



Hebridean Whale and Dolphin Trust

Research - Education - Conservation

Hebridean Whale
and Dolphin Trust
28 Main Street,
Tobermory
Isle of Mull, Argyll,
PA75 6NU

Dear volunteer,

Having reached the end of another research season, one of the most important things left to do is thank you all very much for your work with us this summer.

Now that winter is here and the summer's visitors have left, life is much quieter in Tobermory. This gives us a little time to reflect on the 2006 research season.

All of us working on Silurian this year have had a great summer, and have ended the season with an excellent dataset. We are still analysing our findings at the moment, but the most obvious result, which many of you will have noticed for yourselves, is the continuing fall in minke whale sightings, and corresponding rise in basking sharks. We still don't know if this will be a long term change or not.

Having worked hard all summer, our research vessel, Silurian, is now in the Caledonian Canal near Fort William. Having covered hundreds of miles this season, and been home to all of us for at least a week, the boat was owed a good dose of TLC. We have spent the last few months working on refurbishing her, and she is now in excellent condition in time for the 2007 season.

We do hope you'll stay in touch, and maybe come back and sail with us again sometime.

With warmest wishes,

Dr Peter T. Stevick
Science Director and Principal Investigator

EARTHWATCH INSTITUTE FIELD REPORT

Project Title: Whales and Dolphins of the Hebrides

Principal Investigator: Dr. Peter Stevick

Position/Affiliation: Science Director, Hebridean Whale and Dolphin Trust (HWDT)

Research site: Inner and Outer Hebrides, West Coast of Scotland, UK

Local Management Status of the Research site: Within our survey area there are numerous conservation designations including marine Special Areas of Conservation (SACs), Special Protected Areas (SPAs) and Special Sites of Scientific Interest (SSSIs). Consultation is also currently underway for the designation of Scotland's first Coastal and Marine National Park. Our survey area is included in four of the five areas prioritised by Scottish Natural Heritage as preferred candidates for the park. All the species that we study are protected under law and have been identified as Priority Biodiversity Action Plan Species.

Scientific names of primary species being studied: *Phocoena phocoena* (harbour porpoise), *Balaenoptera acutorostrata* (minke whale), *Tursiops truncatus* (bottlenose dolphin), *Delphinus delphis* (common dolphin) and *Orcinus orca* (killer whale), as well as *Cetorhinus maximus* (basking shark), an increasingly common species in Hebridean waters.

Key Research Objectives:

- To undertake effort-based line transect surveys of whales, dolphins and porpoises in Hebridean waters in order to assess distribution, relative abundance and habitat preference.

This will be done using the following methods:

- Effort-based visual surveys throughout the survey area
- Acoustic monitoring of harbour porpoises during surveys (ultrasonic sound requiring high frequency hydrophone)
- Acoustic monitoring of other audible cetacean species and ambient underwater noise, both natural and anthropogenic
- Continuing to enlarge and expand HWDT's and other organisations' photo-identification image catalogues by photographing bottlenose dolphins, minke whales, killer whales and basking sharks for photo ID purposes
- Maximising the research platform by collecting additional distribution and identification data on marine litter, seabirds, seals and other vessels. Detailed environmental data are also collected.

Hebridean All Teacher Team Objectives:

To enable a group of teachers to gain basic scientific research skills around the Whales and Dolphins of the Hebrides project:

- To inspire the teachers and enable them to use their experience to produce a series of activities and resources within the week for use by themselves and other teachers back in the classroom (this material also to be included on the EWE and HWDT websites)
- To enable the teachers to share ideas about teaching environmental education and identify areas of the national curriculum which could be made more appealing through aspects of this project
- To inspire and enable teachers to undertake a local project when they return to their school using the Whales and Dolphins of the Hebrides project as inspiration – this could include developing or improving a wildlife area, producing a wildlife display, developing a wildlife themed assembly or group session etc.
- To provide teachers with a forum for reviewing current teaching styles and practices and enable them to see the benefits of experiential learning and how they can apply this to their current and future teaching career.

