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Extinct flagships: linking extinct and threatened species

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Abstract Despite much effort worldwide to promote threatened species conservation and recovery, the extent of the current threatened vertebrate list (>7600 species) requires the development of novel communication and marketing tools to raise awareness and funding. Although flagship species have been widely used in conservation marketing, extinct species have largely been overlooked and neglected in a flagship role and the status of lost species (i.e., extinction) is rarely associated with the status of extant species (i.e., currently threatened species which face an elevated risk of extinction). Some extinct species (e.g., dodo, thylacine) are cultural and commercial icons, and so are socially familiar; these may have appeal to the public as conservation flagships. We propose a wider use of extinct flagships to raise awareness for the conservation of threatened species, in particular, using a direct link between already extinct species and extant species at risk of extinction. We present examples of publicly recognized and iconic extinct species for use in marketing for threatened species conservation. These species are socially familiar and are easily linked to threatened species or species groups. We then outline a roadmap for testing their appeal under the extinct flagship concept, through market research. If research identifies that a cognitive link is made between the fate of an extinct species (i.e. they went extinct from human causes) and what may happen to threatened species (i.e. they are at risk of extinction from human causes), extinct species may well have a wider role to play as conservation flagships.

Keywords Conservation funding, dodo, extinction, flagship species, passenger pigeon, threatened species, thylacine

Introduction

The Earth's rate of biodiversity loss is currently 100–1000 times greater than estimated pre-industrial rates, and well beyond 'planetary boundaries' for safe rates (Rockström et al., 2009). In recent centuries, there have been 338 recorded extinctions of vertebrate species, and a further 16 species exist only in captivity (IUCN, 2014b). Another 7678 species are currently classified as threatened with extinction (those falling into the IUCN Red List of Threatened Species categories Critically Endangered, Endangered or Vulnerable; IUCN, 2014b). Despite humanity's vast expansion of ecological understanding and knowledge, the number of threatened species continues to grow (Hoffmann et al., 2010), highlighting that the crisis is only increasing.

Subsequently, there has been much effort worldwide to promote threatened species conservation, including the effective use of 'flagship species' to raise awareness and funds (Verissimo et al., 2011; Jepson & Barua, 2015). A flagship species is "used as the focus of a broader conservation marketing campaign based on its possession of one or more traits that appeal to the target audience" (Verissimo et al., 2011). Flagship species have a high public appeal and can invoke an emotive response in the public that can result in positive outcomes for biodiversity (e.g., awareness gained, funds raised) (Smith et al., 2010; Jepson & Barua, 2015). One criticism of flagship species however, is that the money raised is often tied to spending solely on a particular species with other threatened species unlikely to benefit (Joseph et al., 2011). Thus other approaches to flagships, such as flagship projects or flagship fleets, have been proposed (Joseph et al., 2011; Veríssimo et al., 2011; Veríssimo et al., 2013) whereby the focus is shifted from the singular species.

Some extinct species may represent appropriate flagship species given their iconic status in popular culture. Here we outline the concept of the extinct flagship, in particular using publicly-familiar and valued ('appealing') extinct species for conservation awareness,

education and fund-raising. ‘Extinct flagships’ recognize the fate of lost species, but explicitly link the past to the present (and the future); there may not be an opportunity to recover an extinct species, but there are opportunities to recover threatened species if action is taken now.

Extinct species have been used in conservation marketing previously in order to raise general awareness of conservation issues. For example, Durrell Wildlife Conservation Trust uses the dodo *Raphus cucullatus* as their logo to champion their mission to “to save species from extinction, especially those under threat and overlooked” (https://www.durrell.org/wildlife/). Similarly, Project Passenger Pigeon used the 100th anniversary of the extinction of the passenger pigeon to raise awareness of human caused extinctions, and the passenger pigeon *Ectopistes migratorius* has been described as “an excellent tool for conservation education” (Blockstein & Evans, 2014). However, extinct species have not been used in a formal flagship model to draw an explicit link between extinct and threatened species for targeted marketing purposes.

