What are "charismatic species" for conservation biologists?

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2012-10-01

Keywords : Charismatic species, ecosystem management, adaptive management, endangered species, flagship species, indicator species, keystone species, umbrella species, culture, marketing.

Current conservation biology often appeals to abstract concepts and models in order to embrace a wide reality with practical methods. Among these tools, there are different types of "focal" (or "surrogate") species, like flagships, keystones, umbrellas or indicators, which all stand for a wider portion of biodiversity for different usages. These benchmarks are sometimes accused of being only "buzzwords" with few actual meaning or relevance, and are the subject of intense debate among conservationists. One of these terms, "charismatic species", seems less debated, while it is widely used and does not seem to bear an obvious meaning. The purpose of this article is to draw a portrait of the use of this term in the conservation literature, and to sum up the debates it provokes and the problems it poses. We highlight that even if the actual signification of this concept lacks a consensus definition, the reality it indicates does exist and may have an underrated importance in biodiversity conservation.

Introduction

Conservation biology is usually defined as a holistic science [1], but biodiversity management often has to call for practical objectives. Conservation history shows that it is impossible to measure or monitor all biodiversity, and even more when considering its state and dynamics, so ecologists need proxies [2]. According to this view, many shortcuts have been designed in conservation management, among which some are referred to as "focal species" [3] or "surrogate species" ([4], we will consider both as synonyms). First used in the 1980s then theorized in the 1990s ([5•), these terms define many concepts used to concentrate certain aspects of an ecosystem in one or a few species, making it easier to study, understand and monitor, for research or for actual conservation.

The main focal species concepts defined in the scientific literature are (sorted by frequency after Leader-Williams & Dublin [6]• and Verissimo [5]•): "*keystone*", "*indicator*", "*flagship*", "*umbrella*" and "*charismatic*" species (Table 1). These terms are often subject to debate [7]•, while the last one remains the least well defined. Depending on the authors, these concepts often overlap, may be strictly exclusive, and some even turn out to seem useless or synonyms in some combinations of definitions: for example an indicator species can't be a flagship (according to Simberloff [8]•), but a keystone species often acts as an umbrella [9]•. They happen to be considered either as conservation tools (in particular umbrella and flagship), study tools (indicator, keystone), or both. Whereas it is frequently used, the concept of "*charismatic* species" has received few systematic study (except Lorimer, 2007 [10]•) or definition.

In this review, we pooled the main conservation biology articles and academic works concerning these themes (n=70), in order to offer a clear overview of the concept of charisma in conservation biology, and highlight its many meanings and controversial points.

Defining charisma and its role

The term *charisma* sounds odd in such a research domain, as it has been borrowed from Latin ecclesiastical vocabulary, where it meant "*a divinely conferred power or talent*" (Oxford dictionary). In popular language, it has been secularized as a "compelling attractiveness or charm that can inspire devotion in others" (*ibid*): hence it appears as a very subjective characteristic. It was then theorized and made famous by Max Weber, who notably defined it in *Economy and Society* (1924) as "*a certain quality of an individual personality by virtue of which he is set apart from ordinary men and treated as endowed with […] exceptional powers or qualities […] on the basis of [which] the individual concerned is treated as a leader*". This definition is still a reference in social sciences, and is occasionally cited in conservation literature [10]•, but whereas the term has been designed to designate only humans, no new definition has been added for its use about animals.

The term *charismatic* first appeared in conservation literature as a specific trait in flagship species identification, the most famous definition of which being "*popular, charismatic species that serve as symbols and rallying points to stimulate conservation awareness and action*" [12]. The word was soon re-used in other definitions, such as "*charismatic species [that] draw financial support more easily*" ([6, 13, 14]•, cf. Table 1 and Figure 1). Soon, a confusion occurred between flagship species and other conservation concepts, and charisma was consequently taken in, beginning to be a trait for both flagship and indicator species: "*A flagship species, normally a charismatic large vertebrate, is one that can be used to anchor a conservation campaign because it arouses public*

Table 1 : Consensus definitions of surrogate species concepts.