Data Collection and Results

a) Data collected during the past field season

HWDT conducted six main Earthwatch survey trips from April to September 2006. A seventh trip, dedicated to teacher training was also carried out. Trips were either seven or 10 days long. The trip dates were 24th April – 5th May, 15th May – 26th May, 5th June – 16th June, 26th June to 7th July, 10th August – 18th August and 14th September – 22nd September. The teacher training trip was from 27th August – 2nd September. The usual distance covered was between 300 – 500 nautical miles depending on the weather conditions and the duration of trip. During these surveys we undertook the following:

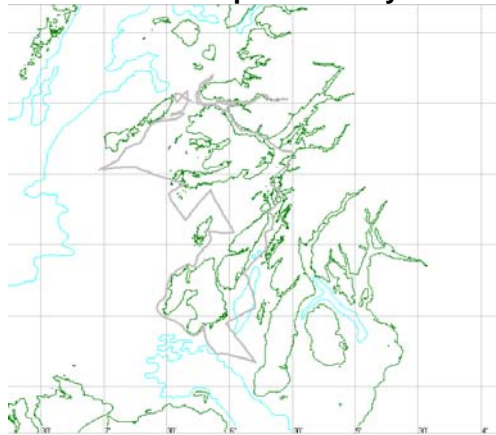
- Visual observations for all cetacean species, plus basking sharks, seals, seabirds, marine litter, and other vessels
- Photo Identification images of minke whales, bottlenose dolphins and basking sharks showing the dorsal fins and any body scars or flank patterns. A Canon EOS 10D with a 300mm lens was used for photo ID shots and images have been contributed to the appropriate catalogues
- Continuous acoustic monitoring of harbour porpoises and other cetacean species using a high frequency towed hydrophone
- All data were collected and stored using the real time data logging program LOGGER (developed by International Fund for Animal Welfare)
- All teacher Team: four primary teachers from English schools and one junior high teacher from Florida, USA carried out normal survey methodologies during the day, and teacher work in the mornings and evenings. The education work involved discussion of current teaching methodologies and government strategies/policies, how the experience could be brought back to school, presentation on the educational work of HWDT, and several sessions preparing resources to use in school (either working individually or in groups) etc. The aim is for the resources to be completed at home by the teachers, and included on

Earthwatch and HWDT's websites for public use. During the week, a live call was made to a school in Florida where HWDT staff answered children's questions, and a blog was set up specifically for the week.

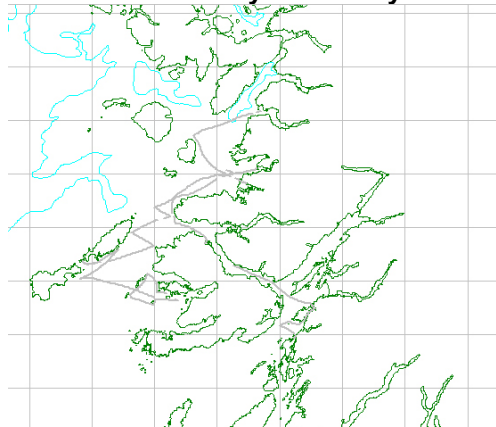
Survey routes

The maps below indicate the survey routes undertaken during each trip. The route was chosen to take into account weather and sea conditions and to obtain an even coverage of survey effort throughout the area. In spite of poor weather on several trips, we achieved good coverage of all our survey areas, including some more remote and hitherto poorly surveyed areas such as Stanton Banks to the southwest of Tiree (Team III).

