DISPATCH

Conservation: Threatened By Luxury

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When animals are traded in lucrative international luxury markets, individuals really do matter to conservation. Identifying the intrinsic and extrinsic factors that make some species especially vulnerable to this kind of threat helps set guidelines for more effective conservation.

Conservation deals in mass nouns. We talk about the loss of 'biodiversity', about the destruction of 'habitats', about coral bleaching, overfishing and mass extinction. Management strategies, too, tend towards the holistic, from traditional wilderness-based conservation to the more anthropocentric ecosystem approach in which human well-being is a central goal [1,2]. And while we might consider the importance of individual species both to the integrity of ecosystems and the services they provide [3], we pay little attention to individual organisms. Yet, the endgame of extinction is a question of individuals. Occasionally these charismatic creatures attain symbolic importance, with famous endlings such as the Pinta Island giant tortoise Lonesome George [4]. More often, the last individuals of a population remain anonymous, their destiny decided by the success or failure of more generic conservation actions. There are situations, however, in which the importance of individuals becomes central to conservation efforts, for instance when killing or capturing individual organisms has a high economic return. Sometimes that return is immediately realised, as in the hundreds of thousands of dollars occasionally paid for individual bluefin tuna (*Thunnus spp.*) in Tokyo's Tsukiji fish market [5]. But often the value is attached to non-perishable products, such as tusks, skins, fins or shells, derived from the dead organism. It is these products that are the focus of a new study by McClenachan *et al*. [6] in this issue of *Current Biology*, which shows how the international trade in luxury goods interacts with intrinsic biological traits to further drive large animals towards extinction.

McClenachan *et al*. [6] have assembled data on over 100 large (>10kg) animal species subject to trade in non-perishable products in international luxury markets. These products include skins and furs from crocodiles and big cats, fins and gill plates from sharks and rays, ivory and horns from a range of large mammals, and various other items used in traditional medicine, as status food, or for decorative purposes. Such products are highly significant from a

conservation perspective not only because of the extremely high value they can attain in (legal and illegal) luxury markets, but also because they can be stockpiled and distributed globally, decoupling standard consumer-exploiter feedbacks. McClenachan *et al*. [6] have added information on the value that these products can attain, both per unit weight, and per animal. This latter point is important because there may still be a high incentive to hunt animals for relatively low-value parts, if an individual provides a large enough supply. Thus although tigers (*Panthera tigris*) are hunted for products worth nearly 300 times more per kilogram than those from whale sharks (*Rhincodon typus*), vast size and a relatively higher proportion of tradable product (shark fin versus tiger penis) mean that an individual whale shark can approach the value of an individual tiger.

Key among these results is the important interaction McClenachan *et al*. [6] find between the forces of trade and of individual life histories in driving extinction risk in large animals. In species hunted for low value products, the chance of being listed as threatened with extinction increases with body size. This makes sense for a number of reasons. First, body size is frequently a correlate of threat status because populations of bigger organisms tend to recover more slowly, and require more space to reach viable sizes. But also, as for the whale shark, if an animal is big enough then it can provide sufficient quantities of even relatively low-valued products to make the risk and expense of hunting it worthwhile. This translates into a straightforward positive relationship between the total sale value of individuals of a species, and the likelihood of that species being listed as threatened with extinction.

This relationship between body size and extinction risk is completely decoupled however in species hunted for high value products. For example, a 12kg forest musk deer (*Moschus berezovskii)* may only yield 25g of musk, but musk is worth so much (US$ 45–80,000 per kg) that, depending on associated risks and penalties, its attractiveness to poachers may be similar to a 33kg Tibetan antelope *Pantholops hodgsonii* (hunted for its *c*. US$50,000.kg^{-1} fur) or a 2,550kg Indian rhinoceros *Rhinoceros unicornis* (hunted for its horn which can fetch US$100,000.kg^{-1}). Despite a 200-fold difference in body mass, all three species are threatened with extinction, largely due to illegal trade [7-9].

Teasing apart such relationships in a statistically robust way is made more difficult by a striking feature of the data set of McClenachan *et al*. [6], concerning just how highly threatened these targeted species are. Discounting 9 marine species listed as 'data deficient', only 2 of 53 marine and 14 of 67 terrestrial species are listed in the ‘safest’ IUCN category (Least Concern); 57% of marine and 75% of terrestrial species fall into threatened categories. This is far higher than rates calculated across all IUCN-assessed species in each realm (18% and 40%

respectively [10]). Across only well-known taxonomic groups (to which most of the large animals considered by McClenachan *et al*. [6] belong) threat rates are also typically much lower, at around 20-25% of assessed species in both realms [10]. Although many of the species in their list will also be imperilled by other factors such as habitat destruction or direct exploitation for food, it is clear that hunting to supply international luxury markets is a significant threat to large animals in both marine and terrestrial habitats.

The study also identifies important differences between marine and terrestrial realms that can help to more effectively target conservation efforts. For instance, focusing conservation efforts on exploited species with small range sizes may be appropriate for terrestrial species, where range size is a reasonable predictor of threat (at least for those species of relatively low total value in traded goods). However, the marine species in the dataset typically have much larger ranges, and range size plays no significant role in determining threat, over and above value. This may be due to wide-ranging marine species being more likely to come into contact with potential hunters in some part of their range, exacerbated by increased vulnerability of species such as whale sharks and manta rays during large, localised seasonal aggregations [11,12]. Despite these differences between marine and terrestrial systems, McClenachan *et al*. [6] suggest some promising opportunities for conservationists to learn from best practice in other systems. In particular, they highlight opportunities for marine conservation to learn from terrestrial successes, including increased application to marine species of existing trade conventions (especially CITES, the Convention on the International Trade of Endangered Species), establishment of more (and more effective) marine protected areas, and intervening early in developing markets to steer them towards more sustainable activities. For instance, just as large terrestrial mammals are a significant draw to wildlife tourists [13], so well-regulated marine tourism can spread the perception that charismatic animals are worth more alive than dead [14].

However, whether such alternative sources of revenue provide an effective disincentive to poaching will depend on how they are distributed, both locally and globally. A mixed economy that includes regulated harvest may sometimes be more effective from a conservation perspective than blanket bans on lethal activities. In a recent paper, Di Minin *et al*. [15] make a strong case for the role that regulated trophy hunting — even of endangered species — has played and can continue to play in the conservation of large African mammals. Similarly, trophy fishing can make a positive contribution to marine and freshwater conservation [16]. In both cases, the focus is on regulating a legal industry to help drive out illegal or unsustainable practice (including in the fishing case, it should be acknowledged, an increased emphasis on

catch-and-release). An additional motivation is to recruit vocal and powerful lobbies to the conservation cause, but the outcry whenever the killing (even when legal) of charismatic individual animals is publicised [15,16] reveals clashes of values that may limit discussions of creative conservation options, raising interesting parallels with previous efforts to reconcile groups sharing a generalised conservation ethic but differing in the extent to which they emphasise populations and communities over the lives and welfare of individual animals [17,18]. Clearly, legal trade in some of the goods listed by McClenachan *et al*. [6] will never be compatible with conservation. But the study shows just how ineffective the current stick of enforcement is, in the form of inadequate poaching fines. Adding the carrot of alternative sources of income is therefore likely to be critical if the goal of protecting species is to be achieved by placing appropriate and equitable ecological, economic, and social value on individuals.

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