

# Management Tools for Raptor Conservation

R.E. Kenward

## ABSTRACT

Following the Convention on Biological Diversity, the focus in Europe on protection-based conservation is starting to be complemented by the incentive-driven approaches that have been more widespread elsewhere, to give “dual-approach” conservation. Incentive-driven approaches build conservation on the use of wild resources, which must be sustainable, typically using public funding for ecosystem services and private funding for more direct benefits such as ecotourism and extractive use. Whereas the “protect-and-reserve” has been strongly educational, the “sustain-by-use” approach can be less polarising in societies and landscapes, although it is also much more complex and thus harder to apply. It requires new tools, both ecological and socio-economic, especially to encourage cooperation between the variety of stakeholders involved in the conservation of raptors, including landowners, game managers, falconers, other wildlife organisations and governments. This paper concentrates on tools for encouraging falconers and other hunters to contribute to conservation of raptors. It presents new survey data to indicate that poisoning of raptors is least where governments have a most conciliatory attitude to predation problems, and that use of hybrids in falconry is least where governments permit harvest of wild raptors. It recommends that hunters work for recognition of their conservation benefits while governments and other conservation interests encourage public understanding of wild resources as renewable. It recommends that falconers be encouraged to contribute to conservation of wild raptors in exchange for permitted harvest, especially by adopting systems that ensure that traditional use of Saker Falcons is sustainable and beneficial. It proposes charters as a basis for agreement between different stakeholder groups and pooling of all the human resources that can maintain and enhance biodiversity.

## DUAL-APPROACH CONSERVATION

A decade after initiation of the Convention on Biological Diversity (CBD), it is becoming clear that conservation now has two main approaches. One approach, of *protection-based conservation* is at least one and a half millennia old, because several categories of reserve including the inviolable "hima" of Makkah and al-Maddinah were established with the Qu'ran. Indeed, at a time of tension between Islam and other beliefs, it is well worth noting that there is much more about conservation in the Koran than in the principal texts of other monotheistic beliefs (Bagader *et al.* 1994).

The second approach is *incentive-driven conservation* (Hutton & Leader-Williams in press). This approach is rooted in CBD article 11 on Incentive Measures "Each Contracting Party shall, as far as is appropriate, adopt economically and socially sound measures that act as incentives for the conservation and sustainable use of components of biological diversity".

The first, protection-based approach is the one on which Europe has focused in recent decades. Its pillars are the protection of species and the creation of reserves to protect habitats, as encapsulated for example in the Bern Convention on the Conservation of European Wildlife and Natural Habitats. This "protect and reserve" approach has been highly successful in changing popular attitudes to wildlife. Unfortunately, it has been much less successful in preventing dramatic declines in wildlife populations due to agricultural intensification (Paine & Pienkowski 1997).

The second, incentive-driven approach embraces the utility of the components of biodiversity to encourage conservation. It notes that humans value and hence conserve what is useful to them (Webb 1997). Ecosystem services, such as natural degradation of human wastes or flood abatement, are common goods for which public payments (e.g. agri-environment subsidies) are appropriate. Ecosystems can probably provide all the services that humans require without the survival of every raptor species. However, there are many uses of raptors that do motivate conservation, including bird-watching, scientific research, falconry and pest management with raptors. These uses of raptors can all benefit raptor conservation, by providing funds and other human resources (e.g. volunteer time), provided that use is sustainable.

For future conservation, both the protect-and-reserve and the sustain-by-use approaches are likely to be important. After a great deal of effort, some 8.8% of the terrestrial surface is in reserves, about half being protected to an extent that excludes any extractive use of wild resources (IUCN 1998; Pretty 2002). A target of protection for 10% is deemed politically practical. However, estimates from species-area curves indicate that retention of biodiversity requires the application of conservation measures to some 50% of the land surface (Soulé & Sanjayan 1998). Protection measures might achieve some of this, but use of the incentive "carrot" as well as the protection "stick" is likely to achieve more, especially because "stick" alone can become counterproductive.