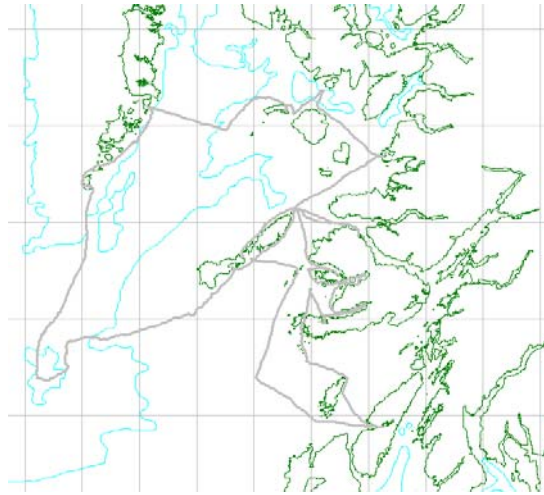
Team I: 24th April – 5th May 2006



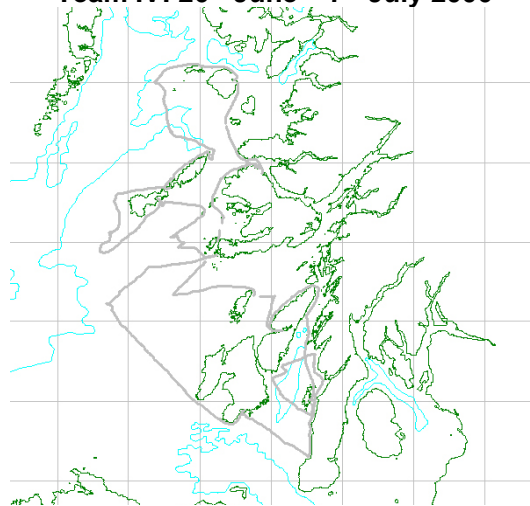
Team II: 15th May – 26th May 2006



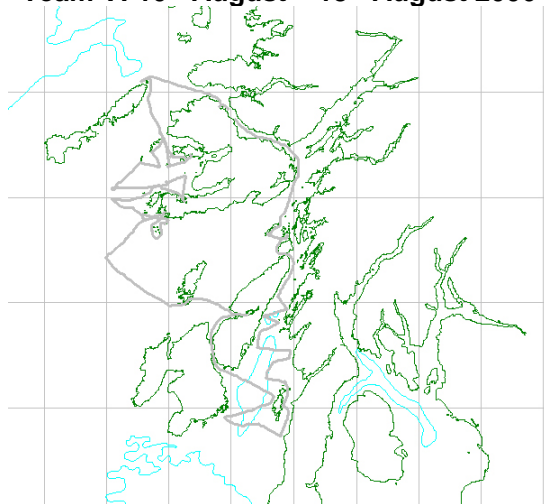
Team III: 5th June – 16th June 2006



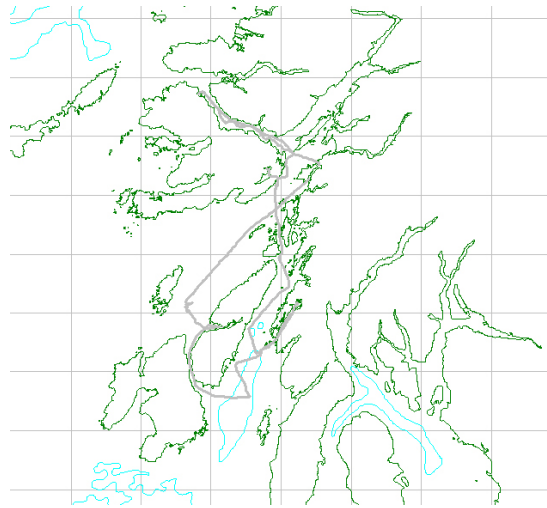
Team IV: 26th June – 7th July 2006



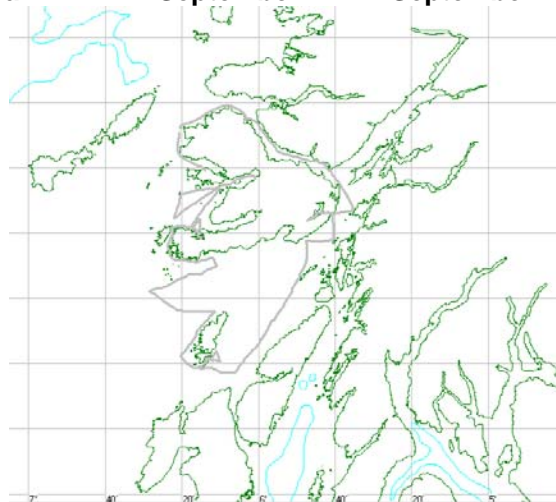
Team V: 10th August – 18th August 2006



Teachers: 27th August – 2nd September 2006



Team VI : 14th September – 22nd September 2006



b) & c) Progress towards achieving original objectives and summary of preliminary results

Each year of visual and acoustic surveys aboard Silurian increases our understanding of cetacean distribution, relative abundance and habitat preferences within our survey area.

In addition to the Earthwatch surveys carried out in 2006, we conducted six other surveys following identical methodology. Some species not encountered on any 2006 Earthwatch trips, such as bottlenose dolphins, were observed on these other surveys.

As expected, harbour porpoise continued to be the most frequently sighted cetacean in 2006. It is becoming increasingly apparent that, although these animals are distributed throughout our survey area, there are certain areas with environmental and oceanographic features more conducive to harbour porpoise occurrence. This study of

high-use areas was a focus of the PhD work of Clare Embling, from the Sea Mammal Research Unit (SMRU), University of St Andrews, whose last field season aboard *Silurian* was in 2005. As Clare now writes up her work, Cormac Booth, also at SMRU, is starting his PhD research in conjunction with HWDT. He will further investigate areas particularly favourable to harbour porpoise.

