



## Darwin Initiative Final Report

To be completed with reference to the Reporting Guidance Notes for Project Leaders (<http://darwin.defra.gov.uk/resources/>) it is expected that this report will be a **maximum** of 20 pages in length, excluding annexes)

### Darwin project information

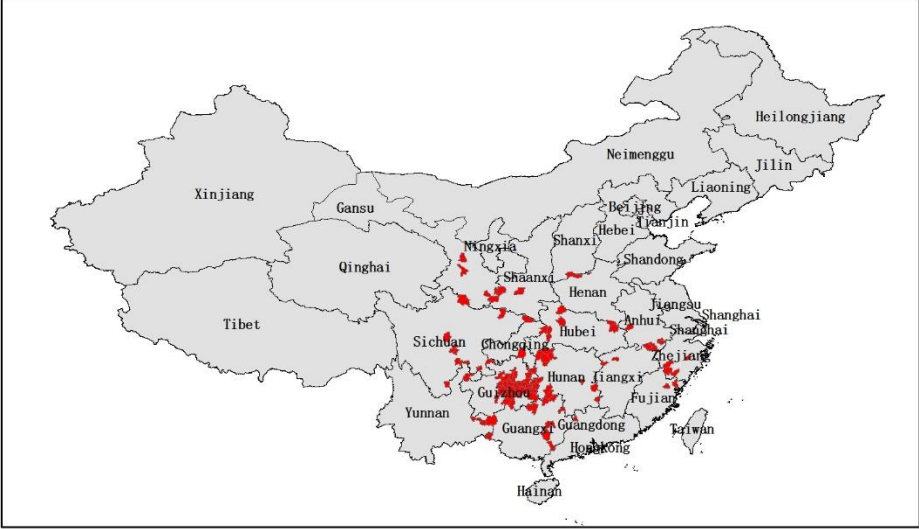
Project Reference	19-003
Project Title	A sustainable future for Chinese giant salamanders
Host country(ies)	China
Contract Holder Institution	Institute of Zoology, Zoological Society of London
Partner Institution(s)	Kunming Institute of Zoology (KIZ) Shaanxi Normal University (SNNU) Guiyang University (GU)
Darwin Grant Value	£300,374
Funder (DFID/Defra)	Defra
Start/End dates of Project	1 July 2012 – 30 June 2016
Project Leader's Name	Andrew Cunningham
Project Website/blog/twitter	<a href="http://www.chinesegiantsalamanders.org">www.chinesegiantsalamanders.org</a>
Report Author(s) and date	Andrew Cunningham, Shu Chen 30 <sup>th</sup> April 2016

### 1 Project Rationale

The world's largest amphibian, the Critically Endangered Chinese giant salamander (CGS; *Andrias davidianus* - Cryptobranchidae), is highly evolutionarily distinct. The cryptobranchid lineage has evolved independently for 170 million years and includes just two other surviving species (*Andrias japonicus* and *Cryptobranchus alleganiensis*). This ancient species likely plays an important role in maintaining freshwater ecosystems and food chain stability. As it is mostly found where there are undisturbed riverbanks, clean water and deep forest cover, the CGS is regarded as an "environmental indicator" of healthy freshwater ecosystems.

Originally occupying a range that encompassed mountain tributaries of the Pearl, Yellow and Yangtze Rivers across 17 provinces in China, the CGS has experienced a severe range-wide decline in the wild since the 1960s. This decline appears to be mainly due to overexploitation for food and also habitat destruction, but there has been a marked lack of research concerning the historic and current distribution, status of, and threats to, this species. The recent development of a rapidly growing CGS farming industry might have exacerbated the regional extinction of wild populations, but until this project started little was known about the extent of CGS farming, its potential (positive or negative) impacts on CGS conservation or the possible impact of CGS protection on local livelihoods.

By way of this project, therefore, we aimed to build the evidence base and capacity to underpin, promote & conduct a strategic conservation plan for the CGS. This has included engaging with local and national policy makers and the CGS farming industry, building collaborations with multiple academic, NGO and governmental institutions, training local personnel in a range of field, laboratory and outreach techniques and conducting a national survey encompassing 100 field sites across China (Figure.1). In addition to CGS conservation, this project will have a lasting impact on China’s ability to respond to the broader amphibian extinction crisis and to implement national CBD objectives.



**Figure 1.** CGS project survey sites across China

**2 Project Achievements**

**2.1 Outcome**

Outcome:	Building the evidence-base & capacity to underpin, promote & conduct a strategic conservation plan for the CGS.			Comments (if necessary)
	Baseline	Change by 2016	Source of evidence	
Indicator 0.1	First robust dataset of population distribution, relative abundance and threat distribution across key range areas & genetic connectivity.	Standardised CGS national surveys conducted at 100 sites across China, allowing the first understanding of this species’ current status and threats to inform future conservation planning.	i.e. Annex 7; Section 2.3.1 of this report	
Indicator 0.2	Improved in-country resources & capacity for addressing both <i>in situ</i> & <i>ex situ</i> conservation concerns, including: monitoring protocols; population genetics database & biobanked material; disease diagnostic protocols; conservation breeding protocols; CEPA strategy and 2 campaigns; & the establishment of an effective national & international network to support & promote the sub-goal.	In-country capacity developed in CGS survey and monitoring, genetic screening and diseases diagnosis; key sites for CGS <i>in situ</i> conservation identified; CGS profile greatly promoted through diverse CEPA campaigns and effective stakeholder engagement at regional, national and international levels.	i.e. Annex 7; Section 2.3 of this report	

This project included the largest CGS survey to be completed in China's conservation history. A combination of field, questionnaire and pathogen surveys were conducted in 100 scientifically selected sites across 15 provinces and 1 municipality. Data were collected on CGS current & historical distributions and on perceived and actual threats across its historical range to build the first robust evidence base to inform and underpin future conservation management. Samples collected across the species' range have greatly enhanced a CGS genetic database and also our understanding of selected CGS pathogens. Also, both in-country conservation & research capacity and public (and political) awareness-raising were greatly strengthened. Collaborations and networks were established to inform a strategic conservation plan for the CGS. CEPA strategies were developed and CEPA networks were enhanced, with diverse public campaigns carried out in China reaching an estimated 1.5 million people. The international CGS conservation profile and the importance of freshwater ecosystems were highlighted at international conferences, London Zoo's new CGS exhibit and high-level engagement with the Chinese government, Chinese Embassy (London), the British Embassy (Beijing), the British Consulate (Chongqing) and the British Royal family.

## 2.2 Impact: achievement of positive impact on biodiversity and poverty alleviation

**Impact statement from logframe:** Improving scientific understanding & in-country capacity to strengthen the conservation framework for CGS.

This project aimed to obtain the evidence required to develop a national conservation plan for the CGS across its natural range in the drainage basins of the Yellow, Yangtze & Pearl Rivers. The work done so far has achieved this aim and will also benefit regional biodiversity by raising awareness (public and policy makers) of the need to conserve the CGS and its habitats, through identifying areas requiring additional protection based on our survey results and through building in-country research capacity for the conservation of amphibians and freshwater ecosystems (8 research teams and staff at two reserves have been trained so far). Also, engagement with Provincial Fisheries Management Bureaux and the CGS farming industry along with our disease research is helping to reduce/prevent the loss of stock on farms due to infectious disease (e.g. recent catastrophic ranavirus outbreaks on CGS farms have led to significant economic loss resulting in multiple farm bankruptcies. Such diseases, spread and amplified by farms, also threaten wild CGS conservation). This is helping to safeguard rural livelihoods (especially smallholder farmers who are poor and vulnerable to economic loss) through better biosecurity and management for improved farming sustainability.

To facilitate improved freshwater management in China and to inform high-level CGS and amphibian conservation strategies, such as protected area designation and conservation policy enactment, the results collated from this project (from CGS status in the wild to the genetic and disease management on farms) will be reported to both the central and provincial governments (Ministry of Agriculture, Environmental Protection Bureaux, Forestry Management Bureaux and Fisheries Management Bureaux) through written reports and the national CGS action plan workshop which we plan to hold in 2017, probably at our partner institute, the CAS Chengdu Institute of Biology.

## 2.3 Outputs

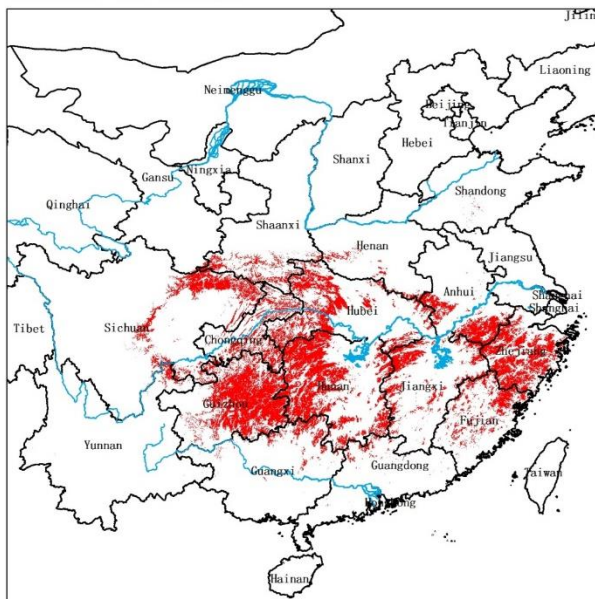
### 2.3.1 Output 1

Output 1:	Evidence-base on CGS distribution, population status, ecology & conservation requirements strengthened & disseminated		
	Baseline	Change recorded by 2016	Source of evidence
Indicator 1.1	Scientifically robust baseline data for CGS occurrence/abundance in range-wide study regions collated, analysed & reported	Standardised and integrated field survey, questionnaire and farm surveys successfully conducted in 100 sites to determine the current & historical distribution, threats and population status of wild CGS across CGS historical range in China	i.e. Annex 7,8,9, Section 2.3.1 of the report

Indicator 1.2	Predictive Habitat Model developed, that factors-in Climate Change, to delimit a suitable remaining range area for CGS to inform future conservation breeding release efforts & establish potential locations of remnant populations	A CGS habitat suitability map across China was developed based on published ecological parameters of this species (Fig.2). Also, a historical wild CGS distribution map was developed based on gazette records. These two maps were used in the selection of 100 CGS survey sites (Fig.3).	i.e. Annex 7, Section 2.3.1 of the report
Indicator 1.3	Questionnaire-based survey protocols developed & utilised to collect local informant data on current / historical range and threats	Questionnaire surveys of 1) local villagers, of 2) local fisheries and forestry officials, and of 3) CGS farms local to our field survey sites were developed to determine the distribution, status and threats impacting wild CGS. Questionnaire surveys were successfully piloted in Guizhou Province and published by Pan et.al. (2016)	i.e. Annex 7,8,9, Section 2.3.1 of the report Pan et al (2016). Using local ecological knowledge to assess the status of the Chinese giant salamander in Guizhou Province, China. <i>Oryx</i> <b>50</b> , 257-264.
Indicator 1.4	Standardised field survey programme developed & utilised	International CGS Conservation Field Training Workshop (ICGSCFTW) was held in Fanjingshan National Nature Reserve in 2013, with standardised field survey protocols developed. Eight survey teams were trained by ZSL on conducting standardised surveys & long-term monitoring throughout the country.	i.e. Annex 7,8,9, Section 2.3.1 of the report; Tapley et al. (2015). Failure to detect the Chinese giant salamander ( <i>Andrias davidianus</i> ) in Fanjingshan National Nature Reserve, Guizhou Province, China. <i>Salamandra</i> <b>51</b> , 206 -208
Indicator 1.5	1 CGS survey & monitoring EDGE Fellow trained	EDGE Fellow Jing-Cai Lv was trained over the past 4 years in CGS and amphibian survey and monitoring techniques; this helped to develop his career and he has subsequently been appointed by the Guizhou Academy of Sciences to lead herpetological research in Guizhou province.	i.e. Annex 10 and Blogs posted by EDGE Fellow Lv Jingcai ( <a href="http://www.edgeofexistence.org/edgeblog/?p=7202">http://www.edgeofexistence.org/edgeblog/?p=7202</a> )

We convened an International CGS Conservation Field Training Workshop (ICGSCFTW) in Fanjingshan National Nature Reserve (FNNR), Guizhou Province, in May 2013. With input from a multi-institutional team from within and outside China (including an experienced Japanese giant salamander researcher from Japan), a scientifically robust CGS national survey strategy with standardised protocols was developed to determine the current distribution, status, and threats impacting wild populations across the historical range of this species and to collect swab samples to conduct conservation genetic analysis and pathogen surveillance. This involved conducting independent methods to determine the current distribution and status of CGS: (1) visual encounter field surveys, (2) trapping surveys, (3) questionnaire surveys of local villagers, and (4) questionnaire surveys of local fisheries and forestry officials. Any CGS caught were measured (range of morphometrics) and swabbed to collect material for population genetics and pathogen infection status. In addition, questionnaire and swabbing surveys of CGS farms local to our field survey sites will were conducted to determine possible conservation threats and opportunities from the farming industry (i.e. buccal swabs and skin and cloacal swabs collected from farmed animals for host genetic and pathogen analysis). We identified 100 field survey sites (Figure 1), comprising: 50 sites of best habitat detected using niche modelling developed using published ecological parameters for this species (Figure 2) and 50 randomly-selected sites at which the species had been historically reported according to gazette records (Figure 3). This being considered the optimal strategy to detect the presence of this understudied species in as scientifically robust a way as financial, logistical and political constraints allowed. A full workshop report in English and a detailed standardised survey

manual in Chinese were produced as outputs from the workshop (Annex 7 and 8). Survey protocols were successfully piloted in Guizhou (resulting in two peer-reviewed papers), and 8 in-country survey teams were developed and intensively trained, following the protocols developed during the ICGSCFTW. Most survey teams were accompanied most of the time by a UK expert (professional herpetologist volunteers who assisted with training the teams), thus helping to ensure that comparable results were collected across all survey sites.