By itself, a protect-and-reserve approach can lead to polarised attitudes, with human resources squandered in conflict between different interest groups, and to polarised landscapes in developed countries, with protected fragments of low productivity land as the alternative to intensive use (Kenward & Visi

Garcia 2001). In developing countries, where it can be hard even to maintain a minimum standard of living, successful implementation of restrictions can be elusive (Misra 2003). In these circumstances, positive incentives that include use of wild resources can be more powerful and cost effective for driving habitat and species conservation (Murphree 2003).

For example, where land is relatively unproductive, sustain-by-use approaches frequently compete effectively with intensive uses (Child 1995; Prins *et al.* 2000), for example when tourism or hunting become more economic than livestock farming (Bigalke 2000; Earnshaw & Emerton 2000; Hurt & Raven 2000). Such cases are rarer in Europe than the developing world, although grouse moors are an example (Arroyo *et al.*, this volume). However, even where intensive use has high value, de-intensification measures that are critical for conservation can be funded if reduction in yield is slight (Kenward & Visi Garcia 2001).

The ideal may well be a dual approach to conservation (Inamdar *et al.* 1999). This would create “a much more biodiversity friendly mosaic of land uses driven by the livelihoods that are derived from the sustainable use of wild living resources, instead of landscapes with small islands of biodiversity in a sea of agriculture” (Hutton & Leader Williams *in press*). In some cases, protected areas can aid this sustain-by-use approach by supporting core populations that render harvest more productive in surrounding areas (Roberts *et al.* 2002). In other cases, some extractive use may be desirable to maintain human practises that preserve reserved habitats (Getz *et al.* 1999).

## TOOLS FOR DUAL-APPROACH CONSERVATION

The challenge of the dual approach to conservation is that protecting species and creating reserves is less complex than ensuring that uses are balanced in ways that give maximum biodiversity benefit. Incentive-driven conservation requires an understanding of ecological, economic and social processes, all of which must then be managed to be sustainable. It requires a great deal of science, leading to the development of appropriate ecological and socio-economic tools, and then the will of societies to use those tools.

Some of the most important tools for conservation of raptors are those that can reduce tensions between different interest groups whose use of resources can contribute to conservation (Arroyo & Redpath, this volume). Such tools help the different interests to resolve differences and co-operate to maximise their synergistic contributions to conservation. Areas of tension between different stakeholder groups that can contribute to conservation of raptors occur in game conservation and in falconry. It is instructive to examine each case.

## RAPTORS AND GAME CONSERVATION

A great deal of ecological research on raptors has resulted in many ecological tools for managing them (reviews in Kenward 2000, 2002). These tools include the behavioural approaches of (i) physically excluding raptors (e.g. with netting), (ii) deterring them with noxious stimuli (e.g. aversive tastes or objects), (iii) distracting them with rewarding stimuli (e.g. artificial feeding),

(iv) landscaping (e.g. to hinder hunting) and (v) pre-empting predation on game with an early season for human hunting. There are also demographic tools, which include the domestic breeding and mass-release of game birds, and the removal of raptors by trapping and translocation, by the killing of problem individuals and perhaps by encouraging intra-guild predation.

Although removal of individual raptors can be acceptable for raptor conservation (WWGBP 2000), it should be selective, humane and unlikely to damage biodiversity. The eradication of predators through persistent persecution, a historic technique that had the advantage of minimal maintenance effort (for removing recolonising individuals) is no longer acceptable. To ensure that any demographic management techniques permitted for raptors are tolerable for conservation, they should ideally be “fail-safe”, in the sense of inability to reduce populations severely without impractical effort.

