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Societal extinction of species

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| Abstract: | <p>The ongoing global biodiversity crisis not only involves biological extinctions, but also the loss of experience and gradual fading of cultural knowledge and collective memory of species. We refer to this phenomenon as 'societal extinction of species' and apply it to both extinct and extant taxa. We describe the underlying concepts as well as the mechanisms and factors that affect this process, discuss its main implications, and identify mitigation measures. Societal extinction is cognitively intractable, but it is tied to biological extinction and thus has important consequences for conservation policy and management. It affects societal perceptions of the severity of anthropogenic impacts and of true extinction rates, erodes societal support for conservation efforts, and causes the loss of cultural heritage.</p> |

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1 **Societal extinction of species**

2

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40 **Keywords:** collective memory; communicative memory; cultural memory; societal species

41 salience; extinction of experience; shifting baseline syndrome.

42

43

44

45 **Abstract**

46 The ongoing global biodiversity crisis not only involves biological extinctions, but also the loss of

47 experience and the gradual fading of cultural knowledge and collective memory of species. We

48 refer to this phenomenon as ‘societal extinction of species’ and apply it to both extinct and extant

49 taxa. We describe the underlying concepts as well as the mechanisms and factors that affect this

50 process, discuss its main implications, and identify mitigation measures. Societal extinction is

51 cognitively intractable, but it is tied to biological extinction and thus has important consequences
52 for conservation policy and management. It affects societal perceptions of the severity of
53 anthropogenic impacts and of true extinction rates, erodes societal support for conservation efforts,
54 and causes the loss of cultural heritage.

55

56 *Species go extinct twice – one time when the last individual stops breathing, and a second time*
57 *when the collective memory about the species disappears.*

58 [adapted from a quote attributed to both Banksy and Irvin Yalom]

59

60 **The concept of societal extinction**

61 The ongoing biodiversity crisis is characterized by extinctions, and impoverishment and
62 homogenization of biological communities [1-3]. Extinctions cause the loss of ecological functions,
63 ecological and cultural ecosystem services [3-5], and consequently the **extinction of experience**
64 (see Glossary) [6]. This depletion of human-nature interactions [7] can reduce the societal salience
65 of species, to a point where they are collectively forgotten. We refer to this phenomenon as
66 ‘**societal extinction of species**’: the loss of **collective memory**, attention, knowledge,
67 representations and **cultural products** associated with species from cultures and/or societies
68 (Figure 1). We suggest that societal extinction is typically associated with biologically extinct
69 species, but can also occur for extant species that have lost societal salience. Societal extinction
70 represents a link between societies and nature (in their broad, inclusive sense), and thus is affected
71 by changes in **society**, nature, and/or in their intersection. Like biological extinction, societal
72 extinction operates at multiple spatial scales: a species can be globally or regionally extinct from
73 either a biological or societal perspective.

74 Societal extinctions are relevant for conservation policy and management because
75 collective memory guides individual and collective decision-making [8,9]. We argue that societal

76 extinctions can affect people's perceptions of the environment, its natural state, severity of
77 anthropogenic impacts, and true extinction rates. They can ultimately lead to collective generational
78 amnesia, or a **shifting baseline syndrome** [8,10], and erode people's expectations of the state of the
79 environment (i.e., what is normal or healthy) and their understanding of, and support for,
80 conservation and restoration efforts [8].

81 Given the significance of these impacts, understanding the phenomenon of societal
82 extinction could be important for mitigating the ongoing anthropogenic biodiversity crisis. Here, we
83 suggest underlying mechanisms and factors that could affect this process, and discuss potential
84 implications and mitigation measures.

85

86 **Societal salience dynamics, transformation and extinction**

87 *Communicative and cultural memory*

88 Collective memory and its two distinct but interrelated components—communicative and
89 cultural memory—drive societal salience of species [11]. **Communicative memory** (also referred
90 to as lived memory [9]) is generated through societal communication and interaction and
91 transmitted through personal interactions or contemporary dissemination channels, like news,
92 movies, social and other media [11-13]; its dynamics tend to be associated with relatively short
93 timeframes. **Cultural memory** (sometimes referred to as distant memory [9]) is maintained by
94 physical or digital recordings and cultural products, such as oral traditions, literature, paintings, and
95 other artworks; it typically unfolds over longer timeframes [11,12].