**Figure 2.** CGS habitat suitability model



**Figure3.** Counties with historical CGS distribution records

From May 2013 to July 2016, standardised surveys were conducted by trained teams in each of the 100 selected survey sites across 15 Provinces and 1 Municipality in China. Despite a cumulative 2810-day continuous effort, only 25 wild CGS were found at 5 sites in 4 provinces (Guizhou, Sichuan, Shaanxi & Guangdong Province). All the salamanders found were within the Protected Area network (Figure 4). The largest animal found was only 82 cm in length, and there was no evidence of breeding across the survey sites. During the surveys, direct exploitation (bow hooks, electrofishing, trapping or poisoning) was evident at 25% of the 100 survey sites.

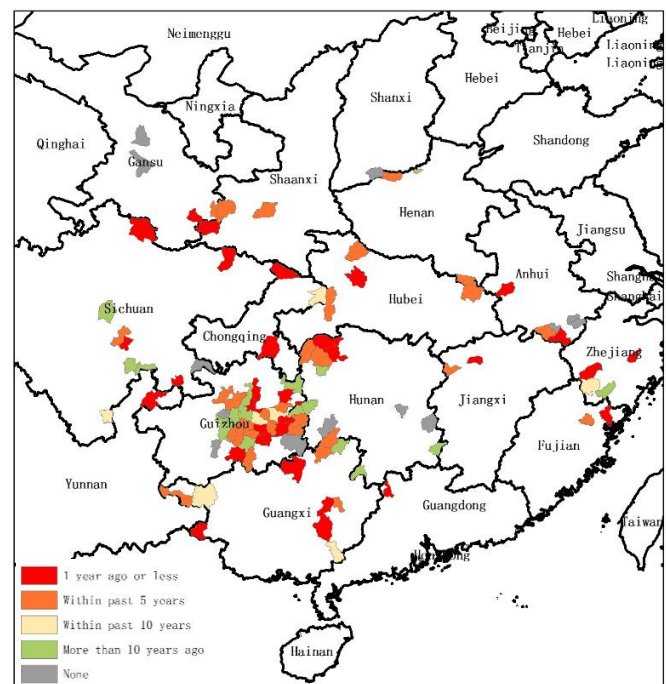
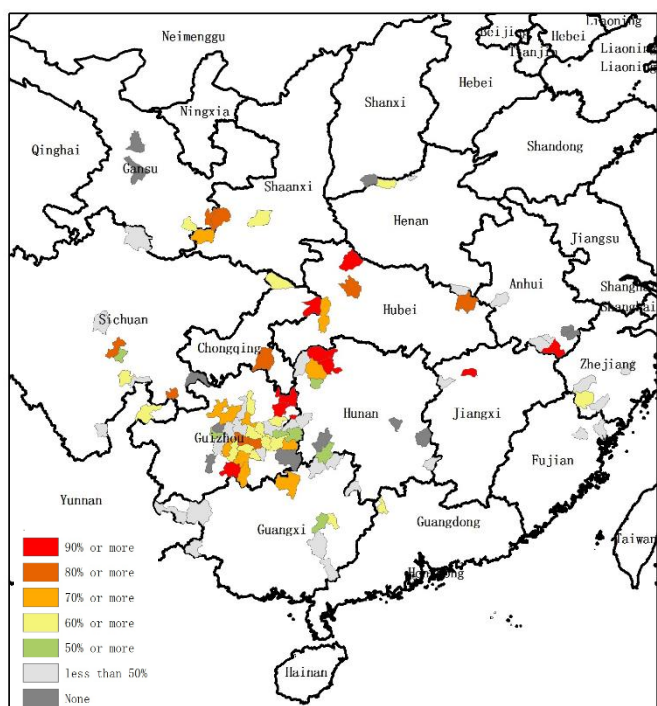


**Figure 4.** Wild CGS caught in field survey

We were able to interview 2902 respondents in target counties between 2013 and 2016, representing 16 Chinese provinces or equivalent administrative units (Anhui=6, Chongqing=3, Fujian=1, Gansu=4, Guangdong=1, Guangxi=10, Guizhou=33, Henan=3, Hubei=4, Hunan=13, Jiangxi=2, Shaanxi=3, Shanxi=1, Sichuan=9, Yunnan=1, Zhejiang=4). Respondents were mainly farmers, comprised both men and women (age range = 15-89), and included 17 different Chinese ethnicities. In total, 84% of respondents could identify and were familiar with

CGS, 46% reported having seen CGS in the wild at some point in their lives, and 41% provided a last-sighting date. Proportions of villagers reporting wild CGS sighting and the most recent sighting date across sites surveyed were mapped to investigate spatial patterns (Figure 5 and Figure 6). Many local names and local traditions about CGS were collected, many relating to bad luck if the animal was encountered in the wild. These data support the former wide distribution of the CGS across the large survey region. We found very little evidence of historical usage of CGS in local economies (i.e. before the recent advent of large-scale salamander farming); for example, whereas Traditional Chinese Medicine is a major driver of other species declines in China, <15% of respondents knew of any traditional medicinal use for the CGS, with only 15 respondents in total reporting having actually used CGS for medicine. Giant salamander sightings were reported from local rivers within the five-year period before interviews were conducted by at least one respondent from 53 target counties, representing all surveyed provinces except Shanxi. However, it is not possible to determine whether these potentially “outlier” reports represent accurate recall of encounters with surviving wild populations, or instead encounters with farm escapes/releases, and most respondents had either not seen wild CGS at all or had not seen them for a considerable period of time; the mean salamander last-sighting date across all respondents per county only fell within the previous five year period for six target counties (Fujian=1, Guangxi=1, Guizhou=3, Zhejiang=1), indicating that CGS are now encountered very rarely across the survey region and are likely reduced to low-density fragmented remnant surviving wild populations.

Both field survey and questionnaire survey results indicate that wild populations have been greatly diminished over much of their historic range, and urgent conservation action is required if extinction in the wild is to be avoided.



**Figure 5.** Proportion of villagers reporting sighting of Wild CGS

**Figure 6.** Most recent sighting date of wild CGS reported by villagers

### 2.3.2 Output 2

Output 2:	Range-wide population genetics & phylogeography of CGS resolved to safeguard maximum genetic diversity of this species.		
	Baseline	Change recorded by 2016	Source of evidence
Indicator 2.1	CGS Genetics Group established to coordinate collection, analysis, storage, databasing & dissemination of genetic information to facilitate conservation management and sustainable production of wild CGS	Standardised buccal swabbing surveys of wild and farmed CGS developed at ICGSCFTW, with teams trained. Sample collection and information sharing coordinated by ZSL	i.e. Annex 7 and 8, Section 2.3.2 of the report
Indicator 2.2	Field collection of CGS genetic samples across known range	Genetic samples of wild (n=20), known wild-caught (n=15 & other captive CGS (n=1390) from 71 farms were collected across 12 provinces.	i.e. Section 2.3.2 of the report
Indicator 2.3	Microsatellites developed & databased to enable the analysis of genetic samples	12 effective markers developed by KIZ and genotyped for samples	i.e. Section 2.3.2 of the report
Indicator 2.4	Genetic analysis of samples, investigating phylogeography, & identifying distinct evolutionary units & possible evidence for cryptic species • Biobanking of genetic information	Lab work conducted on mitochondrial COI sequencing and microsatellite loci genotype of genetic samples; Genetic diversity, differentiation, gene flow among populations and phylogenetic patterns analysed and impact of anthropogenic trade investigated	i.e. Section 2.3.2 of the report
Indicator 2.5	Integration of CGS genetic data into longer-term range-wide conservation management	24 haplotypes and 12 population clades of CGS identified from mitochondrial results and 2 distinct groupings of CGS identified through microsatellite results, which will inform future conservation management.	i.e. Section 2.3.2 of the report
Indicator 2.6	1 CGS conservation genetics EDGE Fellow trained	EDGE Fellow Fang Yan trained in skills of genetics and phylogeography study on CGS; her career has been developed at KIZ to continue & lead CGS conservation genetics work in China.	i.e. Annex 11

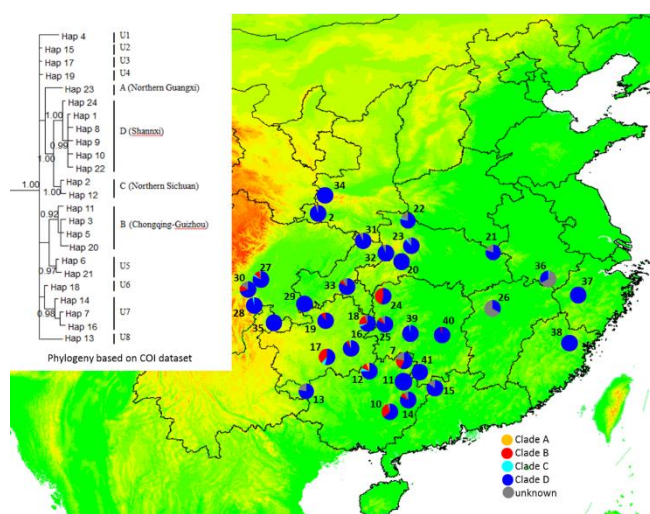
To help inform the conservation management of the CGS, we investigated the population genetics of wild and farmed CGS. Traditionally, geneticists in China have used toe clips from CGS (or they have killed larval CGS for genetic analysis), but during this project we optimised DNA extraction from buccal swabs, thus enabling a non-destructive technique to be used. A total of 1425 genetic samples, from 20 wild CGS, and from 15 wild-caught and 1390 captive-bred CGS from 71 farms, were collected from 12 provinces across China during the national survey. Genetic diversity, differentiation, phylogenetic patterns and gene-flow amongst farms were analysed to identify genetic units, investigate anthropogenic impacts and develop evidence to inform future conservation management of the species. The samples collected under this project have been archived as a CGS gene bank at KIZ.

Protocols for population genetics analysis of CGS were optimised at KIZ, including: 1) improvement of the protocol to extract DNA from buccal swabs, and 2) the development of mitochondrial primers specific for *Andrias* (generic primers were found to amplify bacterial DNA which interfered with the results). To improve the resolution of the genetic analyses, 36 microsatellite markers were tested and screened, and 12 effective markers (all from published papers) were identified. DNA was extracted from all buccal swabs. As a result, DNA samples from 20 wild, 15 wild-caught and 1050 captive-bred CGS were successfully amplified and sequenced for the mitochondrial cytochrome oxidase I (COI) gene.

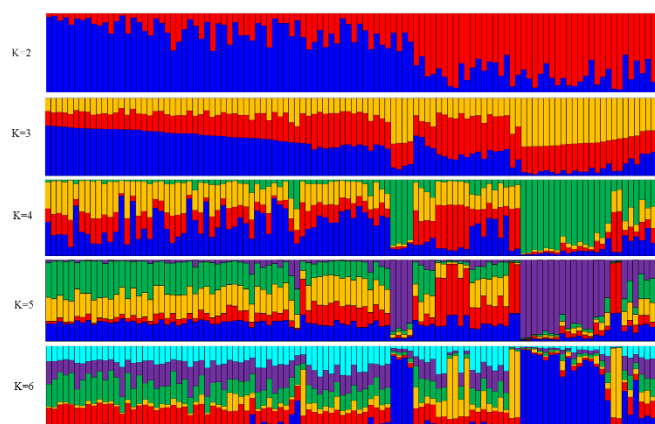
Preliminary results have found 24 haplotypes, including one (from Shaanxi) which has a broad distribution amongst farmed CGS (Figure 7). Twelve genetic lineages were identified, comprising four lineages (lineage A-D in Figure 7) already observed from KIZ's previous mitochondrial analyses and eight newly discovered lineages (U1- U8). Our results identified widespread mixing of animals amongst farms and isolation by distance (IBD) analysis shows no relationship between geographic and genetic distances among captive individuals from different farms. Our data also indicate that, although animals were tested across 12 provinces, most animals originated from Shaanxi province (lineage D in Figure 1), the province where CGS farming was initiated and where most CGS farming occurs.

The individuals we sampled from the wild also appear to have originated from Shaanxi province, even though most were caught elsewhere (Guizhou, Sichuan, Guangxi, and Gansu provinces in addition to Shaanxi). This suggests that they were released, or had escaped, from farms, possibly as part of government-sponsored conservation efforts. Such activities are increasing genetic invasion and admixture of the species and threaten genetically specific populations, which should be protected by improved conservation management, possibly including conservation breeding.

To detect the genetic mixing of farmed individuals, 12 microsatellite loci were examined from each of 109 CGS from Guizhou province. Genetic structure analysis showed that Delta K was highest for K=2, with lower support for K=3 and K=4 (Figure 8). These results are similar to those obtained from the mitochondrial DNA data and suggest at least two distinct origins of the animals, most likely Guizhou and Shaanxi. The additional genetic lineages indicated by K=3/K=4 may be due to genetic diversity within Guizhou or the importation of other genetic lineages from outside this province. Analysis of additional animals from elsewhere in China is required before these data can be interpreted fully, but they do indicate the mixing of distinct genetic lineages within farms.