As recognised in the recent EU Fifth Framework project on Reconciling Gamebird Hunting and Biodiversity (Viñuela 2002), another important set of tools are socio-economic. They are based on recognition that problems such as the dispute about management of raptors on grouse moors (Redpath & Thirgood 1997) are more socio-economic than ecological. That is to say, the landowners are concerned that proposed ecological solutions, such as artificial feeding and habitat management, may not be cost effective compared with removing harriers, while protectionists are concerned that any compromise on harriers may lead to renewed extirpation of raptors over large areas. Even if agreeable and enforceable zoning and quota systems could be established to avoid this risk (Potts 1998), organisations whose business is protection risk loss of credibility and membership if they sanction reduction of raptor density. When conflicts arise, there are a number of measures to resolve them (Redpath *et al.*, this volume). These include the engagement of all stakeholders, building trust between them by finding common ground and encouraging compromise “gestures” (maybe on a temporary basis). It is important to educate the supporters of the different groups, so that those making compromises are not discredited. It is also important to identify those who may benefit from continuation of the dispute, such as organisations that gain income or political benefit from campaigning on one side or the other, and even scientists who may unwittingly delay the settlement process if the conflict but not the solution provides work for them. Government intervention can be helpful for reaching a timely solution, provided that those involved are neutral to the dispute.

However, a long-term aim should be to develop tools that reduce the tendency for disputes to occur in the first place. This is primarily a matter of changing attitudes, among hunters, protection interests and government, so that appropriate processes occur in each case.

## TOOLS TO MAXIMISE CONSERVATION CONTRIBUTIONS FROM HUNTING

When game populations decline due to habitat loss, raptors that take any prey dependent on those habitats are also vulnerable. There is thus a clear common interest of hunters and other conservationists in remedial actions against habitat loss. There may also be common interest in restricting



pollutants that adversely affect both raptors and humans (Newton 1979).

Hunters need to be encouraged to engage in conservation. A conceptual tool for encouraging conservation contributions from hunters is the Public Acceptance Rating Scale, on which an activity may be rated as "unacceptable", "tolerable", "useful" or "essential" (Kenward 2002). The benefit of endeavours that move public perception of an activity like hunting up the scale is a reduced risk of adverse legislation. To move up the scale, hunters need also to be proud to publicise what they are doing for conservation. Sadly, hunters are so used to the "stick" from protection groups that, even when their representatives wish to co-operate with other conservation interests, there may be resistance from a constituency that no longer recognises "carrots". Hunters need to be rewarded by other conservation groups with more recognition than at present for their endeavours if this "laager attitude" is to be overcome.

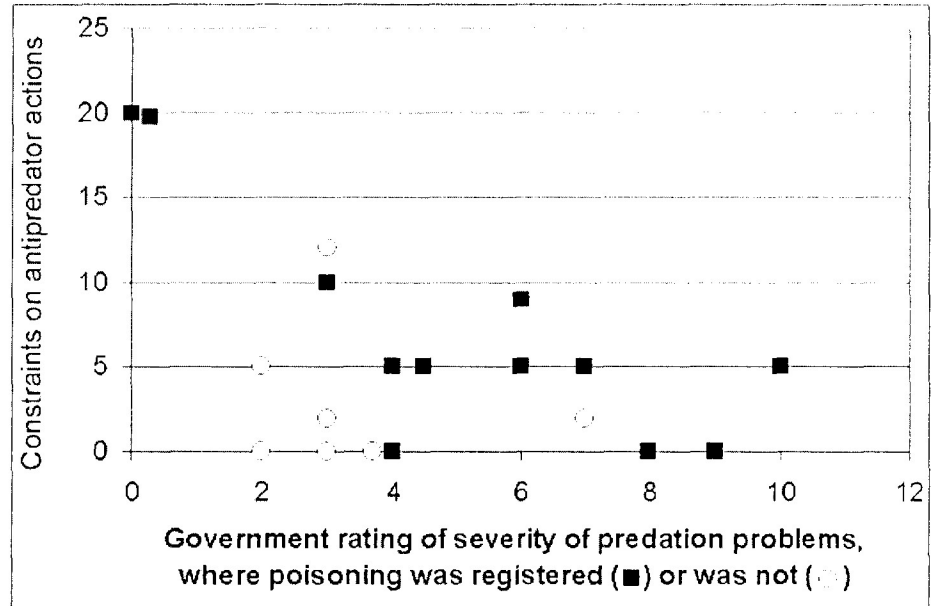
Other conservation interests need to prioritise biodiversity over the lives of individual creatures and educate the public accordingly. Raptor biologists are well-placed to explain that the death of individuals is a necessary condition for biodiversity, through trophic webs and other recycling processes. All creatures (humans included) are renewable resources for other creatures. Sadly, a lack of understanding that most wild animals naturally die traumatically and early in life tends to be encouraged by animal rights interests. All conservationists need to help with the educational concepts and other tools to overcome misunderstandings about the natural world that hinders conservation. Public education in its broadest sense, from pre-school onward and using all available media, is needed to move that agenda forward.

