



The ZSL Bushmeat Research Programme

The Bushmeat Research Programme at ZSL (Zoological Society of London)'s Institute of Zoology has been active since 1999, operating in a number of West and Central African countries as well as Europe, and carrying out both empirical and modelling studies. The programme is interdisciplinary, tackling ecological, social and economic questions, and policy focused, aiming to answer a range of questions relevant to potential management responses. Brief details are given below of some specific past and current projects within the programme, together with research and policy outputs from these projects. See www.zsl.org/bushmeat for more information.

Bioeconomic modelling of bushmeat harvesting systems

This project is developing a general model of a bushmeat harvesting systems that links socio-economic drivers of hunting behaviour with the dynamics of multi-species prey communities. This modelling framework is being used to evaluate the impact of policy and management initiatives on long-term patterns of hunter profit, species offtake and sustainability, and to shed light on the relationship between market data and the state of hunted populations in heterogeneous source areas.

Outputs

- Rowcliffe J.M., Cowlshaw G. & Long J. (2003) A model of human hunting impacts in multi-prey communities. *Journal of Applied Ecology* 40: 872-889.
- Rowcliffe J.M., de Merode E. & Cowlshaw G. (2004) Do wildlife laws work? Species protection and the application of a prey choice model to poaching decisions. *Proceedings of the Royal Society Series B - Biological Sciences* 271: 2631-2636.

Trade and sustainability along a Ghanaian bushmeat commodity chain

This project aims to describe the social and economic processes that drive the bushmeat commodity chain, from harvesting to market sales in Sekondi-Takoradi, Ghana's third largest city. This work focuses primarily on market traders, but also encompasses detailed analyses on farmer hunters, commercial hunters, wholesalers and chop bars, and the relationships between these actors.

Outputs

- Mendelson S., Cowlshaw G. & Rowcliffe J.M. (2003) Anatomy of a bushmeat commodity chain in Takoradi, Ghana. *The Journal of Peasant Studies* 31: 73-100.
- Cowlshaw G., Mendelson S. & Rowcliffe J.M. (2004) The bushmeat commodity chain: patterns of trade and sustainability in a mature urban market in West Africa. *Overseas Development Institute Wildlife Policy Briefing series*, no. 7.
- Cowlshaw G., Mendelson S. & Rowcliffe J.M. (2005) Evidence for post-depletion sustainability in a mature bushmeat market. *Journal of Applied Ecology* 42: 460-468.
- Cowlshaw G., Mendelson S. & Rowcliffe J.M. (2005) Structure and operation of a bushmeat commodity chain in Southwestern Ghana. *Conservation Biology* 19: 139-149.
- Cowlshaw G., Mendelson S. & Rowcliffe J.M. (2005) Management of the bushmeat trade in Ghana. *id21 Research Highlights*, no. 2: 1.
- Cowlshaw, G. (2005) Management of the bushmeat trade in Ghana. *id21 Communicating Development Research*, www.id21.org/id21ext/r2gc1g1.html
- Cowlshaw, G., Mendelson, S., & Rowcliffe, J.M. (2007) Livelihoods and sustainability in a bushmeat commodity chain in Ghana. In *Bushmeat and Livelihoods: Wildlife Management and Poverty Reduction* (eds G. Davies & D. Brown), pp. 32-46. Blackwell Publishing, Oxford.

Park protection, armed conflict and the bushmeat trade in Democratic Republic of Congo

This study investigates patterns of prey availability, hunter offtake, household bushmeat consumption/sales and market dynamics, in and around Garamba National Park during a period of civil conflict in the region.