**Figure 7.** phylogeny and its distribution map for all successfully sequenced captive-bred individuals.



**Figure 8.** Genetic mixing analysis based on microsatellite data of 109 individuals from Guizhou province.



### 2.3.3 Output 3

Output 3:	Disease threats to farmed and wild CGS identified and mitigation strategies developed.		
	Baseline	Change recorded by 2016	Source of evidence
Indicator 3.1	Develop CGS disease diagnostic & research capacity within China	An amphibian disease diagnostics laboratory established in SNNU and disease diagnostic and screening protocols for CGS developed; Zhou Feng received 45-days training at ZSL plus additional on-going training by UK experts at SNNU.	i.e. Annex 7 and 8, Section 2.3.3 of the report, and <a href="http://www.edgeofexistence.org/edgeblog/?p=919">http://www.edgeofexistence.org/edgeblog/?p=919</a>
Indicator 3.2	Identify major disease threats to wild and farmed CGS & investigate routes of transfer between the two	Major CGS pathogens identified: ranavirus, <i>Batrachochytrium dendrobatidis</i> and <i>Mycobacterium marinum</i> . Also, disease threats due to inadequate husbandry and poor water quality management were identified as major disease threats on farms.	i.e. Section 2.3.3 of the report
Indicator 3.3	Raise awareness of disease / biosecurity / quarantine issues among farms & captive breeding centres, including treatment of waste water from farms	A policy letter highlighting the needs of sustainable farming submitted to the Ministry of Agriculture; connections and trust built with provincial and local Fisheries Management Bureaux and farms in project areas for pathogen and disease investigation; farms in Shaanxi with disease outbreaks regularly visited and samples collected for disease monitoring	i.e. Annex 14, Section 2.3.3 of the report and blog available at <a href="http://www.edgeofexistence.org/edgeblog/?p=7002">http://www.edgeofexistence.org/edgeblog/?p=7002</a>
Indicator 3.4	Develop protocols to determine health and infection status of animals destined for release • Develop disease mitigation measures & treatments for captive/farmed CGS	Standardised farm questionnaire and disease swabbing surveys of CGS developed at ICGSCFTW, with teams trained; Skin and cloacal swabs collected from 20 wild and 1301 farmed living animals across 12 provinces for the investigation of selected amphibian pathogens	i.e. Annex 7 and 8, Section 2.3.3 of the report
Indicator 3.5	CGS farming becomes self-sustainable and no longer relies on regular inputs of wild-caught animals	Importance to adopt biosecurity measures and sustainable farming practices raised to Fisheries Management Bureaux and farms by project partners in relevant project areas; Fisheries in Guizhou Province trained in microchipping techniques in ID wild and manging farms CGS	Section 2.3.3 of the report and blog available at <a href="http://www.chinesegeantsalamanders.org/2014/04/14/identification-cards-were-firstly-issued-to-the-wild-caught-chinese-giant-salamanders-in-quizhou-province/">http://www.chinesegeantsalamanders.org/2014/04/14/identification-cards-were-firstly-issued-to-the-wild-caught-chinese-giant-salamanders-in-quizhou-province/</a> .
Indicator 3.6	1 CGS disease diagnostics & surveillance EDGE Fellow trained	Since EDGE Fellow Zhou Feng was trained in CGS disease diagnostics & surveillance, her career has been developed at SNNU to continue CGS disease research in Shaanxi province	Annex 12 and blog at <a href="http://www.edgeofexistence.org/edgeblog/?p=919">http://www.edgeofexistence.org/edgeblog/?p=919</a>

An amphibian disease diagnostics laboratory was established in SNNU in 2012 and Zhou Feng received intensive training at IoZ, ZSL for 45 days on CGS disease diagnostics & surveillance techniques. Additional training and on-going support at SNNU was provided by Professor Andrew Cunningham and Dr. Steven Price (IoZ) during the project period to develop and refine disease diagnostic and screening techniques for both wild and captive CGS. This included identifying pathogens threatening CGS, using cell culture for virus isolation and establishing molecular diagnostics (PCR/qPCR) for pathogens of interest. The selected pathogens were:

- *Ranavirus* – known to be a frequent cause of mortality in farmed CGS, with outbreaks resulting in high mortality rates.
- *Batrachochytrium dendrobatidis* – cause of amphibian mortality and population declines/extinctions globally.
- *Batrachochytrium salamandrivorans* – newly emerged pathogen of urodeles in Europe, possibly originating from East Asia.
- *Mycobacterium* spp. – common cause of mortality in captive amphibians world-wide.

In order to detect the cutaneous chytrid fungi, *B. dendrobatidis* and *B. salamandrivorans*, skin swabs were used; this being the standard method for detecting infection with these pathogens.

In order to detect the systemic pathogens, ranavirus and *Mycobacterium* spp., cloacal swabs were used. The sensitivity of this method for these pathogens, however, has not been validated and is likely to be low or very low, particularly if the animal is not clinically ill. The ideal method for the detection of these pathogens involves destructive sampling and testing internal organs, such as liver and spleen, but this was neither feasible nor ethical for this project.

From 2013 -2016, our project partners made excellent progress and built trust amongst Fisheries Management Bureaux and major farming companies in CGS survey provinces. This enabled us to investigate CGS mortality on a regular basis over several years on farms in Shaanxi Province, the most important province for CGS farming. On these farms, identified causes of death included poor water quality, ranavirus infection and *Mycobacterium marinum* infection, in decreasing order of importance (see below).

Our engagement with the authorities and farming industry also enabled the sampling of 60 farms in 12 provinces during the national surveys. We aimed to sample a minimum of 30 animals from each farm in order to detect any of the selected pathogens with a reasonable degree of certainty (e.g. 95% probability if at a prevalence of 5%), given certain assumptions such as the sampling method is 100% sensitive and there is an equal probability of infection for each animal at any given site. In some instances, fewer CGS were sampled if there were fewer on the farm or if the farmer was unwilling to allow the desired number to be sampled. The survey teams were trained to undertake swabbing on farmed CGS using a standardised protocol developed during the ICGSCFTW. Training comprised practical instruction, written guidance and video demonstration; with the last two being carried by the teams an aide-memoire to help ensure consistency during the surveys (along with the embedded UK expert).

A total of 1301 live farmed animals were swabbed for the investigation of selected amphibian pathogens. The results showed that: 1) 3 samples from Hubei, 1 sample from Sichuan and 1 sample from Chongqing were *Mycobacterium* spp. positive. There appears, therefore, to be a low prevalence of detectable *Mycobacterium* spp. infection in farmed CGS, possibly with localised distribution and with a higher prevalence of actual infection given we used suboptimal methodology. 2) We found no evidence of detectable *Ranavirus* infection in farmed CGS using cloacal swabs – possibly due to the need to use destructive sampling for the detection of this pathogen in non-diseased animals. 3) No evidence of detectable *B. salamandrivorans* infection was detected in farmed CGS; 4) *Batrachochytrium dendrobatidis* was detected using qPCR from 11 animals, and validation of these results are on-going by analysing positive samples with standard PCR and sequencing. These results are likely to be true, however, as all 11 were from the one province, with clustering within only two farms.

In addition to taking samples for laboratory analysis, data were also collected using standardised farm questionnaire surveys to understand the history, husbandry and disease status of farmed CGS and the potential threats the farming industry might pose to wild populations. Sixty-six farm questionnaires have been collated so far. Except for four farms established in the 1990s, the other 62 were established between 2003 and 2014. Business models of these farms comprised 18 smallholders, 38 companies, 8 cooperatives and 2 government-owned farms, with various stock sizes, from around 10 animals up to 10,000 CGS. The owners of the majority of the farms (n=49) believed that remnant wild populations of CGS were extant in their areas. Potential threats from the farming industry, however, were evident. For example: 1) 42 farms reported of the occurrence of disease problems; 2) only 22 farms

reared their animals separately based on their origin; 3) 25 farms admitted they sources animals from the wild, either through purchase or through directly catching them; indeed 29 farms stated a preference for stocking with wild CGS as they have better breeding/survival rates; and 4) 13 farms had released farmed animals into the wild. These release are conducted as part of a government-funded conservation initiative, but the lack of pre-release genetic or pathogen screening, post-release monitoring or, indeed, identification of suitable release sites renders this activity more of a conservation threat (see Cunningham *et al.* (2016) *Oryx* **50**, 265-273).

Skin and cloacal swabs were examined from 20 wild CGS (12 in Guangdong, 6 in Shaanxi, 1 in Sichuan and 1 in Guizhou). Although no positive detections were made from any of the swabs taken from wild CGS for any of the targeted pathogens, the number of wild CGS sampled was too small to draw any conclusions about the presence/absence of these pathogens in the wild.

To further investigate and monitor the disease outbreaks in Shaanxi province where commercial CGS farming originated and where the mass mortality of captive CGS was first reported, 33 farms in Shaanxi Province in which disease outbreaks occurred during the project years were visited. From these, 504 samples were taken from sick and dead animals for disease screening and diagnostic investigations. Sixty-three of 384 samples tested were found to be ranavirus positive and 51 of 302 samples tested were found to be *Mycobacterium* spp. positive, with these pathogens considered to be the cause of death in the animals from which they were detected, based on gross post-mortem and histopathological investigations. Ranavirus is also known to occur in farmed bullfrogs in China. To understand whether CGS ranavirus is a natural pathogen of the species or if it originated from elsewhere and is a consequence of commercial farming, we have been testing farmed bullfrogs for the pathogen with a view to conducting molecular comparisons of the bullfrog and CGS viruses. To date, 12 of 50 dead bullfrogs purchased from markets have been ranavirus-positive. We are currently in discussions to expand our collaborations within China to include other groups working on CGS ranavirus in order to further investigate CGS ranavirus evolution on farms and its possible origins.

#### 2.3.4 Output 4

Output 4:	Build upon existing CGS farming protocols & infrastructure to develop <i>ex situ</i> protocols for conservation.		
	Baseline	Change recorded by 2016	Source of evidence
Indicator 4.1	Develop protocols for CGS conservation breeding through cooperation with farms & a targeted CGS Conservation Breeding Workshop	A key stakeholder meeting” Building the 1 <sup>st</sup> CGS conservation breeding and education facility in FNNR” convened in FNNR, May 2014, which brought together different government, farms and academic institutions for the first time.	i.e. Annex 15, Section 2.3.4 of the report and governmental official blog at <a href="http://www.bjny.gov.cn/nyj/231595/618526/619059/5463822/index.html">http://www.bjny.gov.cn/nyj/231595/618526/619059/5463822/index.html</a>
Indicator 4.2	Develop plan for first captive population of CGS for conservation breeding & create appropriate facility at the Shaanxi Wild Animal Rescue and Research Centre	Potential sites visited and evaluated in FNNR, with a joint funding proposal submitted to Guizhou Environmental Bureau; annual transect surveys conducted in FNNR with reserve rangers trained for future <i>in situ</i> & <i>ex situ</i> conservation & monitoring; CEPA campaigns conducted to raise awareness and mitigate threats in this park. Locally wild-caught CGS on farms around FNNR microchipped and the swabs collected for genetic analysis and pathogen surveillance to screen potential animals for future conservation breeding/re-introduction programme; local fishery officials trained to develop skills for better management and monitoring of wild and re-introduced populations.	i.e. Annex 15, Section 2.3.4 of the report and the blog available at <a href="http://www.chinesegiantsalamanders.org/2014/04/14/identification-cards-were-firstly-issued-to-the-wild-caught-chinese-giant-salamanders-in-guizhou-province/">http://www.chinesegiantsalamanders.org/2014/04/14/identification-cards-were-firstly-issued-to-the-wild-caught-chinese-giant-salamanders-in-guizhou-province/</a> .

Indicator 4.3	Government-endorsed conservation breeding and release programme for CGS, removing any requirement for the release of commercially farmed CGS as a conservation measure	A policy letter highlighting the needs of sustainable farming and better-managed releasing programme submitted to the Ministry of Agriculture	i.e. Annex 14, Section 2.3.4 of the report
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Although not a DI-funded project milestone, construction of the pilot CGS *ex situ* conservation breeding facility and initiating conservation releasing programmes have been delayed due to the relocation of the initial recipient, the Shaanxi Wild Animal Rescue and Research Centre (SWARRC) to a new site which is less suitable for such a facility. Results from the national surveys and conservation genetic study have heightened the necessity to identify key suitable conservation sites at which threats can be mitigated (and ultimately extirpated) before initiating any *ex situ* conservation breeding programme. During this project, an alternative site (FNNR) which can meet the required criteria was identified and an MoU has been signed with the Park Administration regarding 1) the building of the CGS conservation breeding and education facility in FNNR, 2) conducting longitudinal surveys & monitoring of wild CGS in FNNR, 3) developing a CGS reintroduction programme in FNNR and 4) developing local CEPA campaigns to reduce (and eventually remove) threats from poaching the species. Additionally and importantly, a collaborative effort will be made for the conservation of other species (e.g. other amphibians, reptiles and small mammal species) within and around FNNR.

FNNR, a UNESCO Biosphere Reserve located in Tongren City of Guizhou Province, is an historically important location for wild CGS and one of the 5 sites where we detected wild CGS, although overexploitation has led to a markedly depleted population. There is a growing interest in CGS conservation locally, however, and a real possibility to reduce poaching through increased enforcement and local education. As such, and given its relatively remote location and protected status, it fulfils many criteria required for a suitable site for a restocking programme. In May 2014, the first CGS conservation breeding planning key stakeholder meeting “Building China’s 1<sup>st</sup> Conservation Breeding and Education Centre for the Chinese Giant Salamander in Fanjingshan” was successfully held in FNNR. This meeting, unprecedentedly, brought together 40 representatives from different government bodies (Protected Areas, Guizhou Fisheries Bureau, Forestry Bureau, Science and Technology Association), academic institutes and local farms to discuss and endorse the future for both wild CGS population recovery in FNNR and the sustainable farming of the species in Guizhou Province (Annex 15, governmental official blog <http://www.bjny.gov.cn/nyj/231595/618526/619059/5463822/index.htm>).

Also, to build capacity for *in situ* protection and monitoring of remaining wild CGS and potential conservation-bred animals in the future, annual longitudinal transect surveys have been conducted in FNNR since 2013 to investigate suitable habitat and release sites, with 10 reserve staff trained to date. In addition, facilitated by ZSL, wild-caught CGS from 6 farms around FNNR were microchipped, measured for morphometric characteristics and swabbed for genetic and disease laboratory screening. Key local fishery officials and university researchers were also trained by experienced Japanese Giant Salamander researcher Dr. Yuki Taguchi (Asa Zoo, Japan) in CGS microchipping techniques, building local capacity for the management and monitoring of any future conservation restocking programmes. This is the first time CGS have been microchipped in Guizhou and we hope the technique will become mandatory for the management of farmed CGS and for their identification should they be released, or escape, into the wild. The Guizhou Provincial Fisheries Management Bureau has posted an official blog on the National Fishery Management Website, entitled “The first issue of ID cards to wild-caught CGS in Fanjingshan”, at [http://www.cnfm.gov.cn/sybhyzj/zhsybh/201403/t20140303\\_3801657.htm](http://www.cnfm.gov.cn/sybhyzj/zhsybh/201403/t20140303_3801657.htm). An English blog is available at <http://www.chinesegiantsalamanders.org/2014/04/14/identification-cards-were-firstly-issued-to-the-wild-caught-chinese-giant-salamanders-in-guizhou-province/>.

