

Selection and Implementation of a Flagship Fleet in a Locally Undervalued Region of High Endemicity

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Abstract Flagships are one conservation education tool. We present a proposed flagship species fleet for environmental education in central Chile. Our methods followed recent flagship guidelines. We present our selection process and a detailed justification for the fleet of flagship species that we selected. Our results are a list of eight flagship species forming a flagship fleet, including two small- and medium-sized mammals, the degu (*Octodon degus*) and the culpeo fox (*Lycalopex culpeus*), two birds, the turca (*Pteroptochos megapoidius*) and the burrowing owl (*Athene cunicularia*), the Chilean iguana (*Calopistes palluma*), the tarantula (*Grammostola mollicoma*), and two trees, the litre (*Lithrea caustica*) and the espino (*Acacia caven*). We then describe how these flagships can be deployed most effectively, describing their audience, effective narrative frames, and modes of presentation. We conclude that general selection rules paired with social science background data allow for an efficient selection process.

Keywords Chile · Mediterranean · Flagship species · LEK · Environmental education · *Octodon degus*

INTRODUCTION

The Mediterranean habitat of central Chile is rich in endemic biodiversity (Myers 1990; Simonetti 1999; Myers et al. 2000). Central Chile also has a large human population, significant overdevelopment, and poor land management (Pauchard et al. 2006). This combination suggests an imminent conservation problem for species in central Chile, one which should be prevented rather than allowed to worsen. An issue that stands in the way of mobilizing public and private support for conservation initiatives in central Chile is the low value attributed to nature in this

region. There is a pervasive perception that the landscape is “empty”, without plants or animals of value to protect (Fuentes et al. 1984; de la Fuente de Val et al. 2004; Root-Bernstein, accepted). Central Chile is overlooked at a policy level in terms of prioritization of environmental problems and creation of public protected areas (Simonetti 1994; Tognelli et al. 2008). Here we recommend a complementary approach to conservation policy in central Chile through environmental education.

Environmental education can play an important role in preserving the biodiversity of central Chile. Environmental education, whether through schools, community activities, or publicity, seeks both to transmit information and to engage people in a hands-on, sensual relationship with nature (Jacobson et al. 2006). Environmental education programs, whether for children or for adults, are an essential conservation tool for increasing interest in and positive attitudes towards nature and conservation (Noss 1997; Orr 1999; Ewert et al. 2005). Implicitly, these new attitudes and relationships are expected to translate into positive conservation-related behaviors. However, involving people in action is a complex task and no single conservation tool can move the public from apathy to engagement. The development of a range of tools to incentivize or inspire conservation-friendly actions is thus an area of active research in conservation, ranging from payments for monetized ecosystem services (PES) programs to childrens’ poetry competitions.

Flagship species are one common tool of environmental education and conservation awareness programs (Caro 2010; Barua et al. 2011). A flagship species, or group (“fleet”) of flagship species, possesses characteristics that allow them to carry out conservation-promotion roles in society (Barua et al. 2011). Such roles include, for example, attracting scientific research and funding, stimulating

conservation policy development, engaging people in community-based conservation, or raising conservation awareness through environmental education. Here we present and justify a flagship fleet selection for use in environmental education and conservation awareness programs in central Chile. The proposed flagship fleet is thus one tool, which in conjunction with other tools and programs, could play a role in leading to behavioral change in the public.

This paper aims both to make locally appropriate recommendations for a flagship fleet to raise conservation awareness in central Chile, and to be a case study of putting recent flagship selection criteria into practice (Barua et al. 2011). We present previously unpublished data on local ecological knowledge (LEK) from our ethnographic study, which formed the list of possible flagship species. We present and justify our flagship fleet selection. We then discuss how we believe the flagship fleet could most effectively be presented and used within the local cultural context. We conclude with a discussion of the generalizable versus the locally specific aspects of the flagship selection process.

MATERIALS AND METHODS

Social Science Background

Flagships selected without a basis in social science data on the local attitudes and culture are unlikely to successfully influence their target audience (Bowen-Jones and Entwistle 2002; Barua et al. 2011). However, this data is scarce for central Chile, with very little published human–wildlife ethnography, ethnobotanical or LEK research available. The majority of studies of human relationships to nature in Chile focus on the Mapuche and other rural communities in southern Chile (e.g., Silva-Rodríguez et al. 2006), or Aymara in northern Chile (Villagrán et al. 1999). An unpublished study of local charismatic species has been carried out for rural dwellers near the Fray Jorge National Park, which appears to be the only previous study of LEK and nonhuman charisma in a semi-arid habitat of Chile (W. Marcelo, pers. comm.).