Outputs

- de Merode E., Homewood K. & Cowlshaw G. (2003) Wild resources and livelihoods of poor households in Democratic Republic of Congo. Overseas Development Institute Wildlife Policy Briefing series, no. 1.
- de Merode E., Homewood K. & Cowlshaw G. (2004) The value of bushmeat and other wild foods to rural households living in extreme poverty in the eastern Democratic Republic of Congo. *Biological Conservation* 118: 573- 581.
- Rowcliffe J.M., de Merode E. & Cowlshaw G. (2004) Do wildlife laws work? Species protection and the application of a prey choice model to poaching decisions. *Proceedings: Biological Sciences* 271: 2631-2636.
- de Merode E. (2005) Protected areas and decentralisation in the Democratic Republic of Congo: a case for devolving responsibility to local institutions. In: K. Homewood (ed) *Rural resources and local livelihoods in Africa*, pp. 36-58. James Currey Publishers, London.

Incentives for the sustainable hunting of bushmeat Equatorial Guinea

This study follows a bushmeat supply chain in and around Monte Alén National Park from forest to market, with a focus on hunter incentives. It considers the causes (consumer demand) and effects (changes in prey populations) of hunting, and how this affects hunter behaviour and decision-making, both in terms of livelihood options and prey choice.

Outputs

- Keylock, N. (2002) The importance of hunting for bushmeat to a rural community in Equatorial Guinea. MSc thesis, Imperial College London.
- East, T. (2003) Urban consumer demand for bushmeat and its implications for the sustainability of the bushmeat trade in Equatorial Guinea. MSc thesis, Imperial College London.
- East, T., Kümpel, N.F., Milner-Gulland, E.J., & Rowcliffe, J.M. (2005) Determinants of urban bushmeat consumption in Río Muni, Equatorial Guinea. *Biological Conservation* 126: 206-215.
- Kümpel, N.F. (2006) Incentives for sustainable hunting of bushmeat in Río Muni, Equatorial Guinea. PhD thesis, Imperial College London and Institute of Zoology, Zoological Society of London. Available online at www.zsl.org/equatorialguinea
- Kümpel, N.F., East, T., Keylock, N., Rowcliffe, J.M., Cowlshaw, G., & Milner-Gulland, E.J. (2007) Determinants of bushmeat consumption and trade in Río Muni, Equatorial Guinea: an urban-rural comparison. In *Bushmeat and Livelihoods: Wildlife Management and Poverty Reduction* (eds G. Davies & D. Brown), pp. 73-91. Blackwell Publishing, Oxford.
- Kümpel, N.F., Milner-Gulland, E.J., Rowcliffe, J.M., & Cowlshaw, G. (2008) Impact of gun-hunting on diurnal primates in continental Equatorial Guinea. *International Journal of Primatology* 29: 1065–1082.
- Kümpel, N.F., Rowcliffe, J.M., Cowlshaw, G., & Milner-Gulland, E.J. (2009) Trapper profiles and strategies: insights into sustainability from hunter behaviour. *Animal Conservation* 12: 531-539.
- Kümpel, N.F., Milner-Gulland, E.J., Cowlshaw, G., & Rowcliffe, J.M. (2010) Assessing sustainability at multiple scales in a rotational bushmeat hunting system. *Conservation Biology* 24: 861-871.
- Kümpel, N.F., Milner-Gulland, E.J., Cowlshaw, G., & Rowcliffe, J.M. (2010) Incentives for hunting: the role of bushmeat in the household economy in rural Equatorial Guinea. *Human Ecology* 38: 251-264.
- Gill, D. (2010) Drivers of change in hunter offtake and hunting strategies in Sendje, Equatorial Guinea. MSc thesis, Imperial College London.
- Gill, D., Fa, J.E., Rowcliffe, J.M. & Kümpel, N.F. (2012) Drivers of change in hunter offtake and hunting strategies in Sendje, Equatorial Guinea. *Conservation Biology* DOI: 10.1111/j.1523-1739.2012.01876.x

Bushmeat, poverty, and rural livelihoods in Equatorial Guinea

This is a detailed study of the role of bushmeat in the diets and livelihoods of contrasting communities in Río Muni, using the contrasts to understand how patterns of bushmeat use and sustainability are likely to change with predicted patterns of economic development.

