



Darwin Initiative for the Survival of Species

Annual Report

1. Darwin Project Information

Project title	<u>Nematode biodiversity and worldwide pollution monitoring</u>
Country(ies)	Brazil, Poland, Pakistan, India, Trinidad and Tobago, South Africa, Kenya, Chile, Vietnam
Contractor	Plymouth Marine Laboratory
Project Reference No.	162/8/249
Grant Value	£163,200
Start/Finishing dates	April 1999-March 2002
Reporting period	April 2000-March 2001

2. Project Background

Globally, an increasing number of researchers are using meiofauna to estimate the health of the environment. Outside of Europe and the US most of these analyses are to major taxa level i.e. phylum. Little meaningful information can be extracted from these surveys, they do not aid in environmental management and they do not further local or regional knowledge of biodiversity. There is now a requirement for a rapid increase in the number of biologists able to identify meiofauna and utilise this ecological information for monitoring of the local environment and empowering local management decisions, particularly with respect to pollution. The free-living marine nematodes are usually the dominant phylum in the meiofauna. Free-living nematodes are the most diverse marine phylum and are abundant in almost all habitats and also extremely productive. Yet the expertise to identify them to putative morphological species is found only amongst a handful of researchers, the majority of whom are based in north western Europe. The term putative species is used because outside of European waters it is estimated that only between 0.4% and 0.04% of nematode species have been described. The project will assist countries to assess the local biodiversity of nematodes as well as using this group to assess local environmental quality. Particular assistance will be given to scientists in Poland and Brazil.

3. Project Objectives

The project aims to assist biologists worldwide to assess the local biodiversity of free-living, marine nematodes as well as using this group to assess local environmental quality. To achieve this we are

- developing an easily accessible and updateable marine nematode internet key
- providing two UK based advanced training workshops for 15 biologists
 - in meiofaunal identification and specifically in marine nematode taxonomy

- in statistical analysis of community data;; to provide a UK based advanced training workshop
- collaborating on specific regional and local marine environmental monitoring/biodiversity censusing projects in Poland and Brazil, providing further advanced training and thus developing local facilities and expertise

The project plans were modified slightly in the last six monthly report

4. Progress

Summary

A Darwin nematode web site has been created on the Internet. A nematode identification workshop has been held for 16 scientists from 9 countries and these scientists form the core of the Darwin nematode network. Electronic pictorial identification keys to marine nematodes have been designed and implemented on the web site. The underlying database for the prototype Virtual Museum Nematode Collection is still undergoing development and is not yet available for release but data collection for the collection is underway. Two papers have been published. Fifteen scientists have been invited to return to Plymouth for the 2nd Darwin Statistics workshop concerning statistical analysis of community data and preparations for this workshop have begun. Scientists from Plymouth have visited Brazil to provide further training and collaborate on a joint meiofaunal diversity sampling programme within a mangrove area.

Project planning meetings with staff from NHM and PML were held in Plymouth in July 2000 and in London in October 2000 and through a telephone conference in April 2000 and March 2001. Communication regarding the project takes place regularly between NHM and PML via email and telephone.

Prototype computerised interactive identification keys to nematode genera and prototype computerised training guides for meiofaunal sample preparation and analysis have been completed. The training guides and the nematode XML database have been installed on the web site. Due to technological problems the software engine for searching the nematode database (i.e. the 'keys') was not been installed on the website until December 2000. An earlier version of the key is available in stand-alone version (CD ROM). The web site version is rather large due to its high pictorial content. Whilst it runs quite well on a network it is slow to load and operate through a telephone modem (approximately 6-10 minutes). We are working to improve this but it is unlikely that we will be able to make significant improvements. We will therefore reprogram the most recent version of the keys to make them available in a stand-alone version (CD ROM) which can be regularly updated. We are currently working to discover and rectify any taxonomic errors in the program.

