Darwin Initiative

Final Report

1. Darwin Project Information

Project Ref. Number	162/11/018
Project Title	Aztecs and Axolotls: Integrating Tourism and Conservation at Xochimilco, Mexico City
Country(ies)	Mexico and UK
UK Contractor	Durrell Institute of Conservation and Ecology, University of Kent, Canterbury, Kent CT2 7NS, UK
Partner Organisation(s)	Universidad Autónoma Metropolitana, Unidad Xochimilco (UAM), Mexico. Centro de Investigaciones Biológicas y Acuicolas de Cuemanco (CIBAC) Comision Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO - the National Commission for the Knowledge and use of Biodiversity), Mexico.
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Project website	http://www.kent.ac.uk/anthropology/dice/research/axolotl.html (under reconstruction)
Author(s), date	Dr R.A. Griffiths (Project Co-ordinator - UK) Dr I. Bride (Project Officer) MSc Alejandro Meléndez (Project Co-ordinator - Mexico)

2. Project Background/Rationale

Lake Xochimilco, 20km south of the centre of Mexico City, is a remnant of an extensive wetland system that once covered much of the volcanic basin in which Mexico City now sits. Its agricultural development began in pre-Aztec times, possibly as early as 1000 BC (Rabiela 1991), but intensified with the Aztec's founding of Tenochtitlán in 1325 and the Xochimilcas' promise to supply their new rulers with agricultural produce in perpetuity. These farmers reclaimed land by piling up mud, vegetation and faeces inside corrals of the water-loving willow (*Salix bonplandiana*) forming raised fields known as 'chinampas' and developing a sophisticated lacustrine economy, which, by the mid-sixteenth century, was supplying some 100,000 people in the capital (Parsons et al. 1985). Today, as the only surviving rural landscape of the pre-Columbian Americas (Duffetel 1993), amongst the remaining 2077 km^2 of remaining chinampas the 236 km^2 that are still farmed produce mainly vegetables, flowers and decorative plants (Romero *et al*. 2004). Present-day water bodies occupy just 2.3 km^2, including ~190 km of canals of varying widths. Yet the wetland continues to support an impressive amount of biodiversity, for example 170 tree and flowering plant species amongst 563 species of flora (Zavaleta-Beckler & Ramos-Espinosa 1999) and 160 species of bird (Hernández-Rivera & Meléndez-Herrada 1985). The reduction in the chinampas area, begun over 100 years ago, has been largely due to the diversion of natural springs to meet the water demands of a burgeoning human population, and the urbanization of Mexico City. In 1957, with water levels continuing to fall, the government started discharging tertiary-treated sewage back into the system, and in 1990, in response to intense local pressure, signed an accord which included plans to restrict development, construct buffer lagoons, and improve treatment of the returning waste waters (Wirth 1997). Although this stopped Lake Xochimilco from disappearing altogether, water quality, agricultural pollution and eutrophication have become major issues, alongside continued illegal settlement (Wirth 1997), whilst nutrient enrichment has enabled the invasive water hyacinth (*Eichhornia crassipes*) to spread rapidly, clogging up many of the smaller canals.

The Mexican axolotl (*Ambystoma mexicanum*) has long been a focus of considerable interest within the scientific community, particularly for research with medical applications. Only recently however, has the global interest in the plight of amphibian populations focused attention on its status in its remaining natural habitat, Lake Xochimilco, the place that may well hold the secret to its fascinating biology. Here there is considerable concern for its future. Heavy metals have been detected in axolotls and fish sampled from the lake (Gonzalez *et al*. 1997) and a strong female bias has been found in the sex ratio of captured axolotls (Vergara 1990; Graue 1998), pointing to the pollution-linked 'feminisation' process found elsewhere in amphibians (e.g. Hayes *et al*. 2002). The species (IUCN listed as 'vulnerable' and CITES appendix II) is also threatened by introduced fish (Asian carp and African *Tilapia*) and possibly by collection for food, medicines, and to supply the live animal trade. With the status of the wild population remaining uncertain, but thought to be in precarious decline (Griffiths *et al*. 2004), the need for an integrated in-situ conservation programme for the species is clear.

Fortunately, the axolotl's place in Aztec mythology (it was said to have been born when the god Xolotl threw himself into the waters to avoid sacrifice) together with its significance within the ancient lacustrine economy have made it something of a cultural icon. Moreover, Lake Xochimilco is an extremely popular recreational area for the people of Mexico City, as well as being on the tourist trail for overseas visitors. It was inscribed on the UNESCO list of World Heritage Sites in December 1987, was designated under the Ramsar Convention in February 2004, and provides precious respite from the hustle and bustle of one of the world's largest cities with some 22 million inhabitants.