In 2005, our surveys showed a decrease in the overall number of minke whales sighted, with very few observed in the usual peak months of July and August. Whilst the 2006 season started well, June being an especially good month on *Silurian*, early optimism that last year's minke distribution had been an anomaly was confounded by another tail-off in sightings, albeit slightly later in the year.

In contrast, basking shark sightings continued to rise, with especially high numbers in June, July and August. Earthwatch Team IV saw 156 over the course of their survey, 55 of these being over a two-mile area on a single day at beginning of July off the island of Tìree. Coll and Tìree have been particular basking shark hotspots in 2006, in addition to the Treshnish Isles off the west coast of Mull.

It would seem that a trophic shift is taking place in Hebridean waters, which is also having clear effects on the area's seabird populations. Basking sharks feed on the zooplankton, copepods, as do sandeel. An apparent lack of sandeel in the area has negatively impacted on minke whale distribution and seabird breeding success. However, it appears that this has left abundant zooplankton for the basking sharks, encouraging a change in their distribution as they follow their food sources. The species is also undergoing a population recovery after the relatively recent end of the basking shark fishery on the west coast of Scotland.

2006 has been the first year of a government-funded project to study the distribution of bottlenose dolphins in Scotland. HWDT has been collaborating with Aberdeen University, the Sea Mammal Research Unit and the Scottish Association for Marine Science on the three-year study, contributing our sightings and photo-identification images to the project. Preliminary findings indicate that there are around 20 bottlenose dolphins in the Inner Hebrides, with sightings reported from the Kintyre Peninsula in the south to Skye in the north. There are also about a dozen bottlenose dolphins in the Sound of Barra in the Outer Hebrides. These two groups of animals seem to be completely separate from each other, and have quite different habits. Whereas the dolphins in the Inner Hebrides travel widely throughout the area, their group splitting and reforming, the Sound of Barra animals seem to stay together in this relatively small area fairly constantly – at least over the summer months. However, in spite of this successful summer for bottlenose dolphin sightings, none of these was during an Earthwatch survey.

In addition to photographing bottlenose dolphins for our image catalogue, we continue to collect images of basking sharks, minke whales, Risso's dolphins and killer whales. Basking shark images are passed to the Shark Trust for analysis. This year, Risso's dolphin sightings have been few and distant, and there have been no confirmed killer whale sightings by *Silurian*, so no additions were made to those catalogues. Whilst common dolphins have been sighted this year, particularly offshore as would be expected, numbers have not been high, the decrease being especially apparent in August, when large groups of feeding animals can usually be expected. This perhaps indicates that the decrease in small schooling fish populations is not restricted to sandeel.

It is impossible to work at sea surveying cetaceans without an awareness of a wider ecological context, and this year we have endeavoured to increase volunteer

involvement in the marine environment as a whole. Marine litter is a significant conservation concern for cetaceans, owing to ingestion and entanglement. Whilst Silurian has collected litter data in previous seasons, this year we have done so in a more directed way, to enable density estimates to be calculated. We have also trained volunteers how to identify the most common seabirds encountered in Hebridean waters, increasing their appreciation of the area's wildlife and ecological relationships. Volunteers collect basic data on the number and species of seabirds observed following a standard methodology.

Cetacean sightings from Earthwatch trips 2006

Team	Harbour porpoise	Bottlenose dolphin	Risso's dolphin	Common dolphin	White-beaked dolphin	Minke whale	Basking shark
I 24/4/06 – 5/5/06	14	0	0	1	0	1	0
II 15/5/06 – 26/5/06	10	0	0	0	0	0	1
III 5/6/06 – 16/6/06	21	0	2	64	14	19	25
IV 26/6/06 – 7/7/06	58	0	0	4	0	3	156
V 10/8/06 – 18/8/06	45	0	0	0	0	1	28
VI 14/9/06 – 22/9/06	9	0	0	0	0	0	0
Teachers 27/8/06 – 2/9/06	62	0	0	0	0	5	0

Significance/Benefits of Research

a)

- **Local (in the area of the research site)**

Our work is largely focused on identifying key habitats of importance to local species, with a view to their potential future protection. Providing information on sensitive sites for marine life is of considerable benefit for management of local waters. In addition, we disseminate and share our research results in the following ways:

- 1) HWDT disseminates the results of our surveys locally, both directly to those involved in the wildlife watching industry, a significant sector of the West Coast economy, and to the general public via newsletters and local press. This helps to keep local community and wildlife watching business informed of what

species are being seen and where. This encourages more people to continue reporting their sightings and build up our dataset.

