated with rural and suburban areas while pine martens occupy forested areas. In France, as in some other countries of Europe, both species can be legally trapped and hunted. Very little is known about the population dynamics of both species, and even less about the impact of human activities, such as trapping, hunting and road traffic, on populations, despite their crucial importance for deriving reliable conservation and management strategies. In DISCAR and within the PCoD framework, we will gather knowledge on the effects of land use change and fragmentation on wildcat physiology and behavior while accounting for culling to forecast species viability, aiming to propose best management and conservation strategies.

- **Anticipated results and benefits arising from the project** within the context of the call, specifically for the monitoring programme of terrestrial biodiversity (parameters, indicators, protocols for monitoring the links between pressures and impacts, identification of practices to be avoided and enhanced).

DISCAR will connect the fields of bioenergetic and demographic modeling in an integrated framework to assess human pressures on biodiversity, and to characterize then predict the impacts on small carnivores. DISCAR will identify key parameters underlying coupling between pressures and impacts, and will make recommendations for stakeholders in terms of monitoring and mitigation strategies. These recommendations will be passed on to, and discussed with, governmental and non-governmental organizations in charge of action plans (e.g., Eurasian lynx, Eurasian otter, European mink) in which several members of the consortium are involved.

To that aim, our consortium will pay a particular attention to **knowledge transfer** (Table 3).

1. We will build a **website** (in French and English at least, possibly in Spanish and German), capitalizing on the fact that we have native speakers of these languages on board) through which information about the project will be conveyed to the stakeholder community and the public.

2. Policy recommendations for decision-makers will be released in **policy briefs** (e.g. https://github.com/oliviergimenez/note-information-nombre-loups) and sent to the relevant parties (e.g. https://oliviergimenez.github.io/emails-deputes/). Guidelines will also be released for stakeholders in support of monitoring and mitigation strategies under the form of an **article in the OFB journal *Biodiversité*** previously known as *Faune Sauvage* (e.g. http://files.biolovision.net/www.faune-nievre.org/pdffiles/news/FS287leger-2385.pdf). These recommendations and guidelines will be obtained in WP2 and WP3. A **popular article** will also be written to target a broader audience (e.g. for *The Conversation* like in https://theconversation.com/mieux-connaitre-le-lynx-boreal-grace-a-lecologie-statistique-147241).

3. We will develop a **Shiny application** to facilitate the use of our modelling approach combining bioenergetic and demographic models for stakeholders without quantitative training. Users will input population parameters or choose from pre-set configurations based on DISCAR, and will be able to choose between different human pressure scenarios and evaluate mitigation strategies on their own.

4. An international **training workshop** will be organized during the third year of the project in order to promote the PCoD framework for terrestrial vertebrates in the stakeholder community, possibly in a hybrid format to accommodate attendees' constraints. We will have courses on monitoring methods, as well as bioenergetic and demographic analyses. We will also devote a specific session on scenarios and mitigation strategies, and another one on the Shiny application. The PIs both have extensive experience in the organization of such events.

5. We will publish our results in at **least three academic publications** (data paper, characterization of pressures and impacts, forecasting and mitigation). We will also submit several contributions (**talks and/or posters**) to national (e.g. https://gdrecostat2022.sciencesconf.org/, https://www.sfepm.org/les-actualites-de-la-sfepm/decouvrez-le-programme-du-41eme-colloque-de-mammalogie.html) and international conferences (e.g. http://www.european-mustelid-colloquium.org/, https://www.isec2022.org/) in the two last years of the project. The PIs also commit to present the project outputs in 2026 at the conference organized by CESAB.

6. All data and codes will be managed in the spirit of **reproducible research and open science**. Data will be deposited online. Distill will be used for building the website, R for data analyses and modelling, RMarkdown (or Quarto) for report production, Git/GitHub for code versioning.

2/ Context of the proposal: Maximum of 500 words**.** Information on how the proposal emerged, how the consortium was formed, preliminary studies supporting the proposal, links with existing projects, links with national and international policies and initiatives, complementarity between the two PIs.

How the proposal emerged
The proposal emerged from discussions between several members of the consortium, realizing that, while terrific research is being conducted on the link between pressures and impacts for marine mammals, a quantitative framework is still lacking for terrestrial vertebrates.

How the consortium was formed
The consortium was formed by gathering a core group of people who had already collaborated with each other, and by attracting other members with complementary skills and expertise.

Preliminary studies supporting the proposal, links with existing projects
Several members of the consortium have ongoing works in relation to the modelling framework and the relevant expertise which all add to the feasibility of our project. Their work is mostly on marine mammals, which ensures that our proposal on small terrestrial carnivores remains original.

Links with national and international policies and initiatives.
Assessing the population consequences or impacts of human pressures is a requirement for environmental impact assessment under the European Union (European Habitats Directive 92/43/EEC).

Complementarity between the two PIs
Both PIs have expertise in mammal ecology, and experience in managing collective research projects. Their complementarity lies in that Sandrine Ruette brings her expertise on small carnivores while Olivier Gimenez brings his expertise on Bayesian statistical modelling.

3/ Data management plan

Description and availability of the datasets to be used/compiled in the project (copy and paste for each dataset to be used) - Please note that the call does not finance collecting new data, only existing data (published or not), are eligible.

Dataset name: **French Atlas of Mammals (chapter 3 on carnivores/primates)**
Description (type of data, format, size): Gridded maps with systematic lists of all species.
Current location/owner: UMS Patrinat/SFEPM.
Accessibility (ownership, license): Available for research purpose upon request.
Estimated time required to prepare data for analysis: 1 week.
Comment, if any: Facilitated access through members of the consortium.

Dataset name: **PanTHERIA**
Description (type of data, format, size): Species-level data on reproductive strategy (litter size, weaning age, age at sexual maturity), home range size, body size and mass, longevity, sociality.
Current location/owner: US, Jones et al. 2009.
Accessibility (ownership, license): Open access.
Estimated time required to prepare data for analysis: Ready to be used.
Comment, if any: These data will be complemented with other public databases like COMBINE (Soria et al. 2021) for phenology and behavior and CarniDIET (Middleton et al. 2021) for terrestrial carnivore mammal diets.

Dataset name: **COMADRE**

Description (type of data, format, size): A global data base of animal demography coming with 3317 of population projection matrices on 415 species.
Current location/owner: https://compadre-db.com/, Oxford University.
Accessibility (ownership, license): Open access.
Estimated time required to prepare data for analysis: None, ready to go.
Comment, if any: This database was created and is currently managed by a member of the consortium.

Dataset name: **MALDABA**
Description (type of data, format, size): A global data base of animal demographic rates for mammal species including age-specific information on survival and fecundity (Lebreton et al. 2012).
Current location/owner: Lyon, CNRS.
Accessibility (ownership, license): Available for research purpose upon request.
Estimated time required to prepare data for analysis: None, ready to go.
Comment, if any: The access has already been granted to O. Gimenez Pi of the project by Jean-Michel Gaillard and Jean-François Lemaître, owners and maintainers of the dataset.

Dataset name: **Small carnivorous species logbooks**
Description (type of data, format, size): Data on presence of mustelids species in France collected at municipality level.
Current location/owner: R package scsl (Calenge et al. 2015), OFB.
Accessibility (ownership, license): Open access.
Estimated time required to prepare data for analysis: 2 weeks (updates).
Comment, if any: Facilitated access through S. Ruette PI of the project.

Dataset name: **SAFRAN**
Description (type of data, format, size): model-based weather data, with 8km spatial resolution (regular square grid) and daily temporal resolution.
Current location/owner: Météo France's server.
Accessibility (ownership, license): Météo France. Access and use free of charge for French academic institutions including PI's lab.
Estimated time required to prepare data for analysis: 1 week

Dataset name: **CORINE LAND COVER**
Description (type of data, format, size): land use over the extent of Europe (shapefile format), regularly updated (2000 and 2012, 2018). Land use is defined following a systematic nomenclature which does not change between updates.
Current location/owner: Public, downloadable through government websites.
Accessibility (ownership, license): Government, European database, use for research purpose is free of charge.
Estimated time required to prepare data for analysis: 1 weeks

Dataset name: **OSO Land Cover**
Description (type of data, format, size): OSO is an alternative to Corine Land Cover based on on satellite photographs (Sentinel). Better resolution and validation compared to Corine Land Cover. Available in rasters/shapefiles.
Current location/owner: https://www.theia-land.fr/, Theia
Accessibility (ownership, license): ETALAB V2.0
Estimated time required to prepare data for analysis: 1-2 weeks

Dataset name: **BD TOPO**

Description (type of data, format, size): A 3D vector description (structured in objects) of the elements of the territory and its infrastructures, with metric precision, usable at scales ranging from 1:2000 to 1:50,000. Available in rasters/shapefiles. Better resolution compared to Corine Land Cover when it comes to hedges.
Current location/owner: https://geoservices.ign.fr/bdtopo
Accessibility (ownership, license): Public administrations, Open license.
Estimated time required to prepare data for analysis: 1-2 weeks

Dataset name: **Road traffic**
Description (type of data, format, size): Several variables related to road traffic (average flow and speed) on French national road networks. Public/private road traffic networks in urban/non-urban areas.
Current location/owner: CEREMA / DIR, Datex II format https://www.data.gouv.fr/en/datasets/etat-de-circulation-en-temps-reel-sur-le-reseau-national-routier-non-concede/
Accessibility (ownership, license): Public administrations, Open license.
Estimated time required to prepare data for analysis: 2 weeks
Comment, if any: See also https://github.com/CEREMA/data-trafic

Dataset name: **BD CARTO** (previously known as Route500)
Description (type of data, format, size): Data on road network at 1/250000 scale. Contains the entire main road network (motorways, national roads, departmental roads) characterized by a number of properties (road number, viability, importance of links, etc.), plus elements of the secondary road network to serve the main towns and main transport infrastructures (railway stations and airports);
Current location/owner: https://geoservices.ign.fr/route500
Accessibility (ownership, license): Accessible at no cost, Open license.
Estimated time required to prepare data for analysis: 1 week.

Dataset name: **French naturalness map (CARTNAT)**
Description (type of data, format, size): CARTNAT is the IUCN French map of naturalness, based on levels of artificialization, land control and land fragmentation. Current resolution is 20 m.
Current location/owner: IUCN France.
Accessibility (ownership, license): IUCN, open access freely downloadable at https://uicn.fr/aires-protegees/wilderness/.
Estimated time required to prepare data for analysis: Ready to be used.

