Darwin Initiative Annual Report

Important note:

To be completed with reference to the Reporting Guidance Notes for Project Leaders – it is expected that this report will be about 10 pages in length, excluding annexes

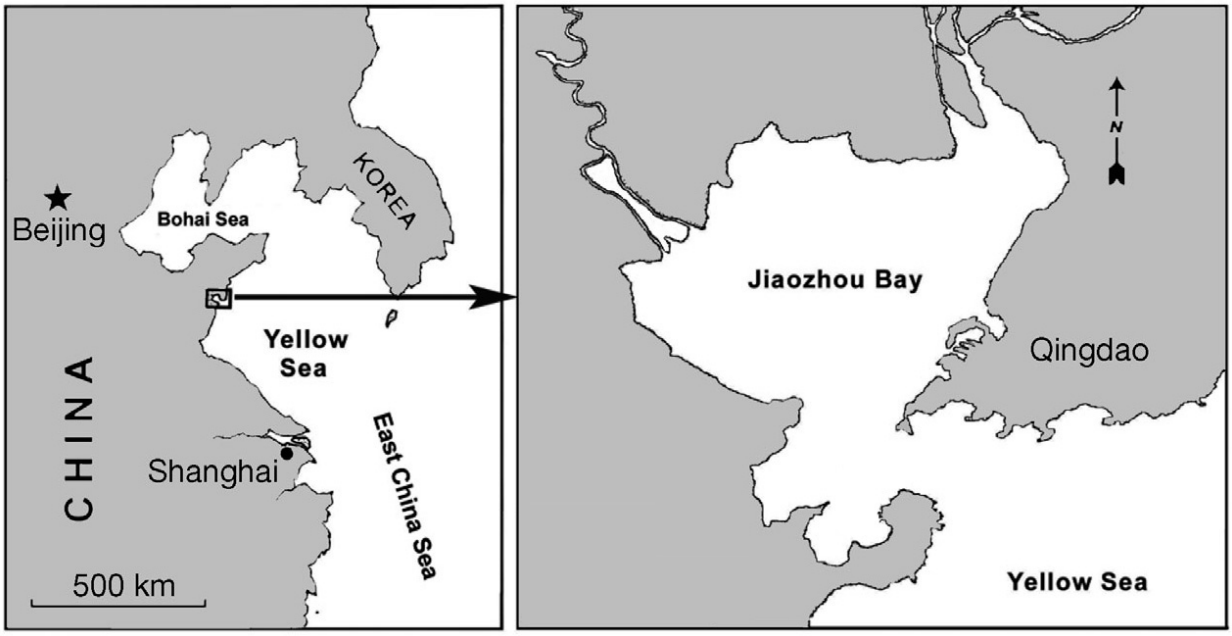
Submission deadline 30 April 2009

Darwin Project Information

Project Ref Number	14-015
Project Title	Conservation of Jiaozhou Bay: biodiversity assessment and biomonitoring using ciliates
Country(ies)	China
UK Contract Holder Institution	The Natural History Museum
Host country Partner Institution(s)	Ocean University of China
Other Partner Institution(s)	n/a
Darwin Grant Value	£137,897
Start/End dates of Project	1/11/05 – 30/09/09
Reporting period (1 Apr 200x to 31 Mar 200y) and annual report number (1,2,3..)	1 Apr 2008 to 31 Mar 2009 Annual report no. 4
Project Leader Name	Dr Alan Warren
Project website	
Author(s) and main contributors, date	Dr Alan Warren (NHM); Professor Weibo Song (OUC); Professor Xiaozhong Hu (OUC) 27 April 2009

1. Project Background

Jiaozhou Bay is located near Qingdao on the NE coast of China (see map) and is a major centre for fisheries and mariculture industries, including fish, molluscs and crustaceans. It is also identified in China`s Biodiversity Action Plan (BCAP) as a potential nature reserve due to its high species richness. The environmental quality of the water in Jiaozhou Bay is therefore of immense significance for: (i) the maintenance of fisheries stock; (ii) successful mariculture; (iii) biodiversity conservation. Increased industrial activity and inadequate wastewater treatment in the area surrounding the bay, however, is compromising the marine water quality. Consequently Jiaozhou Bay is one of only seven estuarine wetland ecosystems listed in the BCAP as requiring priority conservation attention. This project aims to help address the problems of biodiversity conservation and fisheries protection.