Raptor enthusiasts are understandably nervous about avoidable raptor deaths, as an after-effect of previous management through extirpation, and the subsequent problems with trophic accumulation of biocides. However, relations with hunters are likely to benefit from tools that make removal of predators less emotive. Words with strong connotations in human rights, like "persecution", are insulting for conscientious game managers. Other terms provide more precision. Wildlife managers talk of "selective removal" of individual predators that cause problems, and of "culling" when the aim is reduction of predator density. With a common goal for hunters and other conservationists to promote biodiversity, "extirpation" is no longer acceptable as a management technique.

Governments too can help integrate hunting with conservation. During the recent REGHAB project, environment ministries of the 15 EU States and 10 Accession States were surveyed to obtain information on raptor predation and pigeon fanciers, poultry keepers, livestock farmers, game managers and wildlife conservers. They were asked (among other information) how they rated the severity of raptor predation problems for each of the five groups, whether they permitted four types of behavioural remedy against raptor predation to be used by each of the groups, and whether there was poisoning of raptors (deliberate or otherwise) in their countries. A plot of data for the 19 countries that provided full information showed (Figure 1) that governments tended to permit most behavioural remedies where they perceived most predation problems. Of particular interest was a related significant finding

( $P<0.05$ ) that the most permissive countries, in relation to perceived problems, were the ones without illegal poisoning of raptors. Poisoning, the most undesirable management technique for raptors, was least likely where governments were most responsive to predation problems (Kenward 2002).

**Figure 1. From a survey of governments in the European Union and its Accession States, the authorities placed least constraints on managing raptor predation where they viewed the problem as most serious, and registered least poisoning where the regime was least restrictive.**



Governments may respond in even more positive ways to problems of raptor predation. For example, they may consider paying compensation to farmers that have livestock killed by eagles (Davies 1999). Compensation seems not yet to have been paid for loss of income from hunting. However, loss of income is notoriously difficult to quantify, so it is probably better that any compensation should be for positive outputs, which are much easier to confirm. For example, payments might be for releasing additional game. An even better approach may be to pay for numbers of successful raptor nests, because such payments can then be seen as a reward for looking after the predators. However, it is important that statutory compensation payments, and the checks necessary to validate claims, should not drain conservation resources without a net gain for biodiversity. This may make the approach most suitable for landowners who are hosts for rare species. In Spain, for example, the conservation movement is seeking measures whereby less tax might be paid on land with nests of the endangered Imperial Eagle *Aquila adalberti*.

### RAPTORS AND FALCONRY

In terms of quality for conservation, falconers are an especially valuable group of hunters. They pioneered ecological, veterinary, domestic breeding and

reintroduction techniques for raptors and engage extensively in wildlife rehabilitation and demonstrations that educate the public about wildlife issues (Kenward 1987; Fox 1995). Active or former falconers have run the major release programmes for Mauritius Kestrels *Falco punctatus*, California Condors *Gymnogyps californianus* and Peregrine Falcons *Falco peregrinus* in Germany, Poland and the USA (Cade 1986; Saar 1988; Jones *et al.* 1994; Wallace 2001). Despite a global total of less than 5,000 in western countries, they include at least 10 academic professors, and founded two large raptor conservation organisations that are active internationally (Raptor Research Foundation, Peregrine Fund).

