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Article

Writing ecologically functioning nature: A proposed grid for analyzing popular novels

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Abstract

As stated by the international community (IPCC, IPBES), achieving global sustainability needs transformative changes in societies, which include the recognition of fundamental interconnections between humans and the other livings (so-called "nature" in this paper). Such huge transformations of social imaginary can benefit from stories and fictions. In this paper, we present a grid to assess the way nature and human–nature relationships are detailed in fictional novels. Its items mainly refer to concepts coming from ecological and conservation sciences. This grid has been constructed as a tool for content analyses. We hope it will be considered as complementary to qualitative analyses coming from literature or linguistics, in order to assess more widely the place of ecological nature in cultural products.

Keywords: transformative changes; fictional narratives; nature; ecological and conservation sciences

Résumé

Comme l'affirme la communauté scientifique internationale (GIEC, IPBES), construire un monde soutenable nécessite des changements transformateurs des sociétés humaines, changements qui reconnaissent les interrelations entre les êtres humains et les autres êtres vivants (appelés « nature » dans cet article). De tels bouleversements des imaginaires sociaux pourraient être médiés par les créations

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fictionnelles. Dans cet article, nous présentons un outil d'analyse de contenu de la manière dont la nature et les relations humains-nature sont détaillées dans des romans. La plupart des composantes de cette grille est construite à partir de concepts venant de l'écologie scientifique et des sciences de la conservation. Nous espérons que cette grille sera considérée comme un outil complémentaire des démarches développées dans le champ de la littérature ou de la linguistique, de façon à enrichir l'analyse et la compréhension de la place de la nature écologiquement fonctionnelle dans les produits culturels.

1. Introduction

In 2019, the Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES) stated that "goals for conserving and sustainably using nature and achieving sustainability cannot be met by current trajectories, and goals for 2030 and beyond may only be achieved through transformative changes across economic, social, political and technological factors" (Message C, p. 5). Also taken up by the IPCC (2021), these transformative changes include modifications in collective values and paradigms. They would modify what makes sense to societies in terms of quality of life, in connection with nature. In the 2024 report on transformative changes (IPBES, 2024), the IPBES specified that

> Promoting and accelerating transformative change is essential to meeting the 23 action-oriented global targets and four goals of the Kunming-Montreal Global Biodiversity Framework of the Convention on Biological Diversity by 2030 and for achieving the 2050 Vision for Biodiversity, where "biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people". (2024, p. 3)

One of the five strategies proposed by the IPBES to advance transformative changes "focuses on shifting societal views and values to recognize and prioritize fundamental interconnections between humans and nature" (IPBES, 2024, p. 7, KM7).

Nature and biodiversity in question here are defined by the IPBES and the scientific ecologists as a multitude of highly diversified assemblages of living beings in permanent interaction with one another, whose assemblages are dynamic, reflect a diversity of evolutionary histories, and are often unpredictable. These systems do not particularly need humans to exist, but the reverse is not true: humans are one of the living species, interacting *de facto* with other living beings, in a multitude of manners. Integrating this conception of nature (i.e., living, complex, dynamic, in relation with humans) relies on specific values of nature for individuals and the societies. The IPBES synthetized three main values for nature: (i) intrinsic values (see review in Himes et al., 2023), in which nature is important for herself; (ii) instrumental values (see review in Himes et al., 2023), in which nature is important because of what humans can benefit from her; and (iii) relational values (see

review in Himes et al., 2023), in which nature is important because of the relationship people have with her or among humans regarding her. Apart from values, other authors have detailed different manners for human individuals to relate to and experience nature (e.g., Kellert, 2002). The diversity of these experiences includes physical interactions, emotional or cognitive ones, as well as vicarious ones through cultural products (Clayton et al., 2017).