Dataset name: **Human activity Strava**
Description (type of data, format, size): Crowdsourced human mobility data from Strava as a proxy for recreation. Strava is an app for smartphones and smartwatches, used primarily to record and upload georeferenced human training activities. Strava stores this data and processed version of it and can be accessed from Strava Metro https://metro.strava.com/.
Current location/owner: Strava.
Accessibility (ownership, license): Accessible at no cost, upon request for academic purpose.
Estimated time required to prepare data for analysis: 4 weeks.
Comments, if any: To maintain anonymity and conform with privacy regulations, access is limited to data processed by Strava through removal of personal identifiers and spatial and/temporal aggregation. The processing involves linking individual activity events to nearby linear features (paths, roads etc.). See e.g. (Thorsen et al. 2022).

Dataset name: **Human footprint index HFI**

Description (type of data, format, size): Index ranges between 0 and 50 that integrates multiple anthropogenic pressures on the landscape including development, agriculture, and transportation infrastructure, with 1km resolution.
Current location/owner: Columbia, (Venter et al. 2016).
Accessibility (ownership, license): Accessible at no cost.
Estimated time required to prepare data for analysis: 1 week.

Dataset name: **BD TOPAGE**
Description (type of data, format, size): Hydrographic data of French streams
Current location/owner: https://www.eaufrance.fr/actualites/le-millesime-2022-de-la-bd-topager-metropole-est-disponible
Accessibility (ownership, license): Accessible at no cost, Open license.
Estimated time required to prepare data for analysis: 1 week.
Comments, if any: Will be useful for semi-aquatic species like, e.g., the Eurasian otter.

Dataset name: **NAIADES**
Description (type of data, format, size): Particulate PCB and metal contamination data and associated sedimentological data (organic carbon content, grain size, dating).
Current location/owner: http://www.naiades.eaufrance.fr; see also https://professionnels.ofb.fr/fr/node/386
Accessibility (ownership, license): Accessible at no cost, Open license.
Estimated time required to prepare data for analysis: 1 week.
Comments, if any: Will be useful for semi-aquatic species like, e.g., the Eurasian otter.

Dataset name: **Red fox database**
Description (type of data, format, size): Numerical response of predators to large variations of grassland vole abundance and long-term community change.
Current location/owner: P Giraudoux, member of the project
Accessibility (ownership, license): Accessible at no cost, Open license; see https://datadryad.org/stash/dataset/doi:10.5061/dryad.qz612jmd3, https://zaaj.univ-fcomte.fr/spip.php?article118 & https://zaaj.univ-fcomte.fr/spip.php?article115
Estimated time required to prepare data for analysis: 1 week.

Dataset name: **Stone and Pine Marten Database**
Description (type of data, format, size): location of live-trap and recoveries for stone and pine marten in the Bresse area. Trapping pressure over 4 years in the area (location, duration for each trap); Reproduction data from genital tractus observation; Capture-recapture history from telemetry data; VHF location. Estimates of survival, home range size, habitat selection parameters as well as some data on diet (Isotopic ecology). Connectivity metrics through landscape genetic analysis including effect of trapping pressure on gene flow.
Current location/owner: OFB
Accessibility (ownership, license): Accessible at no cost, through S. Ruette PI of the project.
Estimated time required to prepare data for analysis: 1 week.

Dataset name: **Wildcat Database**
Description (type of data, format, size): Distribution data for the species in France from genetically confirmed individuals. Connectivity metrics through landscape genetic analysis. Morphology data.
Current location/owner: OFB
Accessibility (ownership, license): Accessible at no cost, through S. Ruette PI of the project.
Estimated time required to prepare data for analysis: 1 week.

Dataset name: **OFB Red fox Database**
Description (type of data, format, size): Data from 5 study areas (200-300 km²) on a 5 year period with density estimations, hunting and culling effort, age structure, reproduction parameter (see Lieury et al. 2015 for details).
Current location/owner: OFB
Accessibility (ownership, license): Accessible at no cost, through S. Ruette PI of the project.
Estimated time required to prepare data for analysis: 1 week.

Is the metadata available across the data sets you will use? If it is not uniform, how will you deal with this?

Yes, metadata is available for all data sets we will use, although some cleaning is required in case of large public databases. The Data Management Plan will be managed through the platform https://dmp.opidor.fr/ provided by CNRS. This platform follows national and international standards, and is already used by several members of the DISCAR consortium.

Storage and management solutions both during and after the project:

Both OFB and CEFE have storage solutions for databases. Data will be managed during and after the project by the CEFE dedicated platform.

Policy for further access and use of data after the end of the project:

- What data will be generated through the project?

Model outputs that we plan to make easily accessible to stakeholders via shiny apps.

- What type of data will be created?

Mainly numeric data with species occurrences and demographic rates, and spatial data under the GeoJSON format.

- Are there restrictions on data release? If so what are they?

No restrictions whatsoever.

Identify at least one member of your proposed group who will be responsible for data management for the project (this will also be noted in the member's contribution to the group in Section C). Explain your plan if that person is incapacitated. Will the data be transparent to all group members? How will you facilitate this?

The post-doc who will be hired for 2 years will be in charge of data management. He/she will be supervised in that specific matter by a partner of the consortium. Due to his experience in this task, including the management of large databases and the coordination of data-oriented projects, Dr Roberto Salguero-Gomez will play the role of supervisor. The data and models will be transparent to

all group members through the use of GitHub which will allow everybody to monitor and contribute to the project with the additional benefit of versioning.

4/ Literature cited

Boersch-Supan PH, Johnson LR. 2019. Two case studies detailing Bayesian parameter inference for dynamic energy budget models. Journal of Sea Research **143**:57–69.
Ceballos G, Ehrlich PR, Barnosky AD, García A, Pringle RM, Palmer TM. 2015. Accelerated modern human–induced species losses: Entering the sixth mass extinction. Science Advances **1**:e1400253. American Association for the Advancement of Science.
Díaz S et al. 2018. Assessing nature's contributions to people. Science **359**:270–272. American Association for the Advancement of Science.
Do Linh San E, editor. 2022. Small carnivores: evolution, ecology, behaviour, and conservationFirst edition. Wiley-Blackwell, Hoboken, NJ.
IPBES. 2019. Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Zenodo. Available from https://zenodo.org/record/6417333 (accessed August 16, 2022).
IPBES. 2022. Summary for policymakers of the thematic assessment of the sustainable use of wild species of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Zenodo. Available from https://zenodo.org/record/6810036 (accessed August 12, 2022).
Keen KA, Beltran RS, Pirotta E, Costa DP. 2021. Emerging themes in Population Consequences of Disturbance models. Proceedings of the Royal Society B: Biological Sciences **288**:20210325.
Kindsvater HK, Dulvy NK, Horswill C, Juan-Jordá M-J, Mangel M, Matthiopoulos J. 2018. Overcoming the Data Crisis in Biodiversity Conservation. Trends in Ecology & Evolution **33**:676–688.
King SL, Schick RS, Donovan C, Booth CG, Burgman M, Thomas L, Harwood J. 2015. An interim framework for assessing the population consequences of disturbance. Methods in Ecology and Evolution **6**:1150–1158.
Klanjscek T, Caswell H, Neubert MG, Nisbet RM. 2006. Integrating dynamic energy budgets into matrix population models. Ecological Modelling **196**:407–420.
Marneweck C et al. 2021. Shining the spotlight on small mammalian carnivores: Global status and threats. Biological Conservation **255**:109005.
Marneweck CJ et al. 2022. Middle-out ecology: small carnivores as sentinels of global change. Mammal Review:12300.
Martin BT, Zimmer EI, Grimm V, Jager T. 2012. Dynamic Energy Budget theory meets individual-based modelling: a generic and accessible implementation: *DEB theory in an IBM context*. Methods in Ecology and Evolution **3**:445–449.
New L et al. 2014. Using short-term measures of behaviour to estimate long-term fitness of southern elephant seals. Marine Ecology Progress Series **496**:99–108.
Pirotta E et al. 2018. Understanding the population consequences of disturbance. Ecology and Evolution **8**:9934–9946.
Pirotta E et al. 2022. Understanding the combined effects of multiple stressors: A new perspective on a longstanding challenge. Science of The Total Environment **821**:153322.
Rockström J et al. 2009. A safe operating space for humanity. Nature **461**:472–475. Nature Publishing Group.
Salguero-Gómez R et al. 2016. COMADRE: a global data base of animal demography. Journal of Animal Ecology **85**:371–384.
Smallegange IM, Caswell H, Toorians MEM, Roos AM. 2017. Mechanistic description of population dynamics using dynamic energy budget theory incorporated into integral projection models. Methods in Ecology and Evolution **8**:146–154.

Wilson MW, Ridlon AD, Gaynor KM, Gaines SD, Stier AC, Halpern BS. 2020. Ecological impacts of human-induced animal behaviour change. Ecology Letters **23**:1522–1536.
Worm B et al. 2006. Impacts of Biodiversity Loss on Ocean Ecosystem Services. Science **314**:787–790.
Wright PGR, Croose E, Macpherson JL. 2022. A global review of the conservation threats and status of mustelids. Mammal Review **52**:410–424.

5/ Comments, if any

SECTION C – TEAM MEMBERS

Make sure you comply with the call instructions for the composition of your group.

The members you nominate here are an important part of the success of your project. When selecting members[2] (**max. 12** including the PIs but not the postdoc[3] to be recruited under the call), do not just think of the individual's expertise, but also what is required for a highly functioning and innovative team, such as **complementary skills**, international network, **gender balance** and a **range of ages** (and experience) as well as time availability to attend meetings and work on tasks.

You must identify **two co-leaders** of the group, and describe their leadership skills. Information on the intended contribution of each participant to the group, and complementarity among participants, must be clearly mentioned.
You must also identify at least one person responsible for data management, and their expertise for this role should be clear from the information provided.

For each member, please ensure you have 'in principle' agreement for their inclusion (section E)

Member 1

- LAST NAME: GIMENEZ
- First name: Olivier
- E-mail address: olivier.gimenez@cefe.cnrs.fr
- Gender: Male
- Current position: Research director
- Year of completion of PhD: 2033
- Organization: French National Centre for Scientific Research (CNRS)
- Laboratory: UMR 5175 Centre for Functional and Evolutionary Ecology (CEFE)
- City: Montpellier
- Country: France

[2] The group composition can possibly change during the course of the project and additional members can join during meetings on their own funding.
[3] The postdoctoral fellow do not need to be mentioned in the working group composition section when the proposal will be submitted.

• ORCID ID: 0000-0001-7001-5142

• Function in the group**:** Co-PI

• Brief biography describing expertise relevant to the project (<100 words): I'm an ecological statistician, working in ecology and conservation biology dealing with the impact of human activities on population dynamics and species distribution and the management of carnivores. I'm also interested in human-wildlife interactions and how interdisciplinary approaches may contribute to the coexistence of humans and animals. I created and am co-responsible of a national research group on statistical ecology (GdR EcoStat). I was the PI of several national and international projects, funded by ANR, FRB and NSF.