Conservationists have been criticised for negative messages and approaches to marketing conservation (Vasi & Macy, 2003; Weinsten et al., 2015). With this in mind, extinct flagships actually sit on the interface between negative and positive messages and marketing. On one side, an extinct species highlights loss, and touches on emotions of guilt and even sorrow. Conversely, they also inspire action (‘we can’t let this happen again’) with a focus on opportunities to recover (‘save’) extant threatened species. Rather than simply connecting extinction with broad conservation messages, as has typically been done with extinct species in conservation marketing, we argue that an explicit link is needed to make extinct flagships more effective. We argue that a clear link between a single extinct species and a directly related threatened species would provide a more systematic use of extinct flagships. Linking the possibly intimidating message of extinction to a call for action (including indicating how

to make a difference for current threatened species), draws on evidence that combining fear appeal with an appeal to act, is an effective communication tool if the audience feels enabled to effect change (Rogers & Mewborn, 1976; Vasi & Macy, 2003; Weinsten et al., 2015). We use a simple method to present a series of possible extinct flagships and discuss the marketing research required to assess the utility of the extinct flagship concept, with the general public as the broad target audience.

Identifying candidate extinct flagships

The use of extinct species in marketing conservation is not a new concept (e.g., Durrell's dodo as noted above). However, and somewhat surprisingly, the use of extinct species in directly marketing threatened species projects and conservation is not widespread. The obvious, but what we believe to be the under-utilised link, is to connect extinction with possible-extinction (i.e. threatened species) within the flagship species framework. The link between extinctions and current threatened status is directly made and the conservation message of extinct flagships is clear: we must act now to prevent threatened species from going extinct too.

Extinct flagships present an innovative solution to the issue of tied funds to conservation of threatened species; the funds raised under extinct flagships are not tied to the conservation of that species, as it is already extinct, but rather they are tied to conserving currently threatened species. This would allow funds to be spent optimally across related taxa or geographic regions, thus maximising gains to threatened species conservation (Bennett et al., 2015). Douglas & Winkel (2014) recognized that flagships can decrease the attractiveness of non-flagship species, but this can be circumvented with the use of extinct species since they cannot be held to a higher standard than the extant fauna as they no longer exist.

Not all extinct species are going to be suitable flagship species and here we propose three central traits of extinct flagships: (1) social familiarity, or the ability to become familiar through marketing; (2) a link to threatened fauna, either taxonomically or geographically (or both); and; (3) appeal (Jepson & Barua, 2015). A series of additional relevant questions can be asked of candidate species (Table 1) including fitting the extinct species and target threatened species group within existing flagship species selection frameworks (such as Verissimo et al., 2011).

As a starting point to the discussion of extinct flagships, we identified potential candidates based on the first trait outlined above, social familiarity, using a simple quantitative internet search method (Australian Google image search of 'extinct species' and tabulating the frequency of hits by species for the first 200 images; https://www.google.com.au). 'Extinct species' were restricted to those which have gone extinct since the year 1500 AD (following IUCN Red List guidelines; IUCN Standards and Petitions Subcommittee 2013). Results were converted into a Familiarity Index calculated as the number of species-specific hits/total hits for all species.

Extinct flagship candidates identified by their Familiarity Index and their links to examples of conservation campaigns that they could champion are outlined in Table 2. This list is intended to be illustrative, and to demonstrate the clear links that can be made between extinct species (the flagship) and extant species (the threatened fauna). Our simple Familiarity Index delivered the dodo (high international profile), the thylacine *Thylacinus cynocephalus* (high national profile within Australia), and the passenger pigeon (2014 marked 100 years since the death of the last known individual) as the most familiar recently extinct species. Below we use these as extinct flagship examples with a focus on two central extinct flagship traits which could be leveraged for funding: current familiarity and a link to threatened species. We have identified a link to threatened species based on taxa and

geography (Table 2). However, whether these links are salient for target audiences would require experimental testing such as the use of experiments designed to test the psychological impacts and behavioural outcomes of the proposed extinct flagships. A third trait, appeal, should be the focus of research to identify flagship species preferences for target audience (see Discussion).