- 2) HWDT shares all marine debris data collected with Argyll and Bute Council. This information is used in awareness raising and education and is working towards Local Biodiversity Action Plan (LBAP) targets focused on reducing the levels of marine debris, which can cause harm and injury to many marine species.
- 3) Data gathered on bottlenose dolphins is adding to the sparse knowledge we have of the west coast bottlenose dolphin population. Bottlenose dolphins have been identified as a LBAP priority species. As one of the LBAP actions, HWDT initiated a photo ID project, to begin to gather information regarding the number of animals, their range and movement pattern through the area. As discussed above, we are also collaborating in the Scottish Bottlenose Dolphin Project.

- **National**

- 1) All cetacean sightings are shared with and passed onto the Sea Watch Foundation, which is the national coordinator for all UK sightings for whom HWDT acts as the regional coordinator. Sightings and effort related data contributed are reviewed on a 10 yearly basis to provide a comprehensive picture of the status and distribution of UK cetaceans.
- 2) HWDT is working with the Cetacean Research and Rescue Unit (CRRU), which is a cetacean organisation on the east coast of Scotland. We are comparing minke whale identification shots in order to see if there are any matches between west and east coast animals. This is particularly important this year as the east coast has seen a dramatic increase in minke whale activity this year in contrast to the drop-off HWDT has observed here on the west coast.
- 3) HWDT has been working with the Marine Conservation Society in lobbying the Scottish Parliament to introduce a plastic bag levy. All data collected during HWDT surveys has been collated and presented as evidence.

- **International**

- 1) All photo ID images are submitted to the Europhlukes project, which is a Europe wide repository for cetacean photo ID catalogues.
- 2) Links with minke whale research projects in Iceland, Japan and Canada (ORES) have been established and will be developed through a PhD being conducted by Mike Tetley on: 'Site fidelity, habitat preference, and coastal ecology of the minke whale'.
- 3) Local killer whale sightings are being used in a study of population dynamics across the North Atlantic through a PhD project at Aberdeen University.

b) How findings contribute to issues of sustainability

By working to discover more about the whale, dolphin and porpoise populations on the west coast of Scotland, we are providing more detailed information and knowledge about how marine species use this area. A marine mammal watching industry has developed in this area and HWDT is committed to encouraging appropriate, controlled ecotourism activities. We were actively involved in development of the recently launched Marine Wildlife Watching Code for Scotland and our data contribute to the ordered development of marine mammal watching both directly and indirectly. The Hebridean marine environment supports a range of activities such as tourism, fishing, fish farming, shipping, offshore energy development and military exercises, all of which help to sustain the west coast of Scotland as an economically viable area. It is important to provide as much information on the marine life found here as possible to ensure that these activities are carried out in a way that ensures the sustainability of the area, both economically and ecologically.

Dissemination of Results

- Management plans and reports:
 - 'Distribution of harbour porpoise in the Sound of Mull in relation to ADD use: 2003 – 2006'. Report prepared by HWDT for Scottish Natural Heritage and Scottish Sea Farms (in prep)
- Presentations:
 - 'A comparison of minke whale (*Balaenoptera acutorostrata*) dorsal fin edge marks (DEMs) between two geographically distinct study populations'. Poster for 20th Annual Conference of the European Cetacean Society, Gdynia, Poland, 2006
 - 'Predicting the distribution of cetaceans in a changing world: an ecological modelling approach'. Talk at 20th Annual Conference of the European Cetacean Society, Gdynia, Poland, 2006
 - 'Using environmental models to predict harbour porpoise distribution and relative abundance from visual and acoustic survey data'. Poster for 21st Annual Conference of the European Cetacean Society, San Sebastián, Spain, 2007 (in prep)
 - 'A trophic shift off West Scotland: minke whales and basking sharks'. Poster for 21st Annual Conference of the European Cetacean Society, San Sebastián, Spain, 2007 (in prep)
 - 'Density estimates of marine litter in a key cetacean habitat in North West Scotland' Poster for 21st Annual Conference of the European Cetacean Society, San Sebastián, Spain, 2007 (in prep).
 - 'Characteristics of the bottlenose dolphin population off the west coast of Scotland'. Poster for 21st Annual Conference of the European Cetacean Society, San Sebastián, Spain, 2007 (in prep)
 - 'Distribution and abundance of bottlenose dolphins off the West Coast of Scotland'. Poster for 21st Annual Conference of the European Cetacean Society, San Sebastián, Spain, 2007 (in prep)