Unfortunately, falconry in Europe has never recovered from being (incorrectly) blamed for the decline of raptors during the “pesticide era”, which was also the period in which most European bird-protection legislation was enacted. Therefore, whereas falconers in other parts of the world have had continued access to wild raptors and been strongly associated with conservation work, falconers in Europe have become dependent on domestic breeding. Indeed, despite the development of DNA-based techniques that make it almost impossible to “launder” illegally taken wild raptors as domestic progeny, falconers have remained a convenient “bête noire” for some in search of threats from which raptors need protection. In contrast, falconers in North America have been rewarded for their help with restoration of Peregrine Falcons by the re-instatement of their traditional harvest from the wild.

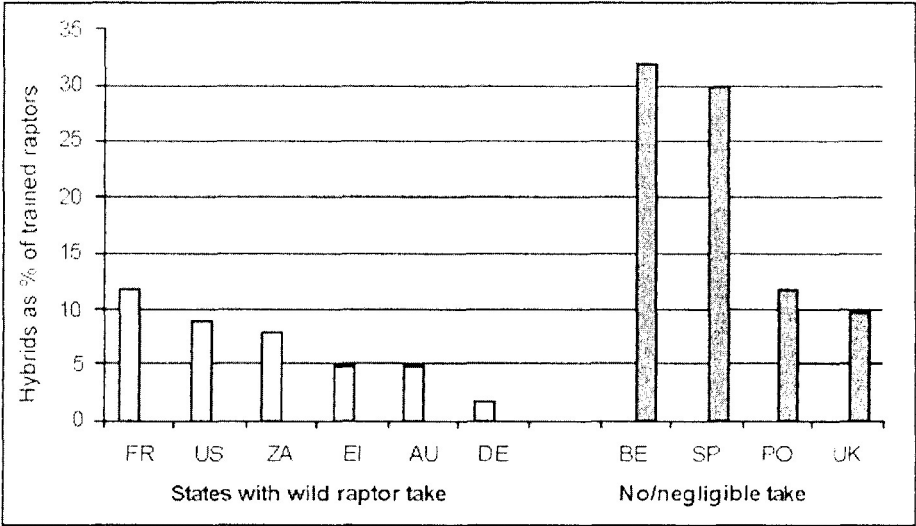
The maintenance of domestic breeding populations of a diversity of raptors is an important insurance against problems in the wild that are identified too late to save local populations (e.g. vultures). However, dependence on domestic breeding has recently raised new concerns in Europe. There have been several cases of hybrid falcons breeding in the wild, which raises the possibility of wild gene pools being modified through introgression of adaptive traits. Such a risk is likely to be low, because sympatric large falcons hybridise without artificial insemination in enclosures (Morris & Stevens 1971), and in the wild (Oliphant 1991), and the Saker Falcon *Falco cherrug* shows genetic evidence of pre-historic hybridisation with two other species (Wink *et al.* this volume).

Despite these reasons to presume that natural selection acts effectively against such hybrids, some biologists remain concerned. The International Association for Falconry and Conservation of Birds of Prey (IAF) has therefore recommended measures to minimise risk of losing hybrid falcons to the wild, and has surveyed the proportion of hybrids among trained birds in 10 countries where breeding of hybrids occurs (Figure 2). In the six states where wild raptors are also permitted to falconers, the proportion of hybrids flown is lower ( $P=0.024$ ) than in the four where the wild take is only 1-2% of the demand or not permitted at all. It seems that a relaxed attitude to harvest of wild raptors is associated with least use of hybrids.

Falconers now secure the respect of conservation organisations at international level. In response to concerns about over-harvest of the Saker Falcon in parts of Central Asia for uncontrolled trade to the Middle East, IAF obtained help from Birdlife International, World Wide Fund for Nature and

TRAFFIC to draft a resolution for the Amman Congress of the World Conservation Union (IUCN). The resolution (WCC2.74) passed without dissent, requesting “that Saker range states and falconers work with CITES and other international regulatory authorities to develop an internationally recognized system, initially for this species but applicable for other wildlife, that combines wildlife research and modern marking technologies to: (a) monitor populations and estimate sustainable yields; (b) regulate procurement and international movements with minimal administrative costs; and (c) motivate conservation of the species and its habitats throughout its range.”. The Emirati Environmental Research & Wildlife Development Agency has made considerable strides in (a) and (b), and in 2002 initiated a registration scheme for marking legally obtained falcons with micro-transponders. This process is now being adopted also by Saudi Arabia, Kuwait and Qatar. If users require birds of legal origin, it should also be possible to develop a system (as with other commodities) to force legality back up the supply chain.

