Institution: Liverpool John Moores University

Unit of Assessment: 24 – Anthropology and Development Studies

Title of case study: LJMU behavioural ecology research impacts conservation strategy and practice in Sichuan Province, China.

1. **Summary of the impact** (indicative maximum 100 words)

Conservation activities must be well grounded in solid science to be effective. Our research identified specific threats to the survival of threatened species in Sichuan Province, China. Research outcomes were used to create, maintain and monitor nature reserves, ensuring species survival. The revelation that human cultural and subsistence activities were adversely affecting threatened species led to successful promotion and adoption of beneficial alternatives to these behaviours. Our research provided the basis for technical support to local communities through capacity building and community development, empowering indigenous ethnic minority populations to protect forest habitat for wildlife. LJMU-led research identified the factors which adversely impacted breeding success of threatened birds, creating opportunities for the amelioration of these threats and promoting conservation of threatened species.

2. Underpinning research (indicative maximum 500 words)

The research underpinning these impacts elucidated the population size and distribution, habitat preferences and breeding ecology of endemic bird species listed as globally threatened by the International Union for the Conservation of Nature (IUCN), the Sichuan Partridge *Arborophila rufipectus* **[1,3]** and the Omei Shan Liocichla *Liocichla omeiensis* **[4,5]**. One of the key findings of the research has been the negative impact of human disturbance, particularly during the breeding season, on population density and breeding success for both species **[1,2,3,4,5]**. Translation of the research into action has therefore focused on working with local communities to find viable and sustainable alternatives to activities such as firewood and medicinal plant collection that cause disturbance to wildlife.

LJMU-led research determined the species densities at optimal elevations required by the Sichuan Partridge, and demonstrated its reliance upon broadleaf forest habitats **[1, 2, 3]**. This study demonstrated that the Sichuan Partridge had successfully colonised areas of secondary / replanted forest, initially altered by logging activity **[1]** but preferred older forest, both primary and established secondary forest **[3]**. The Omei Shan Liocichla was shown to prefer areas of scrub between the broadleaf trees for nesting **[4, 5]**. These research findings were important for conservation efforts in an area where logging has seriously reduced the availability of primary forest and suggested a way forward in conserving these species which has been utilised in conservation efforts.

Studies identified the threats to the bird habitat caused by logging activity, which had been organised at a provincial rather than a more local county level **[2]**. Land clear felled by loggers was often exploited briefly as agricultural or grazing land, although subsequently it would be replanted with native broadleaf species to stabilise steep slopes **[2]**. Logging in the area was banned in 1998 following widespread flooding, attributed in part to deforestation **[3]**. Bamboo shoot collection, which is regulated but widespread, occurs seasonally (April-May) during the Partridge breeding period (March-June) and was also identified as a cause of disturbance affecting conservation **[2]**. Sichuan Partridge and Omei Shan Liocichla were shown to prefer habitats which were less subject to active human disturbance **[3, 4, 5]**. Other cultural activities which disturbed the breeding of target species were identified, including the harvest of medicinal plants and hunting **[2, 4, 5]**.

LJMU-led research thus provided the groundwork for conservation activity in this region by defining the ecological requirements of the taxa studied, including preferred habitats, breeding ecology and ranging behaviour. Since initial population densities, particularly of the Sichuan Partridge, were low, environmental and human threats to breeding success were identified. These findings were actively used to inform conservation activities in Sichuan.

3. References to the research (indicative maximum of six references)

[1] Dai, B., Dowell, S.D., Martins, R.P. and Williams, R.S.R. 1998. Conservation status of the Sichuan Hill-partridge *Arborophila rufipectus* in China. *Bird Conservation International* 9: 349-359. 8(04):349 - 359. http://dx.doi.org/10.1017/S0959270900002112
[2] Dowell, S.D., Dai, B., Martins, R.P. and Williams, R.S.R. 1999. Sustainable management to prevent extinction: The case of the Sichuan Hill-partridge. *Ostrich* 69: CD Rom Format. http://www.int-ornith-union.org/files/proceedings/durban/Symposium/S35/S35.1.htm
[3] Dai, B., Dowell, S.D., Garson, P.J. and He, F.Q. 2009. Habitat utilisation by the threatened Sichuan Partridge *Arborophila rufipectus*: Consequences for managing newly protected areas in southern China. *Bird Conservation International* 19: 187-198. http://dx.doi.org/10.1017/S0959270909007618
[4] Fu, Y-Q., Dowell, S.D., Zheng, Z-W. 2011. Breeding ecology of the Emei Shan Liocichla (*Liocichla omeiensis*). *Wilson Journal of Ornithology* 123:748-754. Available from LJMU upon request.
[5] Fu, Y-Q., Dowell, S.D., Zheng, Z.W. 2012. The application of temperature data loggers for remotely monitoring the nests of Emei Shan Liocichla (*Liocichla omeiensis*). *Zoological Science* 29(6): 373 - 376. http://dx.doi.org/10.2108/zsj.29.373