### 2.3.5 Output 5

Output 5:	Education & awareness-raising activities to promote the status & conservation needs of CGS across its range at local, national & international level.		
	Baseline	Change recorded by 2016	Source of evidence
Indicator 5.1	CEPA training and planning workshop including a variety of stakeholders to set future directions to raise the profile of CGS & facilitate its conservation	A CGS and freshwater ecosystem CEPA training and planning workshop was held in Kunming, China in January 2013, and a public questionnaire was developed; 904 questionnaires collected to develop baseline data on public CGS awareness.	i.e. Annex 16, Section 2.3.5 of the report and blog available at <a href="http://english.kiz.cas.cn/ns/es/201301/t20130130_98688.html">http://english.kiz.cas.cn/ns/es/201301/t20130130_98688.html</a>
Indicator 5.2	Public campaigns conducted in 2 key project target areas (Shaanxi and Guizhou) highlighting importance & conservation requirements of CGS	A series of public and school CEPA campaigns conducted in Guizhou and Yunnan to promote CGS and freshwater ecosystems	i.e. Annex 13, Section 2.3.5 of the report
Indicator 5.3	20,000 appropriate CEPA materials produced & distributed at local community meetings & schools in target areas	More than 81,500 CEPA materials produced and disseminated; and displays in China and UK could potentially reach 700,000 visitors	i.e. Annex 13, Section 2.3.5 of the report
Indicator 5.4	Train EDGE Fellows and supervisors in CEPA and project coordination	EDGE Fellow Chen Shu was trained in CEPA and project management; her career has been developed at ZSL as China Project Coordinator to develop conservation projects in China	i.e. Annex 13,
Indicator 5.5	9 local, 6 national & 2 international newspaper articles; 9 local, 6 national & 2 international radio & TV interviews; Project blog and social networking sites established; 6 internet articles on partner websites	Multiple local, national, and international interviews, media press, scientific publications, and websites generated through this project.	i.e. Section 2.3.5 of the report, and websites at <a href="http://www.chinesegiant salamanders.org">www.chinesegiant salamanders.org</a> ; <a href="http://www.zsl.org/conservation/regions/asia/chinese-giant-salamander-conservation">http://www.zsl.org/conservation/regions/asia/chinese-giant-salamander-conservation</a> ; <a href="http://www.edgeofexistence.org/amphibians/species_info.php?id=547&amp;search=focal">http://www.edgeofexistence.org/amphibians/species_info.php?id=547&amp;search=focal</a> and <a href="http://ynapi.xinhuaapp.com/NEWS/ModularNewsList?mid=1964&amp;ProjectId=42&amp;from=timeline&amp;isappinstalled=0">http://ynapi.xinhuaapp.com/NEWS/ModularNewsList?mid=1964&amp;ProjectId=42&amp;from=timeline&amp;isappinstalled=0</a> . <a href="#">Annex 19</a>

Using the questionnaire developed at the CGS and freshwater ecosystem CEPA training and planning workshop held in Kunming, China in January 2013, we conducted a total of 904 public questionnaire surveys in the capital cities of Yunnan, Shaanxi and Guizhou Provinces and created the first baseline database on the conservation awareness of the public in relation to the CGS (Annex 16). Based on these findings, we identified knowledge gaps of the public and designed and published a CGS cartoon educational booklet for children (and their parents). This uses art & design in the context of CGS local culture to improve public accessibility to scientific knowledge. It describes CGS biology, ecology, threats and legends (e.g. Chinese dragon, Taiji), and includes a series of comics featuring four stylised CGS cartoon characters. It

was widely acclaimed and has since been used in public environmental education campaigns across several provinces. An educational video based on this booklet also has been produced for CEPA activities, see: <http://www.youtube.com/watch?v=dgYqem9xhQU>.

We aimed to promote the plight of the CGS and freshwater ecosystems to children (and their parents) in China, by collaborating with specialist media outlets for children, including UNESCO's "Human and Biosphere", National Geographic Kids (a minimum 10,000 copies disseminated) and Primary Schoolchildren Learning (a minimum of 800,000 copies disseminated). Specifically, to enable children to have fun and to gain interest in learning about the CGS, we designed a series of CGS cartoon games called "The Adventures of Big-headed Wawa" ("Wawa" means "baby" and "Wawa Yu" is a colloquial name for the CGS in China) (Annex EDGE). Xihua News Agency, the biggest and most influential media organisation in China, produced a Chinese website (designed for mobile phone access) to promote our project and our CEPA activities. This can be accessed at: <http://ynapi.xinhuaapp.com/NEWS/ModilarNewsList?mid=1964&ProjectId=42&from=timeline&isappinstalled=0>.

Also, we engaged with urban parks, museums and zoos so as to reach a wider audience in CGS range provinces. To help achieve this, we formed partnerships with Yunnan Science and Technology Centre (YSTC) and Guangxi Natural History Museum (GNHM) to develop self-sustaining, long-running education campaigns to connect the public with nature and with CGS conservation. Project displays have been established at the main entrances of YSTC and GHNH (144,000 and 450,000 visitors annually, respectively) to publicise the CGS and its conservation needs. Also, a mobile display has been initiated by YSTC and this has been shown across Yunnan province to maximise public outreach; this is expected to reach about 200,000 people annually.

To increase local awareness within the CGS natural range, we co-wrote and launched Guizhou Province's first ever wildlife conservation story book: "Xingda's Wildlife Explorations in Fanjingshan". The book includes a CGS conservation chapter. A minimum of 5,000 copies have been distributed to primary schools in Guizhou. The book's launch led to 10 media stories on Chinese TV and in newspapers, e.g. <http://www.gz.chinanews.com/content/2015/03-27/50311.shtml>. The book is likely to be adopted as a study aid for rural students near FNNR. One copy was given to Prince William when he visited China in March 2015. The British Consulate General, Chongqing published an article about this book at <https://www.gov.uk/government/world-location-news/guizhou-teenagers-get-first-science-book-about-local-wildlife?from=groupmessage&isappinstalled=0>. Also, a series of public campaigns and school campaigns called "Go for Salamander, Go for You 为鲵前行" (in Chinese, Salamander "鲵 ni" has the same pronunciation as you "你") was conducted in FNNR, Guizhou with substantial involvement and support from different stakeholders. Results from pre-and post-campaign questionnaire surveys of school children showed increased knowledge and positive perception changes to CGS by 41.6% and 12.5%, respectively. A documentary film "Go for Salamander, Go for You" is available at <http://www.youtube.com/watch?v=P1AeE3yDE-E>. In addition, wildlife documentary film-maker, Darren Williams, made a film of the project in May 2013, featuring the field training workshop in Guizhou. The film, entitled "Giants on the EDGE" won the BBC Earth panel's best student film award in 2013. This 25 minute long film has been shown at a range of events and meetings, including national and international conferences, to raise awareness of CGS conservation and is available on our project website: <http://www.chinesegiantsalamanders.org/2014/03/11/giants-on-the-edge/>.

During the "Go for Salamander, Go for You" campaigns, we facilitated the training of young volunteers from local universities to conduct cascade training to empower young professionals as conservation leaders. This has resulted in connecting far more people to nature than we could do ourselves. For example, following this training, students from Tongren University, Guizhou established their own (and first ever) wildlife conservation association "Wild Fauna & Flora Conservation Society" in October 2014 and, amongst other activities, have since initiated and led two CGS awareness raising campaigns near FNNR. As with most people in China, prior to our involvement, the students at Tongren University were themselves unaware of the CGS or of the concept of wildlife conservation in general.

Outreach outside of China has included a Facebook project page (A sustainable future for Chinese giant salamanders), which was set up to communicate project results and activities and to improve public outreach internationally. Also, a new exhibit at London Zoo (part of ZSL), which obtained a CGS (the only live CGS in the UK) as part of a linked conservation effort with the Chinese campaign. The exhibit, which opened in December 2014 and incorporates the DI logo, was designed around our China project and includes education materials designed in China. Over 1 million people from around the world visit London Zoo each year and the CGS exhibit functions as a channel to raise international awareness of the species and our conservation activities within China. It has quickly become one of the most popular exhibits at London Zoo and it trended on Twitter shortly after opening. A BBC news article is available at <http://www.bbc.co.uk/newsround/30499294> and a link to the London Zoo website, which describes the project, includes project materials and links to the project website, is available at: <https://www.zsl.org/zsl-london-zoo/news/worlds-largest-amphibian-arrives-at-zsl-london-zoo>.

### 2.3.6 Output 6

Output 6:	Development of a global network that seeks to conserve giant salamanders nationally & internationally.		
	Baseline	Change recorded by 2016	Source of evidence
Indicator 6.1	Link up international network of protected areas & CGS/cyptobranchid experts	Reciprocal visits of ZSL and Japanese giant salamander researchers to Japan and China to exchange knowledge and techniques for <i>Andrias</i> conservation; Regional, national and international conferences, seminars & workshop attended to disseminate project findings	i.e. Annex 17, Section 2.3.4 and Section 2.3.6 of the report
Indicator 6.2	Project staff to take part in CIG, JGSS & CHS meetings	ZSL attended JGSS and organised giant salamander international meetings in Guizhou and Hangzhou to link up international cyptobranchid experts	i.e. Annex 17, Section 2.3.6 of the report
Indicator 6.3	Engage with the highest levels of government & advocacy to garner support for the conservation of the CGS as an iconic species and a key component of the maintenance of healthy, functioning watersheds	Networking with high-level governments in both China and UK including the royal family, British embassy China, Chinese embassy UK, Ministry of Agriculture and State Forestry of Administration	i.e. Annex 18, Section 2.3.6 of the report
Indicator 6.4	Meetings with MoEP, MoA, FMBs & other relevant ministries to discuss CGS policy imperatives	Meetings with Ministry of Agriculture and provincial governments by project partners in 16 provinces to garner support for CGS survey and conservation.	i.e. Annex 14, Section 2.3.6 of the report

This project has been presented widely at a range of regional, national and international meetings (Annex 17) to raise the conservation importance of CGS and to develop a network of giant salamander conservationists. For example, Shu Chen and Ben Tapley (Head of Herpetology, ZSL) attended the 10<sup>th</sup> Annual Japanese giant salamander Conservation Annual Meeting, 12<sup>th</sup> -13<sup>th</sup> October 2013, Japan, and visited Kyoto University, Tottori University, Asa Zoo and Japan's Hanzaki Institute. While in Japan, they gave presentations about the CGS project and further developed the international network for giant salamander conservation. Project visits were made to China by Japanese giant salamander experts, Dr. Yuki Taguchi (Asa Zoo, Japan) and Sumio Okada (Tottori University, Japan) to assist with training Chinese partners and collaborators in CGS survey and marking techniques. An international network of

*Cryptobrachidae* experts was established and strengthened on the aspects of CEPA, conservation breeding and *in situ* survey and monitoring. In August 2016, ZSL organised a Darwin Initiative final CGS symposium at the 8<sup>th</sup> World Congress of Herpetology, Hangzhou, China to share the findings and outputs of this Darwin project, following which further national and international networks and collaborations have been developed.

In addition, meetings were held, and close liaisons developed, with key governmental officials in CGS survey range provinces in China, on the purpose of capacity building for CGS *in situ* & *ex situ* conservation and on in-country fundraising to support the conservation and long-term sustainability of this species. Particularly, contacts were cultivated with the central government (Ministry of Agriculture & State Forestry Administration in Beijing and the Chinese Embassy in London) to report the project needs & conservation outputs. A policy letter highlighting the existing threats posed to wild CGS and farming was accepted by the Ministry of Agriculture and further liaison will be made with these government bodies to facilitate and support CGS conservation programmes holistically across China. Excellent collaboration was developed with the British Embassy, Beijing and the British Consulate, Chongqing, which has continued and further strengthens the conservation recognition of this project in China and promotes Sino-UK collaboration on wider conservation issues (e.g. see Appendix 18). Shu Chen was invited by the British Consulate to attend a high-level round-table discussion on the illegal wildlife trade in March 2015, Shanghai, China, which included another 9 key international NGOs in China, and she presented this Darwin Initiative project to Prince William. The meeting subsequently led to strengthened collaboration with other NGOs working in China.

### 3 Project Partnerships

Since its conception, the project has been a partnership between ZSL and a group of organisations in China, each with a specific and equally important role to play. These partnerships arose from a 2010 workshop on CGS conservation, which was convened by ZSL and hosted by SNNU. Although the initial approach was made by ZSL, this tapped into demand within China and the partnerships for the current project stemmed equally from the UK and China. MoUs have been signed between ZSL and each partner or collaborating institute, and a collaboration MoU has been signed amongst all four project partner organisations. Face-to-face project partner meetings were held at least once a year to ensure good communication and working relationships among project partners and to agree annual work plans. Professor Ya-ping Zhang and Dr. Jing Che at the Kunming Institute of Zoology (KIZ, Chinese Academy of Sciences) led on CGS population genetics to provide scientific guidance for future *in situ* conservation management and to inform possible *ex situ* conservation breeding and re-introduction. Professor Gang Wei at Guiyang University (GU) led on conducting field surveys and questionnaires to better understand the current distribution and abundance of this species in the wild and any changes in perceived or actual threats to the CGS. Professor Minyao Wu at Shaanxi Normal University (SNNU) led on the investigation of disease threats to the CGS, both in the wild and from the large and growing CGS farming industry. As the project has developed, the following additional collaborations have been made with organisations across China: Chengdu Institute of Biology (CIB), Hunan Fisheries Science Research Institute (HFSRI), Yangtze River Fisheries Research Institute (YRFRI), Guangxi Teacher Education University (GTEU), Yunnan Science & Technology Centre (YSTC), Guangxi Natural History Museum (GNHM), Kunming Zoological Museum (KZM).

