The Ethical Matrix as a Tool for Decision-Making Process in Conservation

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Decision making-process in conservation can be very complex, having to deal with various value dimensions and potential conflicts. In fact, conflicts and competing interests among stakeholders are among the most quoted reasons for failure of projects. Ethical analysis can be helpful in this regard. In this paper we present a revision of the Ethical Matrix specifically tailored to decision-making processes in conservation. The Ethical Matrix is a conceptual tool devised to help decision-makers by supplying them with a framework of the ethically relevant aspects involved in decision-making process. It was originally developed for the ethical assessment of agri-food biotechnologies and later has been applied to other fields. The revised version we propose here has been designed for the ethical analysis of conservation priority-setting and impact. As conservation can raise many ethical relevant controversies, conceptual tools like the one presented here can be of help for conservationists, providing a map of the value demands involved. This map can be used to question the reasonableness of the value judgments, estimate the impact of different courses of actions, anticipate conflicts, and rank their severeness.

Keywords: ethical matrix, conservation, conservation ethics, decision-making process in conservation, conflicts in conservation, ethical tool, ethical analysis

INTRODUCTION

Decision making process in conservation can be very complex, having to deal with various value dimensions and potential conflicts. Win-win solutions are usually very rare, and hard choices are normally required (McShane et al., 2011). This, ultimately, may impede conservation. In fact, conflicts and competing interests between stakeholders are among the most quoted reasons for failure of projects (Catalano et al., 2019).

Ethical analysis can be helpful in this regard. Its main goal is to unpack entangled ethical scenarios and map the values involved, exploring the existing possibilities for a fair compromise between differing ethical demands. Conflicts in conservation may be very entangled indeed, and they may involve several interest groups and sources of frictions. For instance, conservation practices, due to the differential social, spatial, and temporal allocation of their costs and benefits, can collide with several human interests (Chan et al., 2007; Vucetich et al., 2018). At the same time, from management of captive populations and field studies (Minteer and Collins, 2005a, 2008) to reintroduction (Harrington et al., 2013) and invasive species control (Littin and Mellor, 2005),
they may negatively affect the welfare of wildlife animals. Finally, due to hidden value judgments—like, for instance, unfair precedence accorded to certain taxa in priority setting (Amori and Gippoliti, 2000; Krause and Robinson, 2017)—they may even clash with their actual goals.

Even when conservationists are aware of the ethical dimension associated with their work, and of the fact that it can be—and often is—differently perceived from other ethical perspectives (Peterson et al., 2010), a complete map of the value demands involved is still necessary in front of a complex scenario. Such a map, in fact, performs multiple tasks. It could be used to question the reasonableness of the eventual hidden value judgments—and, if necessary, even of the non-hidden ones. To anticipate conflicts, and rank their severeness. To estimate the impact of different courses of actions on different stakeholders. All this, in turn, allows, on the one hand, to establish a better communication and assist with the transparency of the decision making process, and, on the other hand, to design mitigating strategies and possible fair trade-offs, helping fostering the social acceptance of the project. In this paper we present a revised version of an ethical tool devised to help decision makers by supplying them with a transparent and structured frame of the ethically relevant aspects involved in a decision making process: the Ethical Matrix (EM).

The EM was first developed by Mepham (1996) for the ethical assessment of technologies and policies in agriculture and food processing, and has since been applied in other fields, including veterinary science (England and Millar, 2008; Millar, 2013), forestry (Gamborg, 2002), aquaculture (Millar and Tomkins, 2007; Bremer et al., 2015), assessment of human-animal interactions (de Mori et al., 2019; Biasetti et al., 2020), and management of contaminated agricultural ecosystems and radioactive waste (Howard et al., 2005; Cotton, 2009). Our goal here is to provide a revised version of the EM specifically tailored for the ethical analysis in conservation, as this latter is an ethically significant activity because it preserves several sources of value (Biasetti and de Mori, 2016).

**THE ETHICAL MATRIX IN CONSERVATION**

The EM (see Table 1) is made up of intersecting columns and rows. Cells from the first column list the *stakeholders* involved. Cells from the first row list instead the *general ethical principles*. Every other cell in the EM contains *value demands* as they are advanced by stakeholders on the ground of the general ethical principles.

### Stakeholders

There is no fixed limit to the number of stakeholders that can be represented in a particular EM. In conservation issues, however, all potential stakeholders come from either one of these three classes:

- Ecological entities—such as biodiversity, biotas, ecosystems, ecological processes, species, populations, etc.
- Animals—meaning the individual members of a species or of another ecological group.
- People—such as local communities, different social or professional categories, people directly or indirectly involved in the conservation efforts, future generations, etc.

As it can be seen, to be a stakeholder it does not matter being capable of personally vindicate a value demand. The EM is in this sense an all-inclusive tool, and it encourages decision makers to take into consideration non-human standpoints— to “speak for the wolf”—thus allowing for a comprehensive ethical analysis.