Following an initial approach by Dr Virginia Graue, director of CIBAC (Centro de

Investigaciones Biológicas y Acuicolas de Cuemanco), the research and education field station on the shore of Lake Xochimilco, which is owned by the Universidad Autónoma Metropolitana, Unidad Xochimilco (UAM-X), and with funding from the British Council and the Declining Amphibian Population Task Force (DAPTF) a series of meetings was held between the DICE (University of Kent) and CIBAC in 2000 and 2001 to devise a strategic framework for the conservation of the axolotl. During these meetings discussions were had with local fisherman, boatmen (*remeros*), farmers and artisans, tour operators, schoolteachers, researchers, and representatives from zoos and conservation organisations. It became obvious that people valued Lake Xochimilco in different ways; and although the vast majority knew of the axolotl and appreciated its cultural importance, few were aware of its precarious status. There did however seem to be great potential for raising the whole profile of the cultural and ecological importance of the Xochimilco system by using the axolotl as a 'flagship' species for a programme of conservation education and nature tourism. This was a view reinforced by the fact that the Mexico City authorities had recently granted UAM extra land for the expansion of CIBAC. With an axolotl breeding, research and classroom facilities already in place, the time was ripe to develop a conservation education and tourism programme around CIBAC using the axolotl as a flagship. With support from a range of national and international organisations, notably the Mexican conservation authorities (CONABIO and SEMARNAT); Chapultepec, Toronto and Chester Zoos (who all have breeding colonies of axolotls); DAPTF and the British Herpetological Society; a bid was submitted to the Darwin Initiative programme to fund a three-year project seeking to increase the protection of the Xochimilco wetland and safeguard the wild axolotl population. In April 2002 the Environment Minister announced that the bid had been successful, and the project started almost immediately thereafter.

3. Project Summary

The primary purpose of the project was to assist Mexico in the development of a sustainable programme to conserve the axolotl and other endemic fauna and flora of Xochimilco through educational activities and the promotion of nature tourism using the axolotl as a flagship species. The following outputs were included in the logical framework (Appendix III).

a) Mexicans trained: MSc Tourism & Conservation (1); amphibian ecology (8 undergraduates); conservation education assessment and community appraisal (8 undergraduates);

b) Remeros (boatmen) trained as nature guides (12); unemployed artisans trained in souvenir production (4);

c) An Axolotl Species/Habitat Action Plan;

d) A conservation education programme;

e) Axolotl/Xochimilco ecology data;

The project sought to assist the Comision Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO) to protect and sustainably manage Xochimilco as one of its priority conservation areas under its obligations under the Convention on Biological Diversity, with particular regard to the following Articles:

Article 1 (the project was concerned with the conservation of biological diversity);

Article 5 (the project involved cooperation between two Contracting Parties);

Article 6b (the project incorporated an integrated cross-sectorial approach);

Article 7 (the project sought to establish a monitoring programme for a biodiversity component which requires urgent conservation measures);

Articles 8 and 9 (the project included both in-situ and ex-situ conservation measures for a critically endangered species);

Article 10 (the project was oriented to the long-term sustainable use of the axolotl and its habitat);

Article 11 (the project established social and economic measures for the conservation of the axolotl and the lake Xochimilco area);

Article 12 (the project involved a substantial research and training component);

Article 13 (the project involved a substantial public education and awareness component);

Article 16 (the project involved the transfer of captive breeding technology between project partners);

Article 17 (at the core of the project was an exchange of information);

Article 18 (the project involved an exchange of scientific and technical information);

Article 20 (the project involved financial contributions from both Contracting Parties).

The project suffered a tragic loss in January 2004 with the death of Dr Virginia Graue, the Project Co-ordinator in Mexico, the person who had come up with the original project idea and who had been a dynamic and passionate champion for the axolotl and the 'prime mover' in Mexico. However, despite this fundamentally disruptive and very sad event, the project was able to be kept largely on course and maintain a high level of success in meeting its objectives. Virtually all planned outputs were not just met but in many cases - most notably with the training of students and local people - were significantly exceeded. Moreover, important additional accomplishments were also precipitated by the project, both in the form of support for axolotl promotion and educational activities (e.g. the British Council/PEX support for a school art competion leading to the production of 2000 desk calenders to be distributed to publicise the project and raise further funds) and major political developments (e.g the vote by the Mexican Senate – see below).

4. Scientific, Training, and Technical Assessment

Research

The primary research activities conducted as a direct part of the DI project were surveys of visitor attitudes and behaviour (conducted by the project investigators in Mexico under the supervision of the UK project officer, Dr Bride), plus two DICE MSc dissertations: a study of the local boatmen (by the 'Darwin Fellow' Alejandro Meléndez – supervised by Dr Bride) and a study of the role of captive breeding in axolotl conservation (by DICE Conservation Biology student Jeanne McKay – supervised by Dr Griffiths). The findings of the research can be briefly summarised as follows:

Visitor surveys.

The data, gathered using random sampling methods and the application of a structured questionnaire survey instrument, provided the project with a profile of the visitor population, a picture of patterns of visitation, and a measure of the attitudes and interests of visitors to Xochimilco and its wildlife, and their willingness to spend on nature-related activities. They supported the idea that Xochimilco is predominantly a

destination for local people (~50% of visitors from Xochimilco D.F. and just 5% from outside Mexico City), and that trips to Xochimilco tend to be either a half or full day experience, notably at the weekends, very much an occasion for families and friends, and are strongly focussed around the embarkation points and boat trips. They also suggested that although there is normally very little communication between visitors and remeros (boatmen), there is considerable visitor interest in the history and wildlife of the place and a significant market potential for nature guiding activities to be provided and locally produced souvenirs to be sold. At the same time amongst the visitors the level of recognition of the axolotl and its plight was rather low (10-30%, and ~5% respectively – where N=172 or 264).

Business surveys.
The business surveys were designed to help form a picture of the souvenir market, purchasing patterns and the livelihoods of souvenir sellers. Most notably, almost none of the existing souvenirs on sale, even those at the embarkation points and nearly all of the few that were 'themed' on some aspect of Xochimilco were found to have not been produced locally and/or not to have been made from local, biodegradable or sustainably produced materials. Moreover, although over half of the 90 people surveyed indicated that they knew what an axolotl was, none of them appeared to be aware of its threatened status.