• Intended contribution to the group (<50 words): PI of the project. Scientific leadership of the project, communication with the FRB, organisation of workshops, conceptual framework, data analysis and modelling, scientific and public dissemination. Post-doc supervision.

• Top 5 publications in the last 5 years:

Gimenez O., M. Kervellec, J.-B. Fanjul, A. Chaine, L. Marescot, Y. Bollet, C. Duchamp (2021) Trade-off between deep learning for species identification and inference about predator-prey co-occurrence: Reproducible R workflow integrating models in computer vision and ecological statistics Computo. https://doi.org/10.57750/yfm2-5f45.

Gervasi V., J. Linnell, T. Berce, L. Boitani, B. Cretois, P. Ciucci, C. Duchamp, A. Gastineau, O. Grente, D. Hilfiker, D. Huber, Y. Iliopoulos, A. Karamanlidis, F. Marucco, Y. Mertzanis, P. Mannil, H. Norberg, N. Pagon, L. Pedrotti, P.-Y. Quenette, S. Reljic, V. Salvatori, T. Talvi, M. von Arx, Gimenez O. (2021). Ecological correlates of large carnivore depredation on sheep in Europe. Global Ecology and Conservation 30: e01798.

Gamelon M, Baubet E., Besnard A., Gaillard J.-M., Lebreton J.-D., Touzot L., Veylit L., Gimenez O. (2021). Efficient use of harvest data: An integrated population model for exploited animal populations. Ecography.

Santostasi N.L., Ciucci P., Bearzi G., Bonizzoni S., Gimenez O. (2020). Assessing the dynamics of hybridization through a matrix modelling approach. Ecological Modelling 431: 109120.

Gimenez O., Gatti S., Duchamp C., Germain E., Laurent A., Zimmermann F., Marboutin E. (2019). Spatial density estimates of Eurasian lynx (Lynx lynx) in the French Jura and Vosges Mountains. Ecology and Evolution 9: 11707-11715.

Member 2

• LAST NAME: RUETTE

• First name: Sandrine

• E-mail address: sandrine.ruette@ofb.gouv.fr

• Gender: Female

• Current position: Researcher

• Year of completion of PhD:

• Organization: French Biodiversity Agency

• Laboratory: Research and Scientific Support Direction- Wildlife health and functioning of agricultural ecosystems department

- City: Birieux
- Country: France
- ORCID ID: 0000-0002-7355-3592
- Function in the group**:** Co-PI
- Brief biography describing expertise relevant to the project (<100 words): My research aims at better evaluating the conservation status of small and medium-size carnivores in France. This implies getting better knowledge on population dynamics and ecology, impact of various anthropogenic pressure (hunting and trapping, habitat loss and fragmentation, wildlife-domestic interface) and on prey-predators relations. I have with more than 20 years of experience in conducting field studies on the ecology and behavior of carnivores (lynx, red fox, stone and pine martens, wild cat, badger), in collaboration with field stakeholders (hunters, trappers, environmental protection assosiations) and scientifics.
- Intended contribution to the group (<50 words): co-PI of the project. Coordination of the project. Conceptual framework, data analysis and modelling, scientific and public dissemination.
- Top 5 publications in the last 5 years:

E. Portanier, F. Léger, Laurence Henry, T. Gayet, G. Queney, S. Ruette, S. Devillard (2022). Landscape genetic connectivity in European wildcat (Felis silvestris silvestris): a matter of food, shelters and demographic status of populations. Conservation Genetics 1-16

Payne A., Ruette S., Jacquier M., Richomme C., Lesellier S., Gowtage S., Duhayer J. & Rossi S. 2022. Estimation of bait uptake by badgers, using non-invasive methods, in the perspective of oral vaccination against bovine tuberculosis in a French infected area.Frontiers in Veterinary Science 9 787932

Jacquier M., J.M. Vandel, F. Léger, J. Duhayer, S. Pardonnet, L. Say, S. Devillard* & S. Ruette*. (2021). Breaking down population density into different components to better understand its spatial variation: the relative role of sett density and group size in European badgers. BMC Evolutionary Ecology, 21(1):1-13 *Co-last authors

Jacquier, M., C. Calenge, L. Say, S. Devillard* & S. Ruette*. (2020). Altitude shapes the environmental drivers of large-scale variation in abundance of widespread mammal species. Ecology & Evolution, 10(1), 119-130 *Co-last authors

Larroque J., S. Ruette, J.M. Vandel, and S. Devillard (2018). Home-range size and fidelity of two sympatric Martes species. Can. J. Zool. 96(11): 1272-1277

Member 3

- LAST NAME: MARNEWECK
- First name: Courtney
- E-mail address: courtney.marneweck@gmail.com
- Gender: Female
- Current position: Post-doctoral fellow
- Year of completion of PhD: 2017
- Organization: University of South Africa

• Laboratory: Department of Environmental Sciences

• City: Johannesburg

• Country: South Africa

• ORCID ID: 0000-0002-5064-1979

• Function in the group**:** Researcher

• Brief biography describing expertise relevant to the project (<100 words): I am a quantitative ecologist focusing on subordinate and small carnivores. I am an early career ecologist, with 5 years' experience as a post-doctoral fellow conducting research on subordinate/small carnivores, specifically surrounding spatial and behavioural ecology at the population and guild levels. In particular, my recent research focuses on the impact of global change on small carnivore ecology and intra-guild co-existence. While geographically my research falls in sub-Saharan Africa and North America, my recent work has taken a global perspective.

• Intended contribution to the group (<50 words): My contributions will include sharing my analytical knowledge, supporting data modelling processes and future forecasts. I will also contribute to writing as well as fostering a global perspective when it comes to applying and interpreting findings on the European case study.

• Top 5 publications in the last 5 years:

• Marneweck et al. (2022) Middle-out ecology: small carnivores as sentinels of global change. Mammal Review

• Marneweck et al. (2021) Shining the spotlight on small mammalian carnivores: Global status and threats. Biological Conservation 255: 109005.

• Marneweck et al. (2021) Predicted climate-induced reductions in scavenging in eastern North America. Global Change Biology 27: 3383-3394.

• Marneweck et al. (2021) Reproductive state influences the degree of risk tolerance for a seasonally breeding mesopredator. Behavioral Ecology 32: 717-727.

• Marneweck et al. (2019) Spatial partitioning by a subordinate carnivore is mediated by conspecific overlap. Oecologia 191: 531-540.

Member 4

• LAST NAME: GIRAUDOUX

• First name: Patrick

• E-mail address: patrick.giraudoux@univ-fcomte.fr

• Gender: Male

• Current position: Full Professor

• Year of completion of PhD: 1991

• Organization: University Bourgogne Franche-Comté

• Laboratory: UMR 6249 UBFC/CNRS Chrono-environnement

• City: Besançon

• Country: France

• ORCID ID: 0000-0003-2376-0136

• Function in the group**:** Researcher

• Brief biography describing expertise relevant to the project (<100 words): My research aims at understanding how and on which scales, the spatial structure of ecological systems determines the population dynamics of small mammals, their predators, their pathogens and toxicants transferts. I am also interested in the relations between ecology and health and the conflicts between humanity and wildlife (e.g. small mammal pests in Europe, snub-nosed monkey conservation in China, etc.). Questions are based on the conceptual framework of landscape ecology and on the multi-scale analysis of the disturbances of regional ecosystems, with implications in agriculture, health and conservation. I am currently lead author in the IPBES nexus assessment.

• Intended contribution to the group (<50 words): I have carried out long term research on vole - predators interactions with local stakeholders since the late 1980s. I am currently the scientific coordinator of a 10 year research multidisciplinary programme Careli including farmer, game and conservation NGOs whose aim is to understand the effect of the legal status (protected versus pest) of fox.

• Top 5 publications in the last 5 years:

Giraudoux P (edt). 2022. Socioecosystems. Indiscipline as a requirement of the field. ISTE, Londres.

Giraudoux P, Levret A, Afonso E, Coeurdassier M, Couval G 2020 Numerical response of predators to large variations of grassland vole abundance and long-term community change. Ecology and Evolution

Villette P, Afonso E, Couval G, Levret A, Galan M, Goydadin AC, Cosson JF, Giraudoux P 2020 Spatio-temporal trends in richness and persistence of bacterial communities in decline-phase water vole populations. Scientific Reports, 10, 9506

Baudrot V, Fernandez-de-Simon J, Coeurdassier M, Couval G, Giraudoux P, Lambin X 2020 Trophic transfer of pesticides: the fine line between predator-prey regulation and pesticide-pest regulation. Journal of Applied Ecology.

Giraudoux P, Villette P, Quéré JP, Damange JP, Delattre P 2019 Weather influences M. arvalis reproduction but not population dynamics in a 17-year time series. Scientific Reports.

Member 5

• LAST NAME: SMALLEGANGE

• First name: Isabel

• E-mail address: isabel.smallegange@newcastle.ac.uk

• Gender: Female

• Current position: Lecturer

• Year of completion of PhD: 2007

• Organization: Newcastle University

• Laboratory: School of Natural and Environmental Sciences

• City: Newcastle upon Tyne

• Country: UK

• ORCID ID: 0000-0001-6218-7358

• Function in the group**:** Researcher

• Brief biography describing expertise relevant to the project (<100 words): Trained at the University of Amsterdam, Oxford and Imperial College in behavioural ecology, population biology and demography, Smallegange ties separate research threads together by including demographic processes, stochasticity, and development in theoretical studies, backed up with experimental and field research to use her signature empirical-theoretical approach to test the hypotheses generated in detail. She has worked on a variety of study systems, ranging from microorganisms to mites to manta rays. Her expertise means that she is in an excellent position to develop new conceptual and modelling tools to understand how populations respond to human disturbances.

• Intended contribution to the group (<50 words): Smallegange's major contribution to the field is a mechanistic population model that merges energy budget theory and demography. The method has been identified as a necessary step towards a standardised approach to link individual mechanisms to population dynamics and will be at the centre of Smallegange's contribution to the project.

• Top 5 publications in the last 5 years:

• Smallegange IM. 2022. Integrating developmental plasticity into eco-evolutionary population dynamics. Trends in Ecology & Evolution 37:129-137

• Smallegange IM, Flotats Avilés M, Eustache K. 2020. Unusually paced life history strategies of marine megafauna drive atypical sensitivities to environmental variability. Frontiers in Marine Science 7:597492

• Smallegange IM, Berg M. 2019. A functional trait approach to identifying life history patterns in stochastic environments. Ecology and Evolution 9: 9350-9361

• Smallegange IM, Ens HM. 2018. Trait-based predictions and responses from laboratory mite populations to harvesting in stochastic environments. Journal of Animal Ecology 87: 893-905.