Map showing the location of Jiaozhou Bay, NE China. Area of Jiaozhou Bay is ca. 400 km^2

2. Project Partnerships

Project partnership: The partnership between the NHM and OUC has continued to flourish thanks largely to frequent, open communication, principally via e-mail but also during the visits to the UK by five OUC personnel and the visit to OUC by the UK project leader. The success of the collaboration may be judged by the number of jointly authored articles that were published/submitted throughout the year. Many of these were initially drafted by students at OUC and brought to publication standard under the guidance of the China and UK project leaders. In this way the students have developed their capacity to deal with all aspects of the publication process.

The capacity of the OUC to meet CBD commitments was further enhanced by the provision of advanced training for OUC personnel during their visits to the UK. On-the-job training was also given to a number of students, partly during the visit to OUC by UK project leader.

Other collaborations: During the year the UK and China project leaders continued to develop their collaboration with researchers at the King Saud University (KSU), Riyadh, Saudi Arabia supported in part by funding from the Center of Excellence of Biodiversity Research (CEBR). This is evidenced by the fact that of the 16 papers published in 2008/09, 12 were joint with KSU (see list of publications). Formal approval of Saudi government support for CERB, however, is still awaited.

CBD focal point: The project has the support of the CBD focal point in China, Professor Da-Wei Huang (Global Taxonomy Initiative Coordinator, Institute of Zoology, Chinese Academy of Sciences, Beijing) and other interested groups such as the Yellow Sea Fisheries Institute and CAB International, China (see letters of support submitted with original application).

3. Project progress

3.1 Progress in carrying out project activities

Biodiversity Assessment. Data for the description of the ciliate biodiversity of Jiaozhou Bay continued as 23 species were described or redescribed. The total number of ciliate species isolated from Jiaozhou Bay now stands at 508, which is over 25% of the global marine ciliate biodiversity. In addition the morphogenesis of 7 species was investigated and gene sequences for 52 species were determined and submitted to the GenBank database. Fifty-five microscope slide specimens were added to the OUC slide collection. Work on the guide to the identification of marine ciliates was completed and the manuscript has been submitted for publication.

Ciliate-based water quality assessment method. Regular monitoring at five sampling sites representing different levels of water pollution within Jiaozhou Bay was completed. At each site samples were collected at three depths every two weeks in order to investigate the ciliate communities present, including their species diversity, evenness and richness. Also for each sample, water was analyzed for the following parameters: pH, temperature, salinity, turbidity, dissolved oxygen concentration, chlorophyll a, soluble reactive phosphate, ammonia-N, nitrite-N, nitrate-N, and heavy metal ions (Cu, Cr, Cd, Zn, Mn, Fe and Pb). Analysis of these data has begun and will be completed in summer 2009. Based on the initial findings of this long-term monitoring exercise, a rapid 3-day biomonitoring system using planktonic ciliates and other protists is being investigated. Analysis of the data is currently being undertaken and will be completed in summer 2009.

Training and advocacy. A total of 20 postgraduate students worked on the project during the year and all received some level of on-the-job training. Five OUC personnel received advanced training during their visits to the UK. The results of our findings were published in a wide range of scientific journals.

3.2 Progress towards Project Outputs

Biodiversity assessment. Excellent progress has been achieved towards the description of the ciliate biodiversity of Jiaozhou Bay with 16 papers published in 2008/09 (bringing the total number of papers published to date to 35) and another 8 submitted. Among the 35 published papers, 18 describe new or poorly known species, 14 deal with morphogenetic and/or molecular phylogeny and 3 deal with ecology. We are confident that all of the most commonly encountered, the most abundant, the most cosmopolitan and (therefore) the ecologically most significant species will have been described by the end of the project. Any that remain are likely to be cryptic and/or occur in low number. The guide to the identification of marine ciliates was completed and submitted for publication in December 2008. We anticipate it will be published in August 2009. Work has now begun on constructing a website whereby this information can be made freely available to anyone with internet access. We are confident that this site will go on-line before the end of the project. Until the ciliate identification guide and its web-based version are available, it is almost impossible to assess how much importance will be afforded to ciliate biodiversity by stakeholders and others.

Ciliate-based water quality assessment method. The fieldwork component of the development of a ciliate-based tool for water quality assessment and monitoring was completed.and data analysis partly completed. Based on our findings so far we conclude that: (1) surface waters (0.5 m) had higher ciliate abundance and diversity than the other two depths; (2) there was significant positive correlation between ciliate abundance and nutrients (NH_3-N, NO_3-N, NO_2-N and phosphate); (3) nine dominant ciliate species were significantly correlated with nutrients, two positively and seven negatively; (4) for rapid biomonitoring of water quality, other planktonic protist groups should be analyzed in addition to ciliates. From these preliminary findings we conclude that ciliates can be used as potentially reliable indicators of eutrophication in Jiaozhou Bay. Further analysis of the data is being carried including possible relationships with heavy metals, so final conclusions must await the results of this work.