Study of boatmen (remeros).
The interview-based data describe the daily and weekly patterns of the job of the remero and suggest that although there is a high level of job satisfaction amongst members of the remero guild (virtually all of whom are from Xochimilco), the low amounts of work normally available during the first 4 days of the week means that only about half of them work as a remero all week long, whilst nearly two-thirds (where N=63) said they have to have another job in order to make ends meet. Not surprisingly, because the great majority of these men admit to having only received a primary (14=23%) or basic high school (40=65%) level of education, most of these other jobs were of a manual or un/semi-skilled nature. Not enough work and not enough income were identified as the main problems being faced, particularly by those remeros who do not own their own boat (*trajinera*) and who have therefore to give 40-50% of their income to the boat owner (*trajinero*).

With regard to their knowledge of the axolotl, other species and its environs, the remeros demonstrated a high level of concern and recognition, particularly of the axolotl itself (54=86%). They also reported there to be a significant degree of interest in Xochimilco's wildlife and chinampas amongst their passengers and tended to recognise that there exists a significant potential market for nature guiding. Furthermore, almost all those interviewed declared a considerable interest in being trained as nature guides (56 of the 63 respondents) and thought that there would be few obstacles to realising this objective.

Study of axolotl captive breeding.
This research concluded that despite their survival rates being much lower the axolotls reared under low-maintenance and semi-natural conditions in canals had faster growth rates and were in better condition than those raised under high-maintenance conditions in aquaria. A population viability analysis suggested that captive populations can be sustained even given a relatively low survival rate in age class 0-1, and that captive axolotl populations can be harvested at relatively high densities (up to 40 percent of the population) and still be sustainable. However, the cost of maintaining captive breeding facilities was found to be quite high and unlikely to be able to be offset by income from the direct sale of axolotls.

The study also found wild caught axolotls to be on sale for 120 pesos (USD$11.2) per juvenile and 250-300 pesos (USD$23.3-28.0) per adult, and concluded that although vendors appeared to be poorly informed about the species' maintenance requirements its use for medicinal and nutritional purposes were well known and, most worryingly, that it was still cost effective for fishermen to illegally capture and sell wild specimens.

Finally, although it emphasized that the reintroduction of captive bred axolotls to Lake Xochimilco must be avoided until the threats to the species have been ameliorated and whilst questions concerning their genetic quality and possible disease introduction remain unanswered, the study argued that captive populations could still be used to (1) supply current market demands and thereby reduce pressure on wild stocks; and (2) provide specimens for community outreach education programmes and ecotourism activities that raise the conservation profile of the species and its habitat.

Conclusion
Taken together these research findings appeared to suggest there existed a real opportunity for both enhancing the remeros and other local people's livelihoods and the visitor experience whilst increasing public awareness and understanding of the axolotl and its habitat through the provision of nature guide training. They were therefore used to inform the design and operation of the souvenir and nature-guiding workshops (Workshops 3, 4 and 5) in which the most relevant data from this research were also presented to participants in order to encourage them to participate fully and recognise the importance of seeing the process through. The data are also presently being written up as an article to be submitted to a peer-reviewed academic journal.

Training and capacity building activities
The principle training and capacity building activities undertaken as part of the project were those engaged in by the project 'investigator team' and those that took place in the context of the Workshops 1-5 (Conservation Education and Community Appraisal; Amphibian Ecology and Conservation Techniques; Souvenir Production; and, Nature Guide Training I and II).

The Investigator Team, which, over the term of the project, varied in number between 3-5 individuals at any one time, was initially selected from amongst the cohorts of undergraduates who participated in workshops 1 and 2, with Dr Graue taking the lead role in the selection process, but with the UK project team advising after reviewing applicants' CVs and statements of interest. A total of 9 individuals participated in the team during the three year period, with two of the current team of three (Flores and Hildago) having been in the original selection. Investigators have clearly gained very significantly from the project through their development of a range of skills including those relating to: local community and interpersonal interaction; information and resource organisation; record and data keeping; questionnaire design, implementation and data entry; the maintenance of the axolotl colony; workshop facilitation and support; PowerPoint presentations; and, school and visitor conservation education activities. The present team members (Luis Hidalgo, Dulce Flores, and Patricia Sánchez) have each declared their desire to continue with the project during the extension period.

The Training Workshops 1 and 2 enabled many undergraduate UAM-X students to engage with the theory and practice of the subject in question. In the case of Workshop 1: Conservation Education and Community Appraisal this number of students was 17 (instead of the planned 8), and in the case of Workshop 2: Amphibian Ecology and Conservation Techniques, this number was 24 (instead of the planned 8). The increase

in numbers did not seem to unduly affect the quality of these workshops, with both receiving very positive feedback from participants. The overall general workshop assessment score for Workshop 1 was 83 out of 85, with its content averaging 3.1 on a 5 point scale (1=too little, 5=too much), and the students' general assessment of Workshop 2 was 112 out of 120, with the content averaging 3.5. A summary of the contents of each is included in Appendix

The Training Workshops 3, 4 and 5, as well as providing important training for the project team investigators, made significant contributions to the personal development and livelihoods of the local people who participated. Not only did the first of these (Workshop 3: Souvenir Production) 'graduate' 15 individuals instead of the intended 4, but these people established a small network, which has since continued to produce and sell some of the workshop items, has developed further souvenirs in collaboration with the project team (raising over £500 for the project in the UK alone), and has recorded significant increases in the livelihoods of those involved. Similarly, rather more 'graduates' of the Nature-Guiding workshops (I + II) were achieved than expected, with 20 instead of the expected 12 completing the programmes, and these individuals reporting significant increases in their income following their training. Participant feedback on all three workshops was very positive, with overall scores being 74/75, 20/20 and 75/80 respectively.