• Smallegange IM, Caswell H, Toorians MEM, de Roos AM. 2017. Mechanistic description of population dynamics using dynamic energy budget theory incorporated into integral projection models. Methods in Ecology and Evolution 8: 146-154

Member 6

• LAST NAME: DEVILLARD

• First name: Sébastien

• E-mail address: sebastien.devillard@univ-lyon1.fr

• Gender: Male

• Current position: Associate professor

• Year of completion of PhD: 2004

• Organization: Claude Bernard University Lyon1

• Laboratory: Biometry and Evolutionary Biology Lab

• City: Villeurbanne

• Country: France

• ORCID ID: 0000-0001-6911-4362

• Function in the group**:** Researcher

• Brief biography describing expertise relevant to the project (<100 words): My research expertise deals with the evolutionary ecology, the demography and the genetic/genomics of wild population of carnivorous mammals, especially small and medium-sized ones. I mostly working in understanding how anthropogenic pressure modulate the population functioning in a context of wildlife management and conservation biology. Interested in the spatial ecology of species including spatial variability of life history traits, population demography and population genetic structure, in the inter- and intra-population variability of population patterns, I used a comprehensive set of methodological approaches.

• Intended contribution to the group (<50 words): My contribution will be based firstly on my deep knowledge of small- and medium sized carnivorous mammals ecology including demography and human-impact responses and monitoring procedures which are operated in this taxa, and, secondly, to my strong analytical skills in all aspects of the population functioning of wild mammals population.

• Top 5 publications in the last 5 years:

- Jacquier M, Vandel JM, Léger F, Duhayer J, Pardonnet S, Say L, Devillard S*, Ruette S* (2021) Breaking down population density into different components to better understand its spatial variation. BMC Ecology and Evolution, vol. 21: 82. *Co-last authors

- Anile S, Devillard S, Nielsen CK, Lo Valvo M (2021) Anthropogenic threats drive spatio-temporal responses of wildcat on Mt. Etna. European Journal of Wildlife Research, vol. 67: 50

- Jacquier M, Calenge C, Say L, Devillard S*, Ruette S* (2019) Altitude shapes the environmental drivers of large-scale variation in abundance of a widespread mammal species. Ecology and Evolution. *Co-last authors

- Anile S, Devillard S, Ragni B, Rovero F, Mattucci F, Lo Valvo M (2019) Habitat fragmentation and anthropogenic factors affect wildcat (Felis silvestris silvestris) occupancy and detectability on Mt. Etna, Wildlife Biology, wlb.00561.

- Larroque J, Ruette S, Vandel JM, Devillard S (2017) Level- and scale-dependent habitat selection for resting sites by two syntopic Martes species, Journal of Mammalogy, vol. 98 pp.1709-1720

Member 7

• LAST NAME: GALLAGHER

• First name: Cara

• E-mail address: gallagher@uni-postdam.de

• Gender: Female

• Current position: Post-doctoral fellow

• Year of completion of PhD: 2021

• Organization: University of Potsdam

• Laboratory: Department of Plant Ecology and Nature Conservation (BioMove Research Training Group)

• City: Potsdam

• Country: Germany

• ORCID ID: 0000-0001-7094-1752

• Function in the group**:** Researcher

• Brief biography describing expertise relevant to the project (<100 words): Cara is an ecological modeller interested in how energy shapes ecological patterns and influences species risk under human disturbance. She is a postdoctoral researcher at the University of Potsdam, where she uses agent-based models and physiological theory to understand links between animal behavior and energetics and the role of individual variation in driving population dynamics and vulnerability to disturbances, such as noise pollution, habitat degradation, and climate change. Cara completed her BSc in Biological Sciences at California State University East Bay, MSc in Ecology, Evolution, and Conservation Biology at San Francisco State University, PhD in Biosciences.

• Intended contribution to the group (<50 words): Cara will help with designing, developing, and testing bioenergetic, individual-based, and population models, assist with inverse parameterization, including Approximate Bayesian Computation, and pattern-oriented modelling approaches where needed, and provide understanding of standardized approaches to model development and documentation.

• Top 5 publications in the last 5 years:

Gallagher, C.A., Grimm, V., Kyhn, L.A., Kinze, C.C. and Nabe-Nielsen, J., 2021. Movement and seasonal energetics mediate vulnerability to disturbance in marine mammal populations. The American Naturalist, 197(3), pp.296-311.

Gallagher, C.A., Chimienti, M., Grimm, V. and Nabe-Nielsen, J., 2022. Energy-mediated responses to changing prey size and distribution in marine top predator movements and population dynamics. Journal of Animal Ecology, 91(1), pp.241-254.

Gallagher, C.A., Chudzinska, M., Larsen-Gray, A., Pollock, C.J., Sells, S.N., White, P.J. and Berger, U., 2021. From theory to practice in pattern-oriented modelling: identifying and using empirical patterns in predictive models. Biological Reviews, 96(5), pp.1868-1888.

Roeleke, M., Schlägel, U.E., Gallagher, C., Pufelski, J., Blohm, T., Nathan, R., Toledo, S., Jeltsch, F. and Voigt, C.C., 2022. Insectivorous bats form mobile sensory networks to optimize prey localization: The case of the common noctule bat. Proceedings of the National Academy of Sciences, 119 (33) e2203663119.

Grimm, V., Railsback, S.F., Vincenot, C.E., Berger, U., Gallagher, C., DeAngelis, D.L., Edmonds, B., Ge, J., Giske, J., Groeneveld, J. and Johnston, A.S., 2020. The ODD protocol for describing agent-based and other simulation models: A second update to improve clarity, replication, and structural realism. Journal of Artificial Societies and Social Simulation, 23(2).

Member 8

• LAST NAME: CUBAYNES

• First name: Sarah

• E-mail address: sarah.cubaynes@cefe.cnrs.fr

• Gender: Female

• Current position: Associate professor

• Year of completion of PhD: 2011

- Organization: Ecole Pratique des Hautes Etudes (EPHE)
- Laboratory: UMR 5175 Centre for Functional and Evolutionary Ecology (CEFE)
- City: Montpellier
- Country: France
- ORCID ID: 0000-0002-3935-9825
- Function in the group**:** Researcher
- Brief biography describing expertise relevant to the project (<100 words): Expertise in population dynamics. In her research, SC has employed and developed statistical models to analyze longitudinal data collected at the individual level to evaluate the demographic impacts of various environmental changes (related to climate, disease, food abundance, intra and inter species interactions) on several species of marine and terrestrial carnivores. Part of her work involves modeling long-term population consequences of these changes through the use of forecasting population models.
- Intended contribution to the group (<50 words): Methods: matrix models and integral projection models, ecology of small carnivores
- Top 5 publications in the last 5 years:

1. Gicquel, M., East, M.L., Hofer, H., Cubaynes, S. and Benhaiem, S., 2022. Climate change does not decouple interactions between a central-place-foraging predator and its migratory prey. Ecosphere, 13(4), p.e4012.

2. Cubaynes, S., Aars, J., Yoccoz, N.G., Pradel, R., Wiig, Ø., Ims, R.A. and Gimenez, O., 2021. Modeling the demography of species providing extended parental care: a capture–recapture multievent model with a case study on polar bears (Ursus maritimus). Ecology and evolution, 11(7), pp.3380-3392.

3. Coste, C.F., Bienvenu, F., Ronget, V., Ramirez-Loza, J.P., Cubaynes, S. and Pavard, S., 2021. The kinship matrix: inferring the kinship structure of a population from its demography. Ecology Letters, 24(12), pp.2750-2762.

4. Folio, D.M., Aars, J., Gimenez, O., Derocher, A.E., Wiig, Ø. and Cubaynes, S., 2019. How many cubs can a mum nurse? Maternal age and size influence litter size in polar bears. Biology letters, 15(5), p.20190070.

5. Louvrier, J., Duchamp, C., Lauret, V., Marboutin, E., Cubaynes, S., Choquet, R., Miquel, C. and Gimenez, O., 2018. Mapping and explaining wolf recolonization in France using dynamic occupancy models and opportunistic data. Ecography, 41(4), pp.647-660.

Member 9

- LAST NAME: FRYXELL
- First name: John
- E-mail address: jfryxell@uoguelph.ca
- Gender: Male
- Current position: Full Professor
- Year of completion of PhD: 1985
- Organization: University of Guelph
- Laboratory: Department of Integrative Biology

- City: Guelph
- Country: Canada
- ORCID ID: 0000-0002-5278-8747
- Function in the group**:** Researcher
- Brief biography describing expertise relevant to the project (<100 words): My research focuses on interactions between behaviour and food web interactions in spatially-structured ecosystems. A mix of theoretical and empirical approaches is used to consider the dynamics of specific systems. Empirical work has been concentrated on 3 different terrestrial ecosystems in recent years: large herbivores and lions in Tanzania, American martens and small mammals and wolves, moose and caribou in boreal forests of Canada, and both wild and semi-domesticated reindeer in Norway. Theoretical models are used to understand the potential impact of behavioural strategies and environmental disturbance on population and community dynamics.
- Intended contribution to the group (<50 words): I have led 3 major modelling initiatives over the past decade to evaluate the impact of anthropogenic disturbance on mammal communities, involving a mixture of movement, stage-structured demography, and trophic interactions between predators and their prey. I am well poised to make a significant contribution to model development.
- Top 5 publications in the last 5 years:

Fryxell, J.M., S. Mduma, J. Masoy, A.R.E. Sinclair, G.J.C. Hopcraft, and C. Packer. 2022. Stabilizing effects of group formation by Serengeti herbivores on predator-prey dynamics. Frontiers of Ecology and Evolution DOI 10.3389/fevo.2022.981842.

Kittle, A.M., J.K. Bukobme, A.R.E. Sinclair, S.A.R. Mduma, and J.M. Fryxell. 2021. Where and when does the danger lie? Assessing how location, season and time of day affect the sequential stages of predation by lions in western Serengeti National Park. Journal of Zoology DOI: 10.1111/jzo.12944.

Kauffman, M.J. et al. 2021. Mapping out a future for ungulate migrations. Science 372: 566-569.

Fryxell, J.M., T. Avgar, B. Liu, J.A. Baker, A.R. Rodgers, J. Shuter, I.D. Thompson, D.E.B. Reid, A.M. Kittle, A.Mosser, S.G. Newmaster, T.D. Nudds, G.M. Street, G.S. Brown, and B. Patterson. 2020. Anthropogenic disturbance and population viability of woodland caribou in Ontario. Journal of Wildlife Management 84(4):636-650, DOI: 10.1002/jwmg.21829.