**Figure 2. From a survey by the International Association for Falconry and Conservation of Birds of Prey, falconers flew most domestic bred hybrids in states where no more than 2% of their trained raptors came by permit from the wild**



### TOOLS TO MAXIMISE CONSERVATION CONTRIBUTIONS FROM FALCONRY

The voice of falconers may seem rather small compared with other hunters, but falconers have disproportionate potential value. As they require relatively low densities of quarry, they are prepared to rent British grouse moors that are uneconomic for shooting. In a National Park in the north of England they are also managing habitat for grouse in exchange for rights to fly falcons. Falconers can also mediate usefully between hunters and other conservationists.

Falconers potentially have their greatest value for work on wild raptors if they are so enabled. In Europe they now pay 300-1000 Euros for domestic-bred raptors. In the UK at least a thousand birds are sold annually, for a value much greater than is spent annually in the UK researching wild raptors. This raises the question of whether it is better if falconers pay for farmed raptors or pay conservation levies for licensed birds from the wild.

There is also linkage to the issue of compensation payments for predation. Northern Goshawks *Accipiter gentilis*, as well as being a problem at game release and feeding sites across Europe, are popular with falconers, so why not obtain levies from them for the trapped birds? Landowners might view nests of Goshawks or Peregrine Falcons very differently if they received payment for transferring young to falconers (Kenward 2002). With market prices close to 750 Euros for birds from domestic breeding, an average brood size often close to three (Cramp & Simmons 1980) and a requirement to leave one chick in the nest, it could be hard for statutory compensation to compare with a value of, say, 1000 Euros for a successful nest. Statutory compensation could be reserved for species without such strong value as a resource.

There is even more scope for conservation from traditional use of the Saker Falcon in the Middle East. With wild Sakers worth on average about 5,000 US dollars, a 20% licensing levy on 1,000 birds annually could fund a regulatory system and conservation work in natal areas. In areas where Saker populations have been over-harvested, they were already severely limited by low availability of cliff nests sites (Kenward *et al.* 1996). By analogy with Hungary (Bagyura *et al.*, this volume), this population could probably be expanded considerably if induced to adopt power-line sites by appropriate hacking of domestic bred birds.

Of course, the preconditions are (i) agreement by users of Sakers that their falcons must have legal provenance, and (ii) implementation of a system to ensure that legal provenance. IAF proposed, in the background to its Amman resolution, that this could be achieved by using uniquely-coded micro-transponders as licences. These would be issued to trappers by an international management authority, and would be registered to a bird when genetic material (e.g. a feather) was deposited. The genetic material could be obtained at the first border control or, ideally, at marking. The marker would thereafter serve as a passport for the bird for border controls and hunting permits, with the ability to take a second genetic sample to compare with the banked sample if tampering with the transponder was suspected. Local stakeholders could also be paid to mark wild birds in breeding areas, to enable mark-recapture monitoring of population size and harvest levels. Payments to local people for maintaining nests and marking young would motivate conservation of the resource, which will be important for countering incentives to intensify agriculture in natal areas.

Perhaps it is time for all those with interests in incentive-driven conservation to start coming together to create memoranda of understanding, or charters, designed to enable maximum benefit from their activities. For example, a "charter for conservation through falconry" might detail responsibilities expected from falconers in exchange for privileges from

governments. Perhaps the conservation world might then change its approach from “how can we control the hunters and falconers?” to “how can we encourage more of these useful people?” Are hunters, falconers and other conservationists brave enough to move forward together in this way?

