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DISCUSSION

Addendum to "Managing wolves (*Canis lupus*) to recover threatened woodland caribou (*Rangifer tarandus caribou*) in Alberta"[1]

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Abstract: Managing predators to restore threatened or endangered species is often controversial. Hervieux et al. (2014; Can. J. Zool. **92**(12): 1029–1037) report on the efficacy of wolf (*Canis lupus* L., 1758) reduction as a recovery strategy in the Little Smoky population of boreal woodland caribou (*Rangifer tarandus caribou* (Gmelin, 1788)) range in Alberta, which generated a lot of media attention. As such, the authors were invited by the journal editor who handled the original paper to write this addendum to provide clarification regarding the methodology used in the original paper. Wolf reduction was conducted by Government personnel in accordance with appropriate policy and laws (i.e., federal and provincial *Species at Risk Acts*; Alberta *Wildlife Act*; Alberta Woodland Caribou Policy). University-based researchers were involved only in data analysis and writing, and thus did not require approval by a university-based animal welfare board. Collaboration between independent university-based scientists and government biologists is essential to effective assessment of such controversial management practices. Hervieux et al. (2014; Can. J. Zool. **92**(12): 1029–1037) in fact concluded that such wolf reductions, by themselves, would only "buy time" and would not restore woodland caribou alone without effective habitat protection.

Key words: wolf, *Canis lupus*, caribou, *Rangifer tarandus caribou*, threatened, *Species at Risk Acts*, endangered, recovery.

Résumé : La gestion des prédateurs dans un but de rétablissement d'espèces menacées ou en voie de disparition soulève souvent la controverse. Dans un article qui a suscité beaucoup d'attention des médias, Hervieux et al. (2014; Can. J. Zool. **92**(12): 1029–1037) rendent compte de l'efficacité de la réduction de la population de loups (*Canis lupus* L., 1758) comme stratégie de rétablissement de la population de caribous des bois (*Rangifer tarandus caribou* (Gmelin, 1788)) de la chaîne Little Smoky, en Alberta. Le rédacteur de la revue qui s'est occupé de l'article initial a invité les auteurs à rédiger un addenda afin de préciser certains détails de la méthodologie utilisée dans cet article. La réduction de la population de loups a été effectuée par des employés gouvernementaux conformément aux politiques et lois pertinentes (lois fédérale et provinciale sur les espèces en péril, *Wildlife Act* de l'Alberta, politique de l'Alberta sur le caribou des bois). Les chercheurs universitaires n'ont participé qu'à l'analyse des données et à la rédaction des résultats, de sorte que leur contribution n'a pas dû être approuvée par un conseil universitaire chargé d'assurer le bien-être des animaux. La collaboration entre des chercheurs universitaires indépendants et des biologistes gouvernementaux est nécessaire à l'évaluation efficace de telles pratiques de gestion controversées. Hervieux et al. (2014; Can. J. Zool. **92**(12): 1029–1037) concluent en fait que, appliqués isolément, de tels programmes de réduction de la population de loups ne serviraient qu'à retarder l'inévitable et ne suffiraient pas, en l'absence de protection efficace de l'habitat, à rétablir les populations de caribous des bois. [Traduit par la Rédaction]

Mots-clés : loup, *Canis lupus*, caribou des bois, *Rangifer tarandus caribou*, menacée, *Lois sur les espèces en péril*, en voie de disparition, rétablissement.

Introduction

Taking direct action such as culling of predators to protect species at risk invariably attracts public attention, some of it strongly supportive and some of it strongly negative. Hervieux et al. (2014) reported on the efficacy of removing wolves (*Canis lupus* L., 1758) to avoid extirpation of a threatened population of boreal woodland caribou (*Rangifer tarandus caribou* (Gmelin, 1788)) in west-central Alberta. Boreal and Southern Mountain ecotypes of woodland caribou are threatened and endangered, respectively, across Canada (Environment Canada 2012; COSEWIC 2014) and are declining rapidly in Alberta (Hervieux et al. 2013).

Predation by wolves is the proximate cause for declines in these populations of caribou. But the situation arises from anthropogenic habitat alteration through forestry and energy development (Environment Canada 2012, 2014). Hervieux et al. (2014) showed how removal of wolves could "buy time" for caribou recovery. They also pointed out that without effective habitat protection, reductions of populations of wolves alone are unlikely to ensure recovery of threatened populations of woodland caribou.

The Hervieux et al. (2014) paper generated a lot of media attention. Thus, the authors were invited by the journal editor who handled the original paper to write this addendum to provide clarification regarding the methodology used in the original paper.

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Authority and approval of the research

Hervieux et al. (2014) involved five authors—three from Resource Management, Operations Division, of the Alberta Environment and Sustainable Resource Development (D.H., D.S., and M.B.), one from the Wildlife Biology Program, Department of Ecosystem and Conservation Services, College of Forestry and Conservation, University of Montana (M.H.), and one from the Department of Biological Sciences at the University of Alberta (S.B.). D.H., D.S., and M.B. initiated, designed, and delivered the wolf reduction program, oversaw wolf and caribou captures and wolf removal, conducted caribou telemetry monitoring, and participated in analysis and writing. The university-based S.B. and M.H. participated in developing the analytical approach, analysis, and writing. These activities were postfield delivery.