These existing studies focus on the knowledge and attitudes of rural people or communities in smaller, remote towns. However, the center of ecological protest movements as well as the seat of power for development, environmental and conservation policy is the capital, Santiago, located in central Chile. Although urban dwellers of a relatively high socio-economic class may have less LEK than peasants or other rural dwellers (Clergeau et al. 2001; Pilgrim et al. 2008), they may also have strong environmental values and an interest in conservation

(Mankin et al. 1999; Tikka et al. 2000; Bandara and Tisdell 2002). As part of our broader research plan we therefore carried out an ethnographic study focusing on the attitudes, knowledge and experiences of nature among middle and upper class urban dwellers in Santiago, Chile (Root-Bernstein, accepted). This ethnographic research found that subjects largely adhered to a public discourse that presents the natural and rural landscapes of central Chile as empty of species, dry, transitory, degraded, and eternally going from bad to worse. Nevertheless, all subjects attributed positive values to individual species, places or activities, in the context of personal nostalgia for childhood. In addition, some species and places were given value when described as ‘exclusive,’ ‘rare,’ ‘endemic,’ or ‘accessed’ through intimate practices of observation. Thus, these two key concepts of personal nostalgia and exclusivity of access can be used to promote flagship species and their habitat to middle and upper class urban and peri-urban residents in central Chile.

In addition, we used data from this ethnographic study as a direct input into the flagship selection process. We used the LEK of our key informants to produce lists of possible flagship species. The reported LEK represents the knowledge and experience of a subset of people with the kinds of relationships with nature that we would like to promote with the flagship species.

Key Informant Selection

As part of the ethnographic study described above, in 2010–2011 one of us (MR-B) carried out 37 semi-structured interviews of key informants with some relationship to nature or the rural landscape. We focused on middle and upper class adult Chilean women and men. We began with personal contacts who grew up in the countryside, or currently were working in conservation and ecology, and used snowballing to make further contacts. These subjects were considered key informants. Relationships to nature and rural spaces included growing up in rural areas ($N = 8$), currently living at the periphery of the city in semi-rural areas ($N = 8$), having a summer home in the countryside ($N = 1$), being a professional conservationist or field biologist ($N = 10$), being in a profession related to teaching children about nature ($N = 6$), or having a nature-related hobby, i.e., bird watching or nature photography ($N = 11$). Some people fit more than one category. The conservationists, biologists, and professionals teaching children about nature overlapped in only one case with the nature-related hobbyists. Of the professionals in nature-related jobs, 1 was a government employee, 1 worked for a museum, 2 were freelancers, 2 were directors of NGOs, 4 were high school teachers, and 6 were university professors in 5 different departments. People with nature-related

hobbies or who were interviewed primarily because of where they grew up or currently lived worked in fields such as design and architecture, art, engineering, tourism, administration, or as housewives. Semi-structured interviews of key informants were complemented by over 200 h of participant-observation in a variety of nature-related contexts (for details see Root-Bernstein, accepted). At this level of effort we believed we had reached saturation, with no new important information being produced by the later interviews.

Collection of Data on LEK

The list of potential flagship species was derived from quantitative summaries of findings on LEK drawn from the semi-structured interviews. Key informants who answered questions about their own LEK ($N = 29$; some informants did not answer this set of questions) were shown illustrations taken from guides to Chilean animals and plants and asked if they knew the species and could name it. Species illustrations shown are listed below. Some subjects gave more than one name per species, all of which were included in the subsequent analysis. Answers were audio recorded and transcribed. Other uses of the names of animals and plants were tallied from the written summaries of audio recordings of all semi-structured interviews ($N = 37$).

LEK Analysis

For analysis of LEK, species were placed in categories formed post hoc based on qualitative ethnographic analysis. ‘Non-native species in Chile’ included eucalyptus trees (*Eucalyptus* sp.), beavers (*Castor canadensis*), and European rabbits (*Oryctolagus cuniculus*) (total responses in this category $N = 94$). ‘Native birds’ included the red-breasted meadow lark (loica) (*Sturnella loyca*), the Harris hawk (aguilucho) (*Geranoaetus polyosoma*), the moustached turca (turca) (*Pterotochos megapodius*), and the burrowing owl (pequén) (*Athene cunicularia*) ($N = 132$). ‘Native plants’ included the sclerophyllous tree the litre (*Lithrea caustica*), the flowering herb alstroemeria (*Alstroemeria* sp.) and the leguminous tree the espino (*Acacia caven*) ($N = 97$). ‘Other animals’ included the degu (*Octodon degu*), the tarantula (araña pollito) (*Grammostola mollicoma*), the culpeo fox (zorro culpeo) (*Lycalopex culpeus*), the long-tailed snake (serpiente de cola larga) (*Philodryas chamissonis*), and the blackish-green lizard (lagartija negro verdosa) (*Liolaemus nigroviridis*) ($N = 162$). The orangutan (*Pongo borneo*) is a threatened species not found in Chile (even in captivity) and served as a conservation awareness and general natural history knowledge control ($N = 32$). The data on LEK were compared across

categories using a Chi-squared test. As alternative measures of LEK, (1) the rank ordered frequencies with which subjects mentioned species in response to the question “If you could choose an animal or a plant, or both, to represent central Chile, what would they be?” and (2) other spontaneous mentions of species names were compared to each other with a Pearson’s correlation.