## REFERENCES

- ARROYO, B. & S. REDPATH. (this volume) Conflicts in raptor conservation: an overview.
- BAGADER, A.A., A.T.EL-C. EL-SABBAGH, M. AS-S. AL-GLAYAND & M.Y. I-D. SAMARRAI 1994. Environmental protection in Islam. IUCN, Gland, Switzerland & Cambridge.
- BAGYURA, J., T. SZITTA, L. HARASZTHY, G. KÁLLAY, I. DEMETER, I. SÁNDOR, M. DUDÁS & L. VISZLÓ (this volume). Population trend of the Saker Falcon *Falco cherrug* in Hungary between 1980 and 2002.
- BIGALKE, R.C. 2000. Functional relationships between protected and agricultural areas in South Africa and Namibia. pp 169-201 in Prins *et al.* (2000).
- CADE, T.J. 1986. Using science and technology to re-establish species lost in nature. Pages 279-288 in *Biodiversity*. E.O. Wilson, (ed.), National Academy Press, Washington DC, U.S.A.
- CHILD, G. 1995. *Wildlife and People: the Zimbabwean success*. Wisdom, Harare & New York.
- CRAMP, S. & K.E.L. SIMMONS. 1980. *Handbook of the Birds of Europe, the Middle East and North Africa*, Volume 2. University Press, Oxford.
- EARNSHAW, A. & L. EMERTON 2000. The economics of wildlife tourism: theory and reality for landholders in Africa. pp 315-334 in Prins *et al.* (2000).
- GETZ, W.M., L. FORTMANN, D.H.M. CUMMING, J. DU TOIT, J. HILTY, R.B. MARTIN, M. MURPHREE, N. OWEN-SMITH, A.M. STARFIELD & M.L.WESTPHAL 1999. Sustaining natural and human capital: villagers and scientists. *Science*, 283, 1855-1856.
- FOX, N. C. 1995. *Understanding the Bird of Prey*. Hancock House, Blaine, WA, USA.
- HURT, R. & P. RAVEN 2000. Hunting and its benefits: an overview of hunting in Africa with special reference to Tanzania. pp 295-313 in Prins *et al.* (2000).
- HUTTON, J.M. & N. LEADER-WILLIAMS (in press). Sustainable use and incentive-driven conservation: realigning human and conservation interests. *Oryx*.
- INAMDAR, A., H. DE JODE, K. LINDSAY & S. COBB 1999. Capitalising on nature: protected area management. *Science*, 283, 1856-1857.
- IUCN 1998. *1997 United Nations List of Protected Areas*. International Union for the Conservation of Nature, Gland and Cambridge.
- JONES, C.G., W. HECK, R.E. LEWIS, Y.. MUNGROO, G. SLADE & T. CADE 1994. The restoration of the Mauritius kestrel *Falco punctatus* population. *Ibis* 137: 173-S180.
- KENWARD, R.E. 1987. Protection versus management in raptor conservation: the role of falconry and hunting interests. pp 1-13 in D.J. Hill (ed.) *Breeding and Management in Birds of Prey*. Bristol University Press.
- KENWARD, R.E. 2000. Socio-economic problems and solutions in raptor predation. pp. 565-570 in Chancellor, R.D. & B.-U. Meyburg, (eds.) *Raptors at Risk*. World Working Group on Birds of Prey, Berlin.
- KENWARD, R.E. 2002. Management tools for reconciling bird hunting and biodiversity. Workpackage 4 in Reconciling Gamebird Hunting and Biodiversity (REGHAB). EVK2-CT-2000-200004. [www.uclm.es/reghab/initio.html](http://www.uclm.es/reghab/initio.html)
- KENWARD, R.E. & V. GARCIA CIDAD 2002. Innovative approaches to sustainable use of biodiversity and landscape in the farmed countryside. UNEP High-Level Conference on Agriculture and Biodiversity ([http://nature.coe.int/conf\\_agri\\_2002/agri16rev.01.doc](http://nature.coe.int/conf_agri_2002/agri16rev.01.doc))
- KENWARD, R.E., R.H. PFEFFER, E.A. BRAGIN, A. LEVIN & A.F.KOVSHAR 1996. pp. 131-142 in Samour, J. (ed) *Proceedings of the Specialist Workshop*. Abu Dhabi, United Arab Emirates, November 14-16 1995. Middle East Falcon Research Group.
- MISRA, M. 2003. Evolution, impact and effectiveness of domestic wildlife bans in India. In: *The Trade in Wildlife: Regulation for Conservation* (S. Oldfield Ed.), pp. 78-85. Earthscan, London and Sterling VA.
- MORRIS, J. & R. STEVENS 1971. Successful cross-breeding of a peregrine tiercel and a saker falcon. *Captive Breeding of Diurnal Birds of Prey* 2:5-7.
- MURPHREE, M. 2003. Control and the Holy Grail. In: *The Trade in Wildlife: Regulation for Conservation* (S. Oldfield Ed), pp. 52-60.. Earthscan, London and Sterling VA.
- NEWTON, I. 1979. *Population Ecology of Raptors*. Berkhamsted, Poyser.
- OLIPHANT, L.W. 1991. Hybridization between a Peregrine Falcon and a Prairie Falcon in the wild. *Journal of Raptor Research* 25: 36-39.
- PAIN, D.J. & M.W. PIENKOWSKI (eds.) 1997. *Farming and Birds in Europe*. Academic Press, London, UK.
- PRETTY, J.N. 2002. People, livelihoods and collective action in biodiversity management. In *Biodiversity, sustainability and human communities: protecting beyond the protected* (T. O'Riordan, T. & S. Stoll-Kleeman Eds.), pp. 61-86. Cambridge University Press, Cambridge.
- PRINS, H.H.T., J.G. GROOTENHUIS & T.T. DOAN (Eds.) 2000. *Wildlife conservation by sustainable use*. Kluwer, Dordrecht, The Netherlands.
- REDPATH, S.M. & S.J. THIRGOOD 1997. *Birds of prey and red grouse*. Stationary Office, London.

