

FULL TEXT:

- Everard, M., Pinder, A.C., Raghavan, R. and Kataria, G. (2019). Viewpoint: Are well-intended Buddhist practices an under-appreciated threat to global aquatic biodiversity? *Aquatic Conservation: Marine and Freshwater Ecosystems*, pp.1–6. <https://doi.org/10.1002/aqc.2997>.

## 1 **Viewpoint:**

# 2 **Are well-intended Buddhist practices an under-** 3 **appreciated threat to global aquatic biodiversity?**

4  
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## 20 21 **Abstract**

- 22 1. The inherently pro-conservation and humane Buddhist practice of ‘live release’,  
23 entailing release into the wild of creatures destined for slaughter, poses potentially  
24 significant conservation consequences if inappropriate, invasive species are procured  
25 for release.
- 26 2. We collate evidence, citing one legal case and other examples, about the risks of live  
27 release of potentially invasive aquatic species that may result in serious, possibly  
28 irreversible conservation threats to aquatic biodiversity and natural ecosystems with  
29 ensuing adverse ecological and human consequences.
- 30 3. It is essential that practitioners are aware of these risks if their actions are not to work  
31 diametrically against the pro-conservation and humane intents of the practice.
- 32 4. Ensuring that live release occurs safely necessitates awareness-raising and  
33 guidance informed by science to ensure that good intentions do not result in  
34 perverse, environmentally destructive outcomes.

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35 5. We propose four simple principles to achieve this, for dissemination to the global  
36 adherents of these otherwise entirely laudable practices.

37

## 38 **Keywords**

39 Live release; mercy release; invasive species; humane; conservation; fish

40

## 41 **1. Introduction**

42 Biotic homogenisation – declining biological diversity resulting from environmental  
43 changes favouring a subset of species – is a pervasive global problem (McKinney &  
44 Lockwood, 1999), reaching substantial levels in some regions of the Palearctic and  
45 Nearctic realms (Villéger, Blanchet, Beauchard, Oberdorff, & Brosse, 2011). Scott &  
46 Helfman (2001) observed that fish species are prone to biotic homogenisation due to  
47 the pressures of habitat destruction, favouring a few tolerant species, as well as  
48 purposeful introductions that may also lead to extinctions of native species. Across  
49 other taxonomic groups, potentially invasive species introduced beyond their native  
50 ranges are a significant factor driving environmental change, extinctions of formerly  
51 locally representative species increasing the tendency towards genetic, taxonomic or  
52 functional similarity between locations with broader consequences for ecological and  
53 evolutionary processes (Olden, Poff, Douglas, Douglas, & Fausch, 2004). Liu, Comte,  
54 & Olden (2017) provide a review of life history traits of the world’s freshwater fishes as  
55 predictors of invasion and extinction risk to support management decisions without  
56 needing to refer to individual species ecology to support decisions.

57 The Buddhist practice of ‘live release’, also known by many alternative names including  
58 ‘fang sheng’, ‘mercy release’ and ‘prayer animal release’, entails the release into the  
59 wild of captive animals and particularly those destined for slaughter. The practice is  
60 founded on the good intention of protection of living organisms. However, it also  
61 represents a potential pathway for introduction of non-native and potentially invasive  
62 species, which may have perverse outcomes for the conservation of ecosystems into  
63 which they are released. The primary aim of this paper is to provide initial evidence  
64 raising awareness of a potential emerging yet poorly researched threat to aquatic  
65 conservation. This aim is approached from an ecological perspective, without being  
66 critical of the human value dimensions that underpin these otherwise laudable actions.