Tucker, M.A., K. Böhning-Gaese, W.F. Fagan, J.M. Fryxell, B. Van Moorter et al. 2018. Moving in the Anthropocene: Global reductions in terrestrial mammalian movements. Science 359:466-469.

Member 10

- LAST NAME: MCHURON
- First name: Elizabeth
- E-mail address: emchuron@uw.edu
- Gender: Female
- Current position: Researcher
- Year of completion of PhD: 2016
- Organization: University of Washington
- Laboratory: Cooperative Institute for Climate, Ocean, and Ecosystem Studies

- City: Seattle
- Country: USA
- ORCID ID: 0000-0003-3147-2628
- Function in the group**:** Researcher
- Brief biography describing expertise relevant to the project (<100 words): EAM brings expertise on mammalian bioenergetics and their integration within Population Consequences of Disturbance models. She also brings experience with a variety of stressors, including contaminants and changes in prey availability.
- Intended contribution to the group (<50 words): Methods, Expertise in bioenergetics and PCoD models
- Top 5 publications in the last 5 years:

· McHuron, E.A, et al. 2022. Key questions in marine mammal bioenergetics. Conservation Physiology

· McHuron, E.A., L. Aerts, G. Gailey, O. Synchenko, D.P. Costa, M. Mangel, and L.K. Schwarz. 2021. State-dependent behavioral and life history models predict the population consequences of acoustic disturbance, with application to endangered western gray whales. Ecological Applications: e02440.

· McHuron, E.A., K. Luxa, N.A. Pelland, K. Holsman, T. Zeppelin, R. Ream, and J.T. Sterling. 2020. Practical application of a bioenergetic model to inform management of a declining fur seal population and their commercially important prey. Frontiers in Marine Science 7:597973.

· Pirotta, E.M. Mangel, D.P. Costa, J. Goldbogen, J. Harwood, V. Hin, L.M. Irvine, B.R. Mate, E.A. McHuron, D.M. Palacios, L.K. Schwarz, L. New. 2019. Anthropogenic disturbance in a changing environment: modelling lifetime reproductive success to predict the consequences of multiple stressors on a migratory population. Oikos 128: 1340-1357.

· McHuron, E.A., L. K. Schwarz, D.P. Costa, and M. Mangel. 2018. A state-dependent model for assessing the population consequences of disturbance on income-breeding mammals. Ecological Modelling 385: 133-144.

Member 11

- LAST NAME: SALGUERO-GOMEZ
- First name: Rob
- E-mail address: rob.salguero@zoo.ox.ac.uk
- Gender: Male
- Current position: Associate professor
- Year of completion of PhD: 2011
- Organization: University of Oxford
- Laboratory: SalGo Team
- City: Oxford
- Country: UK
- ORCID ID: 0000-0002-6085-4433

• Function in the group**:** Data manager

• Brief biography describing expertise relevant to the project (<100 words): RSG is an expert in population ecology and macro ecology. He has published ca. 100 peer-reviewed papers, including Nature, Nature Ecology & Evolution, PNAS and Ecology Letters on topics regarding multiple-stressors on population viability, the evolution of senescence, and drivers of population collapse at regional and global scales. He is the curator of the COMPADRE and COMADRE Matrix Population Database and the PADRINO Integral Projection Model Database - the two most comprehensive databases of stage-structured demographic information across the Tree of Life. He is also an expert in the development of demographic techniques and R packages.

• Intended contribution to the group (<50 words): Data, methods, and expertise in comparative demography

• Top 5 publications in the last 5 years:

Capdevila P, Stott I, Cant J, Beger M, Rowlands G, Grace M & Salguero-Gómez R. 2022. Life history mediates the trade-offs among different components of demographic resilience. Ecology Letters 25, 1566-1579

Paniw M, James T, Archer R, Römer G, Levin, Compagnoni A, Che-Castaldo J, Bennett J, Mooney A, Childs D, Ozgul A, Jones O, Burns J, Hodgson D, Beckerman A, Patwary A, Sanchez-Gassen N, Knight T*, Salguero-Gómez R*. 2021. The myriad of complex demographic responses of terrestrial mammals to climate change and gaps of knowledge. Journal of Animal Ecology 90, 1398-1407

Compagnoni A, Levin S, Childs D, Harpole S, Paniw M, Römer G, Burns J, Che-Castaldo J, Rüger N, Kunstler G, Bennett J, Archer R, Salguero-Gómez R* & Knight T*. 2021. Perennial plants with short generation time have stronger responses to climate anomalies than those with longer generation time. Nature Communications 12, 1824

Healy K, Ezard T, Jones O, Salguero-Gómez R* & Buckley Y*. 2019. Animal life history is shaped by the pace of life and the distribution of age-specific mortality and reproduction. Nature Ecology & Evolution 3, 1217-1224

Paniw M, Ozgul A, Salguero-Gómez R. 2018. Interactive life-history traits predict sensitivity of plants and animals to temporal autocorrelation. Ecology Letters 21, 275-286

Salguero-Gómez R, Violle C, Gimenez O, Childs D. 2018. Delivering the promises of trait-based approaches to the needs of demographic approaches, and vice versa. Functional Ecology 32, 1424–1435

Member 12

• LAST NAME: POULLE

• First name: Marie-Lazarine

• E-mail address: marie-lazarine.poulle@univ-reims.fr

• Gender: Female

• Current position: Research ingeneer

• Year of completion of PhD: 1991

• Organization: Reims Champagne Ardenne University

• Laboratory: EA 7510 ESCAPE & CERFE

- City: Reims & Boult-aux-Bois
- Country: France
- ORCID ID: 0000-0003-2445-5133
- Function in the group**:** Researcher
- Brief biography describing expertise relevant to the project (<100 words): I am a research engineer with more than 30 years of experience in conducting field studies on the ecology and behavior of carnivores (red fox, coyote, wolf, badger, wild cat and domestic cat). I live and work in a hyper-rural region. To date, I have supervised or co-supervised 12 PhD theses focused on the contamination of the environment by zoonotic parasites of canids and felids. I also enjoy networking with collaborators from various backgrounds and popularizing science for a diverse audience.
- Intended contribution to the group (<50 words): Critical view on the reliability of field data collection on carnivores; Good knowledge of field partners in rural areas; Taste and interest for exchange with a varied public.
- Top 5 publications in the last 5 years:

1. Da Silva A M, Bastien M, Umhang G, Boué F, Bastid V, Boucher J-M, Caillot C, Peytavin de Garam C, Renault C, Faisse M, Courquet S, Scalabrino V, Million L, Jenny Knapp J, Poulle M-L. 2021. Soil contamination by Echinococcus multilocularis in rural and urban vegetable gardens in relation to fox, cat and dog faecal deposits. Parasite 28, 74. https://doi.org/10.1051/parasite/2021073

2. Bastien M, Vaniscotte A, Combes B, Umhang G, Raton V., Villena I, Aubert D. Boué F., Poulle M-L. 2019. Identifying drivers of fox and cat faecal deposits in kitchen gardens into order to evaluate measures for reducing contamination of fresh fruit and vegetables. Food and Waterborne Parasitology 12 e00034: 1-12.

3. Simon J A, Chancel E, Hubert P, Aubert D, Villena I, Gilot-Fromont E, Poulle M-L. 2019. Pattern of latrine use by domestic cats on dairy farms and the implications for Toxoplasma gondii Vet. Parasitol. 273, 112–121.

4. Forin-Wiart M-A, Galan M, Piry S, Cosson J-F, Larose C, Poulle M-L. 2018. Evaluating metabarcoding to analyse diet composition of species foraging in anthropogenic landscapes using Ion Torrent and Illumina sequencing. Scientific Reports 8: 17091, 1-12. DOI: 10.1038/s41598-018-34430-7.

5. Simon J, Pradel R, Aubert D, Geers R, Villena I, Poulle M-L. 2018. A multi-event capture–recapture analysis of Toxoplasma gondii seroconversion dynamics in farm cats. Parasites & Vectors, 11 :339.

Comment(s) about the working team and its members, if any

Although not required in the CESAB application, the PIs would like to emphasize that the proposal was built and written with Cassie Speakman an early career researcher who will be hired on a 2-year post-doc position if the project gets funded. Soon-to-be-Dr Speakman aims to understand how human-induced environmental change impacts wild populations and to identify effective species management and conservation options. Her research uses a variety of individual-, population-, and ecosystem-level modelling approaches, including individual-based modelling and decision analysis (cassiespeakman.com).

Besides skills and field of expertise, we paid a particular attention to have in the consortium a balance between early career and senior researchers. We have 7 females and 5 males,

coming from several continents (Europe, Africa, America). We also have representatives from academic and non-academic organisations (OFB).

SECTION D – CVs

Insert here the CVs of the two PIs (2 pages max each)

Name **Dr. Olivier Gimenez**
Contact Centre for Functional and Evolutionary Ecology
1919 Route de Mende,
34293 Montpellier, France
+33 (0) 467 61 33 14
olivier.gimenez@cefe.cnrs.fr
https://oliviergimenez.github.io/

Education

2010	Habilitation in Ecology and Evolution, U Montpellier, France
1999-2003	Master and PhD in Biostatistics, U Montpellier, France
1997	Undergraduates in Mathematics, U Montpellier, France

Research Experience

2015 - 2019:	Head of Biodiv and Cons department, CNRS, CEFE, Montpellier
2014 - 2018:	Head of French Statistical Ecology research network (https://bit.ly/2UOxYd7)
2012 - now:	CNRS senior scientist (DR1), Montpellier
2006-2012:	CNRS junior scientist, Montpellier
2005:	Postdoc Centre for Research Ecol & Env Modelling, U StAndrews
2004:	Postdoc at Institute of Mathematics, Statistics and Actuarial Science, U Kent
2003:	Assistant Lecturer, National School of Informatics and Appl Math, U Grenoble
2002:	Assistant Lecturer, Montpellier Institute for Engineer Sciences, U Montpellier

Funding (last 5 years)

2022-2025 PI of a project funded by CNRS on accounting for uncertainty arising from computer vision and deep learning in ecological models (including a 3-year PhD for Adélaïde Monchy).
2022-2024 PI of a project funded by OFB on new statistical models for quantifying connectivity in carnivores with non-invasive methods.
2022-2023: PI of a project funded by CNRS on animal species identification and individual re-identification with computer vision and deep learning.
2016-2022: PI of a project funded by the French Research Agency (ANR) of multispecies demography (including a 2-year post-doc for Lucile Marescot, a 2-year post-doc for Sarah Bauduin and a 3-year PhD for Maud Quéroué).
2016-2019: PI of a project funded by Fondation de France on coexistence between bootlenose dolphins and human activities in the Mediterranean Sea.
2017-2020: PI of a project funded by CILB–ITTECOP–FRB ERC–LYNX Mitigating car-lynx collisions (including a 1-year post-doc for Sarah Bauduin).
2018-2020: PI of a project funded by CNRS Socio-ecological approaches for management of large carnivores in France.