The UK lead institution, ZSL, is an international hub of excellence in the conservation of amphibians, and hosts world-class researchers and conservationists contributing considerable expertise to this project. Specifically, ZSL managed the overall project; providing direction and expert guidance; overseeing project capacity building; facilitating and conducting national CGS field and questionnaire surveys; conducting and managing Communication, Education and Public Awareness (CEPA) activities; and creating tailored training programmes with our Chinese partner organisations for in-country conservation scientists who are implementing the CGS work (hereafter EDGE Fellows; please see [www.edgeofexistence.org](http://www.edgeofexistence.org)) and relevant project staff. This project was led by Professor Andrew Cunningham, Institute of Zoology, ZSL, but day-to-day project activities, including developing and facilitating in-country collaborations,



were coordinated by a Chinese Project Manager, Shu Chen, who was based in-country. Shu Chen also continuously monitored and evaluated project progress and reported regularly (usually weekly plus a monthly progress report) to the Project Leader, who took overall responsibility for the delivery of project outputs against the Measurable Indicators. In addition, the Project Partners established a Project Steering Group (PSG). Regular communication of the PSG took place electronically (email) and through physical meetings. Six such meetings of the PSG occurred, respectively, in Kunming in January 2013, Tongren in May 2013, Xi'an in January 2014, Guiyang in May 2014, Xi'an in March 2015 and Tonglu in August 2016. The PSG provided supervision to EDGE Fellows and assessed project performance, allowing in-country skills/capacity development to be monitored and any training issues/needs to be identified. Dr. Michael Lau, Senior Head of Local Biodiversity and Regional Wetlands Programme at WWF-Hong Kong, was appointed as an independent assessor to oversee, guide and advise on project progress. He also attended the PSG meetings.

In order to determine the current distribution and status of, and threats to, the CGS, field and questionnaire surveys were conducted across 100 sites of the species' range. This survey was more ambitious (wider geographic spread, larger number of field sites and the inclusion of local ecological knowledge) than originally planned when the project was initially formulated, but was made possible through the establishment of collaborations with CIB, GTEU, YRFRI and HFSRI (both YRFRI and HFSRI are affiliated to the Ministry of Agriculture and Fisheries Management Bureau). Also, the DI grant was used to leverage additional funding for conducting the surveys, which was raised from the National Natural Science Foundation of China (in Year 2) and from Ocean Park Conservation Foundation, Hong Kong (in Year 3). To raise public awareness of CGS and freshwater ecosystem conservation, additional collaborations were developed with YSTC, GNHM and KZM, all of which conduct environmental education and receive a huge number of visitors (members of the public) annually. Further to training by ZSL staff, all three of these organisations now conduct CGS conservation education (something they had not done previously) through their extensive outreach programmes. In addition to the above established collaborations, a MoU with FNNR – a key protected area for CGS conservation - has been signed and this creates a partnership between ZSL and FNNR to enable a range of wildlife conservation activities, including CGS field surveys and the development of a centre for CGS conservation breeding and public education.

Post project, relationships in China continue to be cultivated and developed among relevant government bodies (e.g. Provincial Fisheries Management Bureaux, Forestry Bureaux and Environment Bureaux), the CGS farming community, protected area managers, and wider stakeholder circles. Links to relevant government agencies are essential to this project's long-term impact and viability as all project outcomes must be endorsed by the Chinese government. During the Project period, Andrew Cunningham and Shu Chen have successfully engaged at high levels with both the British and Chinese governments (i.e. British Embassy Beijing, British Consulate General Chongqing, Chinese Embassy UK, the Ministry of Agriculture of China and the State Forestry Administration of China). In particular, a policy letter was submitted to the Ministry of Agriculture of China, the administrative authority in charge of CGS in China, for political endorsement. Also, Shu Chen represented ZSL in a round-table discussion on CGS conservation and the illegal wildlife trade with Prince William in Shanghai, March 2015. Provincial-level contacts with key government bodies were developed by ZSL and project partners, including with Fisheries Management Bureaux, Environmental Bureaux and Forestry Bureaux. Some of our partners and collaborators, Professor Minyao Wu (SNNU), Professor Hanbin Xiao (YRFRI), Dr. Zhiqiang Liang (HFSRI) and Professor Feng Xie (CIB), were appointed as Scientific Advisors of the Ministry of Agriculture's Fisheries Management Bureau of Shaanxi, Hubei, Hunan and Sichuan Provinces, respectively. As such, they play an important role in establishing project contacts and links to the CGS farming industry, feeding project results directly into the policy development for a sustainable CGS farming industry in China. As a high-ranking Academician and Vice-President of the Chinese Academy of Sciences, Professor Ya-ping Zhang at KIZ is extremely well connected politically. Genuine involvement and buy-ins from all partners have helped to promote the success and long-term sustainability of this project.

## 4 Contribution to Darwin Initiative Programme Outputs

### 4.1 Contribution to SDGs

This project works to implement several <sup>1</sup>SDGs in the context of sustainable livelihoods and health, sustainable use of resources, protection of ecosystems and promoting gender equality and global collaborations. CGS is an iconic species of healthy freshwater system, and our results have identified remnant populations. Securing these sites could benefit the protection of forests, rivers and regional biodiversity and thus combat climate change and provide ecosystem services (e.g. clean water, air and food safety) to rural and wider communities. Practices taken to address threats (e.g. disease and unsustainable harvesting of wild CGS) from the farming industry will help to promote sustainable use of nature resources. In addition, our training programmes to increase conservation knowledge and capacity helped to empower women (e.g. three of our four EDGE fellows were women).

<sup>1</sup>**Special SDGs:** GOAL 3 (Ensure healthy lives and promote well-being for all at all ages); GOAL 5 (Achieve gender equality and empower all women and girls); GOAL 6 (Ensure availability and sustainable management of water and sanitation for all); GOAL 12 (Ensure sustainable consumption and production patterns); GOAL 13 (Take urgent action to combat climate change and its impacts); GOAL 15 (Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss); and GOAL 17 (Strengthen the means of implementation and revitalize the global partnership for sustainable development).

### 4.2 Project support to the Conventions or Treaties (CBD, CMS, CITES, Nagoya Protocol, ITPGRFA)

Our project supported collaborative implementation of CBD (Articles 5-19)<sup>2</sup> by Chinese government agencies and partner institutions and the development of key Conservation Action Plan recommendations. This project worked to implement the CBD in the context of both threatened species and inland water ecosystems.

This project has built knowledge and capacity among government and research institutions, including the training of young conservationists and volunteers. Contacts were made with the central Ministry of Agriculture, Ministry of Environmental Protection (China's CBD liaison) and with Provincial Fisheries and Management Bureaux (authorities in charge of freshwater species conservation & management) and Environment Bureaux. As a direct result of this Darwin project, an MoU for broader collaboration on wildlife conservation projects in China was signed between ZSL and Beijing Forestry University which is partnered with the Endangered Species Import and Export Management Office of the People's Republic of China at the State Forestry Administration (China's CITES liaison). Project outputs will be formally presented to China's CITES office and the State Forestry Administration.

<sup>2</sup>**Specific CBD issues:** Article 5 (Cooperation); Article 6 (General measures for conservation and sustainable use); Article 7 (Identification and monitoring); Article 8 (*In-situ* conservation); Article 9 (*Ex-situ* conservation); Article 10 (Sustainable use of components of biological diversity); Article 11 (Incentive measures); Article 12 (Research and training); Article 13 (Public education and awareness); Article 14 (Impact assessment and minimising adverse impacts); Article 15 (Access to genetic resources); Article 16 (Access to the transfer of technology); Article 17 (Exchange of information); Article 18 (Technical and scientific cooperation); Article 19 (Handling of biotechnology and distribution of its benefits); taking an integrated ecosystem approach wherever appropriate.

### 4.3 Project support to poverty alleviation

In recent years, Chinese local, provincial and national governments have invested in the development of the CGS farming industry as a means of economic development in poor, rural areas. Infectious disease is a significant threat to the sustainability of this industry, with some farms losing > 90% of their stock during a single disease outbreak. Our project has enabled the diagnosis of causes of mortality on farms in Shaanxi province. With diagnoses, comes the

ability to advise on disease outbreak prevention through improved biosecurity and other measures. Identifying and mitigating causes of mortality directly benefits farm communities, particularly rural smallholders whose livelihoods are most vulnerable to loss of stock. Engaging farm communities was a major component of this project as disease reduction reduces disease threats to, and the re-stocking demand for, wild CGS.

#### 4.4 Gender equality

This project has built capacity of four EDGE Fellows, through a two-year fellowship training programme. These Fellows are destined to become future conservation leaders in China. Three of the Fellows were female. Such career development for female conservation leaders will have a gender equality impact as, in China, male scientists dominate. Also, our volunteer training in Guizhou Province targeted both boys and girls in the hope of increasing conservation knowledge, experience and independence equally across both genders. In Guizhou Province, as in many parts of China with low economic development, girls generally have less access than boys to formal education and life opportunities.

#### 4.5 Programme indicators

- Did the project lead to greater representation of local poor people in management structures of biodiversity?

Yes, this project promoted better management and use of resources and biodiversity through awareness raising campaigns of wildlife and freshwater ecosystems and engagement with poor farming communities for sustainable management and disease control on CGS farms.

- Were any management plans for biodiversity developed?

The project results will be used to develop a national CGS Conservation Action Plan. Also, two proposals, based on project results, to develop a model for CGS conservation were submitted to the Guizhou Environmental Protection Bureau.

- Were these formally accepted?

We were invited to write these proposals and the plans are under consideration.

- Were they participatory in nature or were they 'top-down'? How well represented are the local poor including women, in any proposed management structures?

These plans were participatory. Stakeholder meetings were held before the plans were proposed.

- Were there any positive gains in household (HH) income as a result of this project?

This project didn't survey household income.

- How many HHs saw an increase in their HH income?

This project didn't survey household income.

- How much did their HH income increase (e.g. x% above baseline, x% above national average)? How was this measured?

This project didn't survey household income.

#### 4.6 Transfer of knowledge

Did the project result in any formal qualifications?

- i. How many people achieved formal qualifications?  
6 people including 5 MSc degree and 1 PhD
- ii. Were they from developing countries or developed countries?  
5 from China (developing country) and 1 (MSc) from UK (developed country)
- iii. What gender were they?  
3 male and 3 female

#### **4.7 Comment on the extent to which the project has sought to transfer knowledge (including new knowledge generated by Darwin projects) to practitioners or policy makers to apply this thinking to practical conservation challenges. What form has this transfer of knowledge taken e.g. national platforms, international platforms, print media etc.?**

To conduct the national surveys, this project has trained staff in 8 leading research institutes in China, all of whom have actively engaged with provincial-level Fisheries Management Bureaux and protected areas. Endorsements from these authorities enabled the success of this ambitious project and the results generated from this project will be fed back to the relevant authorities to facilitate policy decision making for conservation and farm management. Also, the project results led to FNNR providing financial, administrative and political support for long-term CGS and amphibian monitoring and conservation in this UNESCO Park. Our CEPA campaigns and scientific publications have successfully transferred knowledge nationally and internationally.

#### **4.8 Capacity building**

- i. Did any staff from developing country partners see an increase in their status nationally, regionally or internationally? For example, have they been invited to participate in any national expert committees, expert panels, have they had a promotion at work?

EDGE Fellow Fang Yan has been taken on by KIZ as a post-doctoral research fellow in conservation genetics. Feng Zhou has worked in SNNU as research fellow to continue disease research and facilitate farm biosecurity monitoring in Shaanxi. Jing-Cai Lv has obtained a position in Guizhou Academy of Sciences to develop herpetology research, including long-term *in situ* and *ex situ* conservation of CGS across key nature reserves in Guizhou Province. Shu Chen has gained a permanent, core-funded position at ZSL for the development of conservation programmes in China. Also, Shu Chen was invited by the British Embassy to represent ZSL in a round-table discussion on CGS conservation and the illegal wildlife trade with Prince William in Shanghai, March 2015.

- ii. During the course of this project, our partner Professor Minyao Wu (SNNU), and our collaborators, Professor Hanbin Xiao (YRFRI), Dr. Zhiqiang Liang (HFSRI) and Professor Feng Xie (CIB), were appointed as Scientific Advisors of the Ministry of Agriculture's Fisheries Management Bureaux to advise on the CGS farming industry. Professor Wu was also appointed as an adviser on the CGS farming industry to the Shaanxi Provisional government's fisheries bureau. What gender were they?  
Three female and five male.

#### **4.9 Sustainability and Legacy**

Through this project, the networks built with multiple stakeholders, including high-level engagements with both UK and China governments will benefit the impact and sustainability of this project. In addition, this CGS conservation project has led to the development of other conservation opportunities in China, and projects on the illegal wildlife trade and protected area management are now being developed.

As a direct result of this project, conservation capacity in China among project partners/stakeholders has been improved, particularly for amphibian and wider freshwater ecosystem conservation, but also for conservation biology in general. EDGE Fellows and key project partners were trained in conservation tools to lead biodiversity research and conservation programmes in China. All four EDGE Fellows have obtained employment in conservation beyond the life-time of this project.

Importantly, our project collaborators YRSRI and HFSRI are both institutes affiliated with Fisheries Management Bureaux and CGS conservation research is an institutional focus. The enhancement of their capacity in this area as a result of this DI project will further post-project

sustainability and impact. Also, involvement of our project partners in improving biosecurity practice, genetic management and husbandry on farms will foster a more sustainable CGS farming industry, which could have a long-term impact on both biodiversity conservation and local livelihood security.

The success of this project has leveraged additional funding to support CGS conservation. In addition to support from the National Natural Science Foundation, Ministry of Education and Ocean Park Conservation Foundation Hong Kong, in-country funds have been raised by FNNR to support at least 5-years of CGS conservation research, public outreach and building of conservation facilities. As the Beijing Forestry University is partnered with the State Forestry Administration, we anticipate that, over time, our newly formalised relationship will help to improve the transfer of knowledge to central government, possibly influencing policy and funding decisions in favour of species conservation. We are currently working with our project partners and new collaborators to raise more funds within China to support follow-up activities, following on from successes with GU, SNNU and FNNR. Our collaborations with science centres, museums, universities and local volunteer groups are currently being successfully used to disseminate project outputs, and this is expected to continue beyond the life of the current DI-funded project. Independent CEPA campaigns for CGS conservation have already been conducted by some of these organisations.

## **5 Lessons learned**

The project achieved overall success in networking, science, capacity building and awareness-raising. However, ignorance (including amongst Chinese project partners and Provincial government staff) led to the project being started without going through the central Chinese Ministry of Agriculture – the central government authority in charge of CGS conservation and farming. Contacts have now been made with this Ministry, resulting in a request for a project review which was subsequently submitted. Until this was considered by the Ministry, some of the field work had to be put on hold for a few months, but we were later given clearance to continue with this. While it would have been good to include an CGS Conservation Action Plan Workshop during the course of this project, this would not have been possible: we are still in the process of analysing and interpreting data collected during this ambitious project. Although funding will have to be found from elsewhere, we are committed to holding this workshop in due course (the CIB already has offered convening space free of charge) to transfer the outputs from this project to facilitate high-level decision making and conservation policy enactment. It will be necessary to further engage with the central Chinese government in addition to Provincial governments (as we already have been doing) to maximise the success and impact of the project.