What makes sense to a society is included in what Taylor (2002) called the "social imaginary", i.e. "the ways in which people imagine their social existence, how they fit together with others, how things go on between them and their fellows, the expectations that are normally met, and the deeper normative notions and images that underlie these expectations" (p. 106). Social imaginary is built by sharing stories that rely on facts and experiences, and give them senses. Human societies have all constructed and shared stories, through tales, myths, taboos, rituals, etc. (Barthes, 1966). More precisely, language can be considered as "something which both reflects and has an impact on the larger ecosystems that societies are embedded in and dependant on for their continuing existence" (Stibbe, 2012, p. 1). Among all the stories that give coherence to social worlds, a special place must be given to novels and other fictional narratives (e.g., Bal et al., 2011; James & Morel, 2020). As other narratives, novels reflect and share the social imaginaries of their times. In addition, they can absorb individuals into the story and transport them into the narrative world (Green & Brock, 2000). Reading a wide range of novels allows the readers to immerse themselves in a variety of realities and worlds, and to experiment with different postures. It also gives them access to the complexity of these worlds, and enables them to move beyond purely binary and Manichean reasoning (Huston, 2008). By reading novels, by identifying themselves with or against several different characters, readers can experiment the complexity of social relations and increase their own power to act (Mar et al., 2009). Finally, reading and exchanging views on these readings with peers (particularly among children) have been shown to increase empathy and enrich the way readers relate to other human beings (Bigger & Webb, 2010). Fictional narratives could thus transform social imaginaries (Garduño-García & Gaziulusoy, 2021; Stibbe, 2021).

In a recent collective book, James and Morel (2020) propose to define econarratology as a "paired consideration of material environments and their representations and narrative forms of understanding" (2020, p. 1). This emerging research field wishes to integrate different dimensions of the way environment (and more specifically, nature) is deployed and perceived according to narratives *per se* (both in the told content and in the telling), according to narrative ethics and contexts, as well as to the receptions of narratives by diverse audiences.

The proposition we put forward in this paper relates to a specific dimension of econarratology, i.e., the analysis of the content of narratives with respect to the representation of nature and the more-than-human world. Indeed, in this study, we propose to explore the complexity of nature and human–nature relationships in fictional narratives. We deliberately decided to work on popular novels and not on novels labelled

as nature writing or ecology-friendly, in order to build a grid that could be used for mainstream culture.

Several studies have already explored the place of nature in fictional narratives, with a diversity of methods. Kesebir and Kesebir (2017) counted the relative number of pre-defined names related to common plants, trees and animals, as well as environment, in a series of novels, films and pop songs. Babb et al. (2018) recorded the presence/absence of specific items in the images of children picture books. Prévot et al. (2015) measured the duration of outdoor scenes with drawings of green vegetation in feature films produced by Disney and Disney-Pixar. Hedblom et al. (2022) qualitatively studied the presence of nature and biodiversity in American sci-fi blockbusters. Truong et al. (2018) counted the green cover of screenshots in the World of Warcraft video game. The diversity of these studies reflects the diversity of media used as cultural products. Yet, the complexity of nature and human–nature relationships is not always and homogeneously included in these analyses.

The tool proposed here consists in a description grid, which details different facets of an ecologically functioning nature, the diversity of relationships humans (or other fictional characters) have with her, the values that are devoted to her, and the way conservation of nature is deployed or not in the novel.

This grid has deliberately no item dealing with author's styles or other literature elements. The criteria of the grid do not focus either on the social, historical, aesthetics, or cultural context of the novels, or on their reception by the readers. They are designed to be applied to stories themselves (i.e., content analysis; Babb et al., 2018), in order to compare relative abundances of certain ways to write (or not write) about nature.

2. Method

We built this grid in an iterative process linking ecological knowledge on nature and biodiversity, and specific literature fiction texts.

First, we computed a first version of a conceptual grid, using concepts coming from ecological sciences and IPBES reports. We then chose six novels written in French (our native language) from among the mostly sold books in France between 2014 and 2022 (Table 1). These novels have been selected because they were very diversified in the way they described nature and the relation with the characters. In each novel, we independently sorted the extracts mentioning elements of nature in the pre-defined grid, using the software MAXQDA (VERBI Software, 2022) and discussed each inconsistency between our sorting. When needed, we added some details in the definition of the items of the grid; and when appropriate, we added or removed some items in the grid. In particular, our readings let emerge a specific category of items that depict nature purely through human lens. We repeated this process iteratively several times, in order to accord with each other in a first version of the grid. In order to make the items the more finely depicted, we asked a group of ten colleagues to classify ten to twenty extracts that cover the diversity of the categories from the grid. A final discussion led us clarifying the description of each item of

the grid, in an interactive process.

In the following, we present the grid, together with the ecological definitions and concepts they are anchored in. Then, we present an example of the way this grid could be used, by using the six novels that helped us to compute it.