2016-2018: co-PI with Fridolin Zimmermann of a project funded by KORA on abundance estimation of lynx in Switzerland (including a 1.5 year post-doc for Loreleï Guéry).
2015-2016: co-PI with Jon Ars of a project funded by Norwegian Polar Institute on demography of polar bear in Svalbard (including a 1.5 year post-doc for Sarah Cubaynes).

Professional Activities and Memberships
Associate Editor for People & Nature 2018-2019, Methods in Ecology and Evolution 2014-2017 and Biometrics 2013-2016
Refereed manuscripts for numerous journals including American Naturalist, Ecology Letters, Ecology, Methods in Ecology & Evolution and Biometrics, as well as for funding agencies (French Research Agency, Greek Research Agency, NERC).
Organized International Statistical Ecology Conference 2014; annual one-week workshop (approx. 20 attendants / year) in population dynamics (Spain, Greece, France, Canada, UK and USA).
Lectured in statistics for ecology since 2006.
Supervised > 40 undergraduate students, 16 PhD students, 14 post-docs.

Honors and Recognitions
2006 Marie Curie Individual Fellowship for a Postdoc position in the UK
1999 Doctorate stipend of the French Ministry of Research (DBU)

Ten key publications
1. Louvrier J., Papaïx J., Duchamp C., **Gimenez O.** (2020). A mechanistic–statistical species distribution model to explain and forecast wolf (Canis lupus) colonization in South-Eastern France. *Spatial Statistics* 36 100428.
2. Marescot L., Lyet A., Singh R., Carter N., **Gimenez O.** (2019). Inferring wildlife poaching in southeast Asia with multispecies dynamic occupancy models. *Ecography* 42: 1–12.
3. **Gimenez O.**, Gatti S., Duchamp C., Germain E., Laurent A., Zimmermann F., Marboutin E. (2019). Spatial density estimates of Eurasian lynx (Lynx lynx) in the French Jura and Vosges Mountains. *Ecology and Evolution* 9: 11707-11715.
4. Bonnet-Lebrun A. , Karamanlidis A. A., de Gabriel Hernando M. , Renner I. and **O. Gimenez** (2019). Identifying priority conservation areas for a recovering brown bear population in Greece using citizen science data. *Animal Conservation*. doi:10.1111/acv.12522.
5. Gervasi V., Linnell J.D.C., Brøseth H., **Gimenez O.** (2019). Failure to coordinate management in transboundary populations hinders the achievement of national management goals: The case of wolverines in Scandinavia. *Journal of Applied Ecology* 56: 1905-1915.
6. Santostasi N.L., P. Ciucci, R. Caniglia, E. Fabbri, L. Molinari, W. Reggioni, **Gimenez O.** (2019). Use of hidden Markov capture–recapture models to estimate abundance in the presence of uncertainty: Application to the estimation of prevalence of hybrids in animal populations. *Ecology and evolution* 9: 744-755.
7. Louvrier J., Molinari-Jobin A., Kéry M., Chambert T., Miller D., Zimmermann F., Marboutin E., Molinari P., Mueller O., Cerne R., **Gimenez O.** (2019). Use of ambiguous detections to improve estimates from species distribution models. *Conservation Biology*. 33: 185-195.
8. Chandelier M., Steuckardt A., Mathevet R., Diwersy S., **Gimenez O.** (2018). Content analysis of newspaper coverage of wolf recolonization in France using structural topic modeling *Biological Conservationa* 220: 254-261.
9. **Gimenez O.**, E. Cam, J.-M. Gaillard (2018). Individual heterogeneity and capture–recapture models: what, why and how? *Oikos*. 127: 664–686.
10. Louvrier, J., C. Duchamp, V. Lauret, E. Marboutin, S. Cubaynes, R. Choquet, C. Miquel, **O. Gimenez** (2017). Mapping and explaining wolf recolonization in France using dynamic occupancy models and opportunistic data. *Ecography*. 41: 647-660.

Name **Dr. Sandrine Ruette**
Contact French Biodiversity Agency
Montfort
01330 BIRIEUX
+33 (0) 474 61 73 77 / +33 (0) 625 63 64 72
sandrine.ruette@ofb.gouv.fr

Education

1994	Master in Epidemiology, Environment and Public health (U J. Fourier, Grenoble)
1994	Inter-university diploma in applied biometrics (U J. Fourier, Grenoble)
1993	Doctor in Veterinary Medicine (Faculty of Vet. Med., U of Nantes), thesis prize (silver medal)
1986-1990	Faculty of Veterinary Medicine of Nantes

Research Experience

now	Deputy head of the Wildlife health and functioning of agricultural ecosystems department, Research and Scientific Support Direction, OFB
2002-2020	Project manager for small and medium sized carnivore programs at ONCFS (National Hunting and Wildlife Agency) now OFB
1997-2002	Research engineer on small- and medium-sized carnivores at ONCFS (now OFB)
1995-1997	Veterinian in the Research Department of Virbac Laboratories (Carros, France).
1990-1995	Practice of veterinary medicine.

Professional Activities and Memberships

Coordination of field studies: capture, anesthesia and handling of wildlife carnivores (martens, red fox, wildcats, badgers…); national enquiries on hunting and culling statistics of small and medium size carnivores; responsible of OFB Small and Medium Size Carnivores network (2001-2021)
Management and team coordination
Refereed manuscripts for various journals; co-Organized the 32th European Mustelid Colloquium 2018
Member of ANSES (French Agency for Food, Environmental and Occupational Health & Safety) collective expert appraisals on badger, fox and bovine tuberculosis
Technical appraisals for the ministry in charge of ecology on small and medium sized carnivores ('pest' reglementation) since 2012
Reporting for the Habitats Directive on the conservation status in France of the Pine marten, the Genett, the European mink, the Wildcat, the Polecat since 2006
Supervised > 30 undergraduate students, co-supervised 2 PhD students.

Honors and Recognitions

Chevalier in the National Order of Merit (2013).
Expert in the field of "Sustainable management of natural resources" (Ministry of Ecology, 2016).

Ten key publications

1. E. Portanier, F. Léger, Laurence Henry, T. Gayet, G. Queney, S. **Ruette**, S. Devillard (2022). Landscape genetic connectivity in European wildcat (Felis silvestris silvestris): a matter of food, shelters and demographic status of populations. *Conservation Genetics* 1-16

2. Payne A., **Ruette** S., Jacquier M., Richomme C., Lesellier S., Gowtage S., Duhayer J. & Rossi S. 2022. Estimation of bait uptake by badgers, using non-invasive methods, in the perspective of oral vaccination against bovine tuberculosis in a French infected area.*Frontiers in Veterinary Science 9* 787932
3. Jacquier M., J.M. Vandel, F. Léger, J. Duhayer, S. Pardonnet, L. Say, S. Devillard & S. **Ruette**. (2021). Breaking down population density into different components to better understand its spatial variation: the relative role of sett density and group size in European badgers. *BMC Evolutionary Ecology, 21(1):1-13*
4. Umhang, G., Duchamp, C., Boucher, J. M., **Ruette**, S., Boué, F., & Richomme, C. (2020). Detection of DNA from the zoonotic raccoon roundworm Baylisascaris procyonis in a French wolf. *Parasitology International*, *78*, 102155
5. Jacquier M., J.M. Vandel, F. Léger, J. Duhayer, S. Pardonnet, G. Queney, C. Kaerle, L. Say, S. **Ruette** & S. Devillard. (2020). Population genetic structures at multiple spatial scales: importance of social groups in European badgers. *Journal of Mammalogy 101*(5): 1380-1391
6. Jacquier, M., C. Calenge, L. Say, S. Devillard, & S. **Ruette**. (2020). Altitude shapes the environmental drivers of large-scale variation in abundance of a widespread mammal species. *Ecology and evolution*, *10*(1), 119-130
7. Jacquier, M., Simon, L., **Ruette**, S., Vandel, J. M., Hemery, A., & Devillard, S. (2020). Isotopic evidence of individual specialization toward free-ranging chickens in a rural population of red foxes. *European Journal of Wildlife Research*, *66*(1), 1-13
8. Larroque J., S. **Ruette**, J.M. Vandel, and S. Devillard (2018). Home-range size and fidelity of two sympatric *Martes* species. *Can. J. Zool*. *96*(11): 1272-1277
9. Croose E., J.W. Duckworth, S. **Ruette**, D. V. Skumatov,V. V. Kolesnikov & A. P. Saveljev (2018). A review of the status of the Western polecat *Mustela putorius*: a neglected and declining species? *Mammalia 82*(6): 550-564
10. Lieury N., N. Drouet-Hoguet, S. **Ruette**, S. Devillard, M. Albaret & A. Millon (2017). Rural populations of the red fox *Vulpes vulpes* show little evidence of reproductive senescence. *Mamm Biol 87*(1): 146-151

SECTION E – Confirmation of participation

Insert (copy and paste) here e-mailed confirmations from each participant.

CESAB project « Population consequences of human perturbance on small carnivores » INBOX Personnes

Sandrine Ruette jeudi 1 sept. à 17:52
À : Olivier Gimenez

Dear Olivier,

Please accept this email as my confirmation that I agree to be part of the DISCAR project.

Cheers,

RUETTE Sandrine

Cheffe de service adjointe
Service santé de la faune et fonctionnement des écosystèmes agricoles
Direction de la Recherche et de l'Appui Scientifique

Station de la Dombes - Montfort - 01330 BIRIEUX
04 74 98 31 89 / 06 25 63 64 72
sandrine.ruette@ofb.gouv.fr

CESAB prject « population consequences of human perturbance on small carnivores » Personnes

Olivier Gimenez vendredi 2 sept. à 12:47
À : Olivier Gimenez

Dear myself,
Please accept this email as your own confirmation that I agree to part of the DISCAR project ;-)
Cheers,
Yours, truly.