67

## 68 **2. Causes and conservation impacts of alien freshwater fish introductions**

69 Riccardi & Rasmussen (1998) recognise eleven factors predisposing aquatic organisms  
70 to becoming invasive (see Table 1). Assessment of the suitability of fish species for  
71 aquaculture tends to address factors such as growth rate and hardiness (for example Ali  
72 *et al.*, 2016), generally omitting consideration of native provenance or potential for  
73 invasion of the regions in which the fish are produced. Aquaculture is consequently  
74 widely observed to be a source of alien invasive species posing conservation threats to  
75 invaded ecosystems, with freshwater fish homogenisation driven by a few widespread

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76 non-native species globally (Toussaint, Beauchard, Oberdorff, Brosse, & Villéger,  
 77 2016). Numerous examples range from temperate system non-native salmonid  
 78 invasions associated with declines of native fishes (Arismendi *et al.*, 2009) to  
 79 widespread tropical invasions by Nile tilapia, *Oreochromis niloticus* (Linnaeus 1758)  
 80 (Schofield, Peterson, Lowe, Brown-Peterson, & Slack, 2011). Table 1 records the high  
 81 coherence between species suitability for aquaculture and predisposition to become  
 82 invasive. Vilà & Hulme (2017) address multiple direct and indirect consequences of  
 83 biological invasions on ecosystem services, including those of farmed fishes. The  
 84 ornamental fish trade is also a significant vector for invasive fishes (for example Costa-  
 85 Pierce, 2003; Gozlan, Britton, Cowx, & Copp, 2010; Raghavan, Prasad, Anvar-Ali, &  
 86 Pereira, 2008). So too is fish stocking, both legal and illegal, in support of recreational  
 87 angling (Davis, & Darling, 2017), as well as accident releases such as through bait  
 88 releases, aquaculture escapes or ballast water transport (Lintermans, 2004; Gupta, &  
 89 Everard, 2017). Notwithstanding individual species life history traits favouring population  
 90 establishment, propagule pressure (i.e. the combination of numbers of introduced  
 91 individuals, the number of introductions and temporal introduction rate) has also been  
 92 demonstrated to be crucially important and a potentially overriding factor in determining  
 93 invasion success and impact (Simberloff, 2009).

94 *Table 1: Attributes of aquatic organisms predisposed to become invasive and also*  
 95 *suitability for aquaculture*

Attributes of aquatic organisms predisposed to become invasive (Riccardi & Rasmussen, 1998)	Suitability for aquaculture with suggested reason	Suitability for aquarist use with suggested reason
1. Abundant and widely distributed in their original range		
2. Wide environmental tolerance	Hardy in crowded rearing conditions	Hardy in crowded aquarist conditions
3. High genetic variability		
4. Short generation time	Highly fecund with short generation time for rapid production	Easy to breed for ornamental fish trade
5. Rapid growth	Grows rapidly suiting production in aquaculture conditions	Rapid growth for ornamental fish trade
6. Early sexual maturity	Highly fecund with short generation time for rapid production	Rapid growth to maturity and breeding for ornamental fish trade
7. High reproductive capacity	Highly fecund with short generation time for rapid production	Fecund, for rapid production and profitability in aquarist trade
8. Broad diet (opportunistic feeding)	Acceptance of diverse diets in rearing conditions	Acceptance of diverse diets in aquarist conditions
9. Gregariousness	Tolerant of crowded rearing conditions	Tolerant of crowded fish-keeping conditions

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10. Possessing natural mechanisms of rapid dispersal		
11. Commensal with human activity (e.g. transport in ship ballast water, or trade of ornamental species for aquarists)	Suited to aquaculture with brood stock readily transported	Suited to aquarist conditions with ready transport for trade

96

97

98 **3. The Buddhist practice of ‘live release’**

99 The Buddhist practice of ‘live release’ is founded on good intentions relating to the  
100 protection of living organisms. However, perverse outcomes may ensue if uninformed  
101 releases of potentially invasive organisms impact native biodiversity.

