Darwin Initiative Annual Report

Important note:

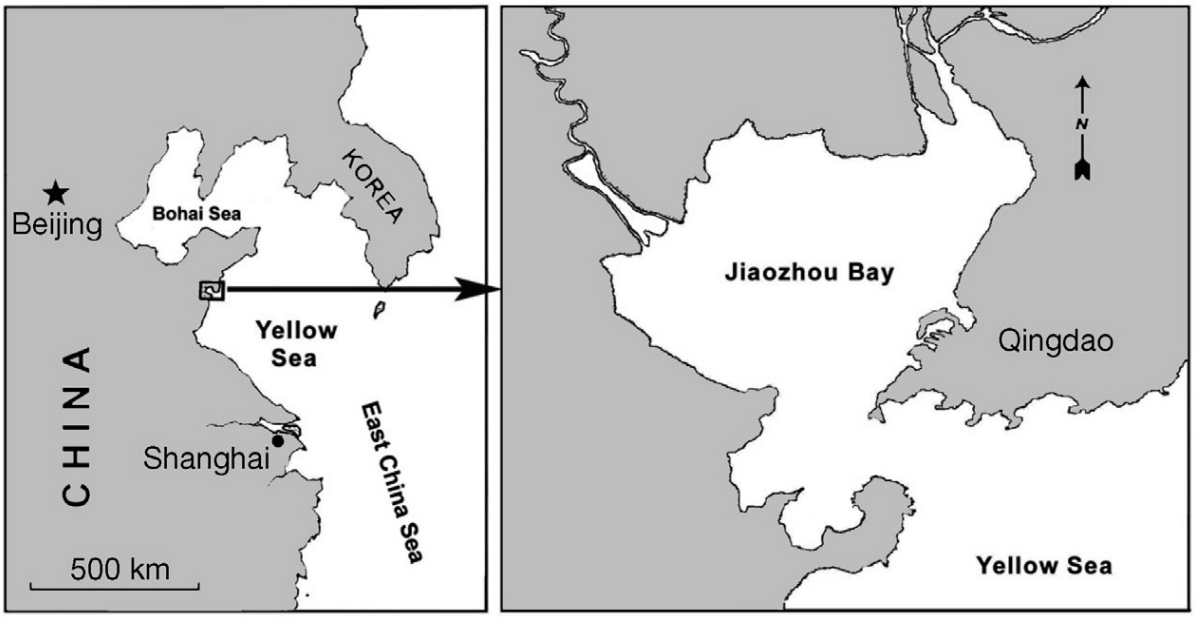
To be completed with reference to the Reporting Guidance Notes for Project Leaders – it is expected that this report will be about 10 pages in length – Submission deadline 30 April 2007

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
UK Partner Institution(s)	
Host country Partner Institution(s)	Ocean University of China
Darwin Grant Value	£137,897
Start/End dates of Project	1/11/05 – 31/03/09
Reporting period (1 Apr 200x to 31 Mar 200y) and annual report number (1,2,3..)	1 Apr 2006 to 31 Mar 2007 Annual report no. 2
Project Leader Name	Dr Alan Warren
Project website	
Author(s), date	Dr Alan Warren; Professor Weibo Song 25 April 2007

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, and (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

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 visit to OUC made by the UK project leader and joint attendance by the UK and China project leaders at an international symposium. 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 UK partners. 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 resources for essential laboratory equipment and for attendance at conferences where the results of the DI project were presented. On-the-job training was also given to a number of students, partly during the visit to OUC by the UK project leader.

The project has the support of the CBD focal point, Professor Da-Wei Huang (Global Taxonomy Initiative Co-ordinator, 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 30 species were described or redescribed. The total number of ciliate species isolated from Jiaozhou Bay by OUC/NHM now stands at 447, which is ca. 25% of the global marine ciliate biodiversity. In addition the morphogenesis of 12 species was investigated and gene sequences for 45 species were determined and submitted to the GenBank database. Work continued on the guide to the identification of marine ciliates with drafting of five chapters having commenced, three of which are at an advanced stage of completion.