PML hosted a one-week workshop for 16 scientists from Brazil, Chile, Trinidad & Tobago, Poland, Kenya, South Africa, India, Pakistan and Vietnam. Participants were selected through three mechanisms to enable wide geographic coverage:

1. From people who had previously written to PML and NHM staff requesting such training
2. By asking other European nematode experts (Belgium, Sweden) who also work with scientists in developing countries for names of scientists who have similarly requested training
3. By approaching scientists in developing countries with a recent publication record in meiofaunal ecology, thus showing a committed interest in

meiofauna, but who had not published species level data indicating a lack of training in species identification

In the letter of invitation to selected candidates it was made clear that the workshop training was aimed at:

- biologists who are already using, or intend to use marine meiofauna studies for pollution monitoring but who do not currently have the expertise to analyse their samples and data with sufficient rigor to obtain data that can most usefully assist them in their environmental management
- teaching staff at universities who will further spread their knowledge to other students.

At the workshop initial training was given in identification of nematodes to genus level, use of the electronic and paper identification keys, and in sample preparation and analysis. Training was given through

- 1-2 daily informal lectures,
- hands on practical identification sessions with a high power research microscope provided for each participant including two microscopes with video monitors
- demonstration of practical techniques used at Plymouth and the NHM for meiofaunal sample preparation

Workshop participants have established a Darwin Nematode network that is active through the Darwin Nematode web site and through personal email contact.

From participants feedback (verbal and questionnaire forms) the multinational Darwin Nematode workshop was a great success. The previous experience in meiofauna work, ages and English language competence of the participants varied considerably. Therefore feedback ranged from suggestions for more basic information on identification, sampling, extraction and ecology from the novices, to suggestions for more detailed lectures and practical sessions on the finer points and more complicated aspects of nematode taxonomy from those with more previous experience! It is difficult to see how this could be avoided. We had not met the majority of the participants before the workshop and were unable to determine their levels of experience even though we had requested this sort of information on the application forms although perhaps not explicitly enough. On the other hand the mix of abilities probably increased the group rapport and helped to show the more experienced participants new and simpler ways of explaining the basics of nematode taxonomy to trainees, thus helping them in their future teaching. Group discussions were clearly a popular part of the workshop and most participants suggested this element of the workshop could be increased. Most also suggested the workshop should have been longer to allow for extra sessions, more detail and more group discussion. Several participants expressed strong enthusiasm for regional workshops so that the workshop could be tailored to the local fauna and the local ecology. We are investigating the possibility of this in future grant applications.

The underlying database for a prototype Virtual Museum Nematode Collection is an extension of the XML nematode database used for the nematode genera identification key. Due to technical problems encountered in developing the identification key the species version of the database is still undergoing development and is not yet available for release but data collection for the collection is underway. A prototype, which can be populated with the data, will be available by June 2001.

The visit of two UK staff to Poland which was to have taken place in September has been postponed until May 2001. One of the Polish scientists who attended the

workshop was away on a cruise throughout the whole of September. It was agreed that August would not be an appropriate time to visit Poland (cruise preparation, too close to Nematode identification workshop for Polish participants to have established areas in which they require advice from UK experts, summer holidays.) Since the planned visit will include fieldwork it was agreed to postpone the visit May when the weather is more appropriate and the meiofauna are starting to reproduce again.

Three scientists from PML visited the Department of Zoology at the Federal University of Pernambuco in Recife, Brazil during October-November. We advised on meiofaunal study techniques used in the department and suggested improvements. We provided further training on meiofaunal sampling, extraction and analysis and assisted on nematode identification. Training was extended to 7 scientists additional to the three who attended the Plymouth workshop. Travel funds were provided to enable students in the Darwin network to travel to Recife to participate in the further training. Fieldwork was carried out in sandy beach habitats, abandoned fish farms and in a mangrove area. A joint sampling program was initiated in the mangrove to assess the diversity of meiofauna and particularly nematodes in microhabitats within the mangrove using a novel sampling design.

timetable (workplan) for the next reporting period.

2001/2002

April 2001	Continue preparation for training workshop on statistical analysis of community data using software
May 2001	Project review meeting
May 2001	2 UK staff visit Poland to advise on local facilities for meiofaunal work, to give further training and to support regional projects. Trainees encouraged to start populating Virtual Museum Nematode Collection
June 2001	Complete prototype Virtual Museum Nematode Collection database entry forms
July 2001	11th Meiofaunal Conference attended and presentation given
Oct 2001	Project review meeting
Oct 2001	Host one week training workshop on statistical analysis of community data using software for 15 trainees
March 2002	Complete β versions of computerised interactive identification keys to nematode genera, computerised training guide and Virtual Museum Nematode Collection.