Table 1: Six novels used to build and test the grid

Label	Author	Publication year	Title	Ranking (ranking year)
novel1	Pancol, Katherine (woman)	2014	*Muchachas*, vol 1	8 (2014)
novel2	Legardinier, Gilles (man)	2015	*Quelqu'un pour qui trembler*	29 (2017)
novel3	Bussi, Michel (man)	2016	*Le temps est assassin*	12 (2017)
novel4	Vargas, Fred (woman)	2017	*Quand sort la recluse*	8 (2017)
novel5	Grimaldi, Virginie (woman)	2018	*Il est grand temps de rallumer les étoiles*	9 (2019)
novel6	De Vigan, Delphine (woman)	2021	*Les enfants sont rois*	5 (2021)

3. The ecological nature grid

The grid is composed of 20 items. For the sake of clarity, we present the items in different categories, based on the scientific dimensions they refer to (we wrote in bold the scientific concepts that are connected with specific items in the grid). The last category gathers items which do not refer to any of these scientific dimensions, but which are more human-based. All these items can concern the ongoing actual story, the memories, even expressions, depending of the objectives of the research.

3.1. Nature presented as ecologically functioning

In this category, we wanted to capture novels' extracts where nature is described as being composed of a diversity of ecologically functioning living beings.

According to the Convention on Biological Diversity (CBD) of the United Nations, the "'*Biological diversity*' means the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes **diversity** within species, between species and of ecosystems" (CBD, 1992).

According to the French Universalis Encyclopedia[1], living beings share the following characteristics: they can move and grow; they can feel; they can breathe; they all feed and absorb nutrients, as well as excrete what is useless or toxic; they all reproduce. These are

[1] https://www-universalis-edu-com.mnhn.idm.oclc.org/1/encyclopedie/etre-vivant (consulted 23/09/2024)

dimensions of what we called their **natural history**. All these activities follow **biological rhythms**, including daily, seasonal or annual cycles (e.g., seasonal flowering, bird migrations, leaves falling in autumn). All these living beings are in constant **interactions** with each other (Begon et al., 2006), such as competition, predation, parasitism, neutralism or mutualism. They also interact with their abiotic habitat, in one direction (climate, topography or water influence the species living in the area) or the other (living beings transform their environment such as climbing plants altering their rocky substrate). Finally, according to ecological theory, they all have **evolved** through time, notably following natural selection which rests on the following propositions: the living beings are not identical; some of this variation is heritable; individuals in a given population do not all reproduce, and leave different number of descendants; the number of descendants that an individual leaves depends, not entirely but crucially, on the interaction between the characteristics of the individual and the environment (Begon et al., 2006, p. 3).

In the novels, we identified the five following dimensions:

- *Natural history (Nat_Hist)*: In this item, we included all the descriptions of the morphology, the functioning or the history of organisms.

- *Phenology and dynamics (Ecol_Dyn)*: This item gathers narrative elements that refer to daily, seasonal or annual cycles of living, as well as narrative elements that refer to natural dynamics (e.g., increasing or decreasing number of individuals).

- *Ecological interactions (Ecol_Inter)*: This items gathers extracts which mention or suggest the presence of interactions: (i) interactions between living organisms from the same or different species, notably visible through complex food networks, or key ecosystem functions such as pollination; (ii) interactions of living organisms with their abiotic habitat.

- *Ecological abundance and diversity (Abund_Div)*: This item gathers extracts which explicitly or implicitly refer to the abundance and diversity in nature, at different scales: ecosystems (e.g., forests, marshes, oceans), communities (i.e., a set of species who live together: flowering plants communities of a meadow, skin microbiota, etc.), species and organisms.

- *Evolution (Evol)*: This item gathers extracts which suggest the evolutionary dimension of the elements of nature.

3.2. Naming nature

Depending on novels, natural species are denominated with names distributed from the most general (e.g., trees, countryside, garden, bushes, animals, bugs) to the most precise

(e.g., lime, oak, orca, moray eel). Species level is the most popular and used level to describe and classify the living (Jaric et al., 2016). In natural history, a species is classically defined as "a group of living beings with common anatomical, morphological and physiological characteristics that reproduce similar and equally fertile beings"[2]. Each described species by taxonomists receives a scientific *Latin* name, common in all languages, and one or several common names. Denominating species by their specific and **precise** names is considered as a way to elicit the diversity and richness of the living (Jaric et al., 2016). On the opposite, animals and plants can also be named by more **generic** terms that combine groups of species and do not refer to this diversity (e.g., trees, mammals, fishes, flowers).