There is an important distinction between government-based managers and researchers (D.H., D.S., M.B.) and university-based researchers (S.B., M.H.). Government-based personnel operated with the authority of the Government of Alberta, which has the authority to manage wildlife in the province. This is laid out under provisions of Alberta's *Wildlife Act* (Government of Alberta 2006). Under Alberta's *Wildlife Act*, the actions of provincial government personnel are recognized as lawful while they are performing their duties in the context of approved programs. All of the wolf and caribou management activities, subsequently analyzed and reported on by Hervieux et al. (2014), were undertaken as a government-approved program. The methods used to capture and handle or remove animals complied with relevant Alberta Government requirements (Alberta Sustainable Resource Development 2009; Alberta Wildlife Management Branch 2012; Alberta Fish and Wildlife Policy Branch 2013). Incidental mortality of nontarget wildlife species was reported in supplementary materials in Hervieux et al. (2014) to fully disclose all information.

The wolf reduction program was informed or enabled by various Alberta Government reports, plans, or policies. For example, the Management Plan for Wolves in Alberta (Gunson 1991) enables wolf population reduction to assist restoring populations of endangered or threatened ungulates. The Alberta Woodland Caribou Recovery Plan (Alberta Woodland Caribou Recovery Team 2005) provided guidance on the application of predator management, while reinforcing the necessity of habitat conservation and management for caribou. Alberta's Cabinet-approved woodland caribou policy (Government of Alberta 2011) requires effective predator management as one element of a suite of measures towards achieving the provincial goal of naturally sustaining woodland caribou populations.

The two university-based coauthors participated in data analysis and writing of the scientific publication through a data-sharing agreement. These activities were post hoc to the design and field delivery of the management program. No university animal care protocol was required because the university scientists were never involved in the capture or handling of any wildlife. This means that the university-based authors did not require an animal care protocol approved by the Canadian Council on Animal Care (CCAC; http://www.ccac.ca/en) or the University of Montana Institutional Animal Care and Use Committee (IACUC; https://www.aalas.org/).

The role of science in management

We recognize that some management practices are ethically or morally questionable by some. Should scientists be involved in the science around such practices? In the wildlife conservation literature, lethal control of wildlife to recover threatened or endangered species is common (Goodrich and Buskirk 1995). Removal of feral pigs (*Sus scrofa* L., 1758) on Channel Islands to protect Channel Island fox (*Urocyon littoralis* (Baird, 1858)) (Roemer et al. 2002) and removal of Barred Owls (*Strix varia* Barton, 1799) to protect Spotted Owls (*Strix occidentalis* (Xantus de Vesey, 1860)) (Livezey 2010) are two examples. We maintain that in such cases, it is particularly important to involve high-quality science published in peer-reviewed journals. The application of critical thought in the analysis of data and preparation of manuscripts, as well as external review by independent university-based scientists, is vital to the success of management programs. The absence of these connections could mean that controversial and ineffective policies and practices could be promulgated. One notable example is the commercial extirpation of North Atlantic cod (*Gadus morhua* L., 1758) (Hutchings et al. 1997). Hutchings et al. (1997) recommended more collaboration and independent review of government-lead management programs.

Should university researchers be prevented from conducting and publishing research on controversial management areas? Had Boutin and Hebblewhite conducted mathematical modeling or a meta-analysis of the impact of predator control studies in wolf–caribou systems, they would not have required approval by CCAC. Bryan et al. (2014) used hormone analysis of hair samples to assess the responses of wolves to hunting pressure. Some of these hair samples came from wolves culled by the Government of Alberta and reported on by Hervieux et al. (2014). The Bryan et al. (2014) work did not require approval by CCAC because the researchers were not involved in working directly with the wolves whose hair they studied, as was the case with the university researchers involved in Hervieux et al. (2014).

In conclusion, we recognize that to some people, wolf control is morally or ethically wrong (Vucetich and Nelson 2014). But an argument could be made that it is morally wrong to knowingly allow populations of threatened or endangered woodland caribou to be extirpated as a result of human-caused landscape alterations operating through the mechanism of altered predation rates. Across Canada and in Alberta, woodland caribou are threatened and (or) endangered. But populations of wolves in these areas are, by and large, healthy and not endangered. The Canadian public and policymakers have recognized this difference, and afforded woodland caribou protections through federal and provincial *Species at Risk Acts* (Government of Canada 2002). The Alberta and Federal recovery plans (Alberta Woodland Caribou Recovery Team 2005; Environment Canada 2012) for woodland caribou recognize the proximate (e.g., wolf) and ultimate (e.g., anthropogenic habitat change) causes of woodland caribou declines. Conservation is not as simple as a series of right/wrong moral or ethical statements, but a complex balancing of multiple competing objectives. To make appropriate decisions in any complex decision-making framework depends on the objectives of society, as well as the feasibility of different management actions leading to desired outcomes. The management actions delivered by the Government of Alberta, and analysed in the study by Hervieux et al. (2014), provide quantitative scientific information about the value and limitations of wolf management in the context of woodland caribou recovery in heavily altered landscapes. For this reason alone, it will be a valuable contribution to future informed dialogue about woodland caribou recovery.