Papers 1-3 present the results of research funded by the British Ecological Society, the Wellcome Trust and *Zoologische Gesellschaft für Arten und Populationsschutz*. Papers 4-5 result from research conducted with financial support from the North of England Zoological Society and a private donor. Outputs 1, 3-5 were published in internationally recognised, peer-reviewed journals and Output 2 is a paper presentation made at an international conference, proceedings of which are available online and widely disseminated within the wildlife ecology community. Field research and the conservation activity take place with collaborators from the Chester Zoo, Sichuan Forest Department, Chengdu Giant Panda Breeding Base, Beijing Normal University, Leshan University and Sichuan University. Chester Zoo fund the conservation project directly through their conservation outreach funding.

Dowell joined LJMU 1 September 1992 and departed 30 June 2013. During this time he held numerous posts, rising from lecturer in Conservation Ecology to Head of the School of Biological and Earth Sciences, precursor to our current School, Natural Sciences and Psychology (2002-2008). He was Head of International Strategy for the Faculty of Science at his departure (2008-2013). All the research cited here was conducted whilst he was a member of LJMU staff.

4. Details of the impact (indicative maximum 750 words)

LJMU research underpinned the following impacts:

- Informed the location, management and monitoring of four newly Protected Areas for Forest biodiversity in the Liang Shan region of southern Sichuan
- Increased the understanding of the effects of human activities on wildlife, creating opportunities for changing human behaviour patterns to benefit both local people and wildlife
- Created better understanding of Chinese wildlife and conservation locally in Sichuan and within the UK

LJMU Research informed the location, management and monitoring of four newly Protected Areas for Forest biodiversity in the Liang Shan region of southern Sichuan

The research outputs that feed into these aims are an understanding of population size and distribution, habitat preferences and ecological requirements of threatened endemic birds that have informed location and management of protected areas **[1, 3, 4]**. Research (1997 – 1999) on population size and distribution of the Sichuan Partridge **[1,2]** ran parallel to active attempts that were being made by the wildlife conservation division of the Sichuan Forest Department (SFD) to secure protection for some of the rapidly diminishing forest habitat within the bird's range. As part of a wider plan to protect remaining forest cover, four new nature reserves containing the species covering a total of 100,000ha were established by the SFD from 2000 **[H,I,J]**. Two of the four supported reserves have achieved national status in the last two years and these now benefit from

central Government funding **[H,I,J]**. These reserves conserve endemic birds and mammals, such as the Giant and Lesser pandas, and the Tibetan Macaque **[H,I,J]**.

As a direct result of his research, Dowell founded the Sichuan Forest Biodiversity Project as a project of the Chester Zoo Conservation outreach programme for China in 2002 and he acted as project coordinator until 2013. **[A,B,E,H,I,J]**. The project supports four nature reserves (Heizhugou, Ma'anshan, Laojunshan and Mamize Nature Reserves) established since 2000. The project is in collaboration with the Sichuan Forest Department, a Chinese Government agency based in Chengdu **[E,H,I,J]**. The overarching aims of the project are to enhance the network of Protected Areas for forest biodiversity (especially broadleaf forest) in the Liang Shan region of southern Sichuan and to engage the local Yi tribal people in their sustainable management and development.

Detailed ecological studies have led to new insights into the habitat requirements of endemic bird species providing the opportunity for research-informed conservation action in the newly established reserves **[3,4,5]**. Dowell has worked closely with nature reserve rangers to develop wildlife monitoring schemes based on the underpinning research. Annual monitoring of all Galliformes (considered to be important as indicator species) using systematic line transect and point count methods has been developed through intensive training and active support for data entry and analysis. There is now a data set going back to 2006 which is beginning to allow the impact of management actions to be monitored. Further monitoring of Galliformes and mammals is being piloted using camera traps **[H,I,J]**.

The project has been highly successful in building capacity for conservation in the Liang Shan region. All four nature reserves are managed by teams of rangers derived from the local population, including many Yi tribal people. The project has actively assisted them in this by providing training in species identification, wildlife survey and monitoring techniques, use of GIS and other computer software to assist management, community project management and publicity raising **[A,B,H,I,J]**. Management of the project has moved from central coordination by the Sichuan Forest Department to local management by the nature reserves themselves, working to a 5 year Conservation Strategy for the Liang Shan region that was prepared by Dowell in 2010 in collaboration with Sichuan Forest Department and nature reserve colleagues **[E,H,I,J]**. There is an annual meeting of all senior staff from all four reserves to share practice at which research results are fully disseminated and there is discussion and agreement as to how they can be used to inform their management plans.