96 Both phenomena affect, and usually reinforce, one another. Communicative memory of
97 species is mainly based on personal memories of **direct experiences** and associated acts of
98 communication (Box 1). However, it is also shaped by cultural memory and **vicarious experiences**
99 based on cultural products [14]. In turn, species are more likely to feature in cultural products if
100 they are present in communicative memory, through recurrent encounters and interactions [15], or

101 **focusing events** [14]. Such communicative acts increase the potential for generating cultural
102 products, or restoring attention towards existing products, thereby contributing to cultural memory
103 [11,13].

104

105 *Species extinctions and societal salience dynamics*

106 Many species go biologically extinct without ever entering the cultural memory, or even
107 being discovered [16]. If known species decline, lose functional roles, and go extinct, the processes
108 that generate and maintain their societal salience typically fade away. Direct experiences with such
109 species gradually disappear and vicarious experiences dominate. Driven by the cessation of
110 experience [6,17], communicative memory is lost over time through individual and generational
111 amnesia, also termed shifting baseline syndrome [8,18,19]. For example, local knowledge of bird
112 species in southwestern China diminished following their extirpation, to the point that people were
113 unable to name any such species [20]. A similar story occurred among indigenous Tsimané in
114 Bolivia [19]. Transgenerational, collective memory of extinct species, their vocalizations and
115 appearance are lost [20,21]. Lack of records also contributes to this process; for instance, the
116 Honshu wolf (*Canis lupus hodophilax*) has only a few specimens in museum collections,
117 challenging its memory within Japanese society [21].

118 Reports of the dire state or extinction of salient species are often followed by a surge in
119 media and societal attention [22]. However, such increases are typically transient [23,24]. Species
120 losses are generally mirrored by reduced prominence in new cultural products and fading cultural
121 memory [15]. Nevertheless, we argue that societal extinction is context-dependent, non-binary, and
122 challenging to measure. For example, a species could become extinct from wider society but
123 maintain salience as media symbols or within smaller groups, such as rural or Indigenous
124 communities.

125

126 **Drivers of societal extinction**

127 The main factors affecting the magnitude and rate of societal extinctions include species
128 charisma, taxonomy, extinction time, spatial factors, sociocultural factors, ecology and
129 demography, technology, and the status and uncertainty of extinctions (Figure 2).

130

131 *Species charisma*

132 The charisma of a species affects its societal salience both before and after extinction and
133 may prolong or weaken the process of societal extinction. Charismatic species are often large,
134 colorful, with forward-facing eyes, and phylogenetically close to humans; they are usually
135 positively perceived, can be evolutionary outliers or otherwise behaviorally novel, but sometimes
136 also dangerous animals [25-29]. For example, the enduring popularity of the dodo (*Raphus*
137 *cucullatus*) and thylacine (*Thylacinus cynocephalus*) has led to their use as conservation flagships
138 [30] or as targets for **de-extinction** [31]. Decades to centuries after their biological extinction, they
139 feature prominently in cultural and commercial products, as mascots, emblems, and logos [32].
140 Some species may even become societally *more* salient post-extinction *because* they are extinct
141 [30], potentially undergoing **cultural transformation** (Box 2), and sometimes even leading to
142 'cultural mythicism' [33].

143 Most species, however, cannot become societally extinct because they never had a
144 societal presence. Such societal absence is common in uncharismatic, small, cryptic, or inaccessible
145 taxa. This includes most of biodiversity, predominantly invertebrates, plants, fungi and
146 microorganisms. Societally absent species can be divided into two sub-groups: (a) species that are
147 known by scientific and/or Indigenous experts but unknown by laypeople, and (b) species unknown
148 to humankind. The second group is part of the **Linnean shortfall** in biodiversity knowledge,
149 affecting understanding of societal salience and extinction.

