



Translocation of bolder birds could provide benefits to Mediterranean osprey populations under current conditions of high human frequentation in natural areas

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Recently, [Martínez-Abraín et al. \(2022\)](#) pointed out that considering animal personalities in translocation programs could be beneficial to their success. [Boldness cannot save osprey in its Mediterranean ecosystem: a reply to Martínez-Abraín et al, 2022](#) agreed with the relevance of accounting for individual personalities within the context of animal conservation translocations, which is the main take-home message of the original essay. However, the above-cited authors strongly disagree with one specific example: the likely advantages of releasing bolder osprey in populations of shy-selected individuals, currently subjected to high human frequentation due to massive tourism. More specifically, the authors of the correspondence note disagree with the release of osprey individuals from continental European populations in translocation programs implemented in the Mediterranean. I would like to clarify some points:

1. Although no study has shown yet that continental European osprey populations are composed in a higher frequency by bolder individuals compared to Mediterranean populations, this assumption seems very likely based on several ecological facts: A) direct human persecution of raptors in central and northern Europe ceased earlier in northern latitudes than in southern European latitudes (see [Brochet et al., 2016](#)). For example, only 3 osprey pairs were remaining in Corsica in 1974, and only 7–8 in the Balearic Islands (4–5 in Mallorca) as late as the 1980s (M. Suárez, T. Muñoz, M. Rebassa, pers. com.). Hence, the few remaining pairs in the Mediterranean (i.e. the likely source population for any future unaided recovery) are expected to be very shy individuals nesting in the most remote places and avoiding contact with humans as much as possible and thus very easily disturbed when faced with humans. B) continental osprey typically nest on trees rather than cliffs; nesting on trees rather than cliffs (despite rock outcrop availability) has been interpreted recently by [Martínez-Abraín et al. \(2021\)](#) as a likely sign of higher raptor boldness, because trees can be more readily accessed by humans than cliffs. Our prediction is that raptors (including osprey) in Mediterranean latitudes most likely will increasingly move to nest on trees in the near future not only as these become more abundant (as a consequence of farming abandonment driven by tourism

growth), but also because raptors are directly persecuted at negligible levels now ([Martínez-Abraín et al., 2008, 2009, 2013](#)). And C) continental populations are much larger than those in the Mediterranean and hence it is more likely that they preserve more variability in the bold-shy genetic continuum than Mediterranean populations.

2. The bold/shy continuum is known to have a genetic component as well as epigenetic and cultural components. Whatever the origin of the likely higher boldness of continental osprey, current environmental conditions (i.e. low to nil direct human persecution but high harmless visitor frequentation) do not select for shyness but rather for boldness. All reproductive individuals acquiring a tamer behaviour by any means would have fitness gains when faced with human visitors, as their main current conservation problem seems to be reduced breeding success due to fear to human presence ([Monti et al., 2018a](#)). Despite low breeding success the trend of the Corsican population has been positive during the last part of the 20th century and the early part of the 21st century. Whereas during the 19th century and until 1960 the osprey population was estimated at 40–100 breeding pairs, by 1964 there were less than 10 pairs, and in 1974 a minimum number was recorded with just 3 pairs. However, from there on the population has been recovering with 11 pairs in 1979, 16 in 1990, 25–27 in 1996 and 38 pairs in 2014 ([Schmidt-Rothmund et al., 2014](#)), despite increasing tourism trends.
3. Genetic differences between continental and Mediterranean populations have not been found to be large, either considering mitochondrial DNA or nuclear microsatellites. The small genetic differences found ([Monti et al., 2015](#); [Monti et al., 2018b](#)) are to be expected from a strong bottle neck generated after intense human persecution during several centuries. By no means it is acceptable the unjustified statement by [Boldness cannot save osprey in its Mediterranean ecosystem: a reply to Martínez-Abraín et al, 2022](#) that osprey have entered a “speciation process” since the last ice ages. This is confounding bottle necks, founder effects, genetic drift or luckily some adaptive microevolution with the process of macroevolution in animals that does not consist on the linear accumulation of small changes over time, but rather on unpredictable non-linear changes in regulatory sequences of gene expression during

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<https://doi.org/10.1016/j.biocon.2022.109642>

Available online 24 June 2022

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development, changes caused by jumping genes during periods of hypermutation, and even hybridization, among other non-linear mechanisms. In addition, there is some gene flow between both populations. Mediterranean individuals have been found to breed in continental populations and vice versa, although in low frequencies (Monti et al., 2018b). On the other hand, differences in migratory behaviour between continental and island populations are to be expected because raptors tend to become sedentary after colonizing islands (Ferrer et al., 2011). Nevertheless, Mediterranean populations are not as sedentary as previously thought (see e.g. a case of a GPS-marked osprey in Mallorca that overwintered in Africa in <https://www.europapress.es/illes-balears/noticia-gob-monitoriza-re-greso-africa-ejemplar-aguila-pescadora-20150314134555.html>).

Hence, the use of continental osprey chicks in Mediterranean translocations cannot harm neither the evolutionary pathway nor the ecology of this cosmopolitan bird of prey. Rather, it will increase the diversity of its genetic pool (i.e. altering evolutionary pathways in the direction of higher fitness) that has to be necessarily very eroded.

Summarizing, I maintain that increased boldness would certainly be a gain to some extent for formerly intensively persecuted Mediterranean raptors including osprey populations, and that translocations with chicks from large continental populations could very likely bring more variability regarding this genetic continuum. At least gains would exceed losses. Examples of Mediterranean island raptor populations that have benefitted from the reinforcement with continental birds are many and include the Majorcan population of black vultures that has moved from 19 individuals and just 1 breeding pair in 1983, to 300 individuals and 45 breeding pairs currently. Also Iberian bearded vulture projects involving birds from different sources have shown to have a higher exploratory momentum than those reinforced only with shy birds from the Pyrenees (Martínez-Abraín et al., 2022). This is because the shy-bold genetic continuum controls at the same time the decrease of fear to humans, the increase in exploratory capacity (e.g. reduced neophobia) and the increase in aggressiveness.

I think that translocations are not the panacea for bird conservation, but once decision-makers have made the decision of translocating birds translocations can benefit from taking into account the behavioural composition (bold-shy nature) of individuals to be released. For sure other conservation measures aimed at reducing disturbance in nesting areas and improving populations of prey species would be welcome and will undoubtedly contribute to further promoting the current recovery of Mediterranean ospreys.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The author was funded by Universidade da Coruña/CISUG and Xunta de Galicia ED431C 2018/57.

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