NB: the European Cetacean Society has a membership of c.750 European marine mammal scientists and students, the majority of whom attend its annual conference
- Popular articles or films:
 - Feature for BBC TV's 'Countryfile' programme on Mull's wildlife (tx: summer 2006)
 - Feature for BBC TV series on UK endangered species (tx: spring 2007)

VOLUNTEERS

Volunteer Tasks and Accomplishments

a) Volunteers' contribution of ideas, skills, expertise and motivations

This is the second year that HWDT has worked with Earthwatch volunteers on our monitoring trips, and the experience continues to be an enriching one on both sides. Each volunteer brings with them an invaluable range of skills and experience. Some are already keen birders or sailors, and their contribution to our research is clear. People who already know how to spot animals in the wild, or who understand the sea are a huge asset. However, those who may never have set foot on a boat, or seen a cetacean in the wild can also make a great contribution. They may be an expert in computer software, a keen photographer, or a good cook. All these skills and experiences are valuable onboard, and make for a rounded team. Our Earthwatch volunteers at the beginning of the season were predominantly from corporate organisations which sponsor Earthwatch, many of them from south east Asia. For them, the entire experience was new, from the food onboard, to wearing Wellington boots and, of course, Scottish weather. None of our teams this summer escaped strong winds and high sea states, but all took it in their stride, as part of the total package of living and working at sea.

b) How volunteers have helped us achieve our objectives

Our volunteers make our research possible. They work long hours carrying out visual observations and logging data, especially in the middle of summer when daylight hours are very long. Teams of two rotate as visual observers, entering data into our computer system and logging seabird sightings. Teamwork is extremely important if the research is to run smoothly, and at this the Earthwatch volunteers excel. They also help in the running of the vessel, cooking, cleaning and carrying out other essential ship-based tasks. Working at sea can be very tiring, especially in poor weather. We need to operate continuously to achieve full and comprehensive coverage of our survey area. Having enough volunteers on board to run a rota system to allow people to rest is essential.

This year has also seen a major development in our work with teachers, through the All Teacher Team. Teachers worked hard during the day to carry out both standard monitoring tasks and extra educational development work, in conjunction with HWDT's Education Officer, Hilda Bransby.

Project Development

a), b), c)

Challenges, additional methods and forthcoming development of our research

This year we have moved from operating the acoustic software Porpoise Detector to RainbowClick. A key advantage of the new system is its higher processing speed, enabling harbour porpoise clicks to be analysed in real time. We have also been working with a new hydrophone. At the beginning of the season, and throughout the summer when gaps in our schedule allowed, extensive testing and modifications to both equipment and the survey vessel were carried out to attempt to isolate and eliminate the electrical noise experienced in the audible frequency range in the 2005 season. We were encouraged to find this problem much reduced in 2006. However, we are still experiencing intermittent and inconsistent high frequency noise (which is beyond human hearing, but is visible on the RainbowClick software), a problem that we are working on this winter. To a certain extent, due to the hostility of the environment to

sensitive electronic equipment, it is impossible to permanently eliminate all technical problems with acoustic equipment on boats. However, good audible and high frequency data have been collected on all surveys this year, and most of the Earthwatch volunteers have found this side of our work very interesting. Our work to fine-tune our systems will continue.

As discussed above, this year we have introduced more rigorous collection of marine litter data, and also trained volunteers to identify and count seabirds. In addition to providing an increased awareness of their environment, these observations also help volunteers with their observation skills and distance estimation, skills which are difficult to master at sea. To enable volunteers to increase their distance estimation accuracy (a key component of accurate line transect surveys), we also carry out training exercises using known distances by using our vessel's radar equipment and by towing buoys.