We didn't expect the wild CGS population to be so low in the wild, or that overt threats to this protected species would still be so prevalent. Thus we had to delay the original plan to construct the CGS conservation breeding facility and the associated releasing programme (activities that were not funded by Darwin). During the course of this project, however, we did identify at least one site (FNNR) which should be suitable for such a conservation breeding and release programme, provided current overexploitation threats can be mitigated. There is strong local support across stakeholders to mitigate this threat and the FNNR administration has asserted its willingness to assign space and funds to support conservation breeding of the local CGS population, combined with an integrated public education and awareness campaign.

### **5.1 Monitoring and evaluation**

The Project Leader took overall responsibility for tracking project execution against the Measurable Indicators and thus monitoring progress towards the timely delivery of the six project Outputs and the project Purpose. Specifically, the process of monitoring and evaluation was a team effort under the day-to-day management of the Project Coordinator and a monthly progress report was submitted to the Project Leader to consolidate tracking of performance. There were no major changes to the logframe, although some aspects of the work plan were

changed, with DI approval: primarily, the expansion of surveys from selected provinces to across the species' range.

The EDGE Fellows were under the supervision of the PSG, which also monitored progress against institutional workplans, timetables and budgets. There was regular communication/meetings of the PSG, organised both electronically and physically, to ensure that project progress was regularly reviewed and evaluated. In addition to expert assessments and supervision provided by the in-country supervisors, staff working for ZSL's EDGE of Existence programme conducted regular meetings and skill audits with EDGE Fellows via email and Skype to ensure their skills gaps were identified and addressed. Tailored training programmes were designed and provided to each EDGE Fellow. Specific EDGE Fellow work plans, comprising a detailed project work plan for each EDGE Fellow within the overall Darwin framework, were reviewed and supervised by the EDGE team in London to provide performance appraisals against milestones and indicators, to monitor skills/capacity development and, in liaison with the Project Leader, to adjust project activities to fulfil the Darwin outputs. A final skills audit and evaluation was conducted in September 2015 to evaluate training progress.

During this Project, ZSL staff visited project sites at least twice a year and provided training of in-country staff and collaborators. In addition, two UK herpetologists joined the national surveys and ensured that the project activities were carried out to international standards and in a timely manner. PSG meetings and EDGE Fellow meetings further strengthened collaboration amongst participating institutions and enhanced group oversight, accountability and monitoring of the overall project. To increase rigour, an external assessor, Dr. Michael Lau, Senior Head of Local Biodiversity and Regional Wetlands Programme at WWF-Hong Kong, was appointed as an independent assessor to oversee, guide and advise on project progress. His attendance at the annual project and PSG meetings provided valuable feedback and suggestions to the implementation of the project.

## **5.2 Actions taken in response to annual report reviews**

Reviews from the last annual report requested evidence of publicising the Darwin Initiative through this project. We have promoted the Darwin logo prominently on our project website homepage ([www.chinesegiantsalamanders.org](http://www.chinesegiantsalamanders.org)) and evidence of the promotion of the Darwin identity in workshops, media release, meeting reports and CEPA outputs can be seen in the supplementary submissions (annex 7, 8, 14, 17 and 19).

## **6 Darwin identity**

A bilingual project website, the ZSL website, a Facebook account and a Chinese website by Xinhua News Agency have all been used as tools for disseminating information about this project. In all cases, the Darwin Initiative has been publicised and its logo used. A documentary film on the CGS field surveys, a CEPA video, and an educational cartoon film on CGS conservation were produced, all of which have a clear Darwin Initiative identity. All these films have been shown at multiple public outreach events and meetings and at international conferences and they have been shared with museums and science centres to maximise the dissemination of this project. All meetings we hosted or co-organised publicised the DI as the key funder, and the importance of DI support for the implementation and success of this project has been highlighted to all stakeholders, including the British royal family and central government contacts in both the UK and China.

During our CEPA campaigns and throughout our excellent collaborations with YSTC, GNHM, KZM, FNNR, protected areas and schools, information about the Darwin Initiative and its support for this project has been disseminated to the urban public, students and rural communities. Particularly, CEPA materials (i.e. booklets, posters and videos), which all include the distinct DI logo, have been distributed amongst these networks and volunteers; this dissemination within China is expected to continue over a sustained period post-project. In addition, the DI has been acknowledged in all of the scientific presentations and publications arising from the project. A bilingual project overview that highlights the distinct identity of the Darwin Initiative has been disseminated to governments in China centrally, provincially and

locally for political endorsement, and also to Chinese academic institutes and NGOs for project networking.

## 7 Finance and administration

### 7.1 Project expenditure

Project spend (indicative) since last annual report	2015/16 Grant (£)	2015/16 Total actual Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below)			21	Salaries incurred during no-cost extension to 30 June 2016. Includes salary to AAC paid by ZSL (i.e. using non-Darwin funds) included due to auditing procedure at ZSL. With this removed (see below), the variance is < 10%.
Travel and subsistence				Primarily visits to China for field work and for final project conference
Operating Costs			13	Primarily field and lab costs in China with higher costs due to extension of field work into 2015/16 following bad weather in preceding years (see agreed change request form submitted in Dec 2014)
Others (see below)			100	This includes £598.78 of operating costs that were erroneously classified as "other". The remaining costs were for bank charges when transferring monies to China.
<b>TOTAL</b>				

Staff employed (Name and position)	Cost (£)
Becky Shu Chen	
Andrew Cunningham	
<b>TOTAL</b>	

Capital items – description	Capital items – cost (£)
<b>TOTAL</b>	

Other items – description	Other items – cost (£)
<b>TOTAL</b>	

## 7.2 Additional funds or in-kind contributions secured

Source of funding for project lifetime	Total (£)
ZSL	
Royal Society	
Kunming Institute of Zoology, Chinese Academy of Science (KIZ)	
Shaanxi Normal University (SNNU)	
Kadoorie Farm & Botanic Garden (KFBG)	
Fisheries Management Bureau (FMB)	
Tottori University (TU)	
IUCN Save Our Species	
Wildfowl & Wetlands Trust (WWT)	
Guiyang University (GU)	
EAZA Amphibian Conservation Fund	
US Fish and Wildlife Service	
National Natural Science Foundation of China	
Ministry of Education	
Ocean Park Conservation Foundation, Hong Kong	
Fanjingshan National Nature Reserve (FNNR)	
Small grant for salamanders	
British Consulate Chongqing	
Asa Zoo	
Yunnan Science and Technology Centre (YSTC)	
Guangxi Nature and History Museum (GNSM)	
UK private donor	
Yunnan Arts University	
Tongren University	
Honolulu Zoo	
<b>TOTAL</b>	

The funds listed above included in-kind contribution.

Source of funding for additional work after project lifetime	Total (£)
Fanjingshan National Nature Reserve (FNNR)	
Yunnan Science and Technology Centre (YSTC)	
Guangxi Nature and History Museum (GNSM)	
ZSL	
Tongren University	
<b>TOTAL</b>	



### **7.3 Value for Money**

When the original project was submitted, we considered only targeting Guizhou and Guangxi Provinces. After initial project visits and partner meetings, and a more-detailed appraisal of the situation, along with the ability to use Darwin funding to leverage the required additional support, we expanded the remit of the project to the known range of the CGS. Thus, following DI approval, we conducted the first national survey on CGS status, distribution and threats to be achieved in China's conservation history. The output generated is enabling us to build the first scientific evidence base for a species conservation action plan, which should also benefit regional biodiversity and freshwater ecosystems. As an unexpected bonus, some of the threat mitigation measures identified, such as biosecurity practices taken on farms to reduce disease, have the possibility of helping to reduce poverty and contribute to a sustainable farming industry. We have trained and educated a large number of staff at multiple institutes and built capacity which will have conservation impact beyond the lifespan and scope of the project. In addition, CEPA campaigns maximised the initial funding and triggered multiple collaborations with media and science centres to allow the wider dissemination of project outputs which continues post-project in a self-sustained way. Importantly, the impact of this project to date has enabled us to connect with key governmental bodies in China and the project has served as a good example of Sino-UK collaboration. One result of this is an increased interest by the ZSL to engage in species conservation and broader conservation issues (such as wildlife trade) in China, with the employment of Shu Chen to facilitate such work.

## Annex 1 Project's original (or most recently approved) logframe, including indicators, means of verification and assumptions.

**Note:** Insert your full logframe. If your logframe was changed since your Stage 2 application and was approved by a Change Request the newest approved version should be inserted here, otherwise insert the Stage 2 logframe.

Project summary	Measurable Indicators	Means of verification	Important Assumptions
<p><b>Goal:</b> Effective contribution in support of the implementation of the objectives of the Convention on Biological Diversity (CBD), the Convention on Trade in Endangered Species (CITES), and the Convention on the Conservation of Migratory Species (CMS), as well as related targets set by countries rich in biodiversity but constrained in resources.</p>			
<p><b>Sub-Goal:</b> Improving scientific understanding &amp; in-country capacity to strengthen the conservation framework for CGS.</p>	<p>Progress on developing &amp; implementing a national conservation strategy in China, supported by the MoEP, MoA, FMB &amp; the farming industry, to safeguard wild CGS in key locations across the range in the drainage basins of the Yellow, Yangtze &amp; Pearl Rivers.</p>	<p>MoEP reports to CBD and reports to CITES • China National Biodiversity Strategy monitoring reports.</p>	
<p><b>Purpose</b> Building the evidence-base &amp; capacity to underpin, promote &amp; conduct a strategic conservation plan for the CGS.</p>	<p>First robust dataset of population distribution, relative abundance and threat distribution across key range areas &amp; genetic connectivity • Improved in-country resources &amp; capacity for addressing both in situ &amp; ex situ conservation concerns, including: monitoring protocols; population genetics database &amp; biobanked material; disease diagnostic protocols; conservation breeding protocols; CEPA strategy and 2 campaigns; &amp; the establishment of an effective national &amp; international network to support &amp; promote the sub-goal.</p>	<p>Conservation Action Plan (National/Provincial) • Evaluated training schemes in monitoring, disease diagnostics, population genetics analysis, database construction, &amp; conservation breeding • Scientific literature in Chinese/English • MoEP reports to CBD • China National Biodiversity Strategy monitoring reports • Project progress reports.</p>	<p>Effective collaboration &amp; communication between all project partners • Chinese government <b>authorities</b> continue to support project.</p>
<p><b>Outputs</b> 1. Evidence-base on CGS distribution, population status, ecology &amp; conservation requirements strengthened &amp; disseminated.</p>	<p>Scientifically robust baseline data for CGS occurrence/abundance in range-wide study regions collated, analysed &amp; reported • Predictive Habitat Model developed, that factors-in Climate Change, to delimit a suitable remaining range area for CGS to inform future conservation breeding release efforts &amp; establish potential locations of remnant populations • Questionnaire-based survey protocols developed &amp; utilised to collect local informant data on</p>	<p>Full review of existing data produced • Revised range map produced • Standardised long-term monitoring protocols formalised &amp; distributed • Interview protocols document • reports and published papers showing results of field work • Centralised information portal developed for dissemination of project progress &amp; findings • Post-</p>	<p>Chinese government (specifically the Province-level FMB representatives) continue to provide permits for field research</p>

	current / historical range • Standardised field survey programme developed & utilised • 1 CGS survey & monitoring EDGE Fellow trained.	project skills audit & expert assessment.	
2. Range-wide population genetics & phylogeography of CGS resolved to safeguard maximum genetic diversity of this species.	CGS Genetics Group established to coordinate collection, analysis, storage, databasing & dissemination of genetic information to facilitate conservation management and sustainable production of wild CGS • Field collection of CGS genetic samples across known range • Microsatellites developed & databased to enable the analysis of genetic samples • Genetic analysis of samples, investigating phylogeography, & identifying distinct evolutionary units & possible evidence for cryptic species • Biobanking of genetic information • Integration of CGS genetic data into longer-term range-wide conservation management • 1 CGS conservation genetics EDGE Fellow trained.	CGS genetic group established & coordination/remit agreed • CGS genetics database expands • Protocols for developing microsatellites produced • Scientific literature in Chinese/English • Moratorium on current government-endorsed release programme & protocol for genetic screening of any animals released to supplement wild population • Biobank established • Post-project skills audit & expert assessment.	Sufficient samples can be collected from wild animals, allowing for possible presence of released salamanders from a different sub-population • MoEP, MoA and FMB accept project recommendations.
3. Disease threats to farmed and wild CGS identified and mitigation strategies developed.	Develop CGS disease diagnostic & research capacity within China • Identify major disease threats to wild and farmed CGS & investigate routes of transfer between the two • Raise awareness of disease / biosecurity / quarantine issues among farms & captive breeding centres, including treatment of waste water from farms • Develop protocols to determine health and infection status of animals destined for release • Develop disease mitigation measures & treatments for captive/farmed CGS • CGS farming becomes self-sustainable and no longer relies on regular inputs of wild-caught animals • 1 CGS disease diagnostics & surveillance EDGE Fellow trained.	First CGS disease diagnostic laboratory & training centre established, training post-doctoral students • CGS disease diagnostic protocols developed and important disease threats identified • Protocols for disease screening of CGS developed and implemented prior to release • CGS disease information and mitigation document developed & circulated to government & CGS stakeholders (including CGS farmers) • Anonymous surveys of farms indicate that wild-caught CGS are no longer required by the farming industry • Post-project skills audit & expert assessment.	Access to sample farmed and wild CGS granted • Farmers willing to adopt disease mitigation protocols • MoEP, MoA and FMB accept project recommendations.