Focal (or surrogate) species	# articles in *Web Of Science*	Standard definition
Indicator	609	*biological entities, such as gene frequencies, populations, species, species assemblages, and communities, that might function as surrogates or proxies for other forms of biodiversity and/or reflect changes in ecosystem patterns or processes* (**Lindenmayer 2000**)
Keystone	342	*A species having impacts on many others, often far beyond what might have been expected from a consideration of their biomass or abundance* (**Simberloff, 1998**) They are usually top predators or engineer species (*ibid*)
Umbrella	254	*Those whose area of occupancy or home range are large enough and whole habitat requirements are wide enough that, if they are given a sufficiently large area for their protection will bring other species under their protection* (**Heywood 1995**)
Flagship	236	*Popular charismatic species that serve as symbols and rallying points to stimulate conservation awareness and action* (**Heywood 1995**) *A species that has become a symbol and leading element of an entire conservation campaign* (**Simberloff 1998**)
Charisma*	132	–

Second column indicates the number of articles appearing in Web Of Knowledge search "[X] species" and "conservation" on 28-02-2012 for a period between 1993 (first record of the term "charisma") and 2011. "Charisma*" stands for any flexion of the word ("charismatic", etc). The order of frequency we got is not exactly the same as the one cited below ([6], [5]) because of differences of dates and methodology between the investigations. References are [11], [8], and [12].

interest and sympathy, but a flagship need not be a good indicator or umbrella. […] Faute de mieux, often vertebrate species are chosen as indicators simply because they are so charismatic that a manager feels obliged to monitor them anyway" [8]•, and then often associated to keystone and umbrella species too [6]•.

In reaction to this, many recent articles tried to further define and delimitate the different concepts of focal species (such as [5 - 7]•), but none of them tackled the idea of charisma head-on whereas they all used the expression, maybe considering it an independent characteristic with few direct ecological importance. Only one of these authors recently considered this aspect, but that was only to ban the idea of charisma from his definition of flagship species [5]•.

The principal article we found focusing especially on charismatic species was entitled "Nonhuman charisma" [10]•, providing a typology of the factors that determine nonhuman charisma and their implications in conservation management. These factors were "*detectability and distinctiveness*" (i.e. fame), "*socio-economic biases*" (the way societies see each animal and its reputation), aesthetics (on a cuddly charisma - feral charisma *continuum*), and "*potential to generate satisfaction*" (which represents its interest for scientists, intellectuals and curious people). Nevertheless, charisma is described as subjective and very relative among people, and able to be enhanced or constructed artificially, notably by marketing and culture: an exemplary case is the killer whale (*Orcinus orca*) which in spite of its frightening name turned to be a famous charismatic species after the successful movie *Free Willy* (1993).

Besides this article, some of the publications using the concept of charisma gave short, *ad hoc* explanations, like "species favored by the public on the basis of size and conservation status" [15]•, and mostly give examples. Then, charismatic species mean essentially some large birds and mammals ([16 - 19]•), often of conservation concern, like pandas (*Ailuropoda melanoleuca*), polar bears (*Ursus maritimus*), wolves (*Canis lupus*) or tigers (*Panthera tigris*), which are the most represented species on US conservation magazines covers [20]•. Other species can be added to this list, like dolphins (*Delphininae*), whales (*Mysticeti*), apes (*Hominoidea*) and many big African savanna mammals, which are the most used flagship species selected on the basis of charisma according to Leader-Williams & Dublin [6]•.