The dodo's familiarity

The dodo is certainly one the world's most famous birds, living or extinct, and has been described as "a leading contender as the 'icon' of extinction" (Hume, 2006). Its demise is the result of not only direct human harvest but also the introduction of exotic animals to its Western Indian Ocean island home of Mauritius, where it was endemic (Hume, 2006). It is estimated that the dodo went extinct during the late 17th century (Roberts & Solow, 2003; Hume, 2006).

The dodo, although long extinct, appears everywhere in Mauritius. It features as the background of the country's immigration form, the watermark of the local currency, a figure in the country's coat of arms, and a local carnival mascot (Plate 1a). It would seem that its extinction promotes its legendary status and its iconic value.

Despite the dodo's celebrity status, we argue that the link between the past (extinct species) and the present (threatened species), could be more explicitly used to leverage conservation action for Mauritius. The dodo's former home of Mauritius and the adjacent island of Rodrigues have a disproportionally high record of avian extinction. Of 34 native terrestrial birds, 19 are extinct and seven are threatened with extinction (Fig. 1a). That extinction figure represents 13.6% of the world's known extinct bird species from a mere 0.001% of the Earth's land surface area. As an example, the status of the Mauritius olive white-eye

166 *Zosterops chloronothus* (Plate 1c), a small, drab Critically Endangered songbird, is largely
167 unknown to the general public. However, its status is only one step removed from the dodo -
168 it faces an extremely high risk of extinction.

169 Some of Mauritius' remaining endemic species, for example the Mauritius kestrel *Falco*
170 *punctatus* and pink pigeon *Nesoenas mayeri*, only exist today due to dedicated efforts to save
171 them. They are conservation success stories (e.g., Jones et al., 1995), but these species aren't
172 recognised in broader (public) society the way that the dodo is. While one might argue that
173 these success story species act as effective ambassadors for the country's threatened birds,
174 they are not as widely known or appreciated as the dodo. Individually, resourcing the
175 conservation of the Mauritius olive white-eye (Critically Endangered) or the Mauritius fody
176 *Foudia rubra* (Endangered) is likely to be a hard sell to members of the public. Marketing
177 these species, and the other threatened birds of Mauritius, as a package centred around the
178 island's high rate of extinction with the dodo as the flagship could be used by the government
179 and non-governmental conservation organizations to encourage a public sense of
180 responsibility (regardless of when extinction occurred), and a sense of ownership of currently
181 threatened species, which is valuable for leveraging funds and action. The dodo therefore
182 presents an opportunity to create a targeted marketing message that there is a conservation
183 crisis in Mauritius, and that without sustained action a further seven native birds in Mauritius
184 are likely to 'go the way of the dodo'. While Durrell's logo is the dodo, and much of their
185 work in Mauritius uses this emblem to remind us of the need for conservation action, they
186 also use this logo more broadly to champion their mission to save species, more generally,
187 from extinction. This use of the same logo for both targeted and mass marketing may dilute
188 the message of the Mauritius conservation crisis. A targeted use of the dodo as an extinct
189 flagship would require the dodo to be used directly to message the conservation needs of
190 threatened birds within Mauritius, rather than threatened species more broadly.

191

192 **The thylacine's appeal**

193 The thylacine (or Tasmanian tiger) was a dog-like carnivorous marsupial originally
194 occupying both mainland Australia and the island state of Tasmania to the south. Its
195 extinction on the mainland is linked to the arrival of a morphologically convergent predator,
196 the dingo *Canis lupus dingo*, some 3500 years ago (Fillios et al., 2012; Letnic et al., 2012),
197 whereas the isolated Tasmanian population remained extant until more recent times given the
198 absence of dingoes from the island. Its demise in Tasmania is attributed to direct human
199 persecution, as well as disease; the last known thylacine died in captivity in 1936 (Paddle,
200 2000; Paddle, 2012). The species remains a regular subject of Bigfoot-style 'sightings' (e.g.
201 see Heberle, 2004), although there is no scientific evidence to support anything but its
202 extinction. Surprisingly, the thylacine has not been embraced widely for conservation
203 messaging, as the continuing quest to rediscover it (Turner, 2009) distracts from accepting its
204 status (extinction) and marketing that loss towards extant threatened species.