Concerning the two classes of non-human stakeholders it is important to stress a fundamental difference. Kipling’s law of the jungle stated that the strength of the pack is the wolf, and the strength of the wolf is the pack. This is not always true from a conservationist’s perspective, as conservation practices can in some cases harm individual animals to benefit their taxon or some other aspects of biodiversity. Ecological entities and individual animals stand as separated classes of stakeholders in order to express this fact. It is perfectly possible, then, to have as stakeholders in the same EM both the wolf (species) and the wolves (individual animals), as their value demands could diverge and collide, and, in order to accomplish a comprehensive and transparent ethical analysis, this fact should be recorded.

### General Ethical Principles

The EM espouses a simplified version of the popular approach firstly developed in human medicine bioethics called *principlism* (Beauchamp and Childress, 1985). This means that its analysis is not structured around a single, influential ethical theory. Instead, the EM tries to account for the moral complexity of the real world by adopting three general ethical principles as cornerstones. These principles are *well-being*, *autonomy*, and *fairness*.

Why these principles? Well-being, autonomy, and fairness are recognized, and shared tenets of ethical reasoning. They mirror the ethical pluralism of common morality, where different angles on values cohabit together (Beauchamp and DeGrazia, 2004; Beauchamp, 2010). While each general ethical principle possess a specific recognizable domain, their content can and need to be contextualized every time they are applied to a scenario. In this way, they provide a broad and flexible frame to describe a large range of situations and values.

The principle of *well-being*, for instance, can refer to physical and psychological welfare, and be associated with health, functioning, and sentient states like pain, suffering, fear, pleasure and happiness, or it may refer instead to more complex concepts like social and economic welfare. Autonomy can be associated to self-determination, respect for uniqueness, freedom, and individual differences. Fairness is complementary to autonomy: while this latter focuses on the ethically relevant differences, fairness entails the exclusion of all the ethically irrelevant differences from the decision process.

The above are general and abstract statements of the principles. When contextualized, the general ethical principles give raise to a more specific array of value demands.
Value Demands

Value demands are specific applications of the general ethical principles to the stakeholders. In other words, they state the ideal requirements to be met in order to respect the stakeholders’ well-being, autonomy and fairness.

Value demands are by no means absolute and mandatory: they are, instead, prima facie—meaning with this technical expression that they can be downsized, revised, or even superseded during a balancing process involving other prima facie value demands. In this sense, the filled EM does not provide a list of dos and don’ts, as value demands usually do not form a consistent set, and cannot be met simultaneously. It provides, instead, a complete picture of the moral claims and interests involved before any balancing and trade-off is attempted.

Specific value demands will vary according to the case under scrutiny. However, it is possible to define a basic set of value demands for each class of stakeholders.

(A) Ecological entities. Concerning ecological entities, application of the three general ethical principles concur in fleshing out a multi-dimensional concept of environmental value.

Well-being equates with conservation, further specified according to the biological level occupied by the stakeholder: for instance, maintaining sustainable populations concerning species, preserving richness and variety at all biological levels for ecosystems and biotas, and so on. Given the holistic dimension of ecological entities, interactions and synergies between different levels and components should be considered. Conservation of a keystone species, for instance, should be considered as valuable both per se and for the ecosystem it is part of. On the other hand, conservation of an invasive species outside its native areal should not be considered valuable neither per se, nor for the ecosystem where it has been introduced.

Autonomy embodies here respect for the naturalness of ecological entities—that is, for their separateness from us and our world. This separateness is a fundamental component of many kinds of non-instrumental environmental value (Jamieson, 2008), and should be considered every time we plan an intervention that could make the natural world “less natural.” This include not only blatantly negative interventions (such as habitat modification or destruction, logging, mining, poaching, etc.), but also conservation over-management and obstinacy. These latter phenomena happen when we enforce a static ideal on nature, or when conservation efforts are started and continued even if their object is irreversibly compromised, as it cannot be restored or brought again to self-sustainability.

Fairness has to be interpreted as equal treatment in relation to welfare. This has two implications. The first is that we should assess the welfare of an animal without biases grounded on preferences and interests relative to its species. The second implication is that, all other things being equal, we should consider the welfare of a particular animal no less important than that of the other individuals of its taxon or of other taxa with similar welfare requirements.

(B) Animals. Concerning individual animals, the three principles work together to shape a multi-dimensional concept of animal welfare (Fraser, 2008).

Well-being involves the first two dimensions: on the one hand, health and functioning, and, on the other hand, absence of negative affective states and allowance of positive ones. Only species considered sentient can be assessed according to this latter dimension of welfare. Health and functioning, instead, can be ascertained for every animal being, regardless of its cognitive capacities.