102 The release of captive animals for religious purposes has historically been a traditional  
103 practice in many religions of Asian origin, including both Buddhism and Taoism, and is  
104 especially prevalent in the Buddhist doctrine (Agoramorthy & Hsu, 2007). Live  
105 release, also known as ‘mercy release’ or Tsethar in the Tibetan tradition, is the  
106 Buddhist practice of saving the lives of beings destined for slaughter and is part of all  
107 schools of Buddhism: Theravada, Mahayana and Vajrayana. By buying and releasing  
108 animals destined to be killed, live release puts the ideal of compassion into practical  
109 action, in part as compensation for the inevitable collateral killing of organisms as  
110 humans walk, breathe and conduct their lives. Whilst live release may be initiated  
111 spontaneously to save an endangered life, it can also be planned in the form of  
112 purchasing animals directly from slaughterhouses, fishermen or other sources,  
113 frequently planned around auspicious days in the Buddhist calendar to amplify the merit  
114 of the act. The Humane Society International (2012), in a report from a conference co-  
115 hosted with The American Buddhist Confederation, record that problems stem from the  
116 fact that “...mercy release has become an industry built on the capture and supply of  
117 wild animals, for whom there are devastating consequences of injury, illness or death”.

118 The ancient origins of this practice may have meant that animals were released into  
119 their native environments. However, live release of animals in an increasingly  
120 internationalised society has the potential to generate negative environmental impacts.  
121 For example, some animals are captured for the explicit purpose of being released, or  
122 are released into environments where they are unable to survive (Humane Society  
123 International, 2009). A gross example is the bird market in Mong Kok, Hong Kong, a  
124 major tourist attraction, where captive-bred budgerigars (*Melopsittacus undulatus*), Java  
125 sparrows (*Lonchura oryzivora*) and various finch species are made available for  
126 purchase by the pious for freeing under ‘fang sheng’ (“giving life”) rituals that tend to  
127 result in the early deaths of organisms not adapted to wild or local conditions (Wordie,  
128 2017). However, a more problematic potential outcome is that live release provides an  
129 as yet unquantified pathway for introduction of invasive species into non-native  
130 environments, with the potentially perverse outcome of substantial ecological harm  
131 including the progressive loss of local biodiversity (Shiu & Stokes, 2008).

132 Despite the best of intentions, some examples of live releases have been associated  
133 with conservation concerns and sometimes legal consequences (Severinghaus & Chi,

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134 1999; Agoramoorthy & Hsu, 2007; Liu, McGarrity, & Li, 2012). As one example, Tsethar  
135 practices are arising as a significant concern in Bhutan, an exceptional region for  
136 freshwater fish biodiversity, where African Catfish (*Clarias gariepinus*) are imported live  
137 from Bangladesh via Kolkata and sold for release by religiously inclined Bhutanese  
138 people (Gurung, 2012). Whilst *Clarias gariepinus* is itself of Least Concern on the IUCN  
139 Red List (Freyhof, FishBase team RMCA, & Geelhand, 2016), it is also listed as having  
140 a wide tropical distribution beyond its native range where it has been listed as a  
141 'Potential Pest' (Froese, & Pauly, 2018) and has been associated with significant  
142 ecosystem disruption (for example Cambray, 2003; Weyl, Dagall, Ellender, & Vitule,  
143 2016). If awareness and education about the ecological consequences of such  
144 practices is not provided to local communities, this may serve as a major avenue for the  
145 introduction of alien species into the freshwaters of Bhutan (Gurung, Dorji, Tshering, &  
146 Wangyal, 2013). In the Yunnan province of China, Jiang, Qin, Wang, Zhao, Shu, *et al.*  
147 (2016) concluded that the introduction since 2009 of two species of non-native  
148 weatherfishes (*Misgurnus anguillicaudatus* and *Paramisgurnus dabryanus*) through the  
149 practice of 'prayer animal release' and their subsequent increasing populations was  
150 putting at risk the threatened native freshwater fish *Ptychobarbus chungtienensis* in  
151 Shangri-La region. In considering 'Deliberate release for cultural reasons', constituting  
152 one of twelve pathways of human-assisted dispersal of freshwater fishes in Australia,  
153 Lintermans (2004) noted that the 2001 Census recorded that 1.9% of the Australian  
154 population were Buddhists and reported anecdotal evidence suggesting that purchase  
155 and release of aquarium species for live release was not uncommon albeit entirely  
156 unquantified