150

151 *Taxonomy*

152 Societal taxonomies do not always align with biological taxonomy. Many biological
153 species are only societally salient as representatives of higher taxa, such as bats, sharks, or spiders.
154 Moreover, societal salience can also be shaped by morphological and **evolutionary distinctiveness**
155 [34]. For example, loss of a fish species from a large family such as Cyprinidae (e.g., Beyşehir
156 bleak, *Alburnus akili* [35]) would likely be perceived as less troubling than the extinction of the
157 Chinese paddlefish (*Psephurus gladius*), which was one of the last two members of the relict family
158 Polyodontidae [36]. Furthermore, public concern about extinction is more focused on the loss of
159 species than of subspecies or other evolutionarily significant units [37]. Moreover, some biological
160 species may have multiple societal identities, often regionally differentiated. For example, *Rangifer*
161 *tarandus* is known as reindeer in Northern Eurasia where it is herded and domesticated, but as
162 caribou in North America where it is not. In addition, societal identity can jump from one species to
163 another, mainly through taxonomic misidentification, as was the case with the red hen
164 (*Aphanapteryx bonasia*), which inherited the dodo's name and identity in Mauritius following the
165 extinction of the latter [38].

166

167 *Extinction time*

168 Extinctions can be distinguished by timeframe: contemporary, historic, or prehistoric. In
169 contemporary extinctions, collective memory of species includes lived memory and direct
170 experiences. Consequently, their extinction may be associated with strong emotions such as
171 environmental grief, loss, and shame [39,40], which can strengthen societal attention and memory.
172 In historic extinctions, species may remain within collective memory especially if they are iconic.
173 However, most are fully culturally transformed (Box 2), and often maintained only in folklore.
174 Rarely, awareness of societally extinct species can be restored from cultural products, as was the
175 case with extinct goose species identified from ancient Egyptian paintings [41]. Prehistorically

176 extinct species have never been part of human lived memory. These species can only enter cultural
177 memory through vicarious experiences from museums and popular media. For example, dinosaurs
178 only became known to science in the 18th century [42]. Their abstract, stylized, and symbolic
179 representation in culture is more akin to mythical creatures (e.g., unicorns, griffins, or dragons) than
180 real species.

181

182 *Spatial factors*

183 Societal salience and extinction dynamics vary spatially [32]. Collective memory is most
184 resilient within a species' geographic range, where it emerged through direct interactions [7].
185 Outside of ranges, collective memory arises predominantly through vicarious experiences (but
186 sometimes also in botanical gardens, zoos, and museums). However, following biological extinction
187 and cultural transformation, collective memories inside and outside the former range will converge.
188 Furthermore, local biological extinction could lead to societal extinction, while elsewhere the
189 species at issue may remain societally salient. The thylacine and the Tasmanian devil (*Sarcophilus*
190 *harrisii*) were both extirpated on mainland Australia in the mid-Holocene [43] and lost from
191 Indigenous people's memory. Concurrently, both species persisted in Tasmania, where they
192 remained important and salient among the Indigenous people.

193

194 *Sociocultural factors*

195 The importance of nature to societies and cultures has been studied at great length from
196 ethnographic and anthropological perspectives. Within this body of work, the importance of species
197 loss from shared experiences and memories has also been noted [44,45]. Sociocultural changes may
198 lead to societal extinction when species remain extant, as happens when the loss of Indigenous
199 societies, cultures, rights to land, or languages causes the loss of their collective memory of species
200 [46]. Cultural losses experienced by Indigenous communities from biological extinctions might be

201 more acute because of their strong cultural ties to species. Furthermore, socio-economic changes
202 driven by urbanization, industrialization, globalization, and modernization may radically change
203 relationships with nature, leading to collective memory loss. For example, the replacement of
204 traditional herbal medicine by modern medicine in Europe has degraded knowledge of many
205 medicinal species [47]. Societal extinction may accelerate as intergenerational environmental
206 knowledge-sharing is reduced [19]. More generally, sociocultural factors can decouple a species'
207 societal status from its biological status.

208

209 *Ecology and demography*

210 Demographic or ecological changes in extant species can also lead to societal extinction,
211 as happens if species go functionally extinct, or remain only in remote, inaccessible locations.
212 Species found in inaccessible habitats with low detectability, such as aquatic environments, are less
213 salient to begin with, so can easily become societally extinct [48,49]. Furthermore, collective
214 memory may fade more quickly for species whose habitats were lost. Societal extinction may also
215 be affected by changes in species population structure, such as shifts to less salient age classes,
216 behavior, or morphology.

217

218 *Technology*

219 New technologies can change the way we share and maintain collective memory. Internet
220 usage changes memory and attention at individual and population levels [50], while print and digital
221 media may replace oral traditions and older people's roles as keepers of collective memory [9].
222 Shifting to technology-mediated experiences of nature further affects public perceptions and
223 intensifies cultural transformation of species [51]. This process can accelerate via positive feedback,
224 whereby digital content drives the generation of similar content (e.g., memes), potentially
225 exacerbating representational inequality among species. Such digital amplification could accelerate

226 societal extinction, as local species representations are replaced by globally iconic species [52].