<p>4. Build upon existing CGS farming protocols &amp; infrastructure to develop <i>ex situ</i> protocols for conservation.</p>	<p>Develop protocols for CGS conservation breeding through cooperation with farms &amp; a targeted CGS Conservation Breeding Workshop  <ul style="list-style-type: none"> <li>• Develop plan for first captive population of CGS for conservation breeding &amp; create appropriate facility at the Shaanxi Wild Animal Rescue and Research Centre</li> <li>• Government-endorsed conservation breeding and release programme for CGS, removing any requirement for the release of commercially farmed CGS as a conservation measure.</li> </ul> </p>	<p>Conservation breeding workshop report  <ul style="list-style-type: none"> <li>• Conservation breeding protocols developed</li> <li>• Conservation breeding training manual developed</li> <li>• First CGS conservation breeding facility and population established</li> <li>• Strategy document developed for establishment of further conservation breeding populations based on CGS Genetics Group recommendations</li> <li>• Disease-free &amp; genetically managed CGS available for release into the wild.</li> </ul> </p>	<p>Government permission granted to establish conservation breeding population(s) of CGS.</p>
<p>5. Education &amp; awareness-raising activities to promote the status &amp; conservation needs of CGS across its range at local, national &amp; international level.</p>	<p>CEPA training and planning workshop including a variety of stakeholders to set future directions to raise the profile of CGS &amp; facilitate its conservation  <ul style="list-style-type: none"> <li>• Public campaigns conducted in 2 key project target areas (Shaanxi and Guizhou) highlighting importance &amp; conservation requirements of CGS</li> <li>• 20,000 appropriate CEPA materials produced &amp; distributed at local community meetings &amp; schools in target areas</li> <li>• Train EDGE Fellows and supervisors in CEPA and project coordination</li> <li>• 9 local, 6 national &amp; 2 international newspaper articles; 9 local, 6 national &amp; 2 international radio &amp; TV interviews; Project blog and social networking sites established</li> <li>• 6 internet articles on partner websites.</li> </ul> </p>	<p>Project annual reports  <ul style="list-style-type: none"> <li>• Pictures, footage &amp; report from CEPA workshop</li> <li>• Project coordinator CEPA training report</li> <li>• Footage &amp; reports of 2 CEPA campaigns (including school presentations, fairs, art displays, theatre, public CGS educational encounters)</li> <li>• Radio &amp; TV transcripts/recordings, newspaper &amp; internet articles, scientific papers</li> <li>• Project partner websites &amp; hit-count</li> <li>• Short film cut from project footage at end of Year 3.</li> </ul> </p>	<p>Target areas are receptive to CEPA campaign activities  <ul style="list-style-type: none"> <li>• Campaigns are appropriately pitched to influence attitudes / behaviour of target audience</li> <li>• Media willing to publicise information about CGS threats &amp; conservation.</li> </ul> </p>
<p>6. Development of a global network that seeks to conserve giant salamanders nationally &amp; internationally.</p>	<p>Link up international network of protected areas &amp; CGS/cyptobranchid experts  <ul style="list-style-type: none"> <li>• Project staff to take part in CIG, JGSS &amp; CHS meetings</li> <li>• Engage with the highest levels of government &amp; advocacy to garner support for the conservation of the CGS as an iconic species and a key component of the maintenance of healthy, functioning watersheds</li> <li>• Meetings with MoEP, MoA, FMBs &amp; other relevant ministries to discuss CGS policy imperatives.</li> </ul> </p>	<p>Project website for dissemination of CGS information, project progress &amp; findings, releasing a biannual online newsletter  <ul style="list-style-type: none"> <li>• Reports &amp; presentations to CIG, JGSS &amp; CHS</li> <li>• Reports of meetings with government bodies.</li> </ul> </p>	<p>Ongoing support from international colleagues and Chinese government.</p>

## Annex 2 Report of progress and achievements against final project logframe for the life of the project

Note: For projects that commenced after 2012 the terminology used for the logframe was changed to reflect DFID's terminology.

Project summary	Measurable Indicators	Progress and Achievements in the last Financial year (2015 – 2016)	Actions required/planned for next period
<p><b>Goal/Impact:</b> Improving scientific understanding &amp; in-country capacity to strengthen the conservation framework for CGS.</p>		<p>In-country capacity built to conduct CGS and freshwater biodiversity research and conservation; connection built with the central Ministry of Agriculture &amp; Provincial Fisheries Bureau and farms in 16 provinces to develop a sustainable farming industry; national survey achieved to inform freshwater biodiversity protection; CEPA campaigns conducted to raise the profile of CGS and the importance of freshwater ecosystems; disease research carried out to mitigate threats and improve biosecurity on farms to safeguard local livelihoods and alleviate risk of poverty; and female EDGE fellows and local volunteers trained to enhance capacity of females to lead conservation in China.</p>	
<p><b>Purpose/Outcome</b> Building the evidence-base &amp; capacity to underpin, promote &amp; conduct a strategic conservation plan for the CGS.</p>	<p>First robust dataset of population distribution, relative abundance and threat distribution across key range areas &amp; genetic connectivity</p> <ul style="list-style-type: none"> <li>Improved in-country resources &amp; capacity for addressing both <i>in situ</i> &amp; <i>ex situ</i> conservation concerns, including: monitoring protocols; population genetics database &amp; biobanked material; disease diagnostic protocols; conservation breeding protocols; CEPA strategy and 2 campaigns; &amp; the establishment of an effective national &amp; international network to</li> </ul>	<p>Standardised CGS national surveys completed in 100 sites across China, allowing the first understanding of this species' current status and threats to inform future conservation planning.</p> <p>In-country capacity developed in CGS survey and monitoring, genetic screening and diseases diagnosis; key sites for CGS <i>ex situ</i> conservation identified and with collaboration secured; CGS profile greatly promoted through diverse CEPA campaigns and effective stakeholder engagement at regional, national and international levels.</p> <p>Effective communication remained among</p>	<p>CGS Action Plan Workshop to be organised to transfer project outputs to scientific communities and policy makers; Project results to be published to peer-review journals and released to media; National &amp; international network continue to be enhanced.</p>

	support & promote the sub-goal.	project partners; continued supports from the Chinese government authorities.	
<b>Output 1.</b> Evidence-base on CGS distribution, population status, ecology & conservation requirements strengthened & disseminated.	Scientifically robust baseline data for CGS occurrence/abundance in range-wide study regions collated, analysed & reported • Predictive Habitat Model developed, that factors-in Climate Change, to delimit a suitable remaining range area for CGS to inform future conservation breeding release efforts & establish potential locations of remnant populations • Questionnaire-based survey protocols developed & utilised to collect local informant data on current / historical range • Standardised field survey programme developed & utilised • 1 CGS survey & monitoring EDGE Fellow trained.	Standardised and integrated field survey, questionnaire and farm surveys successfully conducted in 100 sites to determine the current & historical distribution, threats and population status of wild CGS across CGS historical range in China; A CGS habitat suitability map and a historical wild CGS distribution map were developed; A set of questionnaires developed, successfully piloted and used to determine the distribution, status and threats impacting wild CGS; International CGS Conservation Field Training Workshop (ICGSCFTW) was held in FNNR in 2013, with standardised field survey protocols developed. Eight survey teams were trained by ZSL on conducting standardised surveys & long-term monitoring throughout the country; EDGE Fellow Jing-Cai Lv was trained in the past 4 years on CGS and amphibian survey and monitoring; his career has been developed at Guizhou Academy of Sciences to lead herpetological research in Guizhou province Indicators are adequate and appropriate to measure the progress towards the Output.	
Activity 1.1. Conduct training visits to Guizhou, Shaanxi, Shanxi, Fujian, Guangxi, Guangdong and Zhejiang Provinces with EDGE Fellows and project partners		Training was further provided to 4 new established teams at project sites by two UK herpetologists and the Project Coordinator from May 2015 to June 2016.	
Activity 1.2. Develop standardised questionnaire-based survey protocol		Standardised questionnaire surveys completed for 100 sites across China.	
Activity 1.3. Develop standardised field survey protocol		Standardised field surveys completed for 10 sites across China	
Activity 1.4. Conduct long-term monitoring at selected field site		Annual survey & monitoring conducted in FNNR at selected rivers with habitat information collated for long-term monitoring.	
Activity 1.5. Train and supervise EDGE Fellow and project partners focusing on long-term monitoring of wild CGS in China		Capacity of EDGE Fellows and key project partners built in survey & long-term monitoring of wild CGS in their project areas. EDGE Fellow Jing-Cai Lv obtained a position in Guizhou Academy of Science to lead amphibian survey & monitoring in Guizhou Province. To provide on-going training and supports by ZSL to build in-country capacity to conduct effective <i>in situ</i> CGS survey and monitoring.	
<b>Output 2.</b> Range-wide population genetics & phylogeography of CGS resolved to safeguard maximum genetic diversity of this species.	CGS Genetics Group established to coordinate collection, analysis, storage, databasing & dissemination of genetic information to facilitate conservation management and sustainable production of wild CGS • Field collection of CGS genetic samples across known range • Microsatellites developed & databased to enable the analysis of genetic samples • Genetic analysis of	Standardised buccal swabbing surveys of wild and farmed CGS developed at ICGSCFTW, with teams trained. Sample collection and information sharing coordinated by ZSL; Genetic samples of wild-caught (n=35) & captive CGS (n=1390) in 71 farms were collected from 12 provinces; 12 effective markers developed by KIZ and genotyped for samples; Lab work conducted on mitochondrial COI sequencing and microsatellite loci genotype of genetic samples; Genetic diversity, differentiation, gene flow among populations and phylogenetic patterns analysed and impact of anthropogenic trade investigated 24 haplotypes and 12 population clades of CGS identified from mitochondrial results and 2 distinct groupings of CGS identified through microsatellite results,	

	<p>samples, investigating phylogeography, &amp; identifying distinct evolutionary units &amp; possible evidence for cryptic species • Biobanking of genetic information • Integration of CGS genetic data into longer-term range-wide conservation management • 1 CGS conservation genetics EDGE Fellow trained.</p>	<p>which will inform future conservation management; EDGE Fellow Fang Yan trained in skills of genetics and phylogeography study on CGS; her career developed at KIZ to continue &amp; lead CGS conservation genetics work in China</p> <p>Indicators are adequate and appropriate to measure the progress towards the Output.</p>
Activity 2.1. Collect genetics samples from wild and captive CGS and CGS specimen		Genetic samples (n=1425) of wild-caught & captive CGS in 71 farms of 12 Provinces were collected, greatly enhancing the genetic database at KIZ. To collect more samples in 100 identified field sites by different field teams.
Activity 2.2. Develop microsatellites and associated protocols for analysis of CGS genetics		Conservation genetic lab protocols refined & improved. Mitochondrial primers for COI gene developed specifically for <i>Andrias</i> .
Activity 2.3. Develop protocol for genetic screening of any captive CGS released to supplement wild populations;		Protocols developed & refined by KIZ to conduct mitochondrial DNA sequencing and microsatellite loci genotype lab work & analysis to understand CGS genetic structure on farms and identify unique genetic units, facilitating future screening of farm individuals for conservation breeding/ reintroduction programme. To conduct genetic screening and analysis of samples collected from farms.
Activity 2.4. Analyse genetic samples collected at KIZ		Lab work conducted on mitochondrial COI sequencing and microsatellite loci genotype of genetic samples at KIZ; Genetic diversity, differentiation, gene flow among populations and phylogenetic patterns analysed and impact of anthropogenic trade investigated; 19 haplotypes and 8 population clades of CGS identified from mitochondrial results and 3 distinct groupings of CGS identified through microsatellite results. To conduct lab work and analysis towards remaining and new collected samples.
Activity 2.5. Manage and improve CGS genetics database at KIZ;		Genetic database at KIZ enhanced and improved with more samples collected and analysis conducted. To continue the genetic lab work & analysis to improve the genetic database.
Activity 2.6. Train and supervise EDGE Fellow focusing on CGS conservation genetics at KIZ		EDGE Fellow Fang Yan trained at KIZ in skills of genetics and phylogeography study on CGS; EDGE fellowship supervised by EDGE team in London. To identify and address gaps and provide ongoing training and supports by ZSL and PSG.
<b>Output 3.</b> Disease threats to farmed and wild CGS identified and mitigation strategies developed.	<p>Develop CGS disease diagnostic &amp; research capacity within China • Identify major disease threats to wild and farmed CGS &amp; investigate routes of transfer between the two • Raise awareness of disease / biosecurity / quarantine issues among farms &amp; captive breeding centres, including treatment of waste water from farms • Develop protocols to</p>	<p>Major CGS pathogens identified: ranavirus, <i>Batrachochytrium dendrobatidis</i>, <i>B. salamandrivorans</i> and <i>Mycobacterium</i> spp.; A policy letter highlighting the needs of sustainable farming submitted to the Ministry of Agriculture; connections and trust built with provincial and local Fisheries Management Bureaux and farms in project areas for pathogen investigation; farms in Shaanxi with disease outbreaks regularly visited and samples collected for disease monitoring; Standardised farm questionnaire and disease swabbing surveys of CGS developed at ICGSCFTW, with teams trained; Skin and cloacal swabs collected from 20 wild and 1301 farmed living animals across 12 provinces for the investigation of selected</p>