157 Unregulated mercy releases have also resulted in the red-eared slider turtles  
158 (*Trachemys scripta elegans*) native to central America, but which are widely invasive  
159 (van Dijk, Harding, & Hammerson, 2011) yet readily procured from pet shops in the US,  
160 dominating and outcompeting native terrapin species in New York's Central Park  
161 (Selleck, 2015). Indicative of the potential scale of the problem, mindful of the large  
162 number of ceremonial animal release events occurring globally in accordance with the  
163 traditions of Buddhism and other Asian religions, Liu, McGarrity, Bai, Ke, & Li (2013)  
164 evaluated the release of two highly invasive species (American bullfrogs *Lithobates*  
165 *catesbeianus* and red-eared slider turtles *Trachemys scripta elegans*) by 123 Buddhist  
166 temples surveyed across four provinces in China correlated with intensive field surveys  
167 of release sites, finding that both bullfrogs and sliders were present at the majority of  
168 sites where release of these species was reported. Given the large numbers of such  
169 temples in this region and the pervasion of religious observants across the world, the  
170 scale at which live release could potentially be happening is substantial. Gong, Chow,  
171 Fong, & Shi (2009) record that China is the largest consumer of turtles in the world  
172 serving markets for two main types of local and international trade: for food and  
173 traditional Chinese medicine; and for release by Buddhists. Liu *et al.* (2012) tabulate  
174 evidence from a search of literature and news reports for the global occurrence of  
175 religious wildlife release, though the literature on aquatic species and particularly their  
176 impacts are largely addressed in this summary highlighting the scale of the knowledge  
177 gap.

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178 West (1997) reports that a small congregation of seven Buddhist adherents led by a  
179 monk procured 2,500 goldfish from a storefront temple in New York's Chinatown and  
180 transported them for ritual release in Westons Mill Pond, a reservoir for the city of New  
181 Brunswick as an act of compassion but which was perceived by scientists and wildlife  
182 experts as introducing competition to and potentially outbreeding native species of  
183 perch, sunfish, catfish and of aquatic fauna. The same report recorded conservation  
184 concerns likely to arise from freeing caged birds that are more likely to die than thrive in  
185 their new environments, and that release by Buddhists of turtles into ponds in Brooklyn's  
186 Prospect Park and Central Park also had the potential to perturb local aquatic  
187 ecosystems directly and through the introduction of diseases as well as genetic  
188 dilution. As a general principle, relevant to some instances of live release but also wider  
189 conservation matters, introductions of even conspecific species may perturb  
190 ecosystems posing a threat to conservation though genetic homogenisation including  
191 the introduction of non-native genes and the loss of local adaptation (Champagnon,  
192 Elmberg, Guillemain, Gauthier-Clerc, & Lebreton, 2012).

193 Fish invasions are known to have significant knock-on effects on the conservation of  
194 freshwater ecosystems, their functions and associated biota. Whilst not inferring that it  
195 was consequent from live release, radical degradation of both aquatic and avian  
196 biodiversity has followed the introduction of alien common carp (*Cyprinus carpio*) to  
197 Medina and Zoñar Lakes in South Western Spain. Driven by the destruction of  
198 submerged macrophyte beds via mechanical disturbance and elevated turbidity, the  
199 invasion of *C. carpio* and other non-native fishes throughout the fresh waters of the  
200 Mediterranean region is now recognised as a major threat to water birds, including  
201 globally threatened taxa such as white-headed duck (*Oxyura leucocephala*), listed as  
202 Endangered on the IUCN Red List (BirdLife International, 2017) (Maceda-Veiga, López,  
203 & Green, 2017). Similarly, tilapia, *Oreochromis* spp. and *C. gariepinus* have invaded  
204 and now totally dominate Jal Mahal, the water palace lake in Jaipur (Rajasthan state,  
205 India), with knock-on consequences for avian biodiversity, further extending the  
206 negative socioeconomic implications for bird-watching based ecotourism (H. Vardhan,  
207 pers. com. & author observations). (Invasion of Jal Mahal by *Clarias gariepinus* and  
208 *Oreochromis* spp. has yet to feature in the peer-reviewed literature but is well-known  
209 locally, observed by the authors and other local biologists, and there are many  
210 YouTube.com clips of the two species in vast numbers and also sometimes turning up  
211 dead as the lake goes anoxic.)