Ciliate-based water quality assessment method. Regular monitoring continued at four sampling sites representing different levels of water pollution within Jiaozhou Bay. At each site samples were collected every two weeks in order to investigate the ciliate communities present. For each sample the species diversity, evenness and richness were determined. Also for each sample, water was analysed for the following parameters: pH, temperature, salinity, turbidity, dissolved oxygen concentration, chlorophyll a, soluble reactive sulphate and dissolved inorganic nitrogen. Analysis of these data will be undertaken upon completion of the monitoring programme in July 2008.

Training and advocacy. A total of 18 postgraduate and 3 undergraduate students worked on the project during the year and all received some level of on-the-job training with 6 receiving extensive training. In addition, the results of the project so far were presented at three international scientific conferences with 6 oral and 3 poster presentations made in total.

3.2 Progress towards Project Outputs

Biodiversity assessment. Excellent progress has been achieved towards the description of the ciliate biodiversity of Jiaozhou Bay with 9 papers describing new or poorly known species having been published/submitted and 6 more dealing with morphogenetic processes or molecular phylogeny. We are confident that all of the 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 undescribed are likely to be cryptic and/or occur in low number. The guide to the identification of marine ciliates is on schedule and we do not anticipate any problem in completing this by the end of the project. Until the essential groundwork of describing the ciliate fauna and assembling these descriptions in the identification guide has been completed, it is very difficult to assess how much importance will be afforded to ciliate biodiversity by stakeholders and others. The output level assumptions have only just been established with the revision of the Logframe recommended at the last review.

Ciliate-based water quality assessment method. Work on the development of a ciliate-based tool for water quality assessment and monitoring is on schedule with regular monitoring having taken place at four sites throughout the year. The analysis of the data will take place on completion of the data-gathering exercise in July 2008. Only at this stage will we know precisely which of the environmental parameters can be assessed and monitored using ciliated protozoa. Based on these findings the ciliate-based protocol for biomonitoring marine water will be developed and refined. The success of the protocol, and its adoption for marine management, remains dependent on the assumption that ciliates will prove to be reliable indicators of marine water quality.

Training and advocacy. Training of OUC staff and students remains on target with 6 having received extensive training and 15 others receiving some level of on-the-job training during 2006/07 (out of a target of 30 for the life of the project). Training of other stakeholders is not due to take place until the final year of the project, i.e. after completion of the ciliate identification guide and of the ciliate-based biomonitoring protocol.

3.3 Standard Output Measures

Table 1 Project Standard Output Measures

Code No.	Description	Year 1 Total	Year 2 Total	Year 3 Total	Year 4 Total	TOTAL
Established codes						
4C	OUC personnel receiving training in advanced methods in UK	5	0			5
5	OUC postgrad. students receiving ongoing training in ciliate identification	16	6			22
8	UK staff visits to OUC	2	1			3
11A	Papers published in peer-reviewed journals	0	11			11
11B	Papers submitted to peer-reviewed journals *(Note: some of these papers were also published)*	5	10			15
14B	Papers presented at conferences in China	1	7			8
20	No. items of equipment acquired by OUC	10	2			12