Flagship Species Selection

The lists of species names generated by the different measures of LEK formed the pool of potential flagship species. Selection of flagship species followed the most recent recommendations, as summarized by Barua et al. (2011). For a flagship species whose intended use is the promotion of conservation through environmental education, as is the case here, the authors recommend that the flagship have a local geographical range, that it be threatened or endangered, that it represent other species in a broad, nontechnical sense, that it be recognizable and observable by the public, that it have a striking physical appearance or noteworthy traits, that it or its representations in culture should be charismatic, and that it should not have a pre-existing conflicting use. This is intended as a framework to facilitate the analysis of input information. Each category includes terms that require interpretation, including the appropriate meaning of “local” range, the relevant kind or level of “threat”, the meaning of “representation” of other species, what constitutes “observable”, what is locally charismatic (see below), and what kind of existing use generates a “conflict.”

Barua et al. (2011) do not make specific recommendations about the features or characteristics which make species fit these categories, which should be interpreted according to local information and perceptions. In particular, we emphasize that non-human charisma refers to human perceptions of an animal or plant species, not specific pre-defined traits. Non-human charisma can be based, for example, on a species’ appearance, its movements, or other sensory means through which it is perceived (Lorimer 2007). Lorimer (2007) characterizes three broad forms of non-human charisma: ‘ecological’ or based on human capacities to perceive the species in its habitat, ‘aesthetic’ or based on similarity to humans (anthropomorphic appearances) or dissimilarity to humans (feral appearances), and ‘corporeal’ or based on physical reactions and emotions experienced when presented with the species, including epiphanies about nature and ‘jouissance’ or joy in the presence of knowledge. Non-human charisma develops from relationships between humans and other species and is not an inherent characteristic of a species (Lorimer 2006; Lorimer 2007).

RESULTS

Local Ecological Knowledge (LEK)

LEK is quantified in Fig. 1 and Table 1. Figure 1 shows the names used to identify different species, organized into categories by species type. The distribution of name types differed significantly across categories (Pearson’s Chi-squared test, $\chi^2 = 142.5$, $df = 28$, $p < 0.001$), implying that people know and recognize species in different ways across categories. Table 1 shows the taxa named in response to the question, “If you could choose an animal or a plant, or both, to represent central Chile, what would they be?” We compared these responses to the number of subjects who mentioned the same taxa spontaneously when discussing their personal experiences with nature or the countryside, or their knowledge of typical animals and plants in central Chile. The two lists were not significantly correlated ($r = 0.236$, $df = 35$, $p = 0.16$, Table 1) because there are taxa that people mentioned frequently but did not propose as representatives of central Chile and vice versa.

Flagship Fleet Selection

We considered the lists generated by different measures of key informants’ LEK as sources for the selection of flagship species. We first excluded species on the LEK lists that were domesticated, non-native, or had a distribution outside of central Chile. We kept the espino on our lists despite its ambiguous native/non-native status. In step two,

we sought a main flagship species that was representative of the central Chilean ecosystem broadly construed, through its ecological interactions. Following Barua et al. (2011) we did not specifically seek an umbrella, sentinel, or keystone species. However, as Sergio et al. (2006, 2008) suggest, flagship species may receive more support from biologically oriented conservationists if they have important ecological functions or interactions with other species. Ecological importance can make the flagship a broadly fundable object of research, increasing its exposure to professionals, funders, and the public. Furthermore, we believe that interesting trophic and non-trophic linkages make good narratives that can be used to generate species charisma and convey information for environmental education purposes. The colonial rodent the degu, *Octodon degus*, met this and many of the other recommended selection criteria:

- The degu is endemic to central Chile (Meserve 1984).
- Although the degu is not a threatened species, degu habitat is frequently degraded and under threat (see “Introduction”).
- Degus represent other species through their network of trophic and non-trophic interactions. Degus are a main prey species in central Chile (Jaksic 1986). Through ecosystem engineering in the form of runways, these rodents also interact with plants, invertebrates, and birds (Madrigal et al. 2011; Root-Bernstein 2012). In addition, degu burrows have been observed to provide shelter or nesting sites to a range of commensal species (Table 2).