Among the diversity of living species, **domestic** and cultivated ones are defined by the CBD (1992) as "species in which the evolutionary process has been influenced by humans to meet their needs". They can be split into two sub-categories that have different meanings in Western societies: crops and livestock are cultivated and bred by humans for food; ornamental plants and pets are cultivated and bred by humans for other purposes than food. Non-domesticated and non-cultivated species are considered as **wild** species (Yarrow 2009, as cited in Tian et al., 2023).

In the novels, we wanted to assess two degrees of generalization of species names, as following:

- *Generic terms to name species (Generic_Name)*: This item gathers extracts in which nature is portrayed with very generic terms such as "tree" or "animal".

- *Precise names to name species (Precise_Name)*: This item gathers extracts with precise names of species. It can be further split in sub-groups, referring to wild and domesticated species, even in crops/livestock and ornamental plants/pets.

Note that sorting species names as generic or precise depends on the story context, but also on the subjectivity of the researcher and of the objectives of the study. Specific lists of terms considered as generic could be constructed, depending on the objectives of the study.

3.3. Experiences of nature

In fictional stories, characters can actually interact more or less often with natural elements. In non-fictional lives, human interactions with nature are scientifically studied in what is called "experiences of nature" (EoN) (Pyle, 1993; Soga & Gaston, 2016). Together with Clayton et al. (2017), "we argue that EoN are diverse and complex, and are embedded in social and political contexts. Thus, EoN must be seen as a process, including: 1) interactions between individuals and natural entities; 2) social and cultural context; and 3) consequences for new skills, knowledge, or behavioral changes" (2017, p. 2). The interactions between

[2] https://www.cnrtl.fr/definition/esp%C3%A8ce (consulted 04/11/2024)

individuals and nature can be **embodied** and **sensitive** (i.e., through one or several of physical senses); they can also be **emotional**, **affective**, or **cognitive**; they can even be mediated by technology, i.e., **vicarious** (Clayton et al., 2017).

In the novels, we categorized three sorts of experiences of nature, as following:

- *Physical experiences (Phys_Exp)*: In this item, we included all extracts where characters interact with natural elements through one or several of their senses (vision, smell, touching, taste or hearing).

- *Non-physical experiences (Non_Phys_Exp)*: This item is relevant for all the events or moments when characters are connected to specific natural elements through their cognition (e.g., knowledge), emotions or affects. We included also extracts where the characters express a moral judgement, always toward specific natural elements (general moral judgements refer to relational values, see below).

- *Vicarious experiences (Vic_Exp)*: This item gathers extracts where characters experience technology-based interactions with nature, through nature-based reality shows, documentaries or films, novels, video games, etc.

3.4. The way characters value nature

In parallel to actual interactions with nature, fictional characters (as well as the novel's writer) can express judgment or values towards nature, at individual or collective levels. In the scientific community, the ways humans relate to nature rely on their "judgments regarding the importance of nature in particular situations" (IPBES, 2022, p. 9), i.e., so-called "specific values". The IPBES (2022) summarized three categories of values regarding nature:

> I**nstrumental values** relate to things that are a means to a desired end and tend to be associated with nature (e.g., as asset, capital, resources) and its contributions to people; **intrinsic values** relate to the values of nature expressed independently of any reference to people as valuers and include entities such as habitats or species that are worth protecting as ends in and of themselves; **relational values** refer to the meaningfulness of people–nature interactions, and interactions among people (including across generations) through nature (e.g., sense of place, spirituality, care, reciprocity). (IPBES, 2022, p. 10)

More specifically, instrumental values refer to the framework of Ecosystem Services proposed by the Millennium Ecosystem Assessment (2005): they can relate to food provisioning, heating or cooling, water provisioning; they can also relate to well-being, leisure or social interactions.

We sorted the mentions of these judgments in the novels, in the three following items:

- *Intrinsic value (Intrins_Val)*: By this item, we refer to all extracts which suggest that nature is considered, valued or respected for herself (by the characters or by the novelist). Following Himes et al. (2023), this item refers also to extracts where nature is presented with an "agency", "with inherent properties that do not depend on any human valuer", "regardless of importance or usefulness to humans", or "with inherent moral value" (p. 6).

- *Instrumental values (Instrum_Val)*: In this item, we included all extracts suggesting that natural elements are considered as "means to achieve human ends or satisfy human preferences (in principle replaceable, albeit not always in practice)" (Himes et al., 2023, p. 6). These means can be considered at individual or collective levels (for eating or drinking, housing, resting, pleasuring, being healthy, etc.); this item included also extracts where nature is considered as a resource, an asset, a capital, or a property.