Selection of participants was made on the basis of their willingness to participate, and in the case of the nature guiding by means of a quota from each of the different embarkation points, with an open and transparent random selection procedure ready to be put into action if required (although in the event this was not necessary). Everyone who completed any of the five workshops was awarded a descriptive certificate at a brief closing ceremony. Each certificate bore the logos of the Darwin Initiative, UAM-X and DICE, and was signed by the Rector of UAM-X, the Mexican Project Director and the UK Project Director/Officer.

5. Project Impacts

The impacts of the project have been demonstrated by the increasing interest being shown in the axolotl and Xochimilco, as well as by the additional partners, outputs and resources levered in by the project. The development of the Axolotl Species/Habitat Action Plan was seen to have had a significant impact on those who participated in the seminar/workshop designed for this purpose. Most notably it appears to have been instrumental in precipitating the following, possibly highly significant, political development. On the 15th March 2005 the Senate of the Congress of the Mexican government voted through a motion asking the President to instruct the Secretariat of the Commission for the Environment, Natural Resources and Fishing, to activate an “urgent” governmental programme jointly with UAM-X and the University of Kent to avoid the extinction of the axolotl in lake Xochimilco. What this decision will mean in practice remains to be seen, but it will certainly influence governmental actions that impact upon axolotl and Xochimilco conservation, and in itself is an indication of the leverage that Darwin Initiative projects can achieve.

The educational and awareness-raising work associated with the project has also had demonstrable impacts, including the 2nd place winner in the best float competition by a remero whose entry was themed on the axolotl, and the success of the March 2005 pilot scheme to bring boats of visitors to CIBAC in order to show them the axolotl and give short presentations on the species and the conservation of Xochimilco. Twenty-one boats of visitors came over two weekends carrying a total of 171 individuals who paid a

small fee for the privilege – and CIBAC is presently reviewing this event with a view to making it part of the curriculum activities of UAM-X. In addition, a combination of the publicity surrounding the project and the good relationship the project had established with the British Embassy in Mexico, precipitated the involvement of the British Council in sponsoring an axolotl art competition amongst local schools. Twenty schools participated, with many visiting CIBAC to meet axolotls. Over 1300 entries were submitted, with ten finalists selected in each of 6 year age groups, and judging carried out by a well-known artist, representatives from the British Council, the British Embassy, the Darwin project/UAM-X and the Parque Ecologico Xochimilco, as well as the daughter of the late Dr Virginia Graue. Teachers, parents and children were invited to the British Council for an exhibition of entries by finalists and a ceremony at which 1st, 2nd and 3rd placed children received books and other prizes. First and second placed winning entries have been published in a 2006 calendar - two thousand copies of which have been printed and which are either being given away or sold to promote the project and raise money for the axolotl research.

The artisan and nature-guide training workshops have similarly proven themselves to have had a significant impact on the local community, serving to create an important 'bridge' between the UAM-X project members and both the artisan community and the remero guild. 'Graduates' report a significant increase in their incomes and considerable interest has shown in participating in further workshops of this type. Indeed, the overwhelmingly positive response received for the nature-guiding from the remeros was instrumental in the design of the project extension bid, which will undertake a staged transfer of the nature-guiding package to the remero guild via three workshops during which a group of remeros will be trained to deliver the workshop themselves and then supported in doing so.

The project also served to stimulate the Xochimilco local authority to host a seminar entitled "Lacustrine Conservation in Xochimilco", in 2003 in which project objectives were publicized and disseminated amongst representatives of Union of Fishermen of Xochimilco, the Asociación Nacional de Empresas Comercializadoras de Productores del Campo (ANEC) and the Rural Administration. The seminar explored the problems of: erosion of the "chinampas" and poor water quality; garbage pollution; the drainage system; legal enforcement by riverside police; the use of fishing techniques that harm native species; the introduced carp and tilapia fish species; polluted vegetables produced on the chinampas; bird attacks on crops grown on the "chinampas"; the prohibition of fishing in the Xochimilco system; and, the public mistrust of attempts to address all these problems. The seminar produced a range of recommendations/areas to explore, and UAM-X project partners describe the seminar as having effectively and publicly 'connected' the Darwin project with the local community.

The axolotl research group (Grupo de Investigacion de Ajolote en Xochimilco – GIA-X), which was formed last year, met during the period of the Axolotl Species/Habitat Action Plan seminar/workshop and discussed a portfolio of experimental and other research that is needed to develop a better understanding of the population ecology of the wild axolotl population. Some of the specific resource implications for this research will be met with monies generated from souvenir sales in the UK, others now also be funded with monies allocated in the project extension budget.

Under the supervision of Dr Zambrano of the Instituto de Biología, UNAM, the GIA-X has already produced a comprehensive axolotl bibliography (~900 references) and supplied this to all partners. Dr Zambrano is also co-ordinating the experimental research, both that already being conducted by undergraduates and postgraduates, and that planned by staff of CIBAC, UAM-X and UNAM, and researchers at other institutions (notably

CORENA – in charge of nature reserves, Chapultepec Zoo and UMBRAL). UNAM, which has decided to develop a MSc programme on the restoration of Xochimilco, is also seeking to establish an experimental restoration site in the Xochimilca chinampas and wants to collaborate with DICE, CIBAC and other partners in developing this initiative. This is an exciting prospect because it would bring together all the partners in a commonly defined and executed project that goes well beyond the Darwin project objectives. It is also of particular interest in the light of vote of the Mexican Senate, mentioned above.