227

228 *Status and uncertainty of extinctions*

229 Finally, species extinction status and the potential of rediscovery or reintroduction can
230 also affect collective memory loss [39]. For example, a species may be perceived differently if it is
231 biologically extinct, compared to extinct in the wild. Moreover, uncertainty about whether a species
232 is extinct may help maintain its societal salience. Uncorroborated sightings of the ivory-billed
233 woodpecker (*Campephilus principalis*), long considered extinct, revived public interest, search
234 efforts, investments in recovery plans, and boosted birdwatching tourism [53]. Similarly, declaring
235 the extirpation of the ghost orchid (*Epigogium aphyllum*) in the UK raised its profile and boosted
236 search efforts by amateur botanists, eventually contributing to its rediscovery [54]. Species
237 rediscoveries and efforts towards extinction reversal, such as reintroductions, rewilding, or de-
238 extinction, often reinvigorate species societal presence [31,39,55].

239

240 **Implications and mitigation solutions**

241 *Consequences*

242 Understanding societal extinction of species is important for conservation theory, policy,
243 and practice. Collective loss of memory can weaken pro-environmental attitudes and behaviors
244 (Figure 2) [6,17]. Moreover, the shifting baseline syndrome changes public perceptions regarding
245 the natural state of the environment, and reduces likelihood of pursuing ambitious conservation
246 goals [8]. For example, megafaunal rewilding efforts might have greater support if wild Pleistocene
247 megaherbivore herds were preserved in collective memory. Reintroduction efforts of more recently
248 extirpated species, such as Eurasian beaver (*Castor fiber*) in the UK, may also suffer from their
249 absence in collective memory as natural parts of ecosystems [56]. Societal extinction of traditional
250 ecological knowledge can lead to cultural heritage loss [47].

251 In biologically extant but societally extinct species, societal absence may hinder
252 conservation measures and accelerate biological extinction if, for example, core habitat is destroyed
253 by development. Paradoxically, societal extinction could also be exacerbated by conservation
254 policies, for example those that restrict access to natural areas. Conversely, societal extinction can
255 help conservation by removing pressure on a species from exploitation or over-tourism [57].

256

257 *Mitigation solutions*

258 We suggest that conservation education and marketing campaigns could be important to
259 counteract societal extinction [26,58]. Reviving the memory of societally extinct species is
260 especially important when no living eyewitnesses remain [9]. Such initiatives should embrace a
261 biocultural perspective on extinction that transcends ecological aspects of species to include their
262 societal profile [39]. Indigenous people can be key allies in this process. Cultural memory of
263 species should be incorporated in outreach activities to drive conservation support [59]. Targeted,
264 long-term marketing campaigns could aim to increase connections with extinct species [30]. For
265 example, the National Threatened Species Day in Australia is held annually on September 7, the
266 anniversary of the death of the last captive thylacine in the Hobart zoo [60]. Finally, tackling the
267 process of societal extinction necessitates reducing the extinction of experience by, for example,
268 combining direct nature interactions with conservation marketing [6].

269 Collective memory also needs to be rekindled in reintroduction programs, especially for
270 species extinct in the wild. In the same way that cultural identity has been strengthened by
271 resurrecting dead languages (e.g., Cornish [61]), highlighting society's historic links with extinct
272 species could lay the groundwork for rewilding and reintroductions and increase conservation
273 support. A good example is Alagoas Curassow (*Pauxi mitu*), an endemic bird from northeast Brazil
274 that went extinct in the wild 40 years ago [62] and was reintroduced in 2019 [63]. Prior to
275 reintroduction it was the subject of a high-profile public campaign that used the slogan "Let's bring

276 this Alagoan home", explicitly linking its reintroduction to regional cultural identity.

277

278 **Concluding remarks**

279 Ultimately, the escalation of societal extinction can cause many problems for
280 conservation practitioners (see Outstanding Questions). The ongoing extinction crisis and
281 increasing disconnection of humans from nature are creating a growing **societal extinction debt**,
282 with many occurrences of societal extinction likely lying ahead. Sustaining awareness of species
283 and their threats also holds cognitive and emotional consequences for individuals [64]. Resolving
284 these issues will require multidisciplinary approaches that go beyond ecology and conservation
285 biology.