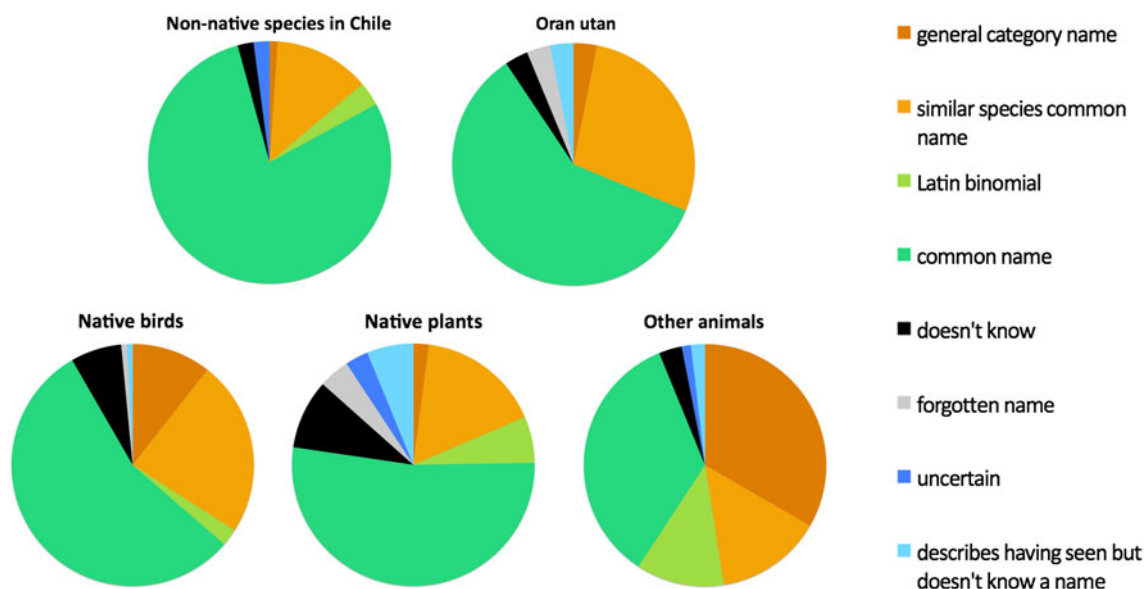


Fig. 1 An assay of local ecological knowledge (LEK) conducted on 29 urban and periurban residents of Santiago, Chile. “General category name” refers to terms like “bird”, “rodent”, or “monkey”

Table 1 List of taxa mentioned in response to the question “If you could choose an animal or a plant, or both, to represent central Chile, what would they be?” Some subjects gave multiple responses. Other contexts in which subjects mentioned these taxa included when asked to describe personal experiences in nature or the countryside, and when asked to describe typical animals and plants in central Chile. Taxa mentioned in other contexts but never suggested as representative are not listed. Entries in bold correspond to species we recommend as flagship fleet members

Suggested representative species for central Chile	<i>N</i> subjects naming as representative (total <i>N</i> = 29)	<i>N</i> subjects mentioning sp. in another context (total <i>N</i> = 37)	Species category	Suggested representative species for central Chile	<i>N</i> subjects naming as representative (total <i>N</i> = 29)	<i>N</i> subjects mentioning sp. in another context (total <i>N</i> = 37)	Species category
Espino (<i>Acacia caven</i>)	7	10	Native tree	Eucalypto (<i>Eucalyptus</i> sp.)	1	4	Non-native tree
Degu (<i>Octodon degus</i>)	5	8	Mammal	Garza (<i>Ardea alba egretta</i>)	1	4	Bird
Quillay (<i>Quillaja saponaria</i>)	4	6	Native tree	Palma chilena (<i>Jubaea chilensis</i>)	1	4	Native tree
Boldo (<i>Peumus boldus</i>)	3	4	Native tree	Puma (<i>Puma concolor</i>)	1	4	Mammal
Loica (<i>Sturnella loyca</i>)	3	3	Bird	Chincol (<i>Zonotrichia capensis chilensis</i>)	1	2	Bird
Turca (<i>Pteroptochos megapoidius</i>)	3	2	Bird	Picafór (<i>Sephanoides sephanoides</i>)	1	2	Bird
Peumo (<i>Cryptocarya alba</i>)	2	6	Native tree	Quique (<i>Galictis cuja</i>)	1	2	Mammal
Rosa (<i>Rosa</i> sp.)	2	2	Domesticated	Aguilucho (<i>Geranoaetus polyosoma</i>)	1	1	Bird
Chahual (<i>Puya berteroniana</i>)	2	1	Plant	Arrayán (<i>Luma apiculata</i>)	1	1	Native tree
Conejo (<i>Oryctolagus cuniculus</i>)	1	15	Non-native mammal	Golondrina (<i>Tachycineta meyeri</i>)	1	1	Bird
Zorro (<i>Vulpini</i> spp.)	1	11	Mammal	Huemul (<i>Hippocamelus bisulcus</i>)	1	1	Mammal
Perro (<i>Canis lupus familiaris</i>)	1	10	Domesticated	Paloma torcaza (<i>Patagioenas araucana</i>)	1	1	Bird
Caballo (<i>Equus ferus caballus</i>)	1	9	Domesticated	Alstroemeria (<i>Alstroemeria</i> spp.)	1	0	Plant
Condór (<i>Vultur gryphus</i>)	1	9	Bird	Avellanita (<i>Avellanita bustillosii</i>)	1	0	Plant
Lagartija (e.g., <i>Leolaemus</i> spp.)	1	9	Reptile	Lechuzca blanca (<i>Tyto alba</i>)	1	0	Bird
Litre (<i>Lithrea caustica</i>)	1	7	Native tree	Llaca (<i>Thylamus elegans</i>)	1	0	Mammal

Table 1 continued

Suggested representative species for central Chile	<i>N</i> subjects naming as representative (total <i>N</i> = 29)	<i>N</i> subjects mentioning sp. in another context (total <i>N</i> = 37)	Species category	Suggested representative species for central Chile	<i>N</i> subjects naming as representative (total <i>N</i> = 29)	<i>N</i> subjects mentioning sp. in another context (total <i>N</i> = 37)	Species category
Queltehue (<i>Vanellus chilensis</i>)	1	7	Bird	Zorzal (<i>Turdus falcklandii magellanicus</i>)	1	0	Bird
Algarrobo (<i>Prosopis chilensis</i>)	1	5	Native tree	Tenca (<i>Mimus thenca</i>)	1	0	Bird

- The degu is not well known to the urban public, though nature photographers and people with university training in biology are familiar with it. The degu is not hard to recognize and is diurnal. Its burrows and runways are easy to see.
- The degu is cute: it is small, furry, with big eyes, round ears, a pale stomach and a tufted tail, and bounds.
- The degu has charismatic potential. People who know about degus or native “mice” in general tend to describe them in charismatic terms (data not shown).
- Degus are not currently used as a flagship by any conservation organization. They also do not occur in popular culture. This allows the degu to be presented to the public without preconceptions.