- *Relational values (Rel_Val)*: This item gathers extracts suggesting that nature in general has an importance for one character or for one or several social groups. Such social groups could rely on different scales, including a general cultural group in the fictional world of the novel. Following Himes et al. (2023), it gathers extracts where relationships to nature are considered as "constituent parts of identity (cultural, individual or collective), for living a 'good life', associated with sense of place, associated with care for or about specific landscapes, places, human and nonhuman livings, or as a point of connection among people" (p. 6). In addition to Himes et al. (2023), we propose to include in this item also extracts where the characters speak about, express knowledge or have moral judgments on nature in general, without referring to particular situations. It also includes mentions of nature as symbolic.

3.5. Conservation and nature impacts

In some novels, writers mention or integrate considerations on reciprocal impacts between nature and human societies. This relates to conservation sciences, which classify collective human actions toward nature as positive or negative, in accordance with biological conservation issues: **positive** human actions improve the ecological functioning of nature (e.g., by conserving individuals, species or ecosystems); **negative** human actions harm biodiversity (e.g., by destroying natural habitats or polluting the environment; IPBES, 2019). In parallel, nature can **impact** humans or human artifacts, either collectively or individually (e.g., poisoning, recolonization of abandoned buildings).

To characterize these interactions, we defined the three following items:

- *Nature impacts (Nat_Impacts)*: This item concerns all extracts where nature is considered as actively impacting humans or human artifacts, at individual or collectively scales. We chose not to separate so-called "positive" and "negative" impacts, because this sorting is based on human-based and not nature-based criteria.

- *Negative societal impacts (Negat_Impacts)*: This item gathers extracts that mention or suggest negative consequences of human actions on biodiversity or on the ecological functioning of nature (see IPBES, 2019): destruction of natural habitats, over-exploitation of species, climate change, pollution, invasive species, etc.

- *Positive societal impacts (Posit_Impacts)*: On the opposite, this item gathers extracts that mention or suggest positive consequences of human actions on the biodiversity or on the ecological functioning of nature (see IPBES, 2019): protection of some species or habitats, habitat restoration, nature regulation, etc.

3.6. Anthropocentric mentions of nature

This category gathers items which mentioned natural elements from anthropocentric points of views, without direct connection to concepts coming from ecological sciences or IPBES.

We defined the four following items:

- *Human analogy* (*Hum_Anal*): This item is activated when natural elements are described with words that are mainly used to describe humans.

- *Nature as passive setting (Nat_Pass_Set)*: This item includes all mentions of nature as setting for the story, without mentioning or suggesting any ecological functioning, in the same manner as buildings or other manufactured tools.

- *Nature in cultural representations (Cultural_Products)*: This item is activated when nature is present in cultural productions and representations (books, films, video games, drawings, etc.), without any interactions between a character and her (which refers to vicarious experiences).

- *Nature in expression (Expression)*: This item gathers extracts where nature is included in a proverb, metaphor or other expression.

4. Propositions to use the grid to assess nature in novels

We think that this grid could be used in diverse manners to study novels, depending on the questions of interest. Here, we propose a first non-exhaustive list of questions, and

exemplify how these questions could be answered with the data recorded in the six novels used to compute this grid (Table 2). Note that a given sentence/word can refer to different items in the grid.

Table 2: Number of extracts sorted per item and novel

Category	Item	novel1	novel2	novel3	novel4	novel5	novel6	Total
Ecologically functioning nature	Ecol_nat_hist	15	13	13	28	10	0	**79**
	Ecol-dynamics	4	5	1	3	3	1	**17**
	Ecol_inter	5	9	9	16	0	0	**39**
	Ecol_abund_divers	2	1	14	12	9	1	**39**
	Ecol_evolution	0	0	0	2	0	0	**2**
Naming species	Precise_names	90	47	223	90	34	1	**485**
	Generic_names	74	60	98	40	56	10	**338**
Experiences of nature	Phys_exp	24	14	32	28	11	2	**111**
	Non_phys_exp	11	17	11	14	21	2	**76**
	Vic_exp	0	0	0	0	8	0	**8**
Values	Intrins_val	0	0	4	0	0	0	**4**
	Instrum_val	10	18	21	8	4	4	**65**
	Relat_val	5	8	19	13	5	0	**50**
Conservation	Nature_impacts	2	3	8	11	3	0	**27**
	Negative_impacts	3	0	4	9	0	1	**17**
	Positive_impacts	0	0	4	1	3	1	**9**
Anthropocentric nature	Human_analogy	4	1	5	2	0	0	**12**
	Setting	20	29	25	10	18	6	**108**
	Culture	2	7	4	2	4	0	**19**
	Expression	66	36	107	27	35	1	**272**
	Total	**337**	**268**	**602**	**316**	**224**	**30**	**1777**

Proposition 1: Inductive analyses of novels

Using this grid, researchers could produce qualitative analyses of novels' extracts referring to nature, whose topics can refer to their scientific objectives. They could plot and discuss the relative importances of different categories of nature mentions (see an example in Figure 1). These analyses could further induce post-hoc and inductive categorizations of the novels.