Table 2 Publications

Type * (eg journals, manual, CDs)	Detail (title, author, year)	Publishers (name, city)	Available from (eg contact address, website)	Cost (if applicable)
Journal	Xu D., Song W. & Warren A. (2006). Morphology and infraciliature of two marine oligotrich ciliates, *Parallelostrombidium armatum* (Bürger, 1908) nov. comb. and *Strombidium montagnesi* nov. spec. (Ciliophora: Oligotrichida) from China. *Journal of Natural History* **40**:1287-1299	Taylor & Francis, Abingdon	http://www.tandf.co.uk/journals/titles/00222933.asp	n/a
Journal	Ji D, Song W & Warren A. (2006). Redescriptions of three marine peritrichous ciliates, *Zoothamnium alternans* Claparède et Lachmann, 1859, *Z. sinense* Song, 1991 and *Z. commune* Kahl, 1933 (Ciliophora: Peritrichia), from North China. *Acta Protozoologica* **45:** 27-39	Jagiellonian University Press, Krakow	www.eko.uj.edu.pl/ap/	n/a
Journal	Xu D., Song W. Lin X. & Warren A. (2006). On two marine oligotrich ciliates, *Spirostrombidium agathae* n. sp. and *S. schizostomum* (Kahl, 1932) n. comb. from China, with a key to the identification of seven well-characterized Spirostrombidium spp. (Ciliophora: Oligotrichida). *Acta Protozoologica* **45**: 433-442	Jagiellonian University Press, Krakow	www.eko.uj.edu.pl/ap/	n/a
Journal	Shang H., Song W., Warren A., Li L. & Chen Z. (2006). Phylogenetic positions of two marine ciliates, *Metanophrys similis* and *Pseudocohnilembus hargisi* (Protozoa, Ciliophora, Scuticociliatia), inferred from complete small subunit rRNA gene sequences. *Progress in Natural Science* **16:** 374-378	Taylor & Francis, Abingdon	http://pub.nsfc.gov.cn/pinsen/ch/currentissue.aspx	n/a

Journal	Song W., Warren A., Wang Y., Ma H., Hu X. & Chen Z. (2006). Phylogenetic position of the marine ciliate, *Cardiostomatella vermiforme* (Kahl, 1928) Corliss, 1960 inferred from the complete SSrRNA gene sequence, with establishment of a new order Loxocephalida n. ord. (Ciliophora, Oligohymenophorea). *European Journal of Protistology* **42**: 107-114	Elsevier, Amsterdam	www.sciencedirect.com	n/a
Journal	Song W., Warren A., Roberts D., Wilbert N., Li L., Sun P., Hu X. & Ma H. (2006). Comparison and redefinition of four marine, coloured *Pseudokeronopsis* spp. (Ciliophora, Hypotrichida), with emphasis on their living morphology. *Acta Protozoologica* **45**: 271-287	Jagiellonian University Press, Krakow	www.eko.uj.edu.pl/ap/	n/a
Journal	Ma H., Song W., Warren A. Roberts D., Gong J. & Al-Rasheid K. (2006). Redescription of the marine scuticociliate *Glauconema trihymene* Thompson, 1966 (Protozoa; Ciliophora): life cycle and stomatogenesis. *Zootaxa* **1296**: 1-17	Magnolia Press, Auckland	http://www.mapress.com/zootaxa/	n/a
Journal	Sun P., Song W. & Warren A. (2006). Taxonomic characterization of two marine peritrichous ciliates, *Epicarchesium corlissi* n. sp. and *Pseudovorticella jiangi* n. sp. (Ciliophora: Peritrichia), from northern China. *European Journal of Protistology* **42**: 281-289	Elsevier, Amsterdam	www.sciencedirect.com	n/a
Journal	Shao C., Song W., Warren A., Al-Rasheid K., Yi Z. & Gong J. (2006). Morphogenesis of the marine ciliate, *Pseudoamphisiella alveolata* (Kahl, 1932) Song & Warren, 2000 (Ciliophora, Stichotrichia, Urostylida) during binary fission. *Journal of Eukaryotic Microbiology* **53:** 388-396	Blackwell Publishing, Oxford	http://www.blackwellpublishing.com/journal.asp?ref=1066-5234	n/a