While other species also fit many of the criteria for a flagship, they did not have important ecological roles linking to many other potential flagships that could be used to form narratives about a fleet. For example, the espino (*Acacia caven*) can be viewed as a keystone species in the espinal habitat of central Chile, but its ecological interactions are mainly with introduced livestock, and it is sometimes associated with low biodiversity and exclusion of sclerophyllous forest (Van de Wouw et al. 2011). We thought that these factors made it too closely associated with controversial anthropogenic activities to be suitable as the central flagship. In addition, the degu has more interesting interactions with other species than the boldo (*Peumus boldus*), quillay (*Quilaja saponaria*), or turca.

As the degu does not perfectly fit all recommended criteria, we suggest a complementary flagship fleet. Thus, in step three of the selection process, we selected species that interact with the degu through trophic and non-trophic links, and which were listed in the LEK measures. In this step we added the turca *Pterotochos megapoidius*, the burrowing owl (pequén) *Athene cunicularia*, the Chilean iguana (iguana chilena) *Calopistes palluma*, the culpeo fox (zorro culpeo) *Lycalopex culpeaus*, and the espino *Acacia*

caven (Fig. 2). In step four, we also selected additional species that were stronger in characteristics where degus were weaker, adding two species that are well known to the public, the tarantula (araña pollito) *Grammostola mollicoma*, and the sclerophyllous tree, the litre *Lithrea caustica*.

We summarize the characteristics of the proposed flagship fleet in Table 3. The trees are much better known than the degu. Although both selected trees have negative aspects (littres give some people a rash, espinos are associated with poverty and agricultural overexploitation and are sometimes considered invasive), these qualities paradoxically make them more charismatic and culturally relevant than other trees (Root-Bernstein et al., in prep.). Other trees were high on the measures of LEK, such as quillay, boldo, and peumo (*Cryptocarya alba*), but we rejected these for three reasons: they are difficult to distinguish and thus recognize; they have few direct ecological interactions with the other possible flagship species; and they had a more generic ‘endemic sclerophyllous tree’ charisma compared to the specific charismas associated with espinos and littres. Foxes, lizards, and tarantulas are well known and easy to recognize, and can be more visible than degus, especially in summer. Tarantulas are often used as children’s pets, foxes are sometimes fed or otherwise thought of as similar to small dogs, and many participants reported having enjoyed trying to catch and hold lizards. Finally, inclusion of birds is important to attract birding enthusiasts.

DISCUSSION

Quantifying Local Ecological Knowledge

The LEK displayed by our key informants suggests that people with some exposure to and relationship with nature, due to where they live, their hobbies, or their work, are able

Table 2 Animal species observed in degu burrows by 8 surveyed researchers and research assistants working in areas with degu burrows. The respondents had over 62 months of fieldwork between them

Animal observed	Taking shelter in burrows	Nesting in burrows
Ants	x	x
Bennett's chinchilla rat (<i>Abrocoma bennetti</i>)	x	x
Burrowing owl (<i>Athene cucularia</i>)		x
Chilean iguana (<i>Calopistes palluma</i>)	x	x
Cricket spp.	x	x
Cururo (<i>Spalacopus cyanus</i>)	x	
Darwin's leaf-eared mouse (<i>Phyllotis darwini</i>)	x	
Degu fleas	x	
Degu lice	x	
Degu ticks	x	
European rabbit (<i>Oryctolagus cuniculus</i>)	x	x
Flies	x	
Harvestmen (arachnids)	x	
Lizard (e.g., <i>Liolaemus lemmiscatus</i>)	x	
Olivaceous mouse (<i>Abrothrix olivaceus</i>)	x	x
Rats (<i>Rattus</i> spp.)	x	
Snake (<i>Philodryas</i> spp.)	x	
Tarantula (<i>Grammostola</i> sp.)	x	x
Turca (<i>Pteroptochos megapodius</i>)	x	x

to recognize and name many typical species from a range of taxonomic groups. The lists illustrate in different ways the best-known species, which are most relevant to flagship selection. The results from identifying images indicated that non-native species are the most correctly recognized. Native plants revealed high common name and Latin binomial use and low confusion with similar species, but also the highest proportion of answers admitting ignorance. Native birds and orangutans were frequently referred to by common names, though with a relatively high incidence of confusing them with related species. By contrast, the list of species volunteered as potentially representative (Table 1)

showed that the same subjects had the capacity to generate the common names of a wide range of native species with which they were familiar. Interestingly, these were often not the same species that they spontaneously talked about, and thus had personal connections to.