Based on findings so far a rapid (3-day) biomonitoring protocol based on planktonic protists (including ciliates) collected at 0.5 m is being trialed at three sites. The results of the trial will be available in summer 2009. That ciliates can be used as reliable indicators of marine water quality, albeit in combination with other protists, is now not in doubt. However, the utility of a

ciliate-based biomonitoring system, and its adoption for marine management, will at least in part depend on the success in developing a protocol that is rapid, reliable, relatively easy to use and cost-effective. We remain optimistic that we will have developed such a protocol by the end of the project.

Training and advocacy. Training of OUC staff and students remains on target with five having received advanced training in the UK in 2008/09. In addition four newly recruited students received some level of on-the-job training during 2007/08, bringing the total to 32 (out of a target of 30 for the life of the project). A total of 20 postgraduate students (12 PhD and 8 Masters) worked on the project in 2008/09. Training of other stakeholders is not due to take place until the ciliate identification guide and the rapid biomonitoring protocol are available.

3.3 Standard Measures

Table 1. Project Standard Output Measures

Code No.	Description	Year 1 Total	Year 2 Total	Year 3 Total	Year 4 Total	Total to date	Number planned for this reporting period	Total planned from application
Established codes								
4C	OUC personnel receiving training in advanced methods in UK	5	0	5	5*	15	0	13
5	OUC postgrad. students receiving training in ciliate identification (number newly recruited onto the project each year)	16	8	4	4	32	4	30 (Note: 20 students in post: turnover of 4 per year)
8	UK staff visits to OUC	2	1	2	1	6	1	5
11A	Papers published in peer-reviewed journals	0	11	8	16	35	6-8	14
11B	Papers submitted to peer-reviewed journals (Note: some of these papers were also published)	5	10	15	8	38	6-8	21
14B	Papers presented at national and international conferences	1	7	14	0**	22	5	11
20	Estimated value of equipment acquired by OUC	£21.5k	£3k	0	0	£24.5k	0	£24.5k
New project-specific measures	Number of species for which gene sequences have been deposited in publicly available databases	8	45	24	52	129	3	9

Code No.	Description	Year 1 Total	Year 2 Total	Year 3 Total	Year 4 Total	Total to date	Number planned for this reporting period	Total planned from application
	Number of microscope slide specimens added to slide collection at OUC	-	40	40	54	134	-	-
	Number of PhD and Masters theses submitted	0	2	5	1	8	-	-

*visits postponed from Y2;

**following extension of project to September 2009, decision was taken to present results at 3 symposia in 2009/10 rather than in 2008/09.

Table 2. Publications

Type (eg journals, manual, CDs)	Detail (title, author, year)	Publishers (name, city)	Available from (eg contact address, website)	Cost £
Journal	Hu, X., Warren, A., Song W. (2008). Stomatogenesis and morphological redescription of the marine ciliate, *Philasterides armatalis* Song, 2000 (Protozoa: Ciliophora: Scuticociliatida. *J. Mar. Biol. Soc. UK*. 88: 29-34.	CUP, Cambridge	http://www.cambridge.org/journals/journal_catalogue.asp?historylinks=ALPHA&mnemonic=MBI	n/a
Journal	Miao M, Warren A, Song W, Wang S, Shang H, Yang G, Chen Z. (2008). Analysis of the Internal Transcribed Spacer 2 (ITS2) region of scuticociliates and related taxa (Ciliophora, Oligohymenophorea) to infer their evolution and phylogeny. *Protist* 159: 519-533	Elsevier, Amsterdam	http://www.elsevier.de/protis	n/a
Journal	Yi Z, Song W, Chen Z, Warren A, Roberts D, Miao M, Gao S, Li L (2008). Comparison of three closely related *Pseudokeronopsis* species (Ciliophora, Urostylida) at inter- and intra-specific levels inferred from SS rDNA gene and ITS1-5.8S-ITS2 region sequences. *J. Zool*. 275: 268-275	Wiley-Blackwell, Oxford	http://www.wiley.com/bw/journal.asp?ref=0952-8369	n/a
Journal	Wang Y, Song W, Hu X, Warren A, Al-Rasheid KAS (2008). Descriptions of two new marine species of *Pleuronema, P. czapikae* sp. n. and *P. wiackowskii* sp. n. (Ciliophora: Scuticociliatida), from the Yellow Sea, north China. *Acta Protozool*. 47: 35-45.	Jagiellonian University Press, Krakow	www.eko.uj.edu.pl/ap/	n/a
Journal	Shao C, Miao M, Song W, Warren A, Al-Rasheid KAS, Al-Quraishy SA, Al-Farraj SA (2008). Studies on two marine *Metaurostylopsis* spp. from China with notes on the morphogenesis of *M. sinica* nov. spec. (Ciliophora, Urostylida). *Acta Protozool*. 47: 95-112.	Jagiellonian University Press, Krakow	www.eko.uj.edu.pl/ap/	n/a