Autonomy involves the third dimension of animal welfare, that is, living natural lives and exercising species-specific behaviors. These may be defined as the behaviors an animal would have the tendency to exhibit under natural conditions because they promote pleasure, biological functionings, or both (Bracke and Hopster, 2006). “Natural” is, in this sense, a necessary yet not sufficient condition, as some natural behaviors—like reactions to sickness or threat of predation—do not correlate with positive welfare. Similarly, species-specific does not mean “species-exclusive,” as many natural behaviors conducive to positive welfare—like walking, or playing—are cross-specific. Freedom to act according with these natural dispositions is an important component of animal welfare (Rollin, 2006), and has to be understood both in a negative and in a positive sense. That is, the animal must not only be free from external constraints that would prevent it, in absence of real needs, to exhibit its species-specific behaviors. It must also live in a properly calibrated context to perform them.

Fairness has to be understood here as equal treatment in relation to welfare. This has two implications. The first is that we should assess the welfare of an animal without biases grounded on preferences and interests relative to its species. The second implication is that, all other things being equal, we should consider the welfare of a particular animal no less important than that of the other individuals of its taxon or of other taxa with similar welfare requirements.

(C) People. Concerning people, well-being equates with the psychological and physiological welfare of individuals, and with the sustainable social, economical, and cultural welfare of communities.

Autonomy can have many manifestations. On an individual level it has to be understood as freedom of choice. Moreover, it is also the capacity to exercise the various fundamental aspects of one’s own persona: one’s profession, culture, traditions, etc. On a community level it equates instead with self-determination. It is important to note that autonomy entails both negative and positive obligations, going in this sense beyond mere non-interference (Beauchamp and Rauprich, 2016). The requirements for autonomous action are not limited to the possession of freedom of choice, but assume instead the possibilities of informed and responsible action. In this way, respect for autonomy is strictly related with providing the stakeholders with complete and reliable information in order to protect their free agency.
Fairness involves equal and fair treatment of individuals, institutions, and communities, avoiding biases grounded on personal preferences or inclinations, partisanship, prejudices, and so on. This includes also fair distribution of costs and benefits concerning the conservation projects analyzed.

The Ethical Frame of the EM
A merit of the EM is to adopt ethical pluralism as a starting point for analysis. The advantages of this methodology are several. Pluralism is more effective in grasping the subtleties of real contexts of decision-making than theories based on a single general ethical principles, or on a hierarchical or otherwise coherent set of principles. Through a pluralist approach it is possible to reconstruct the different moral angles that can be taken on the same issues, and grasp the interests of various kinds of stakeholders. Moreover, by providing a complex analysis of a given scenario, pluralism permits, on the one hand, to include peripheral and even marginal value demands, and, on the other hand, to highlight eventual limits and parochialism of more resounding ones.

The pluralism entailed by the principlist approach, however, does not equate with moral relativism (Beauchamp and Rauprich, 2016). The ethical perimeter sketched by the EM has definite borders which provide a solid backbone to the analysis.

Table 1 recap the value-demands embedded in this version of the EM calibrated for conservation. There are two main ideas behind this configuration. The first is that the ethics of conservation is a specific, non-reducible, and multidimensional field of applied and professional ethics, which encompass and intersect several value-contexts and issues (Minteer and Collins, 2005b; Biasetti and de Mori, 2020). The second is that the most characterizing feature of this field is that it poses several ethical significant desiderata which cannot often be satisfied at the same time. Its “hard problem,” in this sense, is finding acceptable criteria for ordering these desiderata, and avoid ethical stall.

The EM does not offer a direct solution to this hard problem, but can assist by listing in an organized frame the values involved. These are individuated and regrouped according to three fundamental poles of aggregation: the environmental, the animal, and the human. Pushing forward on the pluralist premise, each of these poles of aggregation is constructed in order to reflect the various ethically significant facets it can assume.

Environmental value, for instance, is defined in the EM in order to encompass the different ways and reasons through which it is possible to value biodiversity, nature, and the environment. Starting from the principle of well-being, for instance, it is possible to accommodate reasons for conserving biodiversity either from a non-anthropocentric perspective (Callcott, 1989; Batavia and Nelson, 2017; Piccolo et al., 2018) or from an instrumental perspective based on enlightened or prudential anthropocentrism (Norton, 1991; Reid et al., 2006; Justus et al., 2009)—or, even better, from a much longed-for integration of the two (Tallis and Lubchenco, 2014).

Similarly, the principle of autonomy permits to include into the ethical analysis the concept of naturalness. This latter is important for a third family of environmental values, anthropocentric yet not instrumental—for instance, aesthetic, epistemic and reverential values (Biasetti and de Mori, 2016), or eudaimonic (relative to the ”good life”) relational values (Chan et al., 2016). These require the possibilities for an authentic relationship with nature, and, as such, depend on the genuine quality of the naturalness of an environment—that is, on its autonomy from human intervention.