Outputs

- Allebone-Webb, S.M. (2008) Evaluating dependence on wild foods in continental Equatorial Guinea. PhD thesis, Imperial College London and Institute of Zoology, Zoological Society of London. Available online at www.zsl.org/equatorialguinea.
- Allebone-Webb, S., Rowcliffe, J.M., & Cowlshaw, G. (2009) Wildlife products and forest livelihoods. id21 Rept. No. 77. University of Sussex, Brighton UK: www.id21.org/insights/insights77/art04.html.
- Allebone-Webb, S.M., Kümpel, N.F., Rist, J., Cowlshaw, G., Rowcliffe, J.M., & Milner-Gulland, E.J. (2011) The use of market data to assess bushmeat hunting sustainability in Equatorial Guinea. *Conservation Biology* 25: 597-606.

Simple indices of hunter effort and sustainability in Equatorial Guinea

This project looks at hunter decision-making and the impacts of hunting on prey populations, in particular investigating the spatial dynamics of bushmeat hunting and the development of simple tools that might allow these impacts to be assessed indirectly without the need for difficult and expensive population monitoring.

Outputs

- Rist, J. (2007) Bushmeat catch per unit effort in space and time: a monitoring tool for bushmeat hunting, PhD thesis, Imperial College London and Institute of Zoology, Zoological Society of London. Available online at www.zsl.org/equatorialguinea.
- Rist, J., Rowcliffe, J.M., Cowlishaw, G., & Milner-Gulland, E.J. (2008) Evaluating measures of hunting effort in a bushmeat system. *Biological Conservation* 141: 2086-2099.
- Rist, J., Milner-Gulland, E.J., Cowlishaw, G., & Rowcliffe, J.M. (2009) The importance of hunting and habitat in determining the abundance of tropical forest species. *Biotropica* 41: 700-710.
- Rist, J., Milner-Gulland, E.J., Cowlishaw, G., & Rowcliffe, J.M. (2010) Hunter reporting of catch per unit effort as a monitoring tool in a bushmeat harvesting system. *Conservation Biology* 24: 489-499.

Bushmeat exploitation in the Sanaga-Cross region

This project was part of a collaboration with the Durrell Wildlife Conservation Trust, surveying bushmeat supply and demand in the Sanaga-Cross region of Nigeria and Cameroon. This element of the project focussed on the influence of landscape factors on patterns of trade.

Outputs

- Fa J.E., Seymour S., Dupain J., Amin R., Albrechtsen L. & Macdonald D. (2006) Getting to grips with the magnitude of exploitation: bushmeat in the Cross-Sanaga rivers region, Nigeria and Cameroon. *Biological Conservation* 129: 497-510.

Habitat quality and bushmeat surveys in Sierra Leone

This research builds on detailed ecological studies in the Gola Forest Reserves, where the population densities of antelopes and primates were examined in logged and unlogged forests, plantations and fallows, in conjunction with surveys of hunters and markets in the region.

Outputs

- Schülte-Herbrüggen, B. (2004) Bushmeat hunting impacts on wildlife in Sierra Leone. MSc thesis, University of York, York.
- Davies, G., Schülte-Herbrüggen, B., Kämpel, N.F., & Mendelson, S. (2007) Hunting and trapping in Gola Forest, south-eastern Sierra Leone: bushmeat from farm, fallow and forest. In *Bushmeat and Livelihoods: Wildlife Management and Poverty Reduction* (eds G. Davies & D. Brown). Blackwell, Oxford.

Species vulnerability to bushmeat hunting

Susceptibility to hunting pressure can vary dramatically between different species. This study explores these patterns of variation, and the mechanisms that might underpin such variation, in primates. It also investigates how the same taxa respond to other anthropogenic threats, including selective logging and shifting cultivation.

Outputs

- Isaac N.J.B. & Cowlishaw G. (2004) How species respond to multiple extinction threats. *Proceedings of the Royal Society Series B - Biological Sciences* 271: 1135-1141.