- REDPATH, S., B. ARROYO & J. VIÑUELA (this volume).** Resolving raptor-gamebird conflicts in Europe: lessons from a Scottish case study.
- SAAR, C. 1988.** Reintroduction of the peregrine falcon in Germany. pp. 629-635 in Cade, T.J., J.H. Enderson, C.G. Thelander and C.M. White (Eds). *Peregrine falcon populations, their management and recovery*. The Peregrine Fund Inc., Boise, Idaho, U.S.A.
- SOULÉ, M.E. & M.A. SANJAYAN 1998.** Conservation targets: do they help? *Science*, 279, 2060-2061.
- VIÑUELA, J. 2002.** Reconciling Gamebird Hunting and Biodiversity (REGHAB). EVK2-CT-2000-200004. [www.uclm.es/reghab/initio.html](http://www.uclm.es/reghab/initio.html)
- WALLACE, M P. 2001.** Recovery Efforts for the California Condor. Abstracts, 4th Eurasian Congress on Raptors. Seville-Spain 25-29 September 2001.
- WEBB, G.J.W. 1997.** Sustainable use of wildlife. Pp. 3-10 in Davies, M. (Ed.) Exploiting our native fauna – culling, harvesting, farming? *Australian Biologist* 10.
- WINK, M H. SAUER-GURTH, D.H.ELLIS & R. KENWARD (this volume)** Phylogenetic relationships in the Hierofalcon complex (Saker-, Gyr-, Lanner-, Laggar Falcon).
- WWGBP 2000.** Resolution 10. p. 294 in Chancellor, R.D. & B.-U. Meyburg, (Eds.) *Raptors at Risk*. World Working Group on Birds of Prey, Berlin.

Robert E. Kenward  
 Centre for Ecology & Hydrology,  
 Winfrith Technology Centre,  
 Dorchester DT2 8ZD,  
 United Kingdom  
 E-mail: reke@ceh.ac.uk