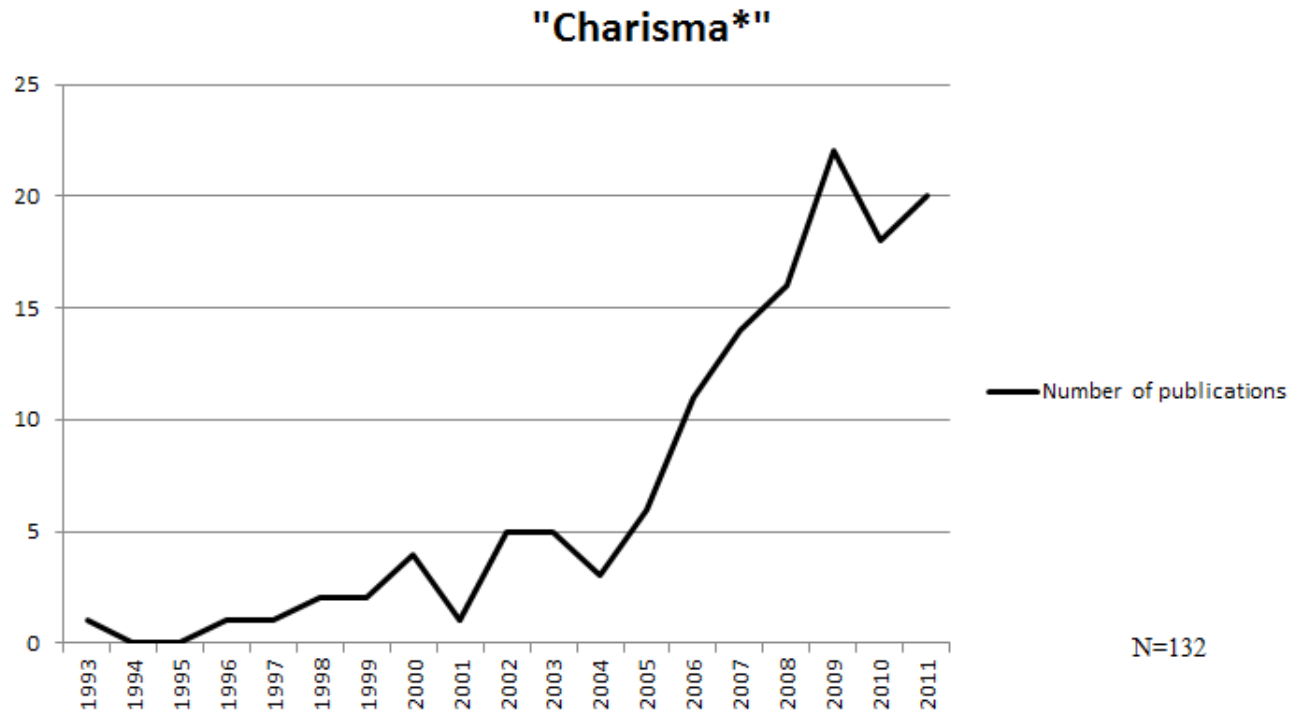

Figure 1: Evolution of the occurrence of the term "charisma" (and its derived) between 1993 and 2011 in conservation articles referenced in Web Of Knowledge database on 28/02/12.

Problems and debates

Despite there has been few systematic definition of what a charismatic species is, the use of this concept as a parameter in conservation biology and especially in focal species determination has been much discussed. Here we sum up the main arguments of this debate.

Pros

There are several main arguments supporting charisma-based approaches in defining conservation objectives, and especially for determining flagship species in conservation campaigns. They include commercial, ecological, communicational and practical dimensions.

The first one consists in assessing that embodying the conservation concern in a sympathetic face (i.e. selecting flagship species according to their charisma) can help people act for conservation more than if this action was purely rational [10]•. Furthermore, using already-existing charisma, for example sacred or traditionally-symbolic animals, can strongly help the involvement of local populations and the respect of the restrictions and constraints [21] induced by the conservation program [14, 22]•, and facilitate environmental education.

The second argument stems from considering that most charismatic species are top predators, like wolves (*Canis lupus*), most *Cetacea* and big cats (*Pantherinae*) [8, 20]•. As such, they are necessarily keystone species, as they play a major role in regulating herbivorous populations, and doing so on the vegetal community, and consequently on the entire ecosystem. This fact also makes them umbrella species as they need a wide and healthy food web to survive. Moreover, top predators are known to have the highest level of concentration of pollutants in the food chain, so they also act naturally as indicator species. That is why using and enhancing the natural charisma of top predators appears to many authors the best way to protect a whole ecosystem and habitat [9]•.

A third argument for considering charisma in flagship species determination comes from a restriction of the concept of flagship species: if one defines a flagship species as the pure "symbolic construct of a marketing campaign" without any link to the actual species and its potential role in the ecosystem [5]•, then charisma is the only parameter that is to be considered when defining a flagship species, as its only aim is to maximize the potential donors' generosity towards conservation in general [23]•. Then, the flagship is no more than a mascot, which must embody the whole biodiversity crisis at the selected scale (the panda being a major symbol of the world wide biodiversity, as the logo of the WWF), so it doesn't need to be a keystone or umbrella species, nor even endangered (according to Walpole & Leader-Williams, [23]•).