Finally, the principle of fairness accounts for the elimination of eventual bias. Preference for “charisma,” for instance, may be detrimental to conservation. It may be the cause for inefficient allocation of resources (Mammola et al., 2020), or, as the story of the attempted eradication of the gray squirrel (Sciurus carolinensis) in Italy (Bertolino and Genovesi, 2003) shows, it may support invasion from non-indigenous species and overall biodiversity homogenization (Jarić et al., 2020). In the end, charisma may even be detrimental to charismatic yet endangered species, as it foments a false impression of abundance in species that are actually in decline (Courchamp et al., 2018).

Applying fairness across different components of biodiversity does not entail, however, that there should be no valid criteria in conservation priority-setting. Consequentialist reasons, if grounded in sound conservation science, are still compatible with application of the principle of fairness. In this sense ecological criteria—keystone species status, for instance—would still be acceptable.

The pluralistic approach embedded in this revision of the EM is adaptable and robust enough to grasp the various aspects of environmental value. Similarly, in this EM animal ethics is dealt with by taking into consideration different aspects of animal welfare—from the physiological to the behavioral,

| TABLE 1 | General template for the EM in conservation. |
|-----------------|-----------------|-----------------|-----------------|
| **Well-being** | **Autonomy** | **Fairness** |
| Ecological entities | Conservation | Freedom from human intervention | Equal treatment in relation to conservation |
| Animals | Health and functioning | Living natural lives and species-specific behaviors | Equal treatment in relation to welfare |
| | Absence of negative affective states and allowance of positive ones | | |
| People | Psychological and physiological welfare | Freedom of choice | Equal and fair treatment |
| | Sustainable social, economical, and cultural welfare | Capacity to exercise the various fundamental aspects of one’s own persona | |
| | | Self-determination | |
and (where applicable) the psychological—combined with the fairness principle. This is done, on the one hand, to reflect the plurality of dimensions in animal welfare, and, on the other hand, to pursue a solid synthesis between them. While dimensions of animal welfare often overlap in terms of goals, single minded adhesion to just one of them leads to an impoverished concept of welfare, and, in this way, to a poor approach to the care of animals (Fraser et al., 1997; Fraser, 2009).

Still, the inclusion of a dedicated space in EM for animal ethics may be objected. It may be said, for instance, that traditional conservation excludes direct interest for the fate of individual animals from its moral compass (Soulé, 1985). On this regard, there is no doubt that conservation and animal welfare are conceptually distinct and usually have distinct goals. In fact, while sometime their agendas may overlap—as it is the case, for instance, of demographic collapse of populations (Beausoleil, 2014), land clearing and other form of habitat destruction (Fraser, 2010; Finn and Stephens, 2017), and animal care in conservation breeding and reintroduction programs (Harrington et al., 2013; Greggor et al., 2018)—in many other occasions they explicitly differ.

Yet, it is precisely for this reason that focusing of animal welfare become important for conservation, as excessive divergence between the goals of conservation and animal welfare may remove societal support for conservation projects (McMahon et al., 2012; Beausoleil et al., 2018). Nonetheless, conservationists should not pursue animal welfare only for realpolitik. Concern for animal welfare per se is indeed an even more important aspect of conservation (Johnson et al., 2019), as much as animal welfare science growing attention toward wild animals (Littin and Mellor, 2005; Hampton and Hyndman, 2018). However, behind direct ethical reasons, maintaining a high welfare standard is certainly important for the prolonged success of a conservation endeavor.

It should be noted that animal welfare does not equate with animal rights (Perry and Perry, 2008)—if this latter is defined as the position advocating that animals possess a right to live akin to that of humans, and, hence, killing them, except for particular cases such as self-protection, is wrong (Regan, 2004). In fact, the two positions can even clash, as when, for instance no-culling policies worsen the welfare of animals—as in the case of herbivores affected by overpopulation (Hampton et al., 2018; Wilson and Edwards, 2019). The general ethical principles and the value demands inserted in the basic EM for conservation do not support an animal rights view for the reason that the analytical frame of the tool, as noted before, is grounded on common morality. While animal welfare ethics (Fraser, 2008; Rollin, 2015) is as an extension and a refinement of the old and cross-cultural imperative to not be cruel to animals, animal rights stands as a drastic revisionary attempt of common morality, and, as such, is outside the analytical scope of the EM.

It should be moreover noted that inclusion in the EM of animal ethics do not amount to adoption of a biocentric stance. Biocentrism is the view that all living beings deserve moral status, regardless of sentience or of other qualities beyond their being alive (Humphreys, 2016). Like animal ethics, biocentrism is an individualistic and extensionist theory. However, the extension of moral concern it proposes crosses the borders of sentience and even of the animal kingdom—as plants and fungi are alive too—and, possibly, also of the eukaryote domain. The biological “interests” of an organism, according to biocentrists, are as much ethically significative as interests born from desires and preferences (Goodpaster, 1978). In this way, even plants should be deemed morally considerable as individuals (Attfield, 1981).