	determine health and infection status of animals destined for release • Develop disease mitigation measures & treatments for captive/farmed CGS • CGS farming becomes self-sustainable and no longer relies on regular inputs of wild-caught animals • 1 CGS disease diagnostics & surveillance EDGE Fellow trained.	amphibian pathogens; Importance to adopt biosecurity measures and sustainable farming practices raised to Fisheries Management Bureaux and farms by project partners in relevant project areas; Fisheries in Guizhou Province trained in microchipping techniques in ID wild and manging farms CGS;EDGE Fellow Zhou Feng was trained since 2011 on CGS disease diagnostics & surveillance; her career has been developed at SNNU to continue disease research in Shaanxi province Indicators are adequate and appropriate to measure the progress towards the Output.
Activity 3.1. Collect field samples from wild and captive CGS		Skin and cloacal swabs collected from 20 wild and 1301 farmed living animals across 12 provinces for the investigation of selected amphibian pathogens; samples of dead CGS taken from farms in Shaanxi at which the disease outbreak happened to monitor disease and develop mitigation and prevention measures.
Activity 3.2. Develop disease diagnostics and screening protocols for wild and farmed CGS and analyse samples		Major CGS pathogens identified and screened: ranavirus, <i>Batrachochytrium dendrobatidis</i> , <i>B. salamandrivorans</i> and <i>Mycobacterium</i> spp.
Activity 3.3. Develop protocol for disease screening of any captive CGS released to supplement wild populations		Farm questionnaire surveys conducted with national field surveys to find out husbandry of farms, disease status and existing releasing activities to provide references for future biosecurity management and releasing programme planning. Samples analysed to inform disease status of CGS on farms across China and evaluate potential impact of current releasing programme.
Activity 3.4. Train and supervise EDGE Fellow focusing on CGS disease diagnostics and mitigation strategies at SNNU		EDGE Fellow Feng Zhou trained at SNNU in skills of CGS disease diagnostics, virus culture and mitigation strategies and developed her career in SNNU.
<b>Output 4.</b> Build upon existing CGS farming protocols & infrastructure to develop <i>ex situ</i> protocols for conservation.	Develop protocols for CGS conservation breeding through cooperation with farms & a targeted CGS Conservation Breeding Workshop • Develop plan for first captive population of CGS for conservation breeding & create appropriate facility at the Shaanxi Wild Animal Rescue and Research Centre • Government-endorsed conservation breeding and release programme for CGS, removing any requirement for the release of commercially farmed CGS as a conservation measure.	A key stakeholder meeting” Building the 1 <sup>st</sup> CGS conservation breeding and education facility in FNNR” convened in FNNR, May 2014, which brought together different government, farms and academic institutions for the first time. Potential sites visited and evaluated in FNNR, with a joint funding proposal submitted to Guizhou Environmental Bureau; annual transect surveys conducted in FNNR with reserve rangers trained for future <i>in situ</i> & <i>ex situ</i> conservation & monitoring; CEPA campaigns conducted to raise awareness and mitigate threats in this park. Locally wild-caught CGS on farms around FNNR microchipped and the swabs collected for genetic analysis and pathogen surveillance to screen potential animals for future conservation breeding/re-introduction programme; local fishery officials trained to develop skills for better management and monitoring of wild and re-introduced populations. A policy letter highlighting the needs of sustainable farming and better-managed releasing programme submitted to the Ministry of Agriculture Indicators are adequate and appropriate to measure the progress towards the Output.
Activity 4.1. Construct, populate and develop pilot CGS <i>ex situ</i> conservation breeding facility		Networks built with governmental bodies, academic institutions and farms in Guizhou to initiate a pilot conservation breeding and releasing programme in FNNR; locally wild-caught CGS on farms around FNNR microchipped and the swabs collected for genetic analysis and pathogen surveillance to screen



		potential animals for future conservation breeding/re-introduction programme; local fishery officials trained to develop skills for better management and monitoring of wild and re-introduced populations.
Activity 4.2. Develop CGS conservation breeding protocols		A MoU signed with FNNR and conservation breeding protocols being developed by ZSL, KIZ, SNUU and FNNR jointly.
<b>Output 5.</b> Education & awareness-raising activities to promote the status & conservation needs of CGS across its range at local, national & international level.	CEPA training and planning workshop including a variety of stakeholders to set future directions to raise the profile of CGS & facilitate its conservation • Public campaigns conducted in 2 key project target areas (Shaanxi and Guizhou) highlighting importance & conservation requirements of CGS • 20,000 appropriate CEPA materials produced & distributed at local community meetings & schools in target areas • Train EDGE Fellows and supervisors in CEPA and project coordination • 9 local, 6 national & 2 international newspaper articles; 9 local, 6 national & 2 international radio & TV interviews; Project blog and social networking sites established • 6 internet articles on partner websites.	A CGS and freshwater ecosystem CEPA training and planning workshop was held in Kunming, China in January 2013, and a public questionnaire was developed; 904 questionnaires collected to develop baseline data on public CGS awareness; A series of public and school CEPA campaigns conducted in Guizhou and Yunnan to promote CGS and freshwater ecosystems; More than 81,500 CEPA materials produced and disseminated; and displays in China and UK could potentially reach 700,000 visitors; EDGE Fellow Chen Shu was trained in CEPA and project management; her career has been developed at ZSL as China Project Coordinator to develop conservation projects in China; Multiple local, national, and international interviews, media press, scientific publications, and websites generated through this project. Indicators are adequate and appropriate to measure the progress towards the Output.
Activity 5.1. Conduct CGS and freshwater ecosystem CEPA training and planning workshop		A student volunteer association “Wild Fauna and Flora Society” was established in Tongren University, Guizhou to conduct CEPA campaigns in Guizhou. YSTC, GNHM and KZM are also trained in CGS CEPA skills to carry out outreaches in Yunnan and Guangxi province.
Activity 5.2. Produce appropriate project CEPA materials		CEPA booklet, educational video, documentary films, posters, paper games, mobile Chinese website and magazine articles produced and disseminated in project areas.
Activity 5.3. Train 3 EDGE Fellows in CEPA campaign organisation and implementation		A CGS and freshwater ecosystem CEPA training and planning workshop held in China and CEPA training held by EDGE team in UK with EDGE Fellow trained
Activity 5.4. Conduct public CEPA campaigns		A series of CEPA campaigns “Go for Salamander” conducted in Guizhou; and more campaigns & long-term project display conducted in Yunnan and Guangxi Province lead by YSTC, KZM & GHNM. A CGS exhibit set up in London Zoo, ZSL
Activity 5.5. Plan and conduct overall awareness strategy (media/social marketing).		Online social marketing conducted to raise awareness of CGS conservation nationally and internationally.
<b>Output 6.</b> Development of a global network that seeks to conserve giant salamanders nationally & internationally.	Link up international network of protected areas & CGS/cyptobranchid experts • Project staff to take part in CIG, JGSS & CHS meetings • Engage	Reciprocal visits of ZSL and Japanese giant salamander researchers to Japan and China to exchange knowledge and techniques for <i>Andrias</i> conservation; Regional, national and international conferences, seminars & workshop attended to disseminate project findings; ZSL attended JGSS and organised giant

	with the highest levels of government & advocacy to garner support for the conservation of the CGS as an iconic species and a key component of the maintenance of healthy, functioning watersheds • Meetings with MoEP, MoA, FMBs & other relevant ministries to discuss CGS policy imperatives.	salamander international meetings in Guizhou and Hangzhou to link up international cyptobranchid experts; Networking with high-level governments in both China and UK including the royal family, British embassy China, Chinese embassy UK, Ministry of Agriculture and State Forestry of Administration Meetings with provincial governments by project partners in 16 provinces to garner support for CGS survey and conservation. Indicators are adequate and appropriate to measure the progress towards the Output.
Activity 6.1. Meetings with relevant government ministries and stakeholders		Meetings with relevant governments in CGS range provinces on the purpose of establishing network, facilitating in-country CGS survey & monitoring, building conservation capacity and developing potential post-project funding.
Activity 6.2. Build and maintain project website		Bilingual (English and Chinese) project website updated. Chinese mobile website built by Xinhua News Agency
Activity 6.3. Different project partners attend relevant national and international conferences to disseminate project purpose, findings and achievements (including CHS, EcoHealth, Society for Conservation Biology; JGSS; CIG)		Scientific presentations given to national and international conferences and to multiple national and international institutes, with collaboration networks built to academic institutes and NGOs
Activity 6.4. Final Darwin Initiative project strategy workshop on promotion of CGS and freshwater ecosystem conservation in China		Final Darwin Initiative project meeting held at WCH8 and successfully prompted importance of CGS and freshwater conservation in China.

## Annex 3 Standard Measures

Code	Description	Total	Nationality	Gender	Title or Focus	Language	Comments
<b>Training Measures</b>							
1a	Number of people to submit PhD thesis						
1b	Number of PhD qualifications obtained	1	Chinese	Female	CGS conservation genetics	Chinese	
2	Number of Masters qualifications obtained	5	Chinese	Male and Female	CGS survey, disease and arts design	4 Chinese and 1 English	
3	Number of other qualifications obtained						
4a	Number of undergraduate students receiving training	40	Chinese	Male and Female	CGS survey, CEPA and conservation Tools	Chinese	
4b	Number of training weeks provided to undergraduate students	60			CGS survey, CEPA and conservation Tools	Chinese and English	
4c	Number of postgraduate students receiving training (not 1-3 above)	15	Chinese	Male and Female	CGS survey, CEPA, disease screening and conservation Tools	Chinese	
4d	Number of training weeks for postgraduate students	82			CGS survey, CEPA, disease screening and conservation Tools	Chinese and English	
5	Number of people receiving other forms of long-term (>1yr) training not leading to formal qualification(e.g., not categories	15	Chinese	Male and Female	CGS survey, CEPA and conservation	Chinese	

Code	Description	Total	Nationality	Gender	Title or Focus	Language	Comments
	1-4 above)				Tools		
6a	Number of people receiving other forms of short-term education/training (e.g., not categories 1-5 above)	88	Chinese	Male and Female	CGS survey, CEPA and reserve management	Chinese	
6b	Number of training weeks not leading to formal qualification	91			CGS survey, CEPA and reserve management	Chinese	
7	Number of types of training materials produced for use by host country(s) (describe training materials)	13			CGS survey, questionnaires, CEPA and management	Chinese and English	

Research Measures		Total	Nationality	Gender	Title	Language	Comments/ Weblink if available
9	Number of species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in the host country (ies)	3			Biodiversity strategy and action plan, CGS conservation breeding and education facility, CGS CEPA tourism planning	Chinese	Stakeholder meetings organised to ensure participatory process
10	Number of formal documents produced to assist work related to species identification, classification and recording.	2			CGS identification protocol and ID photo board	Chinese	
11a	Number of papers published or accepted for publication in peer reviewed journals	3			CGS pilot survey results	English	

					and impact of CGS farming		
11b	Number of papers published or accepted for publication elsewhere	3			CGS chapter on children magazine and Guizou wildlife book Xingda	Chinese	National magazines and book published by Guizhou press
12a	Number of computer-based databases established (containing species/generic information) and handed over to host country	6			CGS questionnaire results on status, threats, farms, disease, public perceptions	Chinese and English	
12b	Number of computer-based databases enhanced (containing species/genetic information) and handed over to host country	1			CGS genetic database at KIZ	Chinese and English	
13a	Number of species reference collections established and handed over to host country(s)						
13b	Number of species reference collections enhanced and handed over to host country(s)						

Dissemination Measures		Total	Nationality	Gender	Theme	Language	Comments
14a	Number of conferences/seminars/workshops organised to present/disseminate findings from Darwin project work	25			CGS survey, CEPA, reserve management and conservation Tools	Chinese and English	
14b	Number of conferences/seminars/ workshops attended at which findings from Darwin project work will be presented/disseminated.	12			CGS survey, genetics, disease status and CEPA results	Chinese and English	

<b>Physical Measures</b>		<b>Total</b>	<b>Comments</b>
20	Estimated value (£s) of physical assets handed over to host country(s)	15,140	CGS survey equipment and CEPA materials produced
21	Number of permanent educational, training, research facilities or organisation established	4	FNNR, YSTC, KZM, GNHM
22	Number of permanent field plots established	2	FNNR and Guangdong Liannan CGS reserve

<b>Financial Measures</b>		<b>Total</b>	<b>Nationality</b>	<b>Gender</b>	<b>Theme</b>	<b>Language</b>	<b>Comments</b>
23	Value of additional resources raised from other sources (e.g., in addition to Darwin funding) for project work	1,147,077			Conservation funds for Endangered species survey, monitoring, CEPA and capacity building for host country	Chinese and English	Including grant and in-kind contributions

## Annex 4 Aichi Targets

	Aichi Target	Tick if applicable to your project
1	People are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.	X
2	Biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.	
3	Incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.	
4	Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.	
5	The rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.	
6	All fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.	
7	Areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.	X
8	Pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.	
9	Invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.	
10	The multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.	
11	At least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.	
12	The extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.	X
13	The genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.	
14	Ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking	

	into account the needs of women, indigenous and local communities, and the poor and vulnerable.	
15	Ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.	
16	The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.	
17	Each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.	
18	The traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.	
19	Knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.	
20	The mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.	



## Annex 5 Publications

Type *	Detail	Nationality of lead author	Nationality of institution of lead author	Gender of lead author	Publishers (name, city)	Available from (e.g. web link, contact address etc)
The development of the Chinese giant salamander ( <i>Andrias davidianus</i> ) farming industry in Shaanxi Province, China: conservation threats and opportunities.	Journal	Cunningham, A. A., Turvey, S. T., Zhou, F., Meredith, H., Guan, W., Liu, X., Sun, C., Wang, Z. & Wu, M. 2015	Male	British	Oryx, Cambridge	<a href="http://journals.cambridge.org/action/displayFulltext?type=1&amp;fid=9595703&amp;jid=ORX&amp;volumeld=-1&amp;issueld=-1&amp;aid=9595698">http://journals.cambridge.org/action/displayFulltext?type=1&amp;fid=9595703&amp;jid=ORX&amp;volumeld=-1&amp;issueld=-1&amp;aid=9595698</a>
Using local ecological knowledge to assess the status of the Chinese giant salamander in Guizhou Province,	Journal	Pan, Y., Wei, G., Cunningham, A. A., Li, S., Shu, C., Milner-Gulland, E. J. & Turvey, S. T. 2015	Female	Chinese and British	Oryx, Cambridge	<a href="http://journals.cambridge.org/action/displayFulltext?type=1&amp;fid=9595712&amp;jid=ORX&amp;volumeld=-1&amp;issueld=-1&amp;aid=9595687">http://journals.cambridge.org/action/displayFulltext?type=1&amp;fid=9595712&amp;jid=ORX&amp;volumeld=-1&amp;issueld=-1&amp;aid=9595687</a>

China.						
Failure to detect the Chinese giant salamander ( <i>Andrias davidianus</i> ) in Fanjingshan National Nature Reserve, Guizhou Province, China.	Journal	Tapley, B., Okada, S., Redbond, J., Turvey, S.T., Chen, S., Lü, J., Wei, G., Wu, M., Pan, Y., Niu, K. & Cunningham, A.A. 2015	Male	British	<i>Salamandra.</i>	<i>Salamandra.</i>
Xingda's Wildlife Explorations in Fanjingshan – Song by the river	Book Chapter	Chen, S., Tapley, B., Lv, J.C.2015	Female	Chinese	Guizhou Science & Technology Press, Guiyang	Guizhou Science & Technology Press

## Annex 6 Darwin Contacts

Ref No	19-003
Project Title	A sustainable future for Chinese giant salamanders
<b>Project Leader Details</b>	
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