Journal	Xu D., Song W., Warren A., Roberts D. & Hu X. (2007). Redescriptions of two marine planktonic ciliates from China, *Parastrombidium faurei* (Kahl, 1932) Maeda, 1986 and *Strombidium capitatum* (Leegaard, 1915) Kahl, 1932 (Ciliophora, Oligotrichea). *European Journal of Protistology* **43:** 27-35	Elsevier, Amsterdam	www.sciencedirect.com	n/a
Journal	Shao C., Song W., Li L., Warren A. & Hu X. (2007). Morphological and morphogenetic redescriptions of the stichotrich ciliate *Diaxonella trimarginata* Jankowski, 1979 (Ciliophora, Stichotrichia,Urostylida). *Acta Protozoologica* **46**: 25-39	Jagiellonian University Press, Krakow	www.eko.uj.edu.pl/ap/	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 data-gathering has been completed and the mechanisms and protocols for utilising ciliates for these purposes have been developed. We do not anticipate these 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 has been suggested (see revised Logframe). 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-gathering 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-, purpose- and final goal indicators will need to await the completion of the ciliate identification guide and the development of the ciliate-based biomonitoring protocol, although both are progressing on schedule. The description of ciliate diversity is exceeding out target with more papers being published and gene sequences determined than anticipated, and likewise the number of OUC personnel trained (see sections 3.1 to 3.3).

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

The review of the last annual report was broadly positive and was welcomed by the project partners at OUC. The only issue raised in the review was that: "There is scope for substantially revising the logical framework to make it clearer". In response to this comment, and with the help of DI Projects staff at ECTF we have revised our Logframe, a copy of which is here included at Annex 2. The revised Logframe has been approved by the DI Secretariat. It should be noted that neither the focus of our project nor any of our planned activities have changed; the wording of the Logframe was amended only to make it clearer as suggested in the review of the last annual report.

6. Other comments on progress not covered elsewhere

The only major difficulty encountered in the past year was that of OUC personnel making the scheduled visits to the NHM in January/February 2007. The NHM and OUC agreed that it would be far preferable that these visits be postponed until August – November 2007. This meant re-arranging the timetable for the remainder of the project (including extending the duration of the project such that the end date is now 31 March 2009) and carrying forward the 2006/07 travel budget. All changes have been approved by the DI Secretariat. The revised timetable is supplied as hard copy.

7. Sustainability

The results of work carried out on the project were presented at two scientific conferences within China (see section 8 for details). The role of the DI in funding this work was acknowledged in all seven presentations made at these conferences.

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 trained in the basic techniques for identifying ciliates and in their use for biomonitoring 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. Furthermore, 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, Yantai and at South China Normal University, Guangzhou. It is hoped that in the future further new specialist ciliate laboratories will be established by OUC postdoctorates at other universities elsewhere in China.

8. Dissemination

Dissemination of results in China has taken place mainly via presentations at two scientific conferences:

- VII Asian Conference on Ciliate Biology, Wuhan, 16 – 20 July 2006, at which 6 papers were presented;

- International Symposium on the Sustainable Use of Aquaculture Resources, Qingdao, 16-18 October 2006, at which one paper was presented.

The target audience at the first conference was specialists and students of ciliate biology, mainly from China but also from 6 other countries including India, Korea, Japan, U.S.A., Italy and Austria. The target audience for the second conference was specialists and students of fishery resources.

Other dissemination activities include presentations made at scientific conferences in India (two presentations) and the UK (one presentation), and in the form of publications in peer-reviewed journals (see Section 3.3, Table 2).

9. Project Expenditure

Table 3 Project expenditure during the reporting period (Defra Financial Year 01 April to 31 March)

10. OPTIONAL: Outstanding achievements of your project during the reporting period (300-400 words maximum). This section may be used for publicity purposes

I agree for ECTF and the Darwin Secretariat to publish the content of this section

Annex 1 Report of progress and achievements against Logical Framework for Financial Year: 2006/07