6. Project Outputs

The planned project outputs in the original agreed schedule, together with additional outputs are presented in tables in Appendices II and III. They have been disseminated by a number of means, including newsletters (University of Kent and UAM-X), radio and television programmes, websites, as part of the school-based educational outreach and CIBAC visitor programmes, as well as through academic articles for refereed journals (both already published and in the making).

7. Project Expenditure

Item	*Budget (total for 3 Years)*	*Expenditure*	*Balance*

- Tabulate grant expenditure using the categories in the original application/schedule.
- Highlight agreed changes to the budget.
- Explain any variation in expenditure where this is +/- 10% of the budget.

Expenditure on travel and subsistence was higher than budgeted because extra staff input from the UK was necessary after the reorganisation of the project following Dr Graue's death. This was met from other budget headings. There was an initial underspend due to the late announcement of the project in the first year, and Defra agreed to carry this over into the 2005-06 financial year in April 2004.

8. Project Operation and Partnerships

There was, in the first instance, just one local partner actively involved in the project; The Centro de Investigaciones Biológicas y Acuicolas de Cuemanco (CIBAC) of the Universidad Autónoma Metropolitana, Unidad Xochimilco (UAM). The Comision Nacional para el Conocimiento y Uso de la Biodiversidad, Mexico (CONABIO - the National Commission for the Knowledge and use of Biodiversity) was contacted early on and declared its approval of and support for the project and its representatives participated in the Darwin Axolotl Species/Habitat Action Plan seminar/workshop and the development of the plan itself). The Indiana University Axolotl Colony also became involved at an early stage taking an active role in improving the captive breeding facilities at CIBAC and at Chapultepec Zoo (another new project partner) and sharing its expertise in using axolotls in outreach school-based education.

In addition to DICE the international partners that have participated in project activities have been The Declining Amphibian Population Task Force (DAPTF – which supported the pre-Darwin visit to CIBAC), the North of England Zoological Society (Chester Zoo; which participated in the Species/Habitat Plan seminar/workshop, and which has now provided £5000 to be used to resource the research and education activities of the project extension), and the British Herpetological Society (which has provided a set of journals to CIBAC and an outlet for some of the souvenirs produced by the artisan network).

9. Monitoring and Evaluation, Lesson learning

Regular email contact was maintained between DICE and UAM-X throughout the three years, with other partners being copied in when appropriate, and the investigator team has been required to submit regular reports of its activities. All workshops included a terminal evaluation questionnaire (and received excellent assessments from participants). A project review meeting was held during the visits associated with Workshops 3, 5 and the Axolotl Species/Habitat Action Plan Seminar/Workshop. Here the team sought to reflect upon the project developments thus far and plan the next stages.

A significant amount of data relating to tourism at Xochimilco, and the activities of the remeros in particular, has been gathered, and this will form the basis for published academic papers, as well as for further survey work, which will allow for a comparative assessment of the effects that project activities might have precipitated.

Clearly the most serious problem the project had to face was the death of the Mexican Director, Dr Graue and the subsequent re-allocation of her responsibilities. Her death perhaps prevented the project from being able to expand its horizons very far, but the strong continuing personal commitment that was expressed by key individuals wishing to honour her memory by continuing her work (Norberto Manjarrez Alvarez - Rector of UAM-X, Alejandro Meléndez and the Mexican Project team, Prof. Reséndez of Dept. of Design and Technology, UAM-X, Xochimilco's Director of Tourism, Dr Zambrano of UNAM, and the group of trained remeros), was vitally important in helping the project maintain its momentum. One development by which the project subsequently sought to ensure its long-term legacy was its input into a written Management Plan for CIBAC, which recommended an integration of axolotl captive breeding, research, education and training; that CIBAC implements specific aspects of the axolotl S/HAP; that it continues

as a venue for training workshops; and, that it be further its developed as a visitor centre holding a stock of saleable products to generate further revenue for the conservation of the axolotl and the Xochimilco wetland.

The greatest challenge facing the project as it was originally conceived was that of establishing a relationship of trust between project team members and the local community, and then developing a willingness for these locals to participate in the project activities (notably the workshops). Key factors in achieving the high level of local involvement that was reached were the recognition of and support given to persons who already had a good working relationship with local people or who were likely to do so (notably Prof. Reséndez and her team from Dept. of Design and Technology, UAM-X), and the project team members spending a significant amount of time with the local people in activities not directly related to the project. For example, the participation of one of the project investigators in the remero's football team is thought to have been a major element in getting younger remeros to participate in the nature-guiding workshops. In regard to the nature-guiding workshops probably the main factor that helped maintain the remero's interest and participation was the decision to involve the 'graduates' from the first workshop in the design and delivery of the second workshop. Indeed, the importance of having done so was commented upon in some of the comments received on the workshop feedback forms. A pivotal aspect of the extension project is the transfer of the nature-guiding workshop package to the remero guild.