286

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303

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526 **Box 1. Direct and vicarious experiences.**

527 Collective memory of a species stems from both (1) direct or embodied experiences, and (2)
528 indirect, vicarious, or disembodied experiences [51]. Direct experiences are mainly built through
529 direct human-nature interactions based on sensory (mainly visual and acoustic) contact [7]. As such,
530 they are associated with specific, first-hand species knowledge and awareness, its morphology,
531 behaviour, environment, and its cultural ecosystem services. Except for contact with species in
532 captivity, especially in zoos and botanical gardens [65], direct experiences are spatially constrained
533 to the species' range. Direct experiences are also highly dependent on a species' abundance,
534 population trends, behaviour, visibility, and accessibility.

535 Conversely, vicarious experiences are based on virtual exposure to species (i.e., without
536 direct sensory contact with the species), through various physical or digital records from natural
537 history, literature, art, oral traditions, and media [66]. While vicarious experiences may involve
538 realistic species representations, they can also be highly stylized, symbolic, or even fantastical
539 representations (e.g., anime), and may not directly link to species in their natural settings [51,65].
540 They tend to be less dependent on species presence, distribution, or status, and are more influenced
541 by other factors, such as a species' charisma, historical fame, socio-economic or symbolic value.
542 The type of experience on which a memory is based can affect its characteristics. Individual
543 vicarious memories tend to be faint and ephemeral, while direct experiences, especially those
544 associated with strong emotions, generate more long-lasting individual memories [9,51], and even
545 environmental epiphanies [67]. Also, the psychological intensity of an individual's nature
546 experience is often positively correlated with their resulting drive to achieve pro-environmental
547 actions [68].

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552 **Box 2. Cultural transformation.**

553 Following their biological extinction, some species undergo societal extinction, while
554 others remain societally salient, or even increase in presence (Figure 1). However, collective
555 memory of such extinct but salient species often undergoes substantial changes: it is disassociated
556 from its biological identity and culturally transformed. Direct experiences and lived memory are
557 lost, while vicarious experiences and inaccurate, stylized, or simplified representations become
558 dominant [51]. For example, following the extinction in the wild of the Spix's macaw (*Cyanopsitta*
559 *spixii*), children living within the Curaçá municipality, part of its previous range, incorrectly
560 believed that this species resides in Rio de Janeiro following its appearance in the animated movie
561 'Rio' [69]. Moreover, prior to extinction, virtual species can compete with the real populations for
562 societal attention and provide a false appearance of abundance [70]. Processes of cultural
563 transformation mostly occur in species that were societally salient. These species have more virtual
564 representation in commercial, artistic, and cultural outlets, which enables the disassociation of their
565 societal from biological fates [70].

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577 **Glossary:**

578 **Collective memory:** shared pool of memories, sustained by a community.

579 **Communicative (lived) memory:** memory generated through societal communication and
580 interaction.

581 **Cultural (distant) memory:** memory maintained by physical or digital recordings and cultural
582 products.

583 **Cultural product:** tangible and intangible creations of a particular culture.

584 **Cultural transformation:** substantial changes in collective memory of a species, characterized by
585 its disassociation from its biological identity.

586 **De-extinction:** recreation of once-extinct species, such as by genetic resurrection [31].

587 **Direct (embodied) experiences:** experiences built through direct human-nature interactions based
588 on sensory contact [66].

589 **Extinction of experience:** progressive loss of daily interactions between people and nature [6].

590 **Evolutionary distinctiveness:** the amount of non-redundant evolutionary change embodied within
591 a given taxon [34].

592 **Focusing events:** sudden, relatively uncommon attention-grabbing events, which often concentrate
593 attention on previously dormant issues.

594 **Linnean shortfall:** the major gaps in taxonomic knowledge, with only a fraction of species
595 worldwide described by science.

596 **Shifting baseline syndrome:** a gradual change in the accepted norms for the condition of the
597 natural environment due to lack of past information or lack of experience of past conditions [8].

598 **Societal extinction debt:** time-delayed societal extinctions of species.

599 **Societal extinction of species:** loss of societal attention and collective memory of a species.

600 **Society:** a group of people who live together in a particular social system.

601 **Vicarious (indirect, disembodied) experiences:** experiences based on virtual exposure to species,
602 through various physical or digital records from literature, art, oral traditions, and media [66].