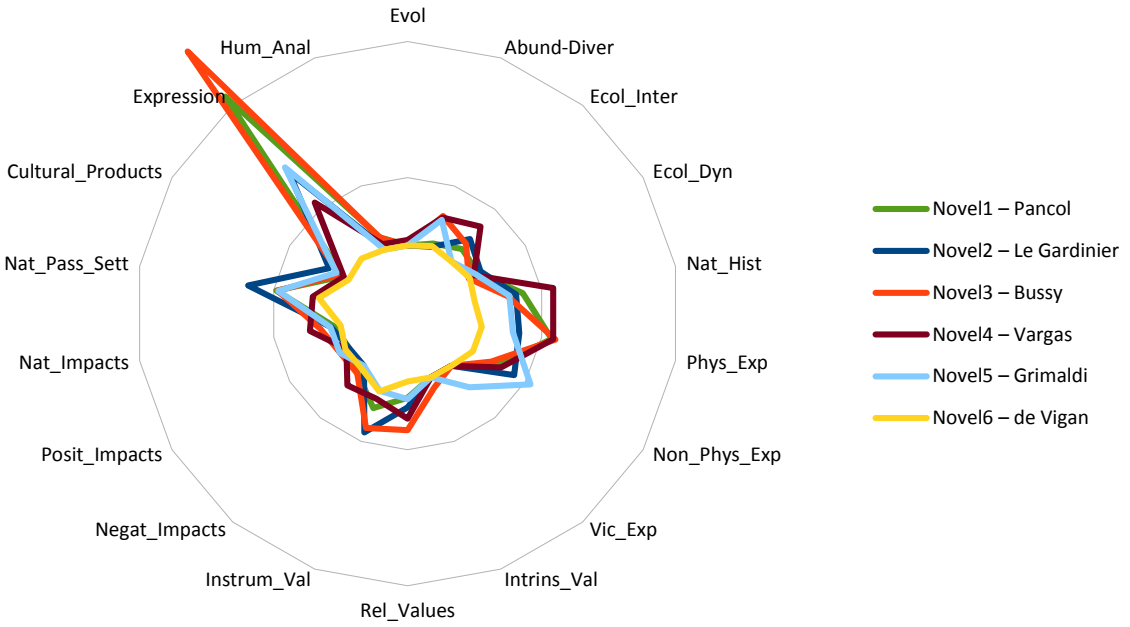

Figure 1: Relative importance of the different types of nature categorizations in the six studied novels (naming species excepted): number of mentions in each item, divided by the length of the novel

Proposition 2: Comparisons between novels

Using this grid, researchers could compare the distributions of nature mentions in novels. With the novels used in this study, we already showed that the grid can detect variability in the way nature and human–nature relationships are presented (comparison of the six novels: chi-square test, df = 25, $p < 10^{-10}$, Figure 2).