LJMU Research increased the understanding of the effects of human activities on wildlife, creating opportunities for changing human behaviour patterns to benefit both local people and wildlife

Since disturbance, especially during the breeding season, has been found to affect habitat selection and productivity in the target bird species, a key impact of our research has led to work with local communities to find viable alternatives to the activities that cause disturbance. Many of the local communities living in and around the nature reserves in the Liang Shan are ethnic Yi tribal people suffering from severe economic deprivation due to rural poverty and unemployment.

One activity which causes disturbance to wildlife is the collection of firewood from within the protected forest reserves. This cause of disturbance has been successfully reduced through the establishment of biogas or fuel saving stoves. At one site, Laojunshan Nature Reserve, installation of biogas stoves that utilise methane gas generated from pig dung as a fuel has been shown to reduce wood collection by up to 95% **[A,B,C,H,I,J]** and to date 28 households have benefited **[H,I,J]**. At Mamize Nature Reserve, the installation of enclosed fuel saving stoves into 20 households has reduced wood collection by one third and led to improvements in human health due to the reduction of smoke inhalation from open fires **[B,H,I,J]**.

A second example is the establishment of bee hives for the generation of honey as a sustainable alternative economic activity to the collection of forest products to sell as a supplemental source of

income. At Heizhugou Nature Reserve, where 15 families have been provided with hives, stock and equipment since 2009 **[H,I,J]**, it has been found that the income generated from honey can be up to one hundred times that gained from collection of wild plants with edible or medicinal properties **[B,H,I,J]**. It is sustainable, contributing to the pollination of wild species of plants and removes the incentives for local people to collect forest products. Recent monitoring shows that conservation activities have been successful, with populations of Sichuan Partridge and other species on the rise **[B,H,I,J]**.

LJMU research created better understanding of Chinese wildlife and conservation locally in Sichuan and within the UK

The Sichuan Forest Conservation Project is the main part of Chester Zoo's China Conservation Outreach Programme **[C,D,E,H,I,J]**. It was founded by Dowell, in collaboration with the Sichuan Forest Department to translate his ecological research on threatened birds into conservation action to prevent their extinction. The project provides financial and technical support to local communities in the Liang Shan region of southern Sichuan for capacity building and community development in order to protect forest habitat for wildlife. Dowell acts as project coordinator and provides the liaison between partners in China and Chester Zoo. The project has succeeded in supporting four new nature reserves and their local communities in finding sustainable alternatives to activities that cause disturbance.

In addition, the research findings have contributed to activities designed to raise public awareness of the international importance of birds and other wildlife in the Liang Shan region via promotional leaflets, local campaigns and work with schools in the villages around the nature reserves. The latter has been implemented since 2008 by the education department at the Chengdu Base for Giant Panda Breeding which is a partner in the project **[C,D,H,I,J]**.

The work of the project, including the ecological research, has been promoted by Chester Zoo on their website, in their publications and at public lectures **[C,D,G,H,I,J]**. Some of the species conserved in the wild are held by the zoo for successful captive breeding **[B,H,I,J]**. In 2009 the project was adopted by the World Association of Zoos and Aquaria and featured on their website as their 'project of the month' in October of that year, further promoting public awareness of this conservation activity **[F,H,J]**.

5. Sources to corroborate the impact (indicative maximum of 10 references) All reports available from LJMU upon request.

[A] North of England Zoological Society 2010. Project Conservation Impact Summary: Sichuan Forest Biodiversity Project. NEZS internal report.
[B] North of England Zoological Society 2011. Project Conservation Impact Summary: Sichuan Forest Biodiversity Project. NEZS internal report.
[C] Chester Zoo 2011 Protecting China's Forests: Focus on Sichuan biodiversity. Page 16 in 2011 Zoo Review (Annual Report of the North of England Zoological Society for the year ended 31st December 2011).
[D] Chester Zoo 2012 Protecting China's Forests: Focus on Sichuan biodiversity. Page 16 in 2011 Zoo Review (Annual Report of the North of England Zoological Society for the year ended 31st December 2012).
[E] A Conservation Strategy for the Liang Shan Region. Sichuan Forest Department in collaboration with Chester Zoo UK.
[F] World Association for Zoos and Aquaria: WAZA Conservation Projects: The Sichuan Forest Biodiversity Project http://www.waza.org/en/site/conservation/waza-conservation-projects/overview/sichuan-forest-biodiversity-project
[G] http://www.chesterzoo.org/conservation-and-research/field-conservation/field-programmes/china-conservation-programme
[H] Director, Chester Zoo
[I] Chief, Sichuan Wildlife Survey and Conservation Management Station, Sichuan Forest Dept.
[J] Director Emeritus, Chester Zoo