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626 **Figure captions**

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628 **Figure 1. Diagram outlining the main conceptual types of trajectories of societal extinction.**

629 Trajectories are based on biological and societal species status (extant or extinct). Continuous red
630 line – standard scenario, societal salience declines following species extinction towards complete
631 societal extinction. Blue dashed line – societal extinction occurs while the species is still extant,
632 often due to different socio-cultural, demographic or ecological changes. Green dotted line –
633 species experiences increasing societal salience following its biological extinction, most often due
634 to its charisma and value. Orange striped line – societal salience of a species remains unaffected by
635 its extinction, often because it was already culturally transformed. Black dash-dotted line – species
636 was already societally absent prior to biological extinction, so its societal status remains unaffected
637 by its disappearance. The figure presents only the major types of scenarios, while there are many
638 more possible variants and more complex combinations of trajectories. It also does not present
639 transient peaks in societal salience, such as those that often follow extinction reports, nor the
640 trajectories characterized by extinction 'reversal', for example due to species rediscovery,
641 reintroduction, or de-extinction.

642

643 **Figure 2. Framework displaying the causes and consequences of societal extinction.** Societal

644 extinction is caused by collective memory loss, driven either by population decline and species
645 extinction, or by different societal factors that can decouple the process of societal extinction from
646 the biological status of a species, often through the process of cultural transformation. Societal
647 extinction process could be affected by several main drivers: extinction time, status and uncertainty
648 of extinctions (extinction status/certainty), ecology and demography (ecology/demography),
649 taxonomy, species charisma (charisma), spatial factors, sociocultural factors, and technology. It

650 leads to a loss of interest in societally extinct species, decreased support for conservation or
651 reintroduction measures, and decreased conservation outcomes, which in turn drive and further
652 strengthen the causes of societal extinction. Links among the elements are to a great extent
653 hypothesized, and further studies are now needed to assess and quantify evidence for such links.

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1 **Highlights**

2 - Just as population declines may lead to biological extinction, the decline of collective attention
3 and memory may lead to the societal extinction of species.

4 - Direct and vicarious experiences with species affect their societal salience and likelihood of
5 societal extinction.

6 - Societal extinctions affect perceptions of the environment, lead to a shifting baseline syndrome,
7 hinder establishment of more ambitious conservation/restoration targets, and diminish support for
8 conservation efforts.

9 - Several mitigation actions, relying predominantly on conservation education and marketing, are
10 needed to reduce or reverse the societal extinction of species.

11

1 **Outstanding questions**

- 2 - Under what conditions, and over what spatial scales, is societal extinction of a species likely to
3 occur and to progress more rapidly?
- 4 - Can we tease apart the biological from human drivers of societal extinction?
- 5 - How omnipresent and differently manifested is societal extinction across societies, and how
6 specific is it?
- 7 - Under what conditions does preventing societal extinction of a species make it less likely to
8 become biologically extinct?
- 9 - What are the best methods to record and maintain local and indigenous knowledge of species?
- 10 - What is the relationship between the ongoing process of loss and impoverishment of languages
11 and societal extinction?
- 12 - What are the best approaches and strategies for societal de-extinction?
- 13 - What measures are needed to promote public awareness of societally non-existent species, and
14 how do such interventions differ from (and influence) those aimed at maintaining interest in salient
15 (societally extant) species?
- 16 - Should we strive to remind people about fully or nearly extinct species with an impending or
17 already manifested societal extinction, or should we allocate efforts to other species that are more
18 likely to societally persist?
- 19 - Could a stronger focus on societally extinct species detract much needed attention from imminent
20 or future societal extinction risks to other species, and how can we balance this potential trade-off?
- 21 - When does mainstreaming knowledge about a species risk increase in the threats to its survival,
22 for example through unsustainable exploitation?
- 23 - Will focusing on societal extinction take conservation attention from other conservation issues, or
24 are these new messages mostly synergistic with previous ones?
- 25 - What are potential negative effects of promoting cultural and national identity through local
26 nature?

27 - Should we always strive to combat collective memory loss, or should we accept that there are
28 human psychological and cognitive constraints that will inevitably lead to a change in saliency for
29 different species through time?
30 - Are the emotional costs of remembering species too high for individuals, given the growing
31 prevalence of ecological grief?
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