205 The thylacine has been described as a "potent cultural icon", "functioning in effect as
206 Tasmania's brand logo" (Turner, 2009). Depictions of the thylacine can be found across the
207 state, including on Tasmanian vehicle number plates and as a commercial symbol for one of
208 the state's two largest breweries (Plate 1b). Like the dodo, the thylacine also demonstrates a
209 tendency to value a species because it is extinct, and a failing to link past extinction and
210 current conservation status.

211 The thylacine is one of 21 recently extinct Australian mammals; Australia has the highest
212 level of mammalian extinction of any continent, responsible for about 27% of the global total
213 of extinct mammal species (Johnson, 2006). The status of the current mammal fauna does not
214 fare well: 52 species are threatened with extinction (18.5% of the fauna) (IUCN, 2014a) (Fig.

1b). Although a handful of these 52 threatened mammals have a high public profile, in particular the Tasmanian devil *Sarcophilus harrisii* and the bilby *Macrotis lagotis*, many more are not publicly recognized or charismatic (e.g., lesser stick-nest rat *Leporillus apicalis* or the central rock-rat *Zyzomys pedunculatus*; Plate 1d).

Attempting to transfer the public's understanding and familiarity of an extant species such as the Tasmanian devil to lesser known threatened species may be problematic given that (a) marketing a single extant species can tie funds only to that species; and, (b) the recovery of the single extant species may be seen as an end-point in the conservation campaign (i.e., it does not represent the fate of the whole threatened species community) (Joseph et al., 2011). The thylacine however was a unique species, with an existing high level of cultural and societal appeal as demonstrated through existing commercial use. The thylacine is a prime example of how an appealing extinct species can be explicitly linked to a group of threatened species and, in this case, the need to act to conserve Australia's threatened mammals.

The passenger pigeon's marketability

The passenger pigeon was once one of North America's most abundant birds, but the last known individual, Martha, died in the Cincinnati Zoo in 1914. The extinction of the passenger pigeon is attributed to the combination of human exploitation (e.g., reduction of suitable forest habitat and over-hunting; Halliday, 1980) and dramatic population fluctuations following climatic, food-resource, and other ecological variations (Hung et al., 2014).

The marketability of the passenger pigeon received a boost with the wide publicity of the centennial of its extinction in September 2014. Project Passenger Pigeon used the 100th anniversary of the extinction "to raise awareness of current issues related to human-caused extinction" and to recognise that "extinction is ecologically, culturally, and morally relevant

to the 21st Century" (http://passengerpigeon.org/). Applying the concept of the passenger pigeon as an extinct flagship would reframe this message to draw direct links between the fate of the passenger pigeon and current threatened species needing immediate conservation attention.

North America has 25 threatened land bird species, with likely further additions to the list in the near future as population declines continue in aerial insectivores and grassland birds (Sauer et al., 2014). Some threatened species have a significant public profile; the Californian condor *Gymnogyps californianus* is a "cultural icon" (Alagona, 2004). Others have a very low profile such as saltmarsh sparrow *Ammodramus caudacutus* and Sprague's pipit *Anthus spragueii*. Linking the passenger pigeon with these low-profile threatened species, could leverage marketing and fundraising to drive the effective management of threatened bird species in North America (the role of the passenger pigeon may not be tied only to the status of North American birds; it has recently been compared to population collapses in an extremely abundant and widespread Eurasian songbird; Kamp et al., 2015).