The contrast between results from different methods of eliciting animal and plant names points to multiple ways of knowing nature (Frazão-Moreira et al. 2007). Recognizing and naming a picture of a species may be based more on experiential knowledge (having seen or tried to identify the species), while knowing the names of typical species may be more related to the social uses or roles of animals and plants as items of conversation or anecdote. The frequent use of the scientific Latin binomial names of species indicates the role that species can play in social interactions as signals of autodidactic and university education (Bourdieu 1984; Frazão-Moreira et al. 2007). Species that were spontaneously mentioned (Table 1) were primarily referred to during anecdotes about events that happened to the speaker in the past.

Recommendations for Using the Flagship Fleet

Narratives can be an effective way to communicate environmental messages. Stories, especially when illustrated, can show how animals and plants look and move, what they do, and how they interact with humans. These features underlie non-human charisma, and can be used to generate charisma for a representation of the species. Through stories, animals and plants can also be presented as egomorphic, or having a self or personhood similar to oneself (Milton 2005). Anthropomorphism can lead to empathy for animal and plant life and an interest in natural history and biology (Mitchell 1997; Milton 2005; Lorimer 2007; Chan 2012). For example, people may be more interested in degus when told that the colony with its trails and lawns is like a miniature city with streets and gardens. The outcomes of degu ecosystem engineering (Root-Bernstein 2012) could be presented through stories in egomorphic and anthropomorphic ways (i.e., “the degu helps the other animals”), in order to provide an implicit moral for how humans could responsibly care for their environment while making and building things (“Degus promote native plant species in their colonies—what do you plant in your garden?”). See Fig. 3 for an example.

We recommend appealing to nostalgia in order to make it easier for urban and peri-urban Chileans to relate to nature and share their experiences in nature with their children. While appeals to nostalgia may have wider application to conservation globally, in practice its success will depend on how it is employed. Nostalgia in colonial contexts may often have an ironic component, when people implicated in