Bushmeat, poverty and rural livelihoods in Ghana

This project aims to understand the role of bushmeat in the economy of rural Ghana, from an anthropological and development perspective, focussing on a cocoa-growing community in a forested part of the Western Region.

Outputs

- Whitham, C. (2009) Linkages between the incentives and strategies of hunters: a case study from Ghana. MSc thesis, Imperial College London.

Large-scale economic and environmental drivers of bushmeat trade in Ghana

This study is analysing a 30 year dataset of bushmeat market flows in Kumasi in combination with data on climate and vegetation cover, and social research on household decision-making. The goal is to understand the large-scale forces driving unsustainable hunting in Ghana in order to guide policy response.

Fruit bats as bushmeat

Fruit bats are widely eaten, and yet surveys of mainstream bushmeat trade chains rarely feature these species. This set of projects aims to focus on the separate commodity chains by which bats are traded and consumed in key parts of West and Central Africa, currently beginning in Ghana and the Gulf of Guinea islands.

Roads and bushmeat trade in Gabon

Roads are a key factor in the bushmeat trade through their provision of access to markets. This study is examining in detail how this facilitation of trade operates in Gabon, focusing on how both the creation and deterioration of roads influence trade and livelihoods.

Monitoring international bushmeat trade – imports to Europe

While there is anecdotal evidence for substantial trade in bushmeat in Europe, we know very little about the scale and operation of this trade. This project aims to address this information gap through rigorous surveys of illegal imports at airports and surveys of traders in European cities.

Outputs

Chaber, A.L. (2008) An analysis of the African bushmeat trade in France. MSc thesis, Royal Veterinary College, London.

Chaber, A.L., Allebone-Webb, S., Lignereux, Y., Cunningham, A.A., & Rowcliffe, J.M. (2010) The scale of illegal meat importation from Africa to Europe via Paris. *Conservation Letters* 3: 317-321.

Books, opinion pieces and reviews

Davies, G. (2002) Bushmeat and international development. *Conservation Biology* 16: 587-589.

Rowcliffe, J.M. (2002) Bushmeat and the biology of conservation. *Oryx* 36: 331.

Ling, S., Kümpel, N.F., & Albrechtsen, L. (2002) No new recipes for bushmeat. *Oryx* 36: 330.

Milner-Gulland, E.J., Bennett, E.L. & the SCB 2002 Annual Meeting Wild Meat Group (2003) Wild meat: the bigger picture. *Trends in Ecology & Evolution* 18: 351-357.

Rowcliffe, J. M., Milner-Gulland, E. J. & Cowlshaw, G. (2005) Do bushmeat consumers have other fish to fry? *Trends in Ecology and Evolution* 20: 274-276.

POST (2005) The bushmeat trade. Parliamentary Office of Science and Technology, London. (By N. Kümpel)

Davies, G. & Brown, D., eds. (2007) *Bushmeat and Livelihoods: Wildlife Management and Poverty Reduction*. Blackwell, Oxford.

Bennett, E.L., Blencowe, E., Brandon, K., Brown, D., Burn, R.W., Cowlshaw, G., Davies, G., Dublin, H., Fa, J.E., Milner-Gulland, E.J., Robinson, J.G., Rowcliffe, J.M., Underwood, F.M., & Wilkie, D.S. (2007) Hunting for consensus: reconciling bushmeat harvest, conservation, and development policy in west and central Africa. *Conservation Biology* 21: 884-887.

Milner-Gulland, E.J. & Rowcliffe, J.M. (2007) *Conservation and Sustainable Use: a Handbook of Techniques*. Oxford University Press, Oxford.

Van Vliet, N., Nasi, R., Abernethy, K., Fargeot, C., Kumpel, N.F., Obiang, A.N. & Ringuelet, S (2012) The role of wildlife for food security in Central Africa: A threat to biodiversity? In de Wasseige, C. et al. *The Forest of the Congo Basin – State of the Forest 2010*.

Key staff, collaborators and students

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