Discussion: marketing extinction

The dodo, thylacine, and passenger pigeon (among other species) are examples of candidate extinct flagships to support conservation of extant threatened species, by leveraging lessons learned to get money in the door for action on current species in decline that are directly linked by phylogeny or geography. In this way, the public can give money to prevent extinctions of a clear set of species, such as Mauritian birds or Australian mammals, rather than a single species. Effective flagship species bridge pre-existing frames involving the species with new frames that inform a conservation agenda in relation to a broader political or societal cause (Jepson & Barua, 2015). Extinct flagships may fulfil this criterion by

bridging the fate of the extinct species to the required action to avert the loss of currently threatened species thus informing a conservation agenda directed at threatened species management. The use of extinct flagships as a novel approach to supporting conservation of extant threatened species should be accompanied by carefully designed media and marketing campaigns that segment the audience and appropriately target the message. We identify four key research gaps to answer whether extinct flagships are an effective approach for conservation marketing of threatened species.

1. Formative research to test the concept of extinct flagships. Central to this it testing whether the public connects their fate with the current conservation status of threatened species;

2. If research confirms that a cognitive link between the fate of extinct species and threatened species can be established, the next step is to understand what emotions extinct flagship species messages invoke, such as fear, loss or a connection to current species. It is important to understand which emotions extinct flagships elicit in order to inform the further design of messages, such as coupling threatening messages with appeals for action (Vasi & Macy, 2003).

3. Our simple method of selecting familiar extinct species identified candidate extinct flagships; however further research is needed to address whether these species have broad public appeal and the cultural context in which they are embedded. This will address whether they have the power to gain popularity and drive behavioural change which results in conservation action for currently threatened species (Jepson & Barua, 2015).

4. Lastly, in addition to establishing whether these species are of broad public appeal, a stronger understanding of how different segments of the market respond to the extinct flagships and associated messages is critical for targeting messages to maximise conservation outcomes (e.g., Vasi & Macy, 2003; Weinstein et al., 2015).

Fulfilling these research gaps should allow conservation practitioners to fully consider the use of extinct species, capitalizing on the familiarity of popular extinct species to market them as flagship species for action to save currently threatened species.

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Biographical sketches

PETER KYNE focuses on the collection of life history and ecological information to guide the management and conservation of biodiversity and assess population status and extinction risk. VANESSA ADAMS focuses on the human dimensions of conservation and systematic environmental decision making.

388 TABLE 1 Relevant questions when selecting extinct flagship species.

Question
Is the extinct species familiar, or capable of becoming familiar?
Can the extinct species be linked taxonomically to the species or species group of conservation concern? (in all cases such a link should be tenable)
Can the extinct species be linked geographically to the species or species group of conservation concern? In particular cases, extinct flagships can be champions of global conservation needs (i.e., Steller's sea cow for global sirenians)
Does the extinct species have public appeal as a marketable flagship species (*this question should be assessed through research of the targeted audience*)?
Are the causes of extinction relevant to the cause for the threatened status of extant species? (this may not be essential)
Can the extinct species highlight threatening processes relevant to the threatened species?
What have we learnt from the extinct species which can be applied to the conservation and management needs of the threatened species?
Can the extinct species and target conservation species group fit within a flagship species selection framework (such as Verissimo et al. 2011)?

389

390

391 TABLE 2 Candidate extinct flagship species and their linked threatened species groups in
392 need of conservation action[a]. This list is not exhaustive, but shows the top eight results using
393 the Familiarity Index[b].