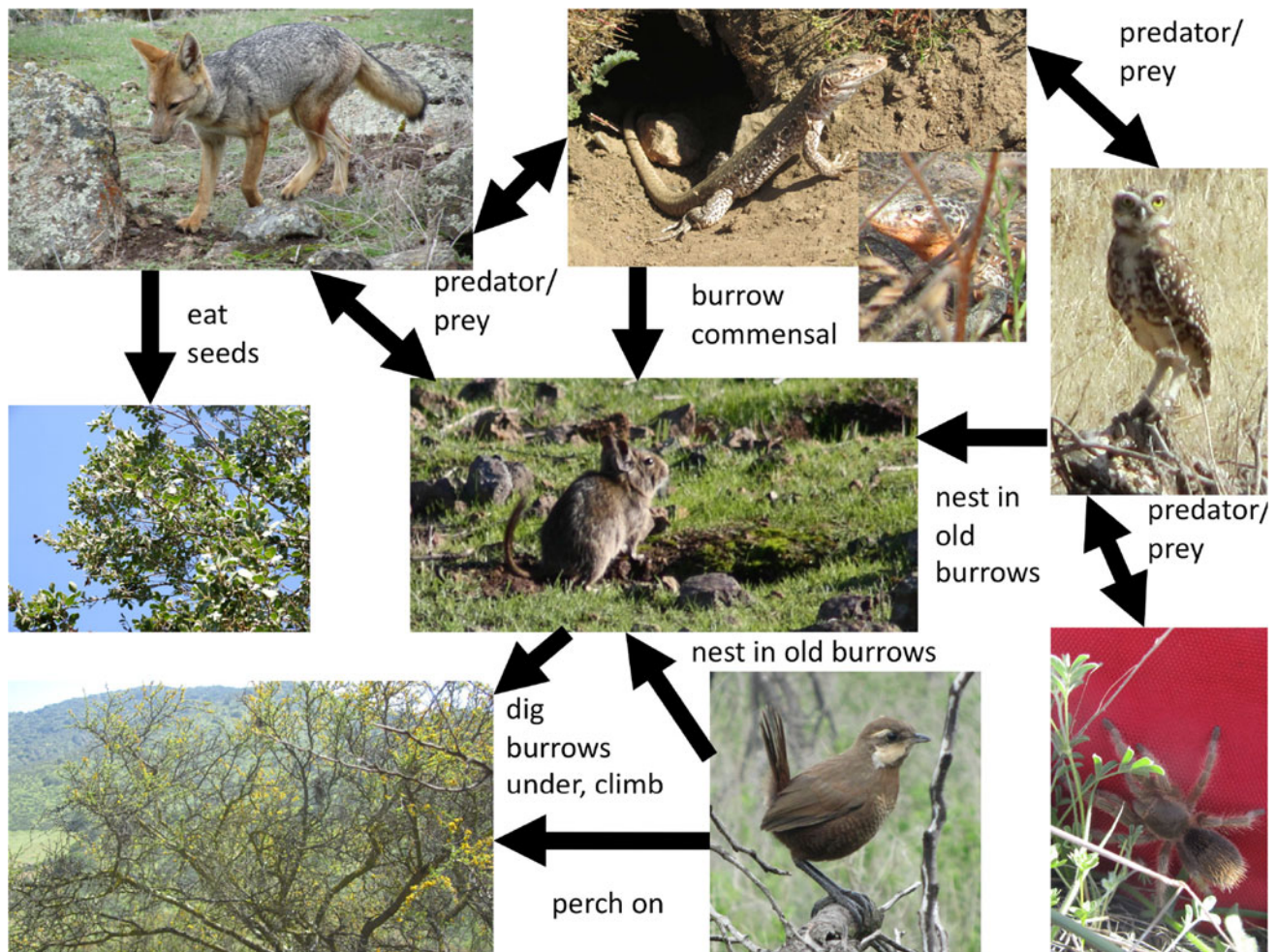


Fig. 2 The eight proposed flagship species in the flagship fleet for central Chile, showing selected ecological interactions with narrative potential. Center, degu *Octodon degus*. Clockwise from top left, zorro culpeo *Lycalopex culpeaus*, female iguana chilena *Calopistes palluma* (male inset), araña pollito *Grammostola mollicom*, pequén *Athene cunicularia*, turca *Pterotochos megapoidius*, espino *Acacia caven*, litre *Lithrea caustica*. Photo of degu copyright César Muñoz, other photos copyright Meredith Root-Bernstein

the destruction of local nature and culture retrospectively claim to value it (Rosaldo 1989). Nostalgia for nature should be used carefully, such that positive associations with nostalgia (e.g., innocence) but not negative ones (e.g., poverty, irony) are elicited. One way to do this in central Chile would be to tell stories about flagship fleet species within the ahistorical frame story of a reminiscence about “when I was young...” or “once, when I was backpacking...”. Another approach would be to present images of flagship fleet species using retro cartoon styles or childlike drawings (Fig. 3). Many participants were also attracted to species that are endemic, fleeting, or encountered at intimate scales. Such attributes of rarity and exclusivity are perceived as conveying social value to those with “access” to the species. These attributes of the flagship fleet species should be emphasized as much as possible (“The degu—just for you”). Flagship species in central Chile should also frequently be referred to by their Latin binomials, in order to

position them as items through which to display education, and to make them more exclusive, thus appealing both to professionals and autodidacts (Fig. 1; Bourdieu 1984). Although technical language is often considered a barrier to the public, for this target audience, in a society with a strong class system experiencing rapid social mobility, “access” to “exclusive” things are signs of social positioning. This applies to nature as much as to consumer products or services (see Root-Bernstein, accepted). The majority of people using Latin binomials to refer to species were not biologists, and in our interpretation their uses of these names acted to point out that the species is officially recognized as an object of interest, to legitimize their knowledge as a display of education, and to erect symbolic barriers to outsiders. In addition, for the espino *Acacia caven*, use of the Latin binomial was used to imply that whereas the “espino” might be worthless and common, the “*Acacia caven*” is special.

Table 3 Recommended flagship fleet species for central Chile. Recommendations from Barua et al. (2011) for a flagship or flagship fleet for conservation awareness are at left. For each species I note how it meets or fails to meet the recommendations. LC least concern, IUCN (2012)

Recommended flagship traits: conservation awareness	Preferred trait value	Degu <i>Octodon degus</i>	Turca <i>Pteroptochos megapodius</i>	Pequén <i>Athene cunicularia</i>	Iguana chilena <i>Calapistes palliuma</i>	Araña pollito <i>Grammostola mollicoma</i>	Zorro culpeo <i>Lycalopex culpeus</i>	Litre <i>Lithrea caustica</i>	Espino <i>Acacia caven</i>
Geographical location and range	Local	Endemic, central Chile	Endemic, central Chile	Central Chile	Endemic, central Chile	Central Chile	Endemic, central Chile	Endemic, central Chile	Central Chile
Conservation status and population size	Threatened or endangered	LC, habitat threatened	No listed status, habitat threatened	LC, habitat threatened	No listed status, habitat threatened	No listed status, habitat threatened	No listed status, habitat threatened	No listed status, habitat threatened	No listed status, habitat threatened
Represents other species	Not necessarily as an umbrella or indicator species	Through trophic and nontrophic links	Native birds	Birds	Native reptiles	Invertebrates	Native mammals	Native trees	Native trees
Recognisable and easily observed	By the public	Diurnal, trails and burrows evident	Diurnal, whistle frequently heard	Diurnal, but confused with other owls	Diurnal, but torpid in winter, large	Diurnal, large	Diurnal	Can be confused with other trees	Abundant
Physical appearance and special characteristics	Beautiful, powerful, memorable, etc.	Cute, social	Large feet, mustache, whistle	Turns head, acute hearing, silent flight	Large, orange stomach (male)	Hairy, eight legs	Dog-like	Sclerophyllous, gives a rash	Seed pods, yellow flowers, spines
Charisma	Personal or institutionalized	Cute, social, endemic	Whistle, walk	General owl charisma	Color, rarity?	“Creepy-crawly” charisma, kept as pets	Dog-like?	Traditional anthropomorphic greeting	Played with, appreciated as typical or despised
Existing flagship usage	Is good if not conflicting	None	None	None	None	None	None	None	None