Biocentrism has been criticized for being either too demanding in theory or too incoherent in its applications (Sterba, 1998). Indeed, its extension of the moral domain multiplies unrealistically the possibilities of friction. It is not necessary here to reconstruct the arguments employed by biocentrists to solve the issue by building hierarchies of value within the life domain—thus restoring sentience to a privileged place. Similarly to animal rights, biocentric egalitarianism, in its most radical versions, is a revisionary approach to common morality, and, as such, whatever may be its merits, it does not fit within the frame of the EM.

Biocentrism, however, more than being a mere defense of plants’ moral standing, has also been used as a cornerstone to build non-anthropocentric environmental ethics (for instance, Taylor, 2011). In this case, the problem lies in how it is articulated the passage from the respect due to individual living beings to the respect due to “nature”—that is, to biological levels higher or lower than individual organisms. In one sense, this synthesis may lead to an inegalitarian version of biocentrism (Agar, 2001) which support forms of non-anthropocentric environmental value compatible with the frame of the EM. In another sense, it may lead instead to a position at odds with the ecological requirements of environmentalism. Conservation practices usually involve reallocating harms and benefits from some group to another (i.e., invasive species control). If there is no way to discriminate between individual organisms, this reallocation can never be justified (except, perhaps, for anthropocentric reasons), and the only form of acceptable approach to conservation would be benign neglect. However, in our heavily anthropized world, such approach cannot be counted to accomplish much.

In a similar vein, the human dimension in the EM is structured in order to take into account several fundamental aspects. In particular, the ethical frame embedded in the EM is able to accommodate the ethically significant elements coming either from consequentialist and deontological perspectives. These elements, moreover, can be assumed both from an individual or from a group or community level, recognizing the dual nature of social ethics. In this way, the integration of the three principles makes it possible to account for the complexity that the human dimension can assume within conservation.

**FILLING IN THE EM FOR CONSERVATION**

The general template provided in Table 1 can be used as a starting point for filling more detailed EMs.

In order to follow the robust ethical approach previously described, while filling in an EM, three general goals should be pursued. The first one is *completeness*. An EM is considered
complete if it includes all the relevant stakeholder. The second goal is pluralism. An EM is pluralist if it explores the outcomes of all the general ethical principles. The third requirement is neutrality. An EM is neutral if value-demands are acquired by taking into consideration the standpoints of each stakeholder, producing an objective description—devoid of biases and prejudices—as much as possible. These requirement are in line with the general goal of the EM to provide a transparent and inclusive list of the values involved.

The actual process of compiling an EM can follow different methodologies. An EM can be filled through a top-down approach, in which ethical experts draw the specific value demands from the available information. Otherwise, it can be filled trough a bottom-up approach carried out by professionals, experts, and representatives of the various stakeholders coordinated by a facilitator. A third and a fourth methodology combine the previous approaches, by starting bottom-up and then refining top-down, or vice versa. These last two approaches have undoubtedly the advantages of combining both basic methodologies and increasing the pluralism of the final matrix by joining both ethical and hands-on expertise on the matter. This may increase the public legitimacy of the assessment. In fact, single approaches may suffer from partiality when assessing particularly controversial topics—especially the top-down approach, as experts may be value-laden (Forsberg, 2004).

Ideally, the process of compiling the EM should happen at the beginning of the decision making process, during the phase of situation analysis. In the context of adaptive management (Williams et al., 2009), for instance, the EM should be compiled during the process of stakeholders engagement. A first top-down draft of the EM could be prepared during the preliminary assessment of the socio-ecological context, and then be discussed and refined bottom-up during the actual process of stakeholders engagement (Organ et al., 2012). The EM constructed in this way can then be used throughout the subsequent participatory process, especially during objectives setting, identification of impacts, and identification of alternatives. Adaptive management is particularly vulnerable to conflicts between stakeholders (Williams et al., 2009; Keith et al., 2011), and the EM can help anticipating these, and suggesting the implementation of conflict resolution before paralysis is reached. Similarly, in the context of structured decision making (Gregory et al., 2012), the EM, prepared during context analysis may then assist the process of creation and discussion of objectives. In fact, the kind of analysis produced by the EM is aligned with two core principle of structured decision making, that is, separation of values from fact, and value focused thinking.

The process of filling in a specific EM follows three steps:

- Gathering information
- Identification of the stakeholders
- Identification of the value demands

In the first step all the relevant information on the case is gathered and evaluated. This is done primarily to clarify the scenario under scrutiny and to highlight the various critical issues it may present. Relevant information may be gathered through various sources, such as scientific literature, gray literature, experts’ opinions, media, laws and regulations, data from interviews, surveys and questionnaires, focus groups, and so on.