Project summary	Measurable Indicators	Progress and Achievements April 2006 - March 2007	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 early 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 drafting of 5 chapters for ciliate identification guide and commence drafting of remaining chapters. 3. Complete data gathering for development of ciliate-based biomonitoring protocol and carry out analysis of results. 4. Continue on-the-job training of OUC personnel in China and deliver advanced training for at least 4 OUC personnel in NHM.
Output 1. Biodiversity assessment programme established and	1. Ciliate biodiversity better known amongst academics and other	The number of publications has exceeded the target for the year, likewise the number of gene sequences deposited in databases. The preparation	

functioning	stakeholders. 2. Ciliate biodiversity data included in coastal marine management decision-making process	of the ciliate identification guide is on schedule. Neither indicator can be assessed until the final year of the project or perhaps after.
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		Eleven papers published including: detailed descriptions and redescriptions of 18 species; morphogenetical processes of 2 species; molecular phylogeny of 3 species. Four additional papers submitted for publication. In 2007/08 collection of ciliates for description and redescription, gene sequencing and determination of morphogenetical processes to continue
Activity 1.2 Produce user-friendly guide to the identification of marine ciliates		Drafting of five chapters undertaken, three of which are at an advanced stage of completion. In 2007/08 drafting of five chapters to be completed and drafting of remaining chapters to commence.
Activity 1.3 Establish reference collection of ciliates at OUC and make available		40 slides added to OUC collection. During 2007/08 at least one slide of each taxon described will be deposited in the collection.
Output 2. Ciliate-based tool for water quality assessment and monitoring developed and used	System adopted for monitoring marine water quality	Data-gathering on schedule. Upon completion of data-gathering exercise in July 2008 the data will be analyzed and the results used for the development of a ciliate-based biomonitoring protocol.
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. Sampling to continue until July 2008.
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 monitored for each sample giving 24 months worth of data. Monitoring to continue until July 2008.
Activity 2.3 Analyze data and develop protocol for biomonitoring marine water quality		No progress in this activity until activities 2.1 and 2.2 are complete. During 2007/08 data will be analyzed and protocol developed.

Output 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 personnel at OUC and at stakeholder institutions trained Advocacy event(s) held	Training of OUC personnel is ahead of target. Training of other stakeholders and advocacy event(s) are not due to take place until the final year of the project.
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		21 OUC students received on-the-job training at OUC of which 6 received extensive training. During 2007/08 further students will receive this training and at least four OUC personnel will receive training in advanced techniques at NHM
Activity 3.2 Advocacy event(s) held		Advocacy event(s) are not scheduled to be held until the final year of the project

Annex 2 Project's full current logframe

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Goal Biodiversity conservation and sustainable use of Jiaozhou Bay	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 Ciliate biodiversity data included in coastal marine management decision-making process	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	System adopted for monitoring and training purposes	Interview/reports by stakeholders	Ciliates prove to be reliable bioindicators of marine water quality; stakeholders adopt the ciliate-based monitoring system
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	Training reports and attendance lists	Active participation of stakeholders in training; OUC staff and students free to attend UK-based training

Activities

Output 1. Ciliate biodiversity assessment programme established and functioning

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

1.2 Produce user-friendly guide to the identification of marine ciliates

1.3 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)

Data for guide assembled (by 03/08); guide compiled and tested by stakeholders (by 07/08); guide submitted for publication and mounted on OUC website (by 01/09)

Ciliate community data and water quality data gathered (Yr 1, 2, 3); assessment tool developed and functionality of assessment tool verified (by 10/08); submitted to publisher (by 02/09).

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 03/09)

Annex 3 Onwards – supplementary material (optional)

1. Copies of papers listed in 3.3 (Table 2) supplied as hard copy.

2. Copies of abstracts of papers presented at conferences in China supplied as hard copy.

3. Revised outputs milestones and revised timetable supplied as hard copy.

Checklist for submission

	Check
Is the report less than 5MB? If so, please email to Darwin-Projects@ectf-ed.org.uk putting the project number in the Subject line.	√
Is your report more than 5MB? If so, please advise Darwin-Projects@ectf-ed.org.uk that the report will be send by post on CD, putting the project number in the Subject line.	X
Do you have hard copies of material you want to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number.	√
Have you completed the Project Expenditure table?	√
Do not include claim forms or communications for Defra with this report.	√