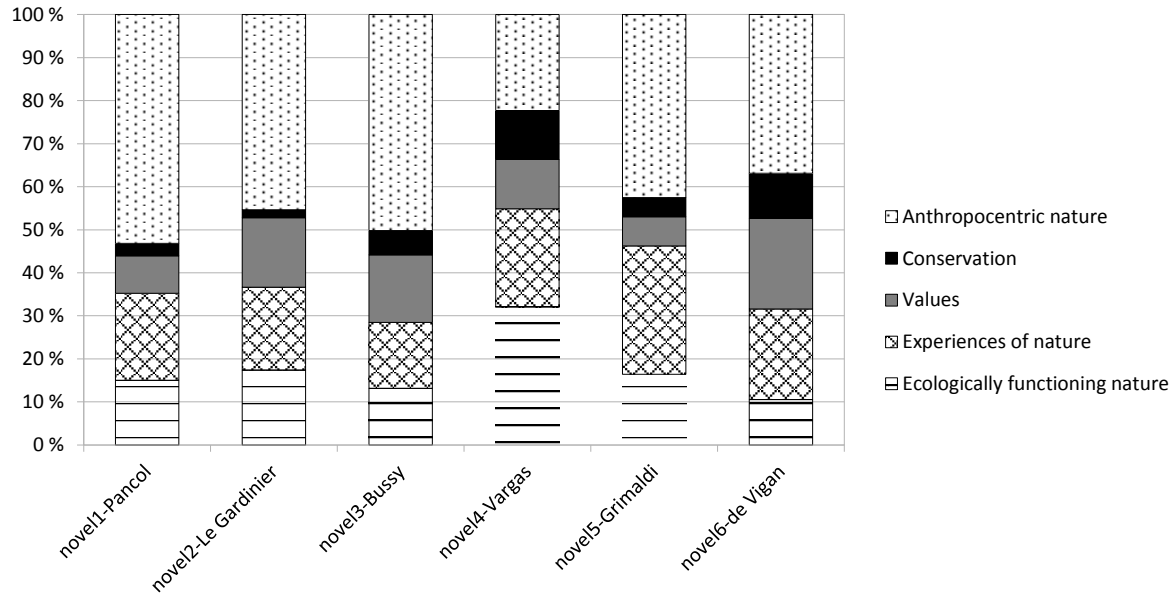

Figure 2: Distribution of nature-related extracts among the categories of the grid, for each novel

In future analyses, this grid could allow specific studies, for instance, on the importance of conservation issues, on ecologically functioning nature compared to other qualifications of nature, etc. Comparisons can also include the novel's or writer's characteristics.

Proposition 3: Focus on some categories of items in the grid

Depending on research interests, specific categories could be examined more thoroughly.

A first example refers to the ways species are named. These items can be used in at least two ways:

> (i) the number of occurrences of precise denominations, which can reflect some kind of ecological abundance of the species in the fictional world, the importance the authors want to give to particular species or individuals, or different writing habits and uses of the novelists. In our case study, the relative proportions of generic and precise denominations of species significantly differ between novels (chi-square test, df = 5, $p < 10^{-10}$, Figure 3).
>
> (ii) the number and diversity of the different species names: this indicator can reflect some kind of ecological diversity. It can also reflect whether animal and plant species refer more to wild or domestic species, etc.

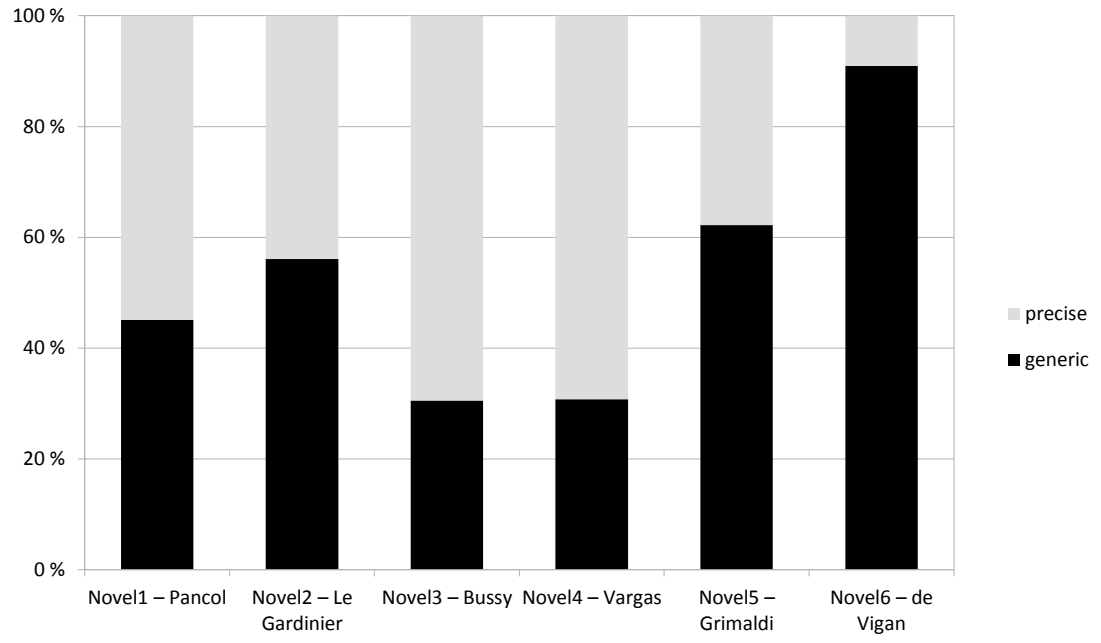

Figure 3: Distributions of occurrences of precise and generic mentions of plant and animal species in the six mentioned novels

A second example refers to the way nature is used in expressions: proverbs, analogies, etc. (see Table 3 for some examples in the six studied novels).