All these arguments may be reinforced by the fact that an animal's charisma can be successfully enhanced or constructed by sensible marketing to serve a conservation campaign [14, 15]•. One of the most famous examples is the Komodo dragon (*Varanus komodoensis*), which used to be feared and hunted by local populations, but has become a strongly charismatic and even emblematic species for both local populations and tourists thanks to an ambitious conservation program [23]•. Lots of other species have been artificially designed as charismatic species by such programs and remain so on, like the American

wolf (*Canis lupus*), many vultures (especially *Catharidae*) or the golden lion tamarin (*Leontopithecus rosalia*) in the Brazilian "Mata Atlantica" [24].

Cons

Many authors criticize the concept of charismatic species, using a wide diversity of arguments, including the scientific and bias it enhances, its deceitfulness for the public, its unscientific character, a wider doubt about surrogate strategies efficiency, and a more particular doubt about the relevance of charismatic species as umbrella or keystone species.

The first one and far more widespread criticism stems from the general acknowledgement that there is a strong bias in conservation literature, attention and programs towards charismatic species, and specially towards big mammals ([7, 10, 17, 20, 25 - 28]•). This arbitrary prioritization represents a major concern to many scientists as there is an important risk to bias the view we have of ecosystems, hence the way we act for their conservation. This could distort results, statistics and programs designing, as only well-known species are known enough to be listed as "endangered". In addition, only charismatic species seem able to appeal enough interest to raise sufficient funds and interest to get decently conserved [25, 28]•. Consequently, these conservation efforts are based on unscientific ground [17]•, creating a sort of class struggle between "wealthy", successful animals and poor, doomed cast-off animals: it is just like if humans could decide on the right to exist or not for the animals they like or dislike, irrespective of ecological concerns and sustainability. This dichotomy can be extended to whole landscapes, those with great biodiversity but without potential rare charismatic species being deserted by public charity and left to their fate [8]•. Studies show that this trend of idealization and virtualization of wildlife seems already active, as studies carried out among European children showed that they knew more about African animals than European ones [29]• – even if they also knew even more different *Pokemons*© than true animals [30]•.

Moreover, conservation campaigns based on the charisma of flagship species, even if they use the money raised for wider conservation campaigns, participate to a biased communication about biodiversity and conservation. This could contribute to increase popular caricatures about an idealized wildlife of kitsch colonial postcard, composed only with noble lions, elegant giraffes, cruel tigers, placid elephants and colorful songbirds [10, 29]•. On the other hand, such redistribution can negatively affect the credibility of a conservation organization, because most donors like to know precisely what their money is used for [17]•.

In addition to these criticisms, many authors highlight intrinsic flaws in this concept. First of all, some authors propose the separation of flagship building from charisma-related considerations. As charisma appears as a subjective, non-scientific, changeable parameter, its influence in a conservation program is discussed, and a random flagship with accurate marketing can prove as efficient [15]•. Other authors prefer choosing random species present in the ecosystem under protection to build on a custom-made flagship species with "objective" marketing and socio-economic concerns, because using an already charismatic species as flagship can sometimes curb the effectiveness of the campaign [5]•. That is especially true considering that charisma is not an objective characteristic: defining a flagship species because it holds a strong charisma among occidental donors can be counter-productive if the same animal is regarded as a pest by local populations, who might not accept well the program's actions. For example, Bowen-Jones & Entwistle [14]• showed that whereas British schoolchildren loved big cats (*Pantherinae*), primates (*Hominoides*) and elephants (*Elephas maximus*), Tanzanian children feared and disliked the dangerous elephants and big cats, preferring zebras (*Equus zebra*), giraffes (*Giraffa camelopardalis*) and buffalos (*Syncerus caffer*), on the basis of attractiveness, money income and meat quality. This takes part of a wider problem about the geography of environmental action, the dangerous animals to protect being rarely wreaking havoc in the activists' backyard [6]•: for example the reintroduction of the European wolf (*Canis lupus*) in France caused a major dispute between activists and farmers, whereas this animal enjoys great popularity in northern America, as a major part of the typically American concept of "*Wilderness*". Even in donors populations, the overexploitation of some famous, charismatic flagship species can decrease its efficiency due to "*flagship fatigue*" ("*reduced impact due to repeatedly using standard flagship species*" [6, 14]•).