Our increasing body of trend data, and predictive modelling work carried out by Clare Embling as part of her PhD, are now giving us a clearer picture of cetacean 'hotspots', the identification of which is important from both ecological and management perspectives. In coming years, our work will become increasingly focused on investigating these high-use habitats, especially as Cormac Booth, like Clare Embling a PhD student from the Sea Mammal Research Unit, commences his studies of this question shortly. 2007 will therefore see Silurian directing its field research more towards fine-scale analysis of key areas, whilst at the same time continuing the collection of the long-term, broad-scale distribution and abundance data which make our work so valuable.

Educational Opportunities

a)

- Local communities – HWDT is in direct contact with the local community in the following ways: we work closely with boat operators, ferry companies, fish farmers, and fishermen in the collection of data; we also visit local schools, colleges and community groups to give presentations and talks.
- Students – university students spend time onboard Silurian to gain practical experience of survey techniques. In conjunction with the University Marine Biological Station, Millport, we run marine mammal survey courses aboard Silurian during the summer.
- We also have opportunities for school students to undertake work experience placements with HWDT. We also provide data and logistical support for undergraduate and, in the future, Masters student projects.
- Early career scientists – several people have been involved in our research work to specifically learn skills relevant to their chosen career. HWDT also provides data for PhD projects. E.g. 'Site fidelity, habitat preference, and coastal ecology of the minke whale' (M. Tetley, in progress) and 'Population structure of North Atlantic killer whales' (A. Foote, in progress).
- Teachers – in 2006 an Earthwatch monitoring trip specifically for teachers gave teachers an opportunity to experience scientific field research, develop teaching methodologies and discuss environmental education strategy in schools.
- Other groups – HWDT runs a Marine Discovery Centre, which is open all year to the general public and provides educational and interpretative information for public.

b) The ways our research helps these groups better understand the conservation of a sustainable environment.

As HWDT is an integral part of the community both on Mull, and over the wider Hebridean area, our work in cetacean research, education and conservation is fully integrated into the area's economic and social structure and development. As we start to teach primary school children of their role within the natural environment when they are young through school visits, they grow up into environmentally conscious adults, with whom we continue to work if they stay within the area and work in the main economies of tourism, fishing, fishfarming and shipping. When students work with us, whether as volunteers on Silurian, on placements, or on short courses, they experience this integration of the trust within the community at first hand, and learn directly the importance of conservation being part of a community's development, not an artificial superimposition.

c) We have worked with a PhD candidate from the Sea Mammal Research Unit at the University of St Andrews for the past three years, whose work is largely based on research carried out onboard Silurian. Following the completion of her work, a new PhD candidate will start working with us in the 2007 season. In 2006, two undergraduates from the University of Oxford carried out their field research for their research projects onboard Silurian.

Partnerships

a) Partnerships or collaborations with other organisations developed or maintained in the past season:

- Sea Mammal Research Unit (SMRU), University of St. Andrews
- University of Aberdeen
- Dunstaffnage Marine Laboratory, Scottish Association of Marine Science (SAMS)
- Sea Watch Foundation
- The Shark Trust
- Marine Conservation Society
- University Marine Biological Station, Millport
- Cetacean Research and Rescue Unit
- WWF
- Whale and Dolphin Conservation Society (WDCS)
- Wild Scotland
- Mull and Iona Community Trust
- LINK Marine Task Force

b) How these organisations have contributed to our project objectives

There has been an exchange of sightings, survey data and photo ID images relevant to our study area by Sea Watch Foundation and The Shark Trust. We have collaborated with SMRU, Aberdeen and SAMS on a national project investigating bottlenose dolphin populations. SMRU has provided expert consultation on survey design as well as hardware and technical support for survey work without which we would not be able to conduct much of the acoustic work we have successfully carried out. Collaborative work was also conducted during 2006 with WDCS on military use of low-frequency sonar in the waters just offshore from our primary study site.

c) How these organisations will use the results generated by the project

The results from HWDT surveys form part of a three year PhD project conducted by SMRU to be published shortly. The study aims to assess marine mammal distribution on the west coast of Scotland in relation to oceanographic variables.

Data contributed to the Sea Watch Foundation and The Shark Trust are used to expand and enhance their own databases, and are used on both a trend and project-specific basis.

Acknowledgements

We would like to thank all our funders and sponsors for enabling the continuation and expansion of our work. We are grateful to all those at SMRU who have continued to provide practical and moral support with equipment and software on Silurian. The project would not have been possible without the energy and dedication of the captains and crew of Silurian.

And of course, many thanks to this year's volunteers for their unfailing enthusiasm, greeting both the highs and the lows with equal equanimity.