The second step is to individuate the relevant stakeholders to be included in the EM. As a minimum, an EM should have at least three stakeholders: one to represent the ecological entity targeted by the conservation project, one to represent the impact of the conservation project on overall or local biodiversity, and another to represent the impact on people. Moreover, in every cases when the target of the conservation project includes animals, these should be represented as a fourth stakeholder.

Normally, however, the EM will include more than three or four stakeholders. In general, the ideal number of stakeholders should be enough to include every party involved without making the ethical analysis excessively complex and specific. Moreover, stakeholder should be selected in order to not duplicate unnecessarily the same ethical standpoint. The weight of a certain value demands is not determined by how many times it is repeated in different cells of the EM. However, multiple instance of the same value demands may cause unwanted bias, escape to criteria’s analysis, or simply unnecessarily complicate the analysis. In this sense, it is particular important to not let that stakeholders in the “people” class duplicate value demands already presented in the other two classes. This does not means that the standpoint of conservationists or animal welfare groups should not be included in the EM. Observations from these groups could be crucial in populating the cells for ecological entities and individual animals in a bottom-up process of filling the EM.

In the third step the general ethical principles are applied to each stakeholder in order to specify the basic value demands contained in Table 1. In some cases, some value demands will not fit the nature of a particular stakeholder, and, as such, they should be excluded. The result should recap the framework of moral interests and demands involved in the situation, thus allowing the decision makers to assess the impact of their choices on each specific stakeholder.

Table 2 offers an example of a compiled EM relative to the conservation of the white-clawed crayfish _Austropotamobius pallipes_, an endangered European freshwater crustacean severely menaced by various human-induced causes such as water abstraction, pollution, and channelization of banks, competition with invasive alien crayfish species, and spreading of the so-called “crayfish plague,” an infectious disease whose etiological agent is the oomycete _Aphanomyces astaci_.

This EM provides an example of the functioning of the tool in a case of real conservation, in which the critical issues that justify the intervention are multiple, as well as the potential conflicts. The level of the analysis is deliberately general: the EM was compiled top-down as a draft for bottom-up refinement and contextualization to specific interventions. The list of stakeholders was restricted in order to avoid unnecessary duplications—all non-indigenous crayfish species, for instance, where collected in a single row, as well as all individual crayfish regardless of the species or indigenous status. A general stakeholder for “local communities”—understood as all the human beings living, working, studying, visiting or simply interested in the area where the conservation efforts
### TABLE 2 | Example of EM—ethical assessment of conservation of *A. pallipes* [modified from Biasetti et al. (2021)].

| Ecological entities | 1. Well-being | 2. Autonomy | 3. Fairness |
|---------------------|---------------|-------------|-------------|
| A. Biodiversity     | Conservation of richness and variety at all levels. Generally speaking, replacement of native species with non-native species determines an overall homogenization of biodiversity, and as such, it should be avoided. Moreover, we should exercise an extra care for the conservation of native keystone species, as their disappearance or replacement could provoke a further loss of biodiversity. | Freedom from human intervention. Conservation efforts should not compromise the naturalness of the areas where they occur. | Respect for the worth of every component. Some species, including NICS, may be better suited to our economic and recreational interests than other. Nevertheless, we should consider the effects they have on other taxa, and the overall biodiversity homogenization and impoverishment they cause. |
| B. White-clawed crayfish | Conservation of the taxon. The white-clawed crayfish (*Austropotamobius pallipes*) is presently classified by IUCN as “Endangered,” with a fragmented and decreasing population. The main extinction drivers are human-induced habitat destruction and modification, competing invasive alien crayfish species, diseases—the “crayfish plague,” caused by the oomycete *Aphanomyces astaci*—carried by alien crayfish species. Conservation of the taxon depends on several human intervention. In particular, conservation could require careful management of existing populations in order to avoid further genetic impoverishment; restricting interventions on rivers and streams inhabited by the species, especially by reducing or eliminating water depletion, modification of riverbeds and banks, and spillage of wastewater; providing means of connection between the fragmented populations; focused re-introductions in appropriate sites; avoiding the spreading of NICS (and outbreaks of *A. astaci*) by means of population control and barriers; avoiding accidental introduction of *A. astaci* in sites; contrast of poaching; containment of competitors (by avoiding, for instance, introduction of predator species); periodical monitoring of the sites; promoting conservation education. | Freedom from human intervention. Conservation obstinacy should be avoided meaning that some populations could be simply not possible to conserve, and some sites could be simply not possible to repopulate. Even when interventions are deemed likely to succeed we still should exercise caution, especially concerning re-introductions and re-populations. For instance, isolated populations could have developed specific adaptations to local conditions, and their gene-pool could be modified by the introduction of conspecifics from other populations. | Respect for the worth of the taxon. In the current context, *A. pallipes* has little sustainable economic and recreational value. Past claims that it could be a good bioindicator of water quality have been scaled down. It has some limited potential as a flagship and umbrella species, and it can considered a heritage species. In its native freshwater ecosystem, is a keystone species. However, whatever the species’ overall appeal could be, we should still consider it important to preserve for its existence value. |
| C. Non-indigenous crayfish species (NICS) | Conservation of the taxon. No NICS is presently at risk of extinction. Hence, no actions are needed to preserve these species in their native range. Outside their native range no conservation value is attached to the presence of NICS. | Freedom from human intervention. Nature is not fixed and unchanging. Species have always got ahead of others, colonized new territories, and replaced “natives.” Every species should have a certain freedom to expand beyond its native range, even if it comes at expense of other species. However, spreading of NICS outside their native area cannot be assimilated to the natural process of interspecific competition, as it is artificially caused by human voluntary or involuntary intervention. | Respect for the worth of the taxon. Invasive alien species (IAS) replace indigenous species, cause biodiversity loss, introduce new diseases and zoonoses, and can provoke economic damages. However, not every non-indigenous species can be automatically classified an IAS. Furthermore, NICS could have positive qualities that could—at least in part—soften our evaluation. They could be, for instance, sources of economic and recreational value. Finally, the same concept of “non-indigenous” goes beyond its scientific definitions, and can be also tied to “being a recognized part of a landscape.” In this regard, it is worth remembering that non-indigenous species can quickly become a “recognized part of the landscape” of people—as the red swamp crayfish (*Procambarus clarkii*)—is, for instance, in some parts of Spain. Such recognition may not become evident until the species is perceived to be threatened, and, as such, can come as a surprise to conservationists. |