The key lessons learnt from the 3yr project perhaps seem rather obvious to those experienced in running projects of this nature. They are, nevertheless, worth stating:

- Prioritize the formation of links with local people who are concerned and interested in conserving their environment, and be imaginative in developing means of developing the trust and collaboration of these individuals.
- Recruit respected local people who are convinced of the value of the project and its objectives and who are prepared to actively participate and communicate with the fellow members of their community.
- Seek to gain an understanding of the partner institutions and collaborating individuals, particularly of their relationships with other relevant organizations and individuals. Using this understanding, it becomes possible to address historical difficulties and encourage partners to work with these other organizations.
- Be flexible in one's approach and ready to reschedule project activities to suit developments on the ground (e.g. as with the nature-guiding workshops)
- Try to understand how best to connect with the culture of the host country in terms of, for example, what tone to adopt in dealing with the day-to-day management of the project or any problems or conflicts that might arise.
- Sometimes things can be clarified with a telephone call when several emails will only lead to greater misunderstandings.

10. Actions taken in response to annual report reviews (if applicable)

The project was able to respond positively to all the issues raised by reviewers. Most of the minor ones, such as the possibility of larger than planned numbers of workshop participants having compromised workshop quality, have already been addressed in the text thus far. Otherwise, possibly the most important concerned the development of an appropriate exit strategy and the involvement of more host country partner organisations (notably CONABIO). Both of these actions were dealt with to the satisfaction of the project team and have been further facilitated by the granting of the project extension, a significant part of the focus of which is upon a process of the further empowerment of

project participants in the host country.

11. Darwin Identity

The Darwin Initiative/DI logo was publicised in all project-related publications, products and activities (articles, leaflets, postcards, posters, T-shirts, information packs, interpretation panels, souvenirs, outreach education, project website, workshops and seminars, certificates, conference presentations). The nature of the Darwin Initiative (as 'seed' funding to set biodiversity conservation processes in motion) was restated at every opportunity in an effort to impress upon those concerned that the support provided was not long-term and that the host country partners should collaborate in order to establish activities that could maintain their own momentum once DI funding ceased.

One piece of evidence of the awareness of the DI identity includes the enthusiasm with which the Institute of Biology, Universidad Nacional a México became a full project partner for the extension application, identifying its respect for the worldwide achievements of the Darwin Initiative as being an important element in its decision to join the project. Another is the way in which UAM-X has come to refer to the axolotl captive breeding colony at CIBAC as the "Darwin Colony".

Throughout the first 3 years of the project it has been regarded very much as a 'stand-alone' initiative, distinct in its own right, with clear objectives. The use of the axolotl as a flagship species, the focus on Xochimilco, and the specific link with CIBAC, have all served to reinforce this view.

12. Leverage

A substantial amount of additional funds, both monetary and in-kind contributions, were levered in during the first three years of the project. These included: UAM-X inputs to improve the CIBAC captive breeding unit; participation of the Indiana Axolotl Colony representatives in Workshops 1 and 2 (plus a visit to advise on the maintenance and management of the CIBAC axolotl captive breeding unit); DICE's sponsorship of Jeanne McKay's MSc dissertation project; the time spent by UAM-X Design and Technology Dept. staff on Workshop 3 and subsequent artisan network support and further training; British Council/British Embassy/Parque Ecologico de Xochimilco (PEX) support for the axolotl art competition and calendar production; additional UAM-X accommodation provision for UK team members to attend workshops etc.; accommodation provided by UAM-X for visiting personnel from UK partner organisations; financial and personnel support from the North of England Zoological Society; financial and scientific support from the British Herpetological Society; a donation from the Tokyo Broadcasting System; and profits from UK sales of souvenirs produced by the artisan network.

Attempts were also made to draw funds from organisations that either use the axolotl in their name or as a symbol, or that have a significant presence in the Xochimilco D.F. e.g. Shering-Plough Pharmaceuticals. Unfortunately none of these proved successful, most probably because of a lack of a direct contact with key person(s) in these organisations. Further efforts will be made to identify and approach potential sponsors during the project extension period.

13. Sustainability and Legacy

Those project achievements from the three-year project that are most likely to endure are the activities of the artisan network and the remero nature-guides. With further financial support having been granted by the Darwin Initiative for another two years the nature-guide workshop package will be able to be transferred to the remero guild through a series of three workshops in which a group of remeros will be trained to deliver the workshop. The existing project co-ordinator in Mexico (Alejandro Meléndez) has agreed to continue in his role, and the project will support the members of the investigator team in seeking employment beyond the end of the project. Those resources that have been passed to CIBAC will continue to be used for research and educational purposes, whilst the pilot scheme of educational visits to CIBAC (in March 2005) proved so successful as to lead the present Director (Prof. Arana) to indicate that they may become included as one of CIBAC's standard activities. With the project focus coming to embrace more science-based empirical research relevant to the conservation of the axolotl and the Xochimilco wetland it is anticipated that the project legacy of education and guiding will be complemented by the development of a greater understanding of the species and its environs. It is expected that to this end the Group for Axolotl Research – Xochimilco (GIAX) will serve to keep project partners in contact with each other beyond the end of the project and will encourage them to continue to collaborate in sharing and publishing data.

14. Value for money

The project team consider that it has provided excellent value for money. Considerably more outputs have been achieved than planned, notably in the amount of interest it has stimulated amongst the local, media, academic and international communities, in the number of individuals receiving training and in the additional financial and human resources it has levered in.