5. Partnerships

There have been two levels of collaboration in this project: the multinational training workshop held in Plymouth and described above, and the collaborative work initiated in Brazil through a visit by three UK scientists to Recife. The workshop created a multinational spirit for the nematode workers. They clearly found support in each other through realising that they share the experience that they are possibly either the only marine nematologists, or one of a very small number in their own country. This is underpinned by the creation of the Darwin nematode network of which they are now a part.

The more specific collaboration with scientists in Recife enabled more focused collaboration and although the joint research initiated there to look at mangrove microhabitat diversity is only a small step, I am confident that the good will and good working relationship we have established is the start of extended, long-term collaboration between Plymouth and Recife benthic ecologists.

6. Impact and Sustainability

The profile of the Darwin Nematode project within each of the partner countries is probably still rather small. This is a result of low-key involvement with many partners providing training to individuals from many countries rather than concentrating all effort on a single country. Where there was more than one person from a country the workshop participants were generally from different geographical regions.

Because each participant in the workshop was carefully selected we are convinced that through teaching and research activities they will continue with their meiofauna work and will encourage and train others as well. In the workshop questionnaires it was clear that all participants had gained increased knowledge of nematode biodiversity. For those few participants who already had a basic knowledge of nematode taxonomy it was clear that they had learned a new and helpful approach to passing on this knowledge to other people. We are already aware of and encouraging 3-6 potential applications currently being prepared by workshop participants (Brazil, India, Vietnam, Poland) for grants (e.g. from UNESCO, Brazilian and Indian national funding agencies, DIFID, EC and British Council) to extend the work and collaboration with PML and the NHM.

7. Outputs, Outcomes and Dissemination

Table 1. Project Outputs (According to Standard Output Measures)

Code No.	Quantity	Description
6a	20	Training for post graduates and post doctoral people at Nematode Identification workshop and for additional staff and students at University of Pernambuco, Brazil
6b	3	“
7	2	Online guides to extracting and processing meiofauna samples, overheads for workshop sessions
8	5	Three staff to Brazil for 10 days each
11b	2	1 papers in Symposium proceedings, 1 paper in journal
12a	1	Nematode identification key database now online (and virtual collection key data base – formatted and ready for population)
14d	1	Porcupine Society meeting in Plymouth
15d	1	Darwin press release concerning Nematode Identification workshop.
17a, 17c	1	Establishment of Darwin Nemetode Network at Plymouth workshop and perpetuated internationally through web site pages and email

18d	1	Coverage of Darwin workshop featured on local TV news
	1	Darwin Nematode project web site www.pml.ac.uk/nematode
20	£1500	Materials given to Darwin workshop participants to enable them to extract and prepare nematode samples

Publications:

Austen, M.C., Ferrero, T., Caithness, N., Kendall, M.A., Lamshead, P.J.D., Nicholson, S.K., Paterson, G.L.J. 2000. Virtual Collections and Interactive keys: Taxonomy on the Internet. In: Proceedings of the second BioNET international global workshop (BIGW2) 22-29th August. Jones, T. and Gallagher S. (eds), BioNET International, Egham, UK. pp. 259-267.

Austen, M.C. 2000. Demystifying nematodes. Porcupine Newsletter, 5, 28-33.

Web site:

www.pml.ac.uk/nematode

8. Project Expenditure

Table 3: Project expenditure during the reporting period

Item	Budget	Expenditure

9. Monitoring, Evaluation and Lessons

The success of the workshop was evaluated from written questionnaires and verbal feedback and certainly participants seemed extremely satisfied with the workshop content. We will have a clearer idea of how successful the nematode identification training has been at next years statistical ecology workshop when we can see what data has been gathered by the participants. The nematode web site has been popular but less frequently visited than could be expected due to lack of synchrony with the workshop (arising from staff and technology problems discussed here and in last years annual report).

Qualitatively, during our visit to Brazil, the enthusiasm of staff and students for meiofauna and the use of nematodes in marine coastal studies was very evident.

10. Author(s) / Date

Melanie C. Austen 4.5.01