The use of charismatic species in conservation programs is also stricken by a general controversy about the effectiveness of surrogates strategies, single-species management being nowadays often considered as deceptive simplifications of complex ecosystem interactions [5, 8, 19, 31]•. Charisma-based approaches are particularly criticized in these works, being considered as the least scientific single-species method, to such extent that some authors propose to abandon it even as a parameter for other surrogates definition [5, 17]•.

Finally, the argument that charismatic animals are most often keystone species and therefore strategic aims for good conservation management has also been controversial. First, many endangered charismatic animals are not keystone species (like the rhinoceroses R*hinocerotidae* or pandas *Ailuropodes melanoleuca*) and lots of charismatic species are of few conservation concern, so they don't always embody well the conservation cause [6]•. On the contrary, the "*engineer species*" (or "*foundation species*"), which often represent endangered capital keystone species, are rarely charismatic species (including corals, shellfishes, insects, echinoderms, worms, plants, algae…) and could be tragically forgotten in charisma-based conservation programs

[8]•.

Discussion

To our knowledge all the authors we reviewed obviously agree that the charisma parameter does exist, holds an importance of conservation concern and can hardly be ignored, even if there is no consensus definition of what a charismatic species is. This is especially true considering its influence on donors' willingness to pay and act for conservation. Thus, there is a strong need for a real systematic definition and study of this object, were we to use it, to fight against it or to deal with it. As the paradigmatic approach of focal species is nowadays well-documented, the need is now of a detailed syntagmatic analysis of this panel of concepts, especially the most vague ones.

One open question relates to how to deal with the problem of subjectivity when using charisma. What makes an animal a charismatic species: is it its appearance, and why (anthropomorphic, cute or impressing?), its level of threat, its ability to embody some human characters, its place in our representations? Many different ways of being a charismatic species may also exist, and need to be distinguished, and new ones may be created. Furthermore, defining what is not charismatic is not easier. Although many articles (like [15, 29]•) deal with "*non-charismatic species*", they never define it any more than that (Andelman & Fagan [31]• talks about "*background species*"). What are the links between non-charismatic species and the emergent concept of "ordinary biodiversity" (created by Rabinowitz [32]•, enhanced by the later works of Gaston [2] – see the thesis of J.C. Abadie [33] and V. Devictor [34], and other current works by D. Couvet)? However, there must be many types of "non-charismatic species", as the reasons why weevils are non-charismatic are different from the reasons for mosquitos, crocodiles and sharks, or the delicious Bluefin tuna (genus *Thunnus*), the precious red coral (*Corallium rubrum*) or demonic pests like louse (*Phthiraptera*) – and all these characteristics change among peoples, as cows are sacred in India and mere foodstuff in the US. Strikingly the relevance of these different types of non-charismatic species on conservation is not studied. A typology of animals based on the way people see them could then, whether as charismatic or not, or even whatever type of non-charismatic they belong to, may be very useful in order to design conservation campaigns, as many strong parameters like religion, culture, trade, food, predation on livestock or crops and dangerousness influence strongly the way different animals are perceived by different populations, and then the effectiveness of a conservation campaign, all the more if it is based on a flagship strategy.

We point out to two dimensions of this problem and only one of them has been studied so far. The first dimension concerns the classification of species as either charismatic or non-charismatic. As we described in this review, charismatic species may then be also umbrella, indicator or keystone species and there are pros and cons that have to be considered when including the charisma of species in conservation planning. The second dimension concerns the inner modalities of charisma, the characterization of non-charismatic species and its variants, and the recognition of these different categories and their potential implication on conservation planning. This dimension has not received attention so far, and further studies should lead in this direction.