Table 3: Some examples of nature mentioned in expressions, in the six studied novels

Novel	**Expression**
Novel1 - Pancol	La colère souffle en lui comme le vent sur les arbres
	Il a le doigt vert
	Ça lui fiche le cafard
	T'es pas une poule mouillée
Novel2 - Le Gardinier	Ses lunettes de soleil lui faisaient une tête de mouche
	Une vitesse de tortue
	Entre chien et loup
Novel3 - Bussi	Hautes comme trois pommes
	Il pèse le poids d'un taureau corse
	Toutes épines dehors. Ma mère est une fleur terriblement orgueilleuse.
Novel4 - Vargas	Il y a anguille sous roche
	Telles des ronces sur un terrain en démolition.
	L'amour est une ortie qu'il faut moissonner
Novel5 - Grimaldi	Je me suis transformée en autruche
	Nous sommes comme des tuteurs de plantes qui les aident à grandir.
	La peur était comme un animal qu'il fallait apprivoiser
Novel6 - De Vigand	Des mamans poules

5. Discussion and conclusion

The grid presented in this paper offers an ex-post evaluation of the presence of nature in the content of a given text (here popular novels), out of the context of its production (novelist's intentions or writing habits; socio-political contexts of the writing period or of the story), and regardless of the literature style or the writing manners of the authors. This evaluation does not include either any semiological analysis on the way the story is written. However, completing the grid still depends on the subjectivity of the reader (here the researcher): selecting the extracts, selecting terms and expressions from the extracts to be coded, choosing the coding items in the grid for those terms or expressions. Throughout the grid construction process, we tried to detail as much as possible the choice and description of each item, in order to reduce differences in coding between readers for a given text, but we are aware that this process is not completed (and it may not be even possible). However, we think that this grid can allow a single reader to compare different texts, as shown in this paper.

With this grid, we propose a mixed method to analyze a novel: qualitative, through the choice of the extracts and the coding process by itself (semiological analyses of the extracts

could be further conducted, reinforcing the qualitative part); and quantitative, with the possibility to compare the respective number of extracts in each category, to sort them in meta-categories, and to compare different novels (among authors, periods, contexts, etc.).

We constructed this grid from a particular point of view, anchored in scientific ecology and the IPBES, as a tool to assess how ecological issues are integrated in popular novels. This grid is therefore anchored in the world vision of ecologists. Consequently, some dimensions are very much detailed, although some others (e.g., the item "expressions") gather a diversity of elements that could be studied in much greater details from other angles. And indeed, some items and considerations cross grids proposed in ecolinguistic or econarratology approaches. Here are some examples: our "human analogy" and anthropocentrism (see for instance Caracciolo, 2020); our "expressions" and Stibbe's (2021) metaphors; our "relational values" and Stibbe's (2021) evaluation or identity.

According to scientific ecology, we also used specific (and specified) definitions of nature, wild and domestic species, values, and experiences of nature, although these terms can refer to different meanings across cultures and contexts (nature: Ducarme & Couvet, 2020; wildlife: Tian et al., 2023). Finally, to construct this grid, we chose contemporary novels written by authors from the same culture and language as ourselves (French), and in which the story is happening now and in occidental context. In homogenizing the cultural anchors of the writers, the story and the researchers, we hope to have lower potential cultural biases (see for instance Khryapchenkova, 2013). This grid does not pretend to be universal, but we would be very happy to collaborate with other researchers from different cultures or contexts, to eventually deploy this grid to a wider set of novels.

In the same way, this grid could be used (and adapted if needed) to analyze a diversity of texts: political discourses and programs; environmental social governance (ESG) texts coming from international companies; propositions for international governance; academic curricula, etc. It could also be adapted to analyze other narratives than texts, such as images or sounds.

We hope that the diversity of the items we proposed in this grid will allow the research community to use them to answer specific research questions. We also hope that this grid could allow quantitative analyses of large corpora of fictional narratives, complementing with qualitative studies coming from literature, linguistics or econarratology to describe the way nature is depicted in fictional narratives. We eventually hope that this study could propose opportunities for voluntary artists to include nature in a transformative way in their novels, as asked by the IPBES in December 2024.

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