Fig. 3 Image of poster for children produced as outreach. The poster can be folded to form a booklet. The text reads: What was that? I know... it's the degu! Do you remember when we were little and the degu told us his story? I'm the degu, I live here with my family. In spring we construct our home. All the neighbors help—except the lazy rabbit. We also help out our fun friends the whistling moustached turca, and the burrowing owls and their chick. The Chilean iguana and the tarantula guard us. And the litre and the espino [trees] give us their advice. “I’m getting out of here!” shouts the Chilean iguana whenever he sees the culpéo fox passing by. In the dry, hot summer, the rabbit comes by. “Degu! Will you give me some space in your nice cool burrow?” “Lazy rabbit! He who lies in the sunshine in spring, gets no shade in summer!” Image copyright Isabel Dedoscruzados

The audience for the flagship fleet should be urban adults and children. Adults can be targeted through appeals to nostalgia and exclusivity and through family activities for children. Organizations such as the Network of Chilean Observers (ROC) and www.fotonaturaleza.cl which provide communities for novices and enthusiasts to watch and photograph nature should also be supported. Children are an important target group because childhood experiences with nature can strongly influence attitudes later in life (Ewert et al. 2005; Stone and Barlow 2005; Jacobson et al. 2006). Flagship fleet species should be represented to children in ways consistent with their representation to adults, in order to avoid mixed messages. In particular, we suggest that the current trend for illustrating and anthropomorphizing cartoon animals in such a way that they bear no resemblance, physical or behavioral, to the real animal (for example,

Chilian Geographic, <http://www.educarchile.cl>), should be avoided, to help children transfer interest in and knowledge of representations of the flagships to the real species, and to facilitate communication with nature-loving adults. The National Museum of Natural History in Santiago is a popular venue where both adults and children can learn about animals together. In their new Biogeography exhibit (opened in 2012), while a handful of “city birds” are the only animals shown for the mediterranean region (perpetuating the myth that central Chile is empty of wildlife), the “transition to the temperate forest” section features, among other species, five of our eight flagship fleet species: the degu, the iguana chilena, the espino, the litre, and the araña pollito. Thus, environmental education activities can use this exhibit in the museum as a compatible resource for middle and upper class families with young children. While other social groups

should also be targeted for environmental education, separate studies should be carried out to assess how best to present the flagship fleet to them, or indeed whether these flagship species are appropriate.

CONCLUSION

In summary, this paper presents both a specific set of recommendations for flagships for central Chile, and a case study of how to implement recent flagship selection recommendations. In this case we have chosen to use qualitative ethnographic methods to generate lists of potential flagship species and background knowledge relevant to their selection and implementation. Where relationships with nature are weak among the general population of the target group, or where there is no information on LEK, snowballing and ethnographic methods will gather detailed and contextualized information efficiently. Where target populations have strong, widely shared relationships with nature and background knowledge on LEK and attitudes toward the environment is already available, quantitative surveys of a random sample of the population will be adequate to understand flagship preferences. Although there is no single optimal or correct flagship for any given conservation goal, we believe that the steps emphasized by Barua et al. (2011), including having social science background data, choosing an intended flagship use, and prioritizing species characteristics most relevant to that use, will produce flagships with a high probability of effectiveness. Implementing flagship species for most conservation goals requires social marketing and working with end users, artists, designers, and funders (Root-Bernstein and Ladle 2010; Verissimo et al. 2011). Testing flagship effectiveness after trial implementation remains the next step.

We believe that aspects of our flagship development approach can be relevant to creating flagship species for other locally underappreciated habitats, such as drylands and habitats with extensive anthropogenic impacts (e.g., the Brazilian caatinga biome, Moura et al. 2013). We highlight three aspects of our approach to the selection guidelines that we believe are generalizable. First, using a flagship fleet rather than a single flagship allows conservationists to target multiple stakeholder groups' preferences and typical interactions with nature. Where nature lovers are few, targeting all of them may be valuable. For example, we targeted bird watchers with two bird species, biologists with the degu, children who play outside with the lizard and tarantula, and so on. Second, and closely related, is the selection of flagship fleet species that, in addition to individually meeting selection criteria, interact in ways that can be easily narrativized. For underappreciated habitats, narratives could help people to imagine inhabitants and

processes of nature that they are unaware of. Third, we have attempted to identify some ways in which value is recognized and attributed in the social groups we are targeting, and we have suggested ways to align the flagship species with these forms of valuation. How nature can be valued may differ significantly between societies or groups within the same society, so there is no prescriptive way to approach this issue. For example, our recommendation to use Latin binomials could be inappropriate for other social groups, such as peasants, indigenous peoples, or groups who would interpret this as pretentious or pedantic. The goal of flagship selection guidelines is to facilitate the conservationist's job, giving an idea of where to start and what data to prioritize. At the same time, context-sensitive interpretation and judgement will always be integral to selecting effective flagships.

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