Type (eg journals, manual, CDs)	Detail (title, author, year)	Publishers (name, city)	Available from (eg contact address, website)	Cost £
Journal	Lin X, Song W, Li J, Warren A (2008). Taxonomic studies on three marine pleurostomatid ciliates*, Litonotus bergeri* nov. spec., *L. blattereri* nov. spec. *and L. petzi* nov. spec. (Ciliophora, Pleurostomatida) from north China. *Eur. J. Protistol*. 44: 91-102.	Elsevier, Amsterdam	www.sciencedirect.com	n/a
Journal	Li L, Song W, Warren A, Shin MK, Chen Z, Ji D, Sun P. (2008). A phylogenetic investigation of five peritrich genera, *Vorticella, Pseudovorticella, Epicarchesium, Zoothamnium* and *Zoothamnopsis* (Protozoa; Ciliophora; Sessilida) and related taxa, based on small subunit rRNA gene sequences. *J. Euk. Microbiol*. 55: 448-456.	Blackwell Publishing, Oxford	http://www.blackwellpublishing.com/journal.asp?ref=1066-5234	n/a
Journal	Shao C, Song W, Li L, Warren A, Al-Rasheid KAS, Al-Quraishy SA, Al-Farraj SA, Lin X (2008). Systematic position of *Discocephalus*-like ciliates (Ciliophora: Spirotrichea) inferred from ontogenetic and SS rRNA gene information. *Int. J. Syst. Evol. Microbiol.* 58: 2962-2972.	SGM, Reading	http://ijs.sgmjournals.org/misc/about.shtml	n/a
Journal	Li L, Song W, Warren A, Al-Rasheid KAS, Roberts D, Yi Z, Al-Farraj SA, Hu X. (2008). Morphology and morphogenesis of a new marine ciliate, *Apokeronopsis bergeri* nov. spec. (Ciliophora, Hypotrichida) from the Yellow Sea, China. *Eur. J. Protistol*. 44: 208-219.	Elsevier, Amsterdam	www.sciencedirect.com	n/a
Journal	Chen X, Song W, Warren A, Al-Rasheid KAS, Gong J (2008). Redescriptions of two marine suctorian ciliates, *Ephelota gemmipara* (Hertwig, 1876) Bütschli, 1889 and *Ephelota crustaceorum* Haller, 1880 (Protozoa, Suctoria). *Acta Protozool.* 47: 113-124.	Jagiellonian University Press, Krakow	www.eko.uj.edu.pl/ap/	n/a
Journal	Yi Z, Song W, Shao C, Warren A, Al-Rasheid KAS, Roberts DM, Miao M, Al-Quraishy SA, Chen Z (2008). Phylogeny of some systematically uncertain urostyloids – *Apokeronopsis, Metaurostylopsis, Thigmokeronopsis* (Ciliophora, Stichotrichia) estimated with small subunit rRNA gene sequence information: discrepancies and agreements with morphological data. *Eur. J. Protistol.* 44: 254-262.	Elsevier, Amsterdam	www.sciencedirect.com	n/a
Journal	Xu H, Song W, Warren A, Al-Rasheid KAS, Al-Farraj SA, Gong J, Hu X (2008). Planktonic protist communities in semi-closed mariculture pond: structural variation and correlation with environmental conditions. *J. Mar. Biol. Ass. UK* 88: 1353-1362.	CUP, Cambridge	http://www.cambridge.org/journals/journal_catalogue.asp?historylinks=ALPHA&mnemonic=MBI	n/a