Extinct flagship	Linked conservation campaign[a]	Familiarity Index[b]
Dodo *Raphus cucullatus*	Mauritius' bird fauna (7 extant THR species) or THR island endemic birds more broadly	0.301
Thylacine *Thylacinus cynocephalus*	Australia's terrestrial mammal fauna (52 extant THR species)	0.260
Passenger pigeon *Ectopistes migratorius*	North America's land bird fauna (25 extant THR species)	0.137
Pinta Island tortoise *Chelonoides nigra abingdoni*[c]	Global amphibians (1,957 extant THR species)	0.110
Baiji (Yangtze River dolphin) *Lipotes vexillifer*	River dolphins or THR cetaceans more broadly (or Asian rivers as an example of a landscape-scale application)	0.055
Steller's sea cow *Hydrodamalis gigas*	Global sirenians (all 4 extant species are THR)	0.055
Caribbean monk seal *Monachus tropicalis*	Global pinnipeds (9 extant THR species)	0.041
Great auk *Pinguinus impennis*	Global alcids (5 extant THR species) or THR seabirds more broadly	0.041

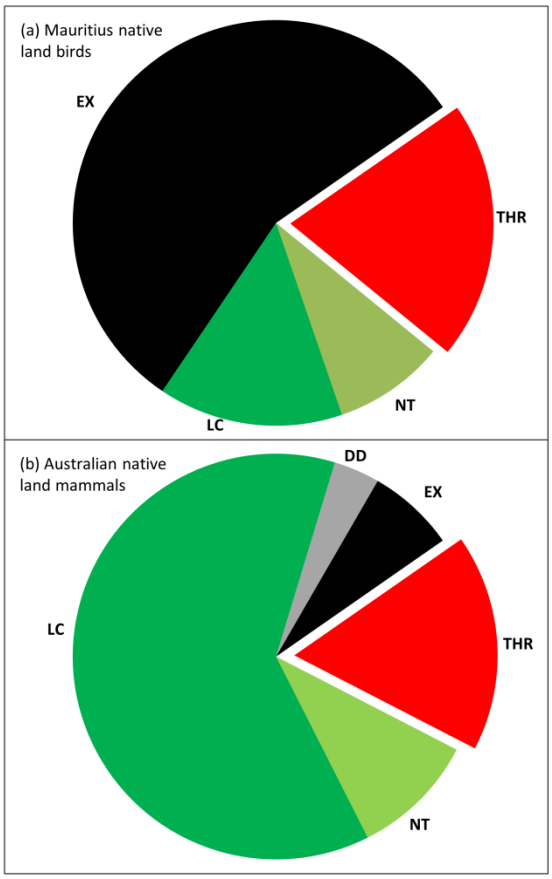
394 *Notes:*

395 [a]Numbers of extant threatened (THR) species calculated from IUCN (2014a).

396 [b]Based on quantitative internet image search (see text).

397 [c]Subspecies of Galapagos tortoise *Chelonoides nigra*.

398



399

400 FIG. 1 Extinction risk status for (a) Mauritius land birds (n = 34) and (b) Australian land
401 mammals (n = 301) (data from IUCN 2014a). IUCN Red List of Threatened Species
402 categories and their brief definition (see IUCN 2012): EX, Extinct: a species where 'there is
403 no reasonable doubt that the last individual has died'; THR, threatened encompassing: CR,
404 Critically Endangered: a species 'facing an extremely high risk of extinction in the wild'; EN,
405 Endangered: a species 'facing a very high risk of extinction in the wild'; and, VU,
406 Vulnerable: a species 'facing a high risk of extinction in the wild'; NT, Near Threatened: a
407 species which 'does not qualify for CR, EN or VU now, but is close to qualifying for or is
408 likely to qualify for a threatened category in the near future'; LC, Least Concern: a species
409 which 'does not qualify for CR, EN, VU or NT'; and, DD, Data Deficient: a species for
410 which 'there is inadequate information to make a direct or indirect, assessment of its risk of
411 extinction'.

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PLATE 1 (a) the dodo and (b) the thylacine presented as commercial advertising tools. Both species are familiar and iconic and are therefore marketable; (c) the Mauritius olive white-eye and (d) the central rock-rat, both only one category removed from extinction (i.e., these are Critically Endangered species). These poorly-known species have less marketability as flagship species, but can be directly linked to (a) and (b) respectively which have high conservation marketability. (Photographs: Peter Kyne (a,b,c), Patrick Hodgens (d)).