**Animals**

| Individual crayfishes (regardless of species) | Health and functioning. Having access to good living conditions depending on the circumstances (animals living in the wild, in a lab, in fisheries, in an aquarium, etc.)—having access, for instance, to good quality water, suitable environments, avoiding overcrowding, etc. | Freedom of choice. Self-determination. Having access to an environment sufficiently not degraded (if in the wild) or enough enriched (if kept captive) to be capable to express the standard behavioral repertoire | Respect for the worth of every individual. Crustaceans, like most invertebrates, receive scarce empathy. This should not prevent us to treat crayfish in a humane way—when manipulating them, and especially when killing them. |

(Continued)
TABLE 2Continued

| 1. Well-being | 2. Autonomy | 3. Fairness |
|----------------|--------------|-------------|
| People         |              |             |
| E. Local       | Sustainable social, economical, and cultural welfare. | Freedom of choice. |
| Sustainable     | Sustainable social, economical, and cultural welfare. | Freedom of choice. |
| communities     | Profitability of the business. | Freedom of choice. |
| Safety from      | Profitability of the business. | Freedom of choice. |
| hydrogeological | Profitability of the business. | Freedom of choice. |
| risks           | Profitability of the business. | Freedom of choice. |
| F. Aquaculturists| Sustainable social, economical, and cultural welfare. | Freedom of choice. |
| G. Anglers      | Sustainable social, economical, and cultural welfare. | Freedom of choice. |
| H. Fishkeepers  | Sustainable social, economical, and cultural welfare. | Freedom of choice. |

The filled EM can fulfill many tasks. It provides, for instance, a moral checklist, recapping to the decision-maker all the ethically relevant aspects involved in the case. In this way, it can be used for implementing should be evident from Table 2. Concerning ecological entities, the matrix is able to structure its analysis at different biological levels, and around different modes of value (instrumental, non-instrumental). Concerning individual animals, the EM is able to account for the complexity and multidimensionality of animal welfare. Concerning people, the matrix is able to distinguish between different levels of aggregation, and anticipate interests and claims from different angles (justice, freedom, equity, safety, etc.).
as a starting point for structured discussion in the participatory process, and as a guide during the debate, in order to not neglect some ethically relevant issues. This may become especially important at the later stages of a decision making process. Some values—such, for instance, existence or heritage value of species—are hard to quantify and end up being overlooked during the phase when trade-offs are discussed and proposed (Law et al., 2018). Use of the EM as a checklist of *prima facie* moral demands can help not to lose sight of these values during all the later stages of the process, and to detect non-compliance. In this regard, one of the merits of the EM is to make the values at stakes explicit, enhancing in this way the transparency of the decision making process.

As shown in the example presented in Table 2, all interests are listed—even those that are not quantifiable (like existence value of the endangered species), seemingly marginal (possibility that alien species become recognized by people as a part of their landscape) or that clearly crash with conservation needs, and must therefore be scaled and balanced in some way (such as fishkeepers' freedom of choice).