Defining these concepts may need a trans-disciplinary approach, as recognized by many authors [5, 15, 23]•, especially when conservation "marketing", promotion and communication are concerned. However, this does not mean necessarily that flagship defining and more broadly management policies deserve to be reduced just to commercial operations with a fund-raising mascot as seem to wish some authors (like [5]• or [23]•), which would amount to forgetting all the non-financial aspects of a conservation campaign. An efficient conservation program is not a commercial investment, and the most fund-earning campaign is not necessarily the most successful for all that: it needs also to be supported by local populations who have to undergo new constraints, and to convince competent authorities. Moreover, it seems important that scientists keep the leadership in conservation management, as the major aim is less to earn lots of money than to spend it wisely, and marketing can cost a lot. A campaign which would bet too much on the emotional power of charismatic species would run the risk to turn from biodiversity conservation to animal protection, which is not ecology any more.

Other concerns that have not yet been approached in the scientific literature include the problems of potentially "rotten-spoiled species". Simberloff stated that "*Intensive management of an indicator or an umbrella species (for example, by transplant or supplemental feeding) is a contradiction in terms because the rest of the community to be indicated or protected does not receive such treatment*" [8]•. But in the case of economically over-exploited charismatic species benefiting from large protected areas where thousands of tourists come and see them, we can fear that one species could wipe all the others out. It could be due to its overgrazing of natural resources and over-competitive status, helped by dozens of trainers, veterinarians and feeders that virtually extract the animals from the actual ecosystem, trophic chain and natural selection. Another cause could come from safety and health standards and zeal inviting park managers to eliminate all dangerous, unaesthetic or simply undesirable biodiversity around their starlets – if the masses of tourists don't kill by themselves vulnerable or disliked species.

In contrast, some species can be the victims of their charisma, especially invertebrates which are not considered by the public as sensitive. Lots of rare and endangered species with nice shape, colors or symbolic are often collected by tourists as *souvenirs*, or by local people to be sold to tourists ("*curios trade*") or on the international trade, leading to rapid local

extinctions [35]. This is especially the case of sessile beings like beautiful endangered flowers (like the edelweiss *Leontopodium alpinum*), expensive edible mushrooms, or even sea stars and shellfishes. For example, overfishing of the beautiful conch gastropod *Charonia tritonis* is often alleged as a probable cause for its prey's wrenching outbreaks, the coral-eating sea star *Acanthaster planci*. Even big mammals can suffer from a too much charismatic image without direct hunting, like dolphins (*Tursiops truncatus*) which are frequently disturbed and harassed by tourists [36].

The fact that people tend to attach little sensitiveness to most invertebrates may also be seen as a limit to the use of charismatic species to help conservation programs. This strong bias toward big vertebrates has already been highlighted [8]•, but the author only dealt with other animals like fishes and insects, acting as a victim of the bias he denounces: conservation concerns also micro-fauna, fungi, plants, algae and even bacteria, which are all often major keystone species but have few hope to benefit from a charismatic image (despite the fact that some plants like the baobab – *Adansonia* and other *Bombacaceae* – can be seen as charismatic). Then, an ecosystem without any obvious charismatic species like the Alaskan rain forest might be considered by the public as a desert, open to any kind of exploitation.

To conclude, we would assess that the potential charisma of living creatures seems a crucial parameter in the definition of a conservation program and its promotion, be it a problem or an advantage [37]. "*Charismatic species*" seems to designate basically large mammals and vertebrates with some attractive traits for the human population considered, such as intelligence, beauty, valor, singularity or a strong symbolic, but there is no sufficient consensus definition for such a widely used term. Considering the way populations see the animals which are to be conserved appears as a necessity if managers wish to avoid unexpected effects of this relationship, like do many marine reserve managers accused to get sharks hunting in the bathing spots. Nonetheless, we recommend using the concept of charismatic species more as a parameter of species conservation planning than as a type of independent surrogate species, as it is not the same thing as a flagship species. If flagship species probably need to be charismatic, this charisma can be constructed by the promotional campaign, whereas what we propose to call "charismatic species" is due to pre-existing cultural and aesthetic characteristics, which depend on the human population considered. It would probably be better if more knowledge of nature influenced our way of seeing biodiversity rather than our emotions affect biodiversity : there could be some contradiction in the fact that programs to resurrect dinosaurs would probably get far more budget than do the protection of current biodiversity.

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