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16. Appendix I: Project Contribution to Articles under the Convention on Biological Diversity (CBD)

Please complete the table below to show the extent of project contribution to the different measures for biodiversity conservation defined in the CBD Articles. This will enable us to tie Darwin projects more directly into CBD areas and to see if the underlying objective of the Darwin Initiative has been met. We have focused on CBD Articles that are most relevant to biodiversity conservation initiatives by small projects in developing countries. However, certain Articles have been omitted where they apply across the board. Where there is overlap between measures described by two different Articles, allocate the % to the most appropriate one.

Project Contribution to Articles under the Convention on Biological Diversity		
Article No./Title	**Project %**	**Article Description**
6. General Measures for Conservation & Sustainable Use	5%	Develop national strategies that integrate conservation and sustainable use.
7. Identification and Monitoring	5%	Identify and monitor components of biological diversity, particularly those requiring urgent conservation; identify processes and activities that have adverse effects; maintain and organise relevant data.
8. In-situ Conservation	5%	Establish systems of protected areas with guidelines for selection and management; regulate biological resources, promote protection of habitats; manage areas adjacent to protected areas; restore degraded ecosystems and recovery of threatened species; control risks associated with organisms modified by biotechnology; control spread of alien species; ensure compatibility between sustainable use of resources and their conservation; protect traditional lifestyles and knowledge on biological resources.
9. Ex-situ Conservation		Adopt ex-situ measures to conserve and research components of biological diversity, preferably in country of origin; facilitate recovery of threatened species; regulate and manage collection of biological resources.
10. Sustainable Use of Components of Biological Diversity	10%	Integrate conservation and sustainable use in national decisions; protect sustainable customary uses; support local populations to implement remedial actions; encourage co-operation between governments and the private sector.
11. Incentive Measures	20%	Establish economically and socially sound incentives to conserve and promote sustainable use of biological diversity.

12. Research and Training	25%	Establish programmes for scientific and technical education in identification, conservation and sustainable use of biodiversity components; promote research contributing to the conservation and sustainable use of biological diversity, particularly in developing countries (in accordance with SBSTTA recommendations).
13. Public Education and Awareness	25%	Promote understanding of the importance of measures to conserve biological diversity and propagate these measures through the media; cooperate with other states and organisations in developing awareness programmes.
14. Impact Assessment and Minimizing Adverse Impacts		Introduce EIAs of appropriate projects and allow public participation; take into account environmental consequences of policies; exchange information on impacts beyond State boundaries and work to reduce hazards; promote emergency responses to hazards; examine mechanisms for re-dress of international damage.
15. Access to Genetic Resources		Whilst governments control access to their genetic resources they should also facilitate access of environmentally sound uses on mutually agreed terms; scientific research based on a country's genetic resources should ensure sharing in a fair and equitable way of results and benefits.
16. Access to and Transfer of Technology		Countries shall ensure access to technologies relevant to conservation and sustainable use of biodiversity under fair and most favourable terms to the source countries (subject to patents and intellectual property rights) and ensure the private sector facilitates such assess and joint development of technologies.
17. Exchange of Information	5%	Countries shall facilitate information exchange and repatriation including technical scientific and socio-economic research, information on training and surveying programmes and local knowledge
19. Bio-safety Protocol		Countries shall take legislative, administrative or policy measures to provide for the effective participation in biotechnological research activities and to ensure all practicable measures to promote and advance priority access on a fair and equitable basis, especially where they provide the genetic resources for such research.
Total %	**100%**	**Check % = total 100**

17. Appendix II Outputs

Code No.	Quantity	Description
Training Outputs		
2	1	Mexican successfully finished MSc in Tourism and Conservation at DICE
4A	17 (8-planned) 24 (8-planned) 5 3	Workshop 1: Conservation Education and Community Appraisal Workshop Workshop 2: Amphibian Ecology and Conservation Techniques Workshop Training of project investigators in questionnaire design and application Training of project investigators in workshop organisation, facilitation and support as part of Workshops 4 + 5.
4B	2	Workshop 1: Conservation Education and Community Appraisal Workshop 2: Amphibian Ecology and Conservation Techniques
6A	15 (4 planned) 17 (6 planned) 16 (6 planned)	Workshop 3: Souvenir Production (artisans) Workshop 4: Nature Guiding I (boatmen) Workshop 5: Nature Guiding II (boatmen)
6B	2 2 2	Workshop 3: Souvenir Production Workshop Workshop 4: Nature Guiding I (boatmen) Workshop 5: Nature Guiding II (boatmen)
7	2	Workshop 3: Souvenir Production – instruction manual. Workshops 4+5: Nature Guiding I+II - workshop pack
Research Outputs		
8	18	3 UK team members on initial visit, 1 at Workshop 1, 1 at Workshop 2, 1 at Workshop 3, 2 at Workshop 4, 2 at Workshop 5, 3 at Axolotl Species/Habitat Action Plan Seminar/Workshop
9	1	Product of Axolotl Species/Habitat Action Plan Workshop
11A		
11B	1	Article in Axolotl News (Summer 2003)
12A	3	Investigator team established an information database at CIBAC + a survey database has been established at DICE + GIAX has established a bibliography of axolotl-related research publications
Dissemination Outputs		
14A	1	Project Axolotl Species/Habitat Action Plan seminar/workshop
14B	2	Darwin Workshop 2004 + Society for Conservation Biology Conference 2004