It is worth noting that, while transparency does not guarantee success when stakeholders do not share a common ethical ground, it remains nevertheless a crucial goal to be pursued (Ford et al., 2021). An incomplete or opaque communication is liable to be contested, can fuel mistrust in stakeholders already inclined to look at the conservation projects with suspicion, and may even alienate the favors of those who shared instead a neutral or positive attitude (Crowley et al., 2017). Transparent communication and willingness to examine different viewpoints are necessary components of participatory decision making (Addison et al., 2013): the EM can help with both.

**Conflict Analysis**

Another standard use of the EM is to reveal ethical conflicts and ethical issues not addressed in-depth (Kermisch and Depaus, 2018). More specifically, the filled EM can be used to anticipate conflicts between stakeholders, as it makes clear which pairs or groups of value demands are difficult or simply impossible to be satisfied simultaneously. For instance, in the example contained in Table 2, several cells of the EM contain conflicting value demands, giving raise to two sets of conflicts:

- Conservation action in favor of *A. pallipes* vs. (a) avoidance of conservation obstinacy; (b) spreading of non-indigenous crayfish species; (c) safeguard of individual crayfish; (d) certain human interests.
- Spreading of non-indigenous crayfish species vs. (a) biodiversity protection; (b) certain human interests.

The map of value conflicts provides the decision maker with a starting point for conflict analysis and resolution. This may happen through different forms of intervention.

A first form of intervention could be ranking the conflicts through their logical order—that is, through the order they should be analyzed. In the example contained in Table 2, conflicts relative to spreading of non-indigenous crayfish species vs. biodiversity protection and human interests should be analyzed first, as they could bring important elements to add to the scenario. Direct intervention in favor of *A. pallipes*, for instance, whereas difficult to ground in front of competing value demands, could nevertheless be justified indirectly due to the friction exercised by the invasive non-indigenous species on human interests or other aspects of biodiversity. At the same time, the necessity of controlling the invasive populations could raise new conflicts due to the interests of particular group of people (like, for instance, fishkeepers, anglers, or aquaculturists)—and so on.

A second form of intervention could be classification of conflicts. Values are often distinguished in two broad categories: “secular,” meaning that they are commensurable and can be traded-off, and sacred, meaning that they are not commensurable as nothing proper can compensate for their loss (Tetlock et al., 2000). Value conflicts, hence, can be of three kinds: between (a) two secular values; (b) a secular and a sacred values; (c) two sacred values. Conflicts of the first kind are usually easily resolved. Conflicts of the second kind—so called “taboo conflicts”—elicit instead repugnance, and people may be psychologically uncomfortable even to think about them, as the prospective of “selling away” a non-commensurable value may cause indignation and moral outrage (Tetlock, 2003). Finally, conflict of the third kind—so called “tragic conflicts”—while clearly not easy to resolve, are not considered repugnant, and careful ponderation may reduce controversy surrounding their eventual resolution (Schoemaker and Tetlock, 2012).

Literature on conflicts in conservation focusing on the psychology and the neuroscience of moral conflicts like the “trolley problem” has confirmed this subdivision (Can and Macdonald, 2018; Schwartz, 2020). In particular, negotiating or even discussing taboo conflicts between stakeholders seems to be rather difficult, while resolution of tragic conflicts, even if accompanied by less controversy, is usually dictated by a preference for the passive course of action and status quo. Recognizing in time taboo and tragic conflicts become then really important for the success of a conservation projects. Anticipating taboo conflicts, for instance, permits to devise the necessary strategies for avoiding deadlocks or loss of support by stakeholders, either by devising alternative interventions, or by reframing conflicts in the more acceptable standard or tragic frames (Daw et al., 2015).

**CONCLUSION**

Acting in conservation today implies carefully considering the consequences of our choices. It also entails engaging in transparent forms of communication, and being able to explain and give reasons for decisions and policies which can have an ethical impact on people, animals and the environment. The EM can help conservationists in reaching these objectives rigorously.

Anticipating value conflicts can help also in early intervention to avoid polarization (Crowley et al., 2017). Polarization occurs when conflicts between stakeholders comes to be defined in
binary terms, and eventual areas of agreement are overlooked. In this way, the whole scenario becomes framed as a win or lose game, with either side forced to not give up ground until stalemate is reached, or one of the participants leaves the table—usually only to escalate the conflict at a higher level.

A detailed map of conflicts can also assist in the process of designing possible trade-off, by anticipating possible impacts on the stakeholders and suggesting fair solutions. It is important to remind, however, that a filled EM does not remove the need for a decision maker: the EM is a descriptive tool, not a “decision making algorithm” to deduce specific conclusions. Its value in this sense, is to offer a clear method to collect all the value demands involved in a complex case and organize them in a complete, pluralist and neutral framework that can be consulted by the participant in the decision making process.

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Both authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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