Type (eg journals, manual, CDs)	Detail (title, author, year)	Publishers (name, city)	Available from (eg contact address, website)	Cost £
Journal	Chen X, Miao M, Song W, Warren A, Al-Rasheid KAS, Al-Farraj SA, Al-Quraishy SA (2008). Redescriptions of two poorly known marine suctorian ciliates, *Ephelota truncata* Fraipont, 1878 and *Ephelota mammillata* Dons, 1918 (Protozoa, Ciliophora, Suctoria), from Qingdao, China. *Acta Protozool*. 47: 247-256.	Jagiellonian University Press, Krakow	www.eko.uj.edu.pl/ap/	n/a
Journal	Wang Y, Song W, Warren A, Al-Rasheid KAS, Al-Quraishy SA, Al-Farraj SA, Hu X, Pan H (2008). Descriptions of two new marine scuticociliates, *Pleuronema sinica* n. sp. and *P. wilberti* n. sp. (Ciliophora: Scuticociliatida), from the Yellow Sea, China. *Eur. J. Protistol*. 45: 29-37.	Elsevier, Amsterdam	www.sciencedirect.com	n/a
Journal	Song W, Shao C, Yi Z, Li L, Warren A, Al-Rasheid KAS, Yang J (2009). The morphology, morphogenesis and SSrRNA gene sequence of a new marine ciliate, *Diophrys apoligothrix* spec. nov. (Ciliophora; Euplotida). *Eur. J. Protistol*. 45: 38-50.	Elsevier, Amsterdam	www.sciencedirect.com	n/a

3.4 Progress towards the project purpose and outcomes

It will be impossible to determine the capacity of stakeholders to utilise ciliates in biodiversity assessments and as bioindicators of marine water quality in Jiaozhou Bay until after the mechanisms and protocols for utilising ciliates for these purposes have been fully developed. We do not anticipate this happening until the final year of the project. We therefore have no evidence to suppose that the purpose level assumptions are incorrect or that the indicators for measuring the outcomes are inadequate, or for the contrary.

3.5 Progress towards impact on biodiversity, sustainable use or equitable sharing of biodiversity benefits

A project-specific final goal statement was included when the Logframe was revised in 2007 (see Annex 2). This statement, however, is an indication of a long-term aspiration deriving (at least in part) from the current project rather than a specific aim to be achieved as a direct result of this project alone. Since we are still at the data-analysis stage it is impossible to estimate the project's impact on biodiversity and neither do we anticipate seeing a measurable impact within the life of this project.

4. Monitoring, evaluation and lessons

At this stage of the project, monitoring and evaluation is determined by the quality and quantity of the data produced and assembled. Measuring of output indicators, purpose indicators and final goal indicators will need to await the completion of the ciliate identification guide and the development of the ciliate-based biomonitoring protocol. The description of ciliate diversity is exceeding our target with more papers being published and many more gene sequences determined than anticipated (see sections 3.1 to 3.3).

5. Actions taken in response to previous reviews (if applicable)

Relevant extracts from review of 2007/08 annual report and project Leader responses as supplied in the 2008/09 half-year report. Project leader responses are in italics.

• Will both project partners participate in the analysis of the collected data?

Yes, both partners will participate. Primary data analyses will be carried out at the OUC and then verified at the NHM

• Will the usefulness of using ciliates as indicators of water quality in comparison to traditional parameters be addressed fully as part of the project, including a financial comparison? In this regard, do you think that data on sufficient other parameters have been collected to make a meaningful comparison?

We will investigate the possibility of carrying out a comparison between our ciliate-based method and traditional (conventional?) methods for monitoring marine water quality. In order to make a financial comparison, the cost of the ciliate-based method will be calculated in terms of staff time and consumables. An estimate of the capital costs (i.e. of essential equipment) will also be made. Equivalent costings for conventional methods of carrying out such monitoring will be estimated based on data obtained from regulatory authorities, assuming such data are made available. Failing this, it may be possible to estimate the costs of conventional monitoring based on the data-gathering exercises carried out during the current project.

• I see that data on heavy metals (copper in particular is toxic to marine life) and phosphorus, for example has not been collected. I note that increased industrial activity and inadequate wastewater treatment is compromising marine water quality and it would be informative to know more about the nature of the effluents which are likely to cause pollution and whether survey design has taken account of point sources. Are samples taken at different points within the water column?