212 There is limited case law at present relating to the potential ramifications of live release.  
213 However, in the UK, two Buddhists performing a live release ritual were convicted, fined  
214 and ordered to pay compensation in September 2017 of offences under the Wildlife and  
215 Countryside Act 1981 for releasing non-native lobsters into the sea, potentially causing  
216 “untold damage” to marine life (Sherwood, 2017).

217

#### 218 **4. Conclusions and recommendation**

219 At present, there appears to be little awareness about potential perverse, unintended  
220 outcomes from live release practices for aquatic and other wildlife, a lack of  
221 quantification of conservation impacts, and consequently no effective, proactive

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222 interventions to avert them. Nor is there a great deal of scientific study to back up  
 223 management advice. Table 2 documents the outcomes of searches on the University of  
 224 the West of England’s online library resources (dated 20<sup>th</sup> April 2018) using the filter of  
 225 ‘Scholarly and peer reviewed’ sources. Although many pertain to the intent of doing no  
 226 harm, only a small number of sources relate directly to the problem of unintended alien  
 227 species invasions affecting aquatic conservation.

228 *Table 2: Searches of the online libraries for ‘scholarly and peer reviewed’ documents*  
 229 *relevant to alien species invasions from live release affecting aquatic nature*  
 230 *conservation*

Search terms	Number of hits	Number of relevant hits
(live release) AND (buddhist) AND (invasion)	657	3, assessed from top 100 beyond which relevance declined substantially (Agoramoorthy & Hsu, 2007; Shiu & Stokes, 2008; Gong, Chow, Fong, & Shi, 2009; Liu, McGarrity, Bai, Ke, & Li, 2013)
(live release) AND (buddhist) AND (fish)	680	4, assessed from top 100 beyond which relevance declined substantially (Agoramoorthy & Hsu, 2007; Shiu & Stokes, 2008; Gong, Chow, Fong, & Shi, 2009; Liu, McGarrity, Bai, Ke, & Li, 2013)
(live release) AND (buddhist) AND (conservation)	346	5, assessed from top 100 beyond which relevance declined substantially (West, 1997; Agoramoorthy & Hsu, 2007; Shiu & Stokes, 2008; Gong, Chow, Fong, & Shi, 2009; Liu, McGarrity, Bai, Ke, & Li, 2013)

231

232 It is not the intent of the authors to denigrate or deter any pro-conservation or pro-  
 233 environmental intent. The authors have not received any external funding or influence  
 234 to research and publish this paper, simply acting on their own volition and concern to  
 235 raise the profile of an emergent and material concern in support of improving the safety  
 236 and the intended outcome of the practice of live release. However, this analysis of  
 237 potential and still largely unquantified risks of perverse outcomes for nature  
 238 conservation and dependent human livelihood needs arising from a traditional practice  
 239 is highlighted as an issue requiring more research and precautionary action. In  
 240 particular, we invoke the Precautionary Principle, a strategy to cope with possible risks  
 241 from human activities that may lead to morally unacceptable harm that is scientifically  
 242 plausible but uncertain (EC, 2000). The Humane Society International (2012), in  
 243 collaboration with The American Buddhist Confederation, announced an intention to  
 244 “...support animal welfare instead of the ritual of releasing animals, such as birds, fish  
 245 and turtles, into the wild”, a useful contribution to modernisation of the inherently  
 246 virtuous intent to Buddhist practices but falling short of addressing conservation risks  
 247 and particularly across the wider world.