Dr Olivier Gimenez | senior scientist at CNRS | @oaggimenez
DiPEE Occitanie Est | PNA lynx boréal | GdR EcoStat | Hair team
olivier.gimenez@cefe.cnrs.fr | https://oliviergimenez.github.io/

Due to my own family/work balance, you may get emails from me outside of normal working hours. Please do not feel any pressure to respond outside of your own working pattern.
---

confirmation of involvement in a SYNTHESIS project INBOX Personnes

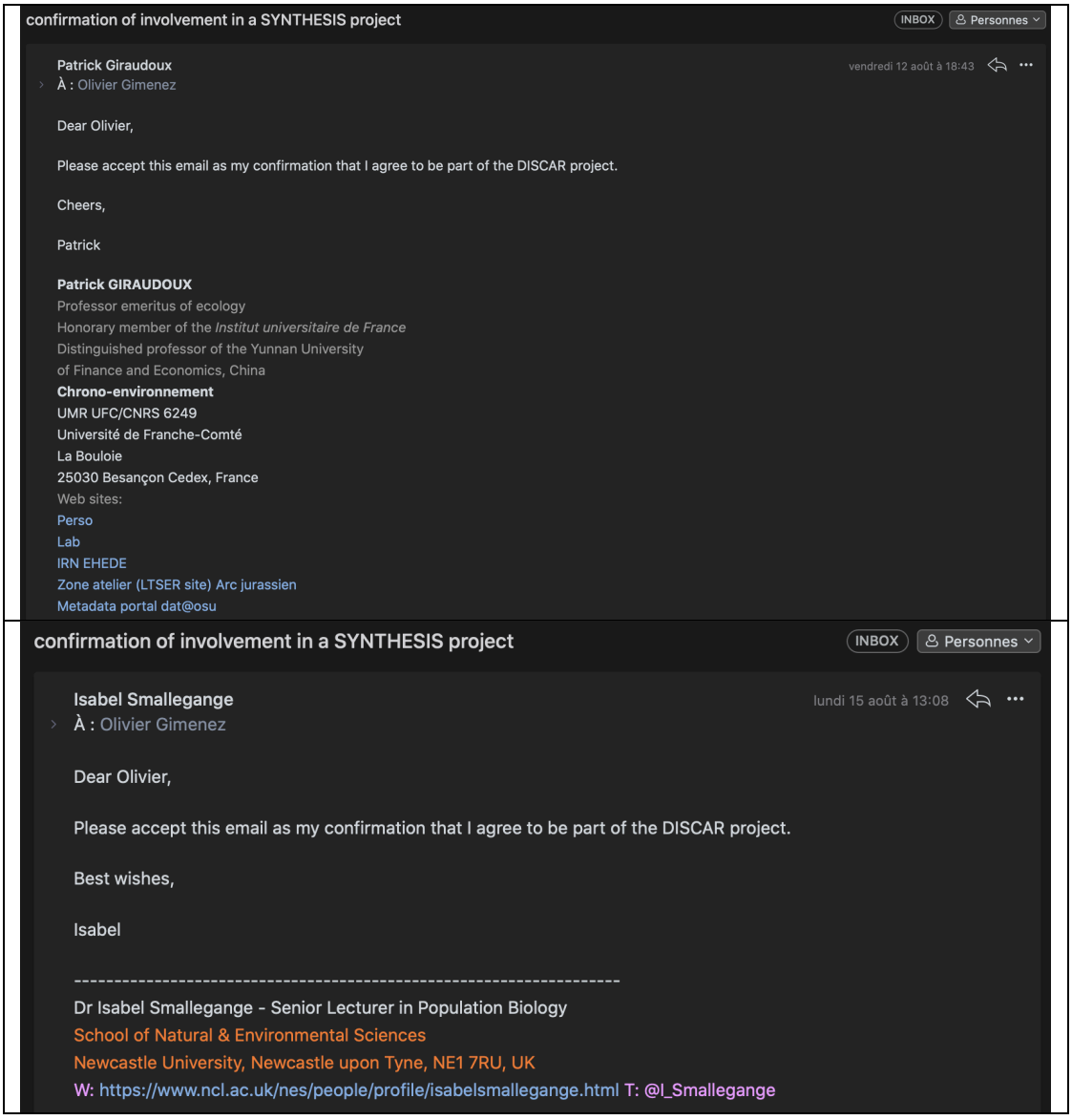
Courtney Marneweck mercredi 24 août à 16:45
À : Olivier Gimenez

Dear Olivier,

Please accept this email as my confirmation that I agree to be part of the DISCAR project.

Cheers,
Courtney

--
Dr Courtney Marneweck
+27 72 754 9784



confirmation of involvement in a SYNTHESIS project

INBOX Personnes

Patrick Giraudoux
À : Olivier Gimenez

vendredi 12 août à 18:43

Dear Olivier,

Please accept this email as my confirmation that I agree to be part of the DISCAR project.

Cheers,

Patrick

Patrick GIRAUDOUX
Professor emeritus of ecology
Honorary member of the *Institut universitaire de France*
Distinguished professor of the Yunnan University
of Finance and Economics, China
Chrono-environnement
UMR UFC/CNRS 6249
Université de Franche-Comté
La Bouloie
25030 Besançon Cedex, France
Web sites:
Perso
Lab
IRN EHEDE
Zone atelier (LTSER site) Arc jurassien
Metadata portal dat@osu

confirmation of involvement in a SYNTHESIS project

INBOX Personnes

Isabel Smallegange
À : Olivier Gimenez

lundi 15 août à 13:08

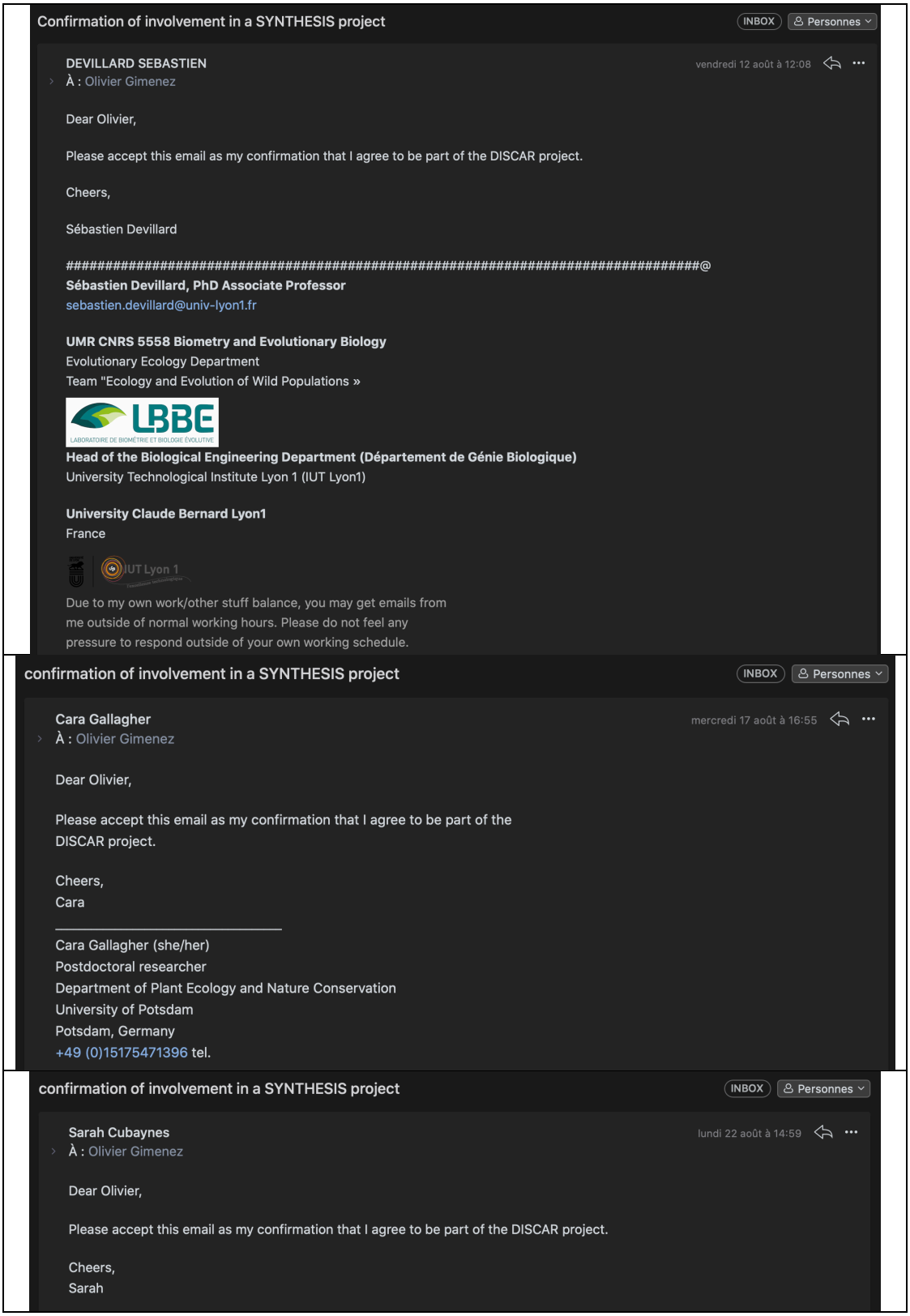
Dear Olivier,

Please accept this email as my confirmation that I agree to be part of the DISCAR project.

Best wishes,

Isabel

Dr Isabel Smallegange - Senior Lecturer in Population Biology
School of Natural & Environmental Sciences
Newcastle University, Newcastle upon Tyne, NE1 7RU, UK
W: https://www.ncl.ac.uk/nes/people/profile/isabelsmallegange.html T: @I_Smallegange



Confirmation of involvement in a SYNTHESIS project

INBOX Personnes

DEVILLARD SEBASTIEN
À : Olivier Gimenez
vendredi 12 août à 12:08

Dear Olivier,

Please accept this email as my confirmation that I agree to be part of the DISCAR project.

Cheers,

Sébastien Devillard

##@
Sébastien Devillard, PhD Associate Professor
sebastien.devillard@univ-lyon1.fr

UMR CNRS 5558 Biometry and Evolutionary Biology
Evolutionary Ecology Department
Team "Ecology and Evolution of Wild Populations »

Head of the Biological Engineering Department (Département de Génie Biologique)
University Technological Institute Lyon 1 (IUT Lyon1)

University Claude Bernard Lyon1
France

Due to my own work/other stuff balance, you may get emails from me outside of normal working hours. Please do not feel any pressure to respond outside of your own working schedule.

confirmation of involvement in a SYNTHESIS project

INBOX Personnes

Cara Gallagher
À : Olivier Gimenez
mercredi 17 août à 16:55

Dear Olivier,

Please accept this email as my confirmation that I agree to be part of the DISCAR project.