There were some omissions in the 2007-08 annual report concerning water quality monitoring. In fact, data on six heavy metals (Zn, Hg, Pb, Fe, Cr and Cu) and on phosphorus were routinely collected throughout the period of sampling. Furthermore, samples were taken at three different depths within the water column at each site: 0.5 m (surface), 2 m and 8-9 m (sea bed). The main sources of pollution in Jiaozhou Bay are run-off from the land surrounding the bay, illegal discharges of industrial and domestic wastewasters, poorly treated municipal sewage effluents, and intensive mariculture activities.

• I realise that there may not be sufficient time in the present project to fully address these issues, but will recommendations be made for future stakeholder monitoring?

We need to complete our analyses before we can decide what (if any) recommendations to make for future stakeholder monitoring

• In the Phase 2 grant application 6 PhD and 7 Masters theses were listed as a project output. It is not clear whether this is still an intended output.

The successful completion of PhD and MSc theses are still an intended output. Currently there are 12 PhD students and 8 MSc students engaged in work on the project. Of these 8 are expected to complete their theses in 2009/10. An additional metric has been added to the Project Standard Output Measures (Table 1) giving data for PhD and Masters theses.

6. Other comments on progress not covered elsewhere

The analysis of the ecological data and the development of the biomonitoring protocol has taken slightly longer than expected. This is because of the large numbers of: (i) samples collected (360); (ii) physico-chemical parameters measured at each (17); (iii) marine ciliate species present in Jiaozhou Bay (over 500). The man-power required to collect and analyze this large volume of data has been significant and 3 additional students and staff at OUC were required to work on this part of the project bringing the total to 8. A full analysis of the results is expected to be complete in summer 2009. Preliminary analyses of the data revealed that, in order to develop a useable biomonitoring protocol, the method of sample collection would need to be modified and refined (i.e. a 3-day method with samples collected at 0.5 m and analyzed for two other main protist groups in addition to ciliates). This refined method is being trialed at 3 sites and the analysis of the results will be completed in summer 2009.

7. Sustainability

During 2008/09 a tenured researcher with expertise in ciliate ecology and biomonitoring (Dr. Henglong Xu) joined the group at the OUC. Part of his role will be to continue research in these areas at Jiaozhou Bay beyond the life of the project and to promote the project within China.

The legacy of this project will include:

- A user-friendly guide to the identification of marine ciliates (hard copy and web-based versions);
- A ciliate-based protocol for biomonitoring marine water quality;
- A slide collection of ciliate specimens at OUC that will be available for reference;
- A large cohort of well-trained postgraduates and postdoctorates who will be available to continue work on ciliate biodiversity and to train others
- A cohort of local stakeholders who will have been made aware of the importance of ciliates in Jiaozhou Bay and their potential for biomonitoring marine water quality.

It is intended that the NHM and OUC will continue their collaborative studies on the biodiversity of marine ciliates after the current project ends. Indeed a NHM/OUC application for a Royal Society Joint Projects award to carry out further investigations on marine ciliates in China has been approved. Two new specialist ciliate laboratories have already been established at universities in China by former OUC postdoctoral workers who have contributed to the DI project and who will continue the work on ciliate biodiversity. These are at Yantai University, Shandong Province and at South China Normal University, Guangzhou. It is intended that future collaborative studies in China between the OUC and NHM will also include at least one of these groups. Other laboratories are being established elsewhere in China. In addition, a collaboration is being established by OUC and NHM with researchers at the King Saud University (Saudi Arabia) with funding being sought from the Center of Excellence in Biodiversity Research (see section 2).

It is therefore anticipated that investigations on marine ciliate diversity and ecology, and their use for biomonitoring water quality in Jiaozhou Bay and elsewhere, will continue long into the future both at OUC and at other laboratories in China.

8. Dissemination

Details of the project were disseminated in a variety of ways. These include:

- to scientists, both from China and elsewhere, during visits to OUC during 2008/09. These include: Dr Yuri Mazei (Penza VG Delinsky State Pedagogical Univ., Russian), Dr. Joong Ki Choi and MS Sunnyong Kim (Inha Univ., Korea), Dr Probir K. Bandyopadhyay (Kalyani Univ., India), Dr Toshihazu Suzuki (Nagasaki Univ., Japan), Dr Ping Sun (North Carolina Central Univ., USA), Dr David Patterson (Woods Hole, USA), Dr David J. S. Mongtagnes (Liverpool Univ., UK), Dr Yingchun Gong (Hydrobiology Institution of CAS, China), MS Weiwei Liu and Zhuo Sheng (South China Normal University;
- publication of articles in peer-reviewed journals (see Section 3.3, Table 2);
- details of 317 species of marine ciliates from Jiaozhou Bay, most of which were isolated during the current project, were included in a book entitled “Marine species and their distribution” (ed. Prof. Zongguo Huang).