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References

Alberta Fish and Wildlife Policy Branch. 2013. Canid capture, handling, immobolization, and release. Class Protocol No. 009. Alberta Wildlife Animal Care Committee, Alberta Environment and Sustainable Resource Development, Edmonton.

Alberta Sustainable Resource Development. 2009. Use, storage and handling of vertebrate toxicants for problem wildlife control and wildlife management. Alberta Fish and Wildlife Standards Manual (P.S.-1) 1999, updated in 2009. Alberta Sustainable Resource Development, Edmonton.

Alberta Wildlife Management Branch. 2012. Ungulate capture by net-gunning, handling and release. Class Protocol No. 008. Alberta Wildlife Animal Care Committee, Alberta Environment and Sustainable Resource Development, Edmonton.

Alberta Woodland Caribou Recovery Team. 2005. Alberta woodland caribou recovery plan, 2004/05–2013/14. Alberta Sustainable Resource Development, Fish and Wildlife Division, Edmonton.

Bryan, H.M., Smits, J.E.G., Koren, L., Paquet, P.C., Wynne-Edwards, K.E., and Musiani, M. 2014. Heavily hunted wolves have higher stress and reproductive steroids than wolves with lower hunting pressure. Funct. Ecol. [Early View (online version of record published before inclusion in an issue).] doi:10.1111/1365-2435.12354.

COSEWIC. 2014. COSEWIC assessment and status report on the caribou *Rangifer tarandus*, Northern Mountain population, Central Mountain population and Southern Mountain population in Canada. Committee on the Status of Endangered Wildlife in Canada (COSEWIC), Ottawa, Ont.

Environment Canada. 2012. Recovery strategy for the woodland caribou (*Rangifer tarandus caribou*), boreal population, in Canada. Environment Canada, Gatineau Que.

Environment Canada. 2014. Recovery strategy for the woodland caribou, southern mountain population (*Rangier tarandus caribou*) in Canada. Environment Canada, Gatineau Que.

Goodrich, J.M., and Buskirk, S.W. 1995. Control of abundant native vertebrates for conservation of endangered species. Conserv. Biol. **9**(6): 1357–1364. doi:10.1046/j.1523-1739.1995.09061357.x.

Government of Alberta. 2006. Wildlife Act. *In* Revised statutes of Alberta 2000, Chapter W-10. Government of Alberta, Edmonton.

Government of Alberta. 2011. A woodland caribou policy for Alberta. Government of Alberta, Edmonton. Available from http://esrd.alberta.ca/fish-wildlife/wildlife-management/caribou-management/documents/WoodlandCaribouPolicy-Alberta-Jun2011.pdf.

Government of Canada. 2002. Species at Risk Act, SC 2002, c29. Government of Canada, Ottawa, Ont.

Gunson, J.R. (*Editor*). 1991. Wolf management plan for Alberta. Wildlife Management Division, Alberta Environmental Protection, Natural Resource Service, Edmonton.

Hervieux, D., Hebblewhite, M., DeCesare, N.J., Russell, M., Smith, K., Robertson, S., and Boutin, S. 2013. Widespread declines in woodland caribou (*Rangifer tarandus caribou*) continue in Alberta. Can. J. Zool. **91**(12): 872–882. doi:10.1139/cjz-2013-0123.

Hervieux, D., Hebblewhite, M., Stepnisky, D., Bacon, M., and Boutin, S. 2014. Managing wolves (*Canis lupus*) to recover threatened woodland caribou (*Rangifer tarandus caribou*) in Alberta. Can. J. Zool. **92**(12): 1029–1037. doi:10.1139/cjz-2014-0142.

Hutchings, J.A., Walters, C., and Haedrich, R.L. 1997. Is scientific inquiry incompatible with government information control? Can. J. Fish. Aquat. Sci. **54**(5): 1198–1210. doi:10.1139/f97-051.

Livezey, K.B. 2010. Killing barred owls to help spotted owls I: A global perspective. Northwest. Nat. **91**: 107–133. doi:10.1898/NWN09-37.1.

Roemer, G.W., Donlan, C.J., and Courchamp, F. 2002. Golden eagles, feral pigs, and insular carnivores: how exotic species turn native predators into prey. Proc. Natl. Acad. Sci. U.S.A. **99**(2): 791–796. doi:10.1073/pnas.012422499. PMID: 11752396.

Vucetich, J., and Nelson, M.P. 2014. Wolf hunting and the ethics of predator control. *In* Oxford Handbook of animal studies. *Edited by* L. Kalof. Oxford University Press, Oxford, UK. p. 15. doi:10.1093/oxfordhb/9780199927142.013.007.