248 The Theravada, Mahayana and Vajrayana schools of Buddhism are common in Tibet,  
 249 Nepal, Mongolia, Inner Mongolia, Tibet, China, Myanmar, Laos, Thailand, Cambodia,  
 250 Vietnam, Korea, Japan and Sri Lanka, also spreading into adjacent nations and more  
 251 remotely in pockets. Consequently, although published evidence is lacking, it can be

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252 assumed that ecological risks associated with uninformed live releases are potentially  
253 globally pervasive. Further research is needed to establish the level of risk, and so to  
254 inform the most appropriate responses.

255 Liu *et al.* (2013) found that ecological knowledge of invasive species reduced the  
256 probability of release at the Chinese temples they were studying, but that conversely  
257 market availability increased the probability of release. Targeted public education about  
258 invasive species could therefore be an effective strategy for preventing religious release  
259 of invasive species on a global scale. Drawing from the eleven attributes of aquatic  
260 organisms predisposed to become invasive (Riccardi & Rasmussen, 1998), we  
261 therefore recommend that Buddhist adherents undertaking the traditional practice of live  
262 release should observe the precautionary considerations in Table 3. This form of  
263 precautionary approach is already inherently included in some national legislation  
264 relating to import of alien fishes, for example under the UK's *Import of Live Fish*  
265 *(England and Wales) Act 1980* (HM Government, 1980). ILFA (as the Act is known)  
266 specifically schedules a number of known problematic invasive fish species, but also  
267 applies more generally to all fish species that have the potential to escape and form  
268 self-perpetuating populations.

269 *Table 3: Precautionary principles for ecologically safe Buddhist 'live release'*

Precautionary principles for ecologically safe 'live release' include that aquatic species should be:

- Native to the geographical range in which they are to be released;
- Of local genetic provenance, so as to avoid dilution of locally adapted strains;
- Released only in numbers that will not dominate the ecosystems into which they are placed; and
- Unlikely to change ecosystem balance, for example by significantly increasing predation or sediment mobilisation.

270

271 Chong (2012) calls upon conservationists to recognise the powerful role of religion in  
272 Burmese society and to engage its potential in support of sustainable development.  
273 Gong, Hamer, Meng, Meng, Feng, & Xue (2012) recognise that Buddhist leaders can  
274 play significant roles in environmental protection in Myanmar and potentially other Asian  
275 countries, whilst also acknowledging that this may be hampered by lack of ecological  
276 understanding citing particularly uninformed practice of 'prayer animal release' and the  
277 captive animal trade associated with it. The aim of the paper is to assist conservation  
278 and religious organisations and other institutions with influence on live release  
279 practitioners and communities to raise awareness and offer practical guidance about the  
280 holistic animal welfare issues associated with fang sheng. We recognize the need to  
281 assist Buddhist practitioners and their advisers about what constitutes a non-native  
282 species, for which we suggest the definition "A species introduced by humans – either

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283 intentionally or accidentally – outside of its natural past or present distribution”, adapted  
284 from a definition provided by IUCN (2018). Science-based professional societies,  
285 conservation organisations and NGO networks may also have roles to play in helping  
286 disseminate key messages, as the Humane Society International has already  
287 demonstrated in its collaboration with The American Buddhist Confederation.

288 As a significant, as yet unquantified, number of releases of aquatic organisms occur in  
289 developing countries where data about biological baselines as well as widespread  
290 knowledge of risks to ecology and ecosystem services is lacking, these risks will  
291 generally be proportionately under-recognised. In the longer term, further research  
292 linked to local capacity building with associated education can shape a more  
293 precautionary approach by local communities. However, a more direct route for uptake  
294 of these precautionary principles in the interim is their onward communication by  
295 influential people and institutions in the global Buddhist community to ensure that  
296 practical outcomes are consistent with the pro-conservation and humane intent of live  
297 release, averting perverse unintended negative consequences for nature conservation  
298 and human livelihoods.

299

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