Future dissemination activities will include;

- a special workshop on techniques for studying marine ciliate diversity and their use for biomonitoring marine water quality, to be held at OUC in October 2009;
- presentations at international and national symposia including: XIII International Congress of Protistology, 23-28 August, 2009, Brazil (2 oral and 1 poster presentation); the meeting of the Chinese Society of Protozoologists, 14-16 July, 2009 at Lanzhou (3 oral and 7 poster presentations); the annual meeting of the British Society of Protist Biology, 15-17 April 2009, Norwich (I oral and 1 poster presentation);
- publications in peer-reviewed journals;
- the publication of the guide to the identification of free-living marine ciliates in the northern China seas (in press);

9. Project Expenditure

Project expenditure <u>during the reporting period</u> (Defra Financial Year 01 April to 31 March)

Summary of Financial expenditure (Table 3) will follow, as agreed by DI office.

Report of progress and achievements against Logical Framework for Financial Year: 2007/08

Project summary	Measurable Indicators	Progress and Achievements April 2008 - March 2009	Actions required/planned for next period
Goal: *To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but constrained in resources to achieve* *The conservation of biological diversity,* *The sustainable use of its components, and* *The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources*		*No progress to report at impact level at this stage in the project, and none is likely until after the end of the project*	*(do not fill not applicable)*
Purpose Capacity of Jiaozhou Bay stakeholders to understand and use ciliated protozoa for assessing biodiversity status and ecosystem health in management decision-making increased	1. Principle of including ciliate-based methods for assessing and monitoring biodiversity and ecosystem health adopted by management decision-makers 2. Ciliate-based methods for biodiversity conservation and ecosystem protection included in China's BCAP and/or local coastal management plan.	Progress towards achieving the project purpose detailed below under individual activities	1. Continue data-gathering for describing ciliate biodiversity. 2. Complete web-based version of ciliate identification guide. 3. Complete analysis of results of ciliate communities and environmental variables and develop ciliate-based biomonitoring protocol. 4. Continue on-the-job training of OUC personnel in China. 5. Hold advocacy meeting for stakeholders in China
Output 1. Biodiversity assessment programme established and functioning	1. Ciliate biodiversity better known amongst academics and other stakeholders. 2. Ciliate biodiversity data included in coastal marine management decision-making process	The number of publications has exceeded the target for the year, likewise the number of gene sequences deposited in databases. The ciliate identification guide was completed and will be published in summer 2009. The inclusion of ciliate biodiversity in coastal marine management decision-making processes is unlikely to happen until after the end of the project.	

Project summary	Measurable Indicators	Progress and Achievements April 2008 - March 2009	Actions required/planned for next period
Activity 1.1 Describe new and poorly known ciliates; determine morphogenetic processes of selected species; analyze gene sequences of selected taxa and deposit in publicly available databases		Sixteen papers published including: detailed descriptions and redescriptions of 23 species; morphogenetical processes of 7 species; molecular phylogeny of 36 species. Eight additional papers were submitted for publication. Gene sequences of 52 species were deposited in publicly available databases. This work will continue until the end of the project.	
Activity 1.2 Produce user-friendly guide to the identification of marine ciliates		Identification guide completed and submitted for publication in December 2008. Publication expected August 2009. Work has begun on constructing a web-based version of the guide.	
Activity 1.3 Establish reference collection of ciliates at OUC and make available		55 slides added to OUC collection. Slide specimens will continue to be added to the collection until the end of the project.	
Output 2. Ciliate-based tool for water quality assessment and monitoring developed and used	System adopted for monitoring marine water quality	Data-gathering completed for 360 samples. Data-analysis partially complete, final completion expected summer 2009. Rapid biomonitoring system being trialed at 3 sites, expected completion summer 2009. Biomonitoring protocol likely to be based on the latter.	
Activity 2.1. Monitor ciliate communities at selected sampling sites on a regular basis for a minimum of 12 months.		Ciliates in each sample identified and enumerated providing 24 months worth of data.	
Activity 2.2. Monitor water samples for a range of physico-chemical parameters on a regular basis for a minimum of 12 months.		Physico-chemical parameters monitoring carried out giving a total of 24 months worth of data.	
Activity 2.3 Analyze data and develop protocol for biomonitoring marine water quality		Data analysis partly completed, expected completion summer 2009. Rapid biomonitoring system being trialed at 3 sites, expected completion summer 2009. Biomonitoring protocol likely to be based on the latter.	
Output 3. Training and advocacy for OUC personnel, decision makers and for stakeholders delivered in the contribution of ciliate monitoring	Minimum of 30 personnel at OUC and at stakeholder institutions trained	Training of OUC personnel is ahead of target both for on-the-job training and advanced training. Advocacy event due to take place at OUC in October/November 2009.	