15A/B	9	National and local press release in México publicising Workshops 3, 4 and 5 + Visit of UK Environment Minister, and AS/HAP seminar/workshop Two UAM-X University newsletter articles An interview with Dr. Bride, entitled “The axolotl, the hope of medicine and Xochimilco” in the national newspaper *El Independiate* (14/12/03) Full page article in the national newspaper *La Journada* (03/05) Article in the Latin American popular science magazine "Muy Interesante"
15C/D	9	National and local press releases in UK publicising project developments thus far 2004, 2005 + Visit of UK Environment Minister Three University of Kent newsletter articles Article in the Declining Amphibian Population Task Force Newsletter Two articles on the British Foreign Office website
17A	1	Axolotl Research Group – Xochimilco (set up 2004)
17B	1	Axolotl Research Group (GIAX) – extended 2005
18	2	A 30 minute programme on Channel 11 TV, Mexico (the equivalent of BBC2) Programme made by the Tokyo Broadcasting System (TBS) Television – to be screened in 2006
19A	1	Radio Education (BBC4 equivalent) at midday on 10th December 2003
Physical Outputs		
20	£400 £1,500	Set of *Herpetological Journal* from the British Herpetological Society CIBAC trajinera + plastic laminating machine + inkjet printer
23	£7,500 £2,500 £2,000 £421 £230 £164 £540 £13,355	Inputs to new captive breeding unit + participation of Indiana Axolotl Colony + sponsorship of DICE student Jeanne McKay's MSc dissertation project. Time spent by UAM-X Design and Technology Dept. staff on Workshop 3 and subsequent artisan network support and further training. British Council – British Embassy- PEX support for axolotl art competition and calendar production UAM-X accommodation support for UK team members to attend workshops etc. Additional in-kind contribution of accommodation by UAM-X for visiting personnel from UK partners Donation from Tokyo Broadcasting System Profit from sale of souvenirs in UK Total additional money from other sources.

18. Appendix III: Publications

Provide full details of all publications and material that can be publicly accessed, e.g. title, name of publisher, contact details, cost. Details will be recorded on the Darwin Monitoring Website Publications Database that is currently being compiled.

Mark (*) all publications and other material that you have included with this report

Type * (e.g. journals, manual, CDs)	**Detail** (title, author, year)	**Publishers** (name, city)	**Available from** (e.g. contact address, website)	**Cost £**
*Journal article	Griffiths, R. A. et al. (2004). Conservation of the axolotl (*Ambystoma mexicanum*) at Lake Xochimilco, Mexico. *Herpetological Bulletin* 89: 4-11	British Herpetological Society	R.A.Griffiths@kent.ac.uk	
*Species/Habitat Action Plan	DI International Seminar (2005). The Conservation of the Axolotl in Xochimilco, Mexico City: A Species/Habitat Action Plan	University of Kent, UAM-X	R.A.Griffiths@kent.ac.uk	

Appendix IV: Workshop content summaries

Conservation Education and Community Appraisal

Exercises

What do we need to know?
Deciding the details of what we need to know
Data collecting – how are we going to find this out?
Understanding other cultures
Identifying sources of data
Planning, defining responsibilities and designing and implementing evaluation
Working in groups
Definition the tasks of the project investigators

Presentations

Linking axolotl research with conservation and outreach"
Questionnaire and interview design and data analysis

Amphibian Ecology and Conservation Techniques

Exercises

Methods of sampling and monitoring of amphibians I
Methods of sampling and monitoring of amphibians II
Methods of sampling and monitoring of amphibians III

Presentations

The conservation of amphibians and the global decline of amphibian populations
The Darwin Initiative project for the conservation of the axolotl of Xochimilco
The programme for environmental education for the community of Xochimilco
The reproductive biology of ambystomatids
The ecology, behaviour and captive breeding of amphibians
The reproductive biology of female ambystomatids
The global diversity and distribution of amphibians
The diversity of the family *Ambystomatidae* in Mexico
The reproductive biology of *A. lermaensis* and *A. granulosom in Mexico*
Captive breeding of *A. mexicanum*
Sampling and monitoring amphibians
Water quality in Xochimilco
Freshwater ecosystems
The wild population status and captive breeding of *A. zempoalensis*
Methods for maintaining the CIBAC *A. mexicanum* colony

Souvenir Production Workshop

Exercises

Making paper
Small axolotl + small flower in water hyacinth/recycled paper
Small axolotl + small flower in plaster – fridge magnets
Large axolotl - in corn leaf, woven hemp mat and dried flowers
Chalupas boat design with flower seller - in corn leaf, hemp mat and dried flowers
Chinampas' design - in corn leaf, hemp mat and dried flowers
Axolotl alebrijes - in papier mâché
An electric lamp in water hyacinth/recycled paper

Presentations

Eco-regional design – an explanation
The axolotl – the flagship for the conservation of Xochimilco
Amaranth production and sweet-making

Nature Guide Training Workshops I + II

Exercises

Understanding and exploring ecology
A mapping exercise
Flow diagrams and the visitor experience
Developing narratives
Developing fact lists
Developing trails
Presenting our trails
Thinking about different audiences
Guiding in practice
Testing nature guiding in the real world
Reviewing the guiding experience
Marketing oneself
Workshop evaluation

Presentations *(*only Workshop I)*

Xochimilco and its biodiversity
The Axolotl
Tourism in Xochimilco
Eco-regional design and souvenir production
The History of Xochimilco
Plants of Xochimilco
Birds of Xochimilco
Reptiles and Amphibians of Xochimilco*
Insects of Xochimilco*
Fish of Xochimilco*

Appendix IV: Darwin Contacts

Project Title	Aztecs and Axolotls: Integrating Tourism and Conservation at Xochimilco, Mexico City
Ref. No.	***162/11/018***
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