Cheers,
Cara

Cara Gallagher (she/her)
Postdoctoral researcher
Department of Plant Ecology and Nature Conservation
University of Potsdam
Potsdam, Germany
+49 (0)15175471396 tel.

confirmation of involvement in a SYNTHESIS project

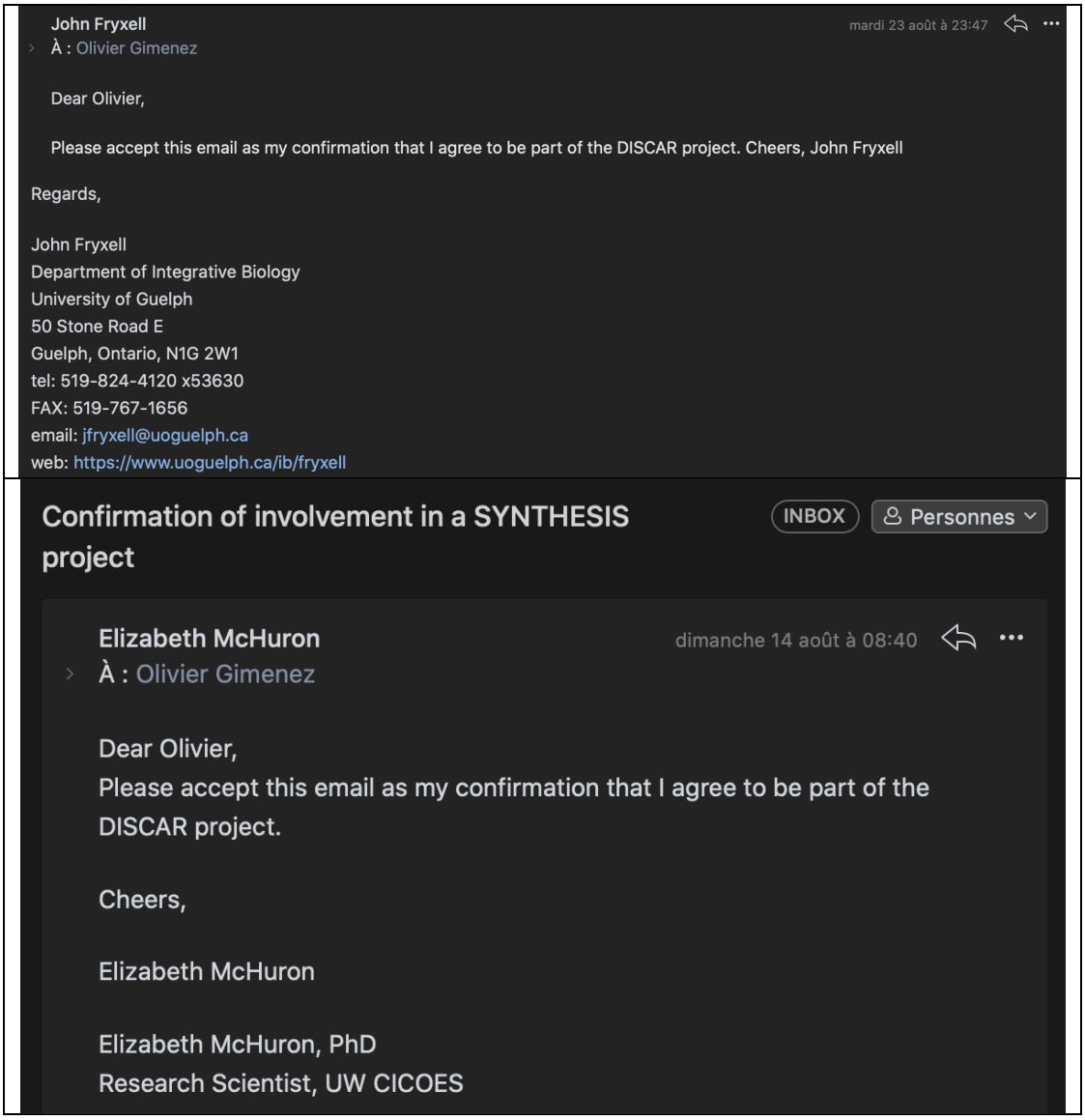
INBOX Personnes

Sarah Cubaynes
À : Olivier Gimenez
lundi 22 août à 14:59

Dear Olivier,

Please accept this email as my confirmation that I agree to be part of the DISCAR project.

Cheers,
Sarah



John Fryxell
À : Olivier Gimenez
mardi 23 août à 23:47

Dear Olivier,

Please accept this email as my confirmation that I agree to be part of the DISCAR project. Cheers, John Fryxell

Regards,

John Fryxell
Department of Integrative Biology
University of Guelph
50 Stone Road E
Guelph, Ontario, N1G 2W1
tel: 519-824-4120 x53630
FAX: 519-767-1656
email: jfryxell@uoguelph.ca
web: https://www.uoguelph.ca/ib/fryxell

Confirmation of involvement in a SYNTHESIS project

INBOX
Personnes

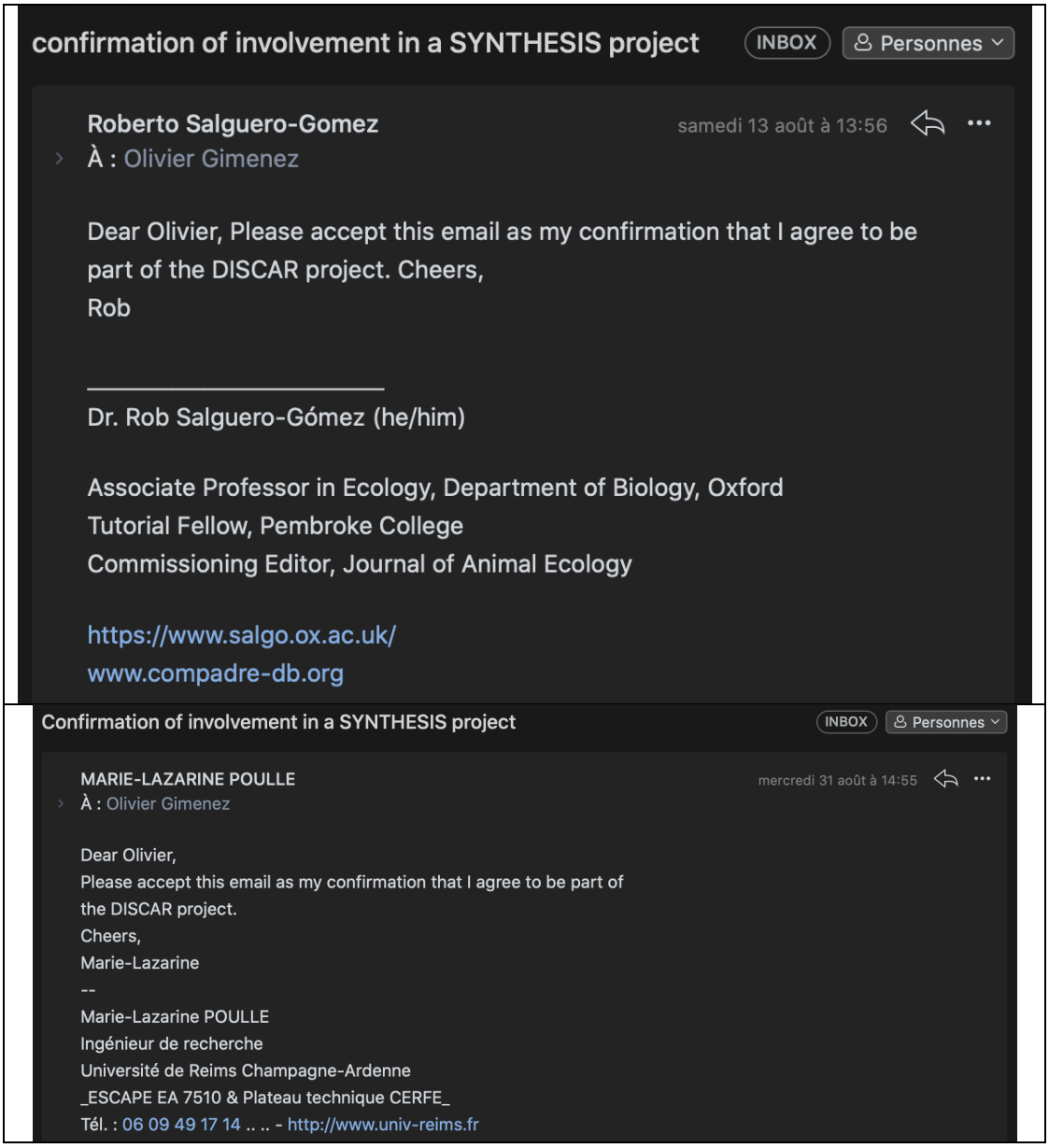
Elizabeth McHuron
À : Olivier Gimenez
dimanche 14 août à 08:40

Dear Olivier,
Please accept this email as my confirmation that I agree to be part of the DISCAR project.

Cheers,

Elizabeth McHuron

Elizabeth McHuron, PhD
Research Scientist, UW CICOES



SECTION F – REVIEW AND EVALUATION

1/ Suggestion of reviewers. Maximum 10 experts. This list of suggested reviewers guides the selection of members of the reviewer committee. There is no guarantee that the suggested experts will actually be mobilised for the evaluation.

- Enrico Pirotta, https://risweb.st-andrews.ac.uk/portal/en/persons/enrico-pirotta(3ff3ffd5-926b-4d54-a502-d714ca907569).html, ep343@st-andrews.ac.uk
- Stephanie Kramer-Schadt, https://www.izw-berlin.de/en/stephanie-kramer-schadt-en.html, kramer@izw-berlin.de
- Magda Chudzinska, https://www.st-andrews.ac.uk/mathematics-statistics/people/mec21/, mec21@st-andrews.ac.uk

- Victoria Boult, https://research.reading.ac.uk/meteorology/people/victoria-boult/, v.l.boult@reading.ac.uk
- Leslie New, https://labs.wsu.edu/leslie-new/, leslie.new@wsu.edu
- Emiel van Loon, https://www.uva.nl/en/profile/l/o/e.e.vanloon/e.e.vanloon.html, e.e.vanloon@uva.nl
- Gerard Oostermeijer, https://www.uva.nl/en/profile/o/o/j.g.b.oostermeijer/j.g.b.oostermeijer.html, j.g.b.oostermeijer@uva.nl
- Emmanuel Do Linh San, https://www.ufh.ac.za/departments/zoology/prof-emmanuel-do-linh-san, edolinhsan@ufh.ac.za
- Aliza le Roux, https://www.ufs.ac.za/aru/aru-team/aru-team/prof-aliza-le-roux, LeRouxA3@ufs.ac.za
- David Jachowski, https://www.clemson.edu/cafls/faculty_staff/profiles/djachow, djachow@clemson.edu

2/ Undesirable reviewers (*optional*). Maximum 5 experts.

None……