Project summary	Measurable Indicators	Progress and Achievements April 2008 - March 2009	Actions required/planned for next period
to ecosystem management	Advocacy event(s) held		
Activity 3.1 Training of OUC personnel carried in the form of on-the-job training at OUC and training in advanced techniques at NHM		20 OUC students received on-the-job training at OUC. Of these 4 were newly recruited in 2008/09. In addition 5 OUC personnel received advanced training at the NHM. Students will continue to receive on-the-job training at OUC until the end of the project.	
Activity 3.2 Advocacy event(s) held		An advocacy event for stakeholders will be held at OUC in October/November 2009.	

Projects full current logframe

LOGICAL FRAMEWORK

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Goal Biodiversity conservation and sustainable use of Jiaozhou Bay enhanced	Levels of biodiversity (e.g. species diversity) and water quality (e.g. concentrations of pollutants)	Biodiversity loss and degradation of water quality both reduced	Those responsible for coastal management agree to implement assessment and monitoring programmes and take remedial action when necessary
Purpose Capacity of Jiaozhou Bay stakeholders to understand and use ciliated protozoa for assessing biodiversity status and ecosystem health in management decision-making increased	Principle of including ciliate-based methods for assessing/monitoring biodiversity and ecosystem health adopted by management decision-makers Ciliate-based methods for biodiversity conservation and ecosystem protection included in China's BCAP and/or local coastal marine management plan	Questionnaire/interviews with decision makers Review of plans	Decision-makers agree that assessment/monitoring of coastal marine biodiversity and ecosystem health should be carried out and that ciliate based methods are appropriate/useful

Outputs			
1. Biodiversity assessment programme established and functioning	Ciliate biodiversity better known amongst academics and other stakeholders	Review of minutes and reports, papers, biodiversity action plan	Priority is given to biodiversity conservation in management of coastal marine environments by stakeholders
2. Ciliate-based tool for water quality assessment and monitoring developed and being used	Ciliate biodiversity data included in coastal marine management decision-making process	Interview/reports by teachers	Ciliates prove to be reliable bioindicators of marine water quality; stakeholders adopt the ciliate-based monitoring system
	System adopted for monitoring and training purposes	Training reports and attendance lists	Active participation of stakeholders in training; OUC staff and students free to attend UK-based training
3. Training and advocacy for OUC personnel, decision makers and for stakeholders delivered in the contribution of ciliate monitoring to ecosystem management	Minimum of 30 staff and students at OUC and stakeholder institutes trained		
	Advocacy event(s) held		

Activities

Output 1. Ciliate biodiversity assessment programme established and functioning

Describe new and poorly known ciliates; determine morphogenetic processes of selected species; analyze gene sequences of selected taxa and deposit in publicly available databases

Produce user-friendly guide to the identification of marine ciliates

Establish reference collection of ciliates at OUC and make available

Output 2. Ciliate-based tool for water quality assessment and monitoring developed and being used

2.1 Monitor ciliate communities at selected sampling sites on a regular basis for a minimum of 24 months.

2.2 Monitor water samples for a range of physico-chemical parameters on a regular basis for a minimum of 24 months.

2.3 Analyze data and develop protocol for biomonitoring marine water quality

Output 3. Training and advocacy for OUC personnel, decision makers and for stakeholders delivered in the contribution of ciliate monitoring to ecosystem management

3.1 Training of OUC personnel carried in the form of on-the-job training at OUC and training in advanced techniques at NHM

3.2 Advocacy event(s) held

Activity Milestones (Summary of Project Implementation Timetable)

Guide guide submitted for publication (by 01/09) and mounted on OUC website (by 09/09)

Ciliate community data and water quality data gathered (by 08/08); assessment tool developed and functionality of assessment tool verified (by 01/09); submitted to publisher (by 03/09).

Training of OUC students ongoing throughout project; training given in UK for a total of ca. 15 staff and students from OUC amounting to ca. 20 man-months (by 09/08); training course (3 days) given at OUC for ca. 20 Jiaozhou Bay stakeholders (by 09/09)