LIFE Project Number

LIFE08 NAT/S/000261

FINAL Report

Covering the project activities from 01/01/2010 to 30/09/2015

Reporting Date

29/02/2016

LIFE+ PROJECT NAME or Acronym

SAMBAH

Project Data

Project location	Baltic Sea
Project start date:	01/01/2010
Project end date:	31/12/2014 **Extension date:** 30/09/2015
Total Project duration (in months)	69 months (including **Extension of 9 months**)
Total budget	€ 4 242 013
Total eligible budget	€ 4 242 013
EU contribution:	€ 1 112 098
(%) of total costs	49.79%
(%) of eligible costs	49.79%

Beneficiary Data

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2. Summary

SAMBAH targeted the Baltic Sea population of harbour porpoise (*Phocoena phocoena*). This population is small and has been drastically reduced during the last decades. The species is listed in Annexes II and IV of the EC Habitats Directive as well as in the national red lists of several Member States. When SAMBAH started, the conservation status of the species in combination with a complex of threats necessitated improved methodologies for collecting data on population size and distribution, and fluctuations over time. The overall objective of the project has been to launch a best practice methodology for this purpose and to provide data for a reliable assessment of distribution and preferred habitats of the species. This would make possible an appropriate designation of SCIs for the species within the Natura 2000 network as well as the implementation of other relevant mitigation measures. The project area encompasses waters between 5-80 metres depth in the Baltic Sea, in the south-east approximately south of latitude 55° 50' N (in the Sound) and east of longitude 12° E (in Fehmarn Belt) in the southeast, and south of latitude 60^0 20'N (Åland and the Archipelago Sea) in the north.

SAMBAH objective 1 has been to estimate densities, produce distribution maps and estimate abundances of harbour porpoises in the project area. Density and abundance estimates have been produced by season for the whole study area and within country. Distribution maps showing probability of detection have been produced per month while maps showing the spatial variation in density have been produced per season. Estimates of density and abundance are necessary to assess the conservation status of the population and the negative impact of anthropogenic activities such as bycatch. It will also serve as a baseline for possible future surveys to follow up the effects of conservation measures taken. Distribution maps are essential to identify areas of importance and areas with higher risk of conflicts with anthropogenic activities.

SAMBAH objective 2 has been to identify hotspots, habitat preferences, and areas with higher risk of conflicts with anthropogenic activities for the Baltic Sea harbour porpoise. In Swedish waters, these results has been used to identify appropriate areas for protection, and within these areas to suggest appropriate management of anthropogenic activities with known or potential negative impact.

SAMBAH objective 3 has been to increase the knowledge about the Baltic Sea harbour porpoise among policymakers, managers, stakeholders, users of the marine environment and the general public, in the EU Member States bordering the Baltic Sea. This is necessary to reach the ultimate aim of the project, a favourable conservation status of the Baltic Sea harbour porpoise.

SAMBAH objective 4 has been to implement best practice methods for cost efficient, large-scale surveillance of harbour porpoises in a low density area. The implementation of coherent methods throughout the distribution range of the Baltic Sea harbour porpoise aimed at facilitating future monitoring actions in order to follow up the effects of conservations measurements taken on a local, regional, national or transnational scale.

Key deliverables and outputs from the project were estimates of density and abundance of harbour porpoises in the study area, as well as spatial distribution maps of animals in the study area. Deliverables also include discussions on habitat preferences and overlap with anthropogenic activities. Additionally, the work reports and scientific manuscripts

produced, describing the methods and results, are expected to be important documents after the end of the project, together with the non-technical report and the report on important areas for porpoise in Swedish waters.

Description of project consortium
SAMBAH was coordinated by Dr Mats Amundin at Kolmårdens Djurpark AB, and had nine associated beneficiaries in Sweden, Finland, Poland and Denmark. The project also included actions in Estonia, Latvia and Lithuania through subcontractors and in Germany through cooperation with the German Oceanographic Museum. The added value of the SAMBAH partners has been very high. All partners have added their specific expertise, competence and network of contacts to the project, which have been immensely valuable, both for purely technical reasons such as handling C-PODs in the field (anchoring etc.) and estimating the detection function of C-PODs, but also for their local knowledge necessary for conducting fieldwork, and their national contacts which has helped spreading information about the project and gaining approval for project results among a wider group of stakeholders.

Project execution
Essentially, SAMBAH can be said to consist of three phases; preparation, field work and analyses. The preparation phase included preparation of field work such as acquiring permits to deploy equipment, readying equipment and personnel for deployment, preparing the database to receive field data and procurement procedures for external assistance and porpoise click detectors. The field work included a two-year field period of collecting data on harbour porpoise presence using porpoise click detectors and collecting auxiliary data from satellite tagged animals and other methods. The analysis phase included estimation of porpoise density and distribution in the study area, and application of those results to identify suitable areas for protection in Swedish waters.

Fieldwork
In SAMBAH, passive acoustic data on harbour porpoise occurrence were collected for two full years, from May 2011 to April 2013, in waters 5-80 m deep throughout the project area. Porpoise click trains were extracted using algorithms specifically designed to minimise false positives in the Baltic environment. C-PODs were deployed at 304 stations including 16 in German waters. Detectors were deployed in spring 2011, serviced regularly and finally hauled in May-June 2013. The pre-set start and end dates for data collection were 1 May 2011 to 30 April 2013. As expected some C-PODs were lost at sea, most of them likely due to trawling, others due to ships running over buoys or failing anchoring systems; buoys sinking or acoustic releasers failing to release. There were also some initial issues with C-PODs stopping prematurely when switching between the two stacks of batteries. All these factors resulted in loss of data, but still the data recovery rate of 68% is quite good for a project of this size and we consider this a success.

A challenge in SAMBAH has been to determine the detection probability function of the C-POD, i.e. the likelihood that the C-POD will log clicks from porpoises at different distances from the C-POD, hence determining the effective detection area (EDA). This information is necessary for calculating the density and abundance of porpoises from C-POD data. Two complimentary methods were applied for determining the C-POD EDA for the Baltic Sea. 1) Playback trials. When approaching or leaving a C-POD deployed at a SAMBAH station, porpoise-like click trains were transmitted and the distance between the transmitter and the C-POD was recorded. After uploading the C-POD data, the detection function was calculated based on the percentage of the transmitted clicks that was logged at each distance. The trials gave information about the effects of physical

properties of water on the detection probability. 2) Hydrophone arrays. This experiment was carried out by the German COSAMM project. The experiment used a boat equipped with a sophisticated hydrophone array system and allowed it to drift through an area where a matrix of C-PODs was anchored at the bottom. Porpoise tracks were calculated by using click time-of-arrival differences from the hydrophone array and then relate these tracks to the detections by the C-PODs. Auxiliary data necessary to estimate densities were also collected through harbour porpoises provided with acoustic recording devices in Danish waters. The relevant parameters were the proportion of time a harbour porpoise is clicking and how the click rate varies throughout the day.

Analyses

The data from playbacks and the hydrophone array experiment were combined to model the detection probability function of free-swimming porpoises in the Baltic Proper, which was then used in the density estimation together with data from acoustic recorder tagged animals and the C-POD data from the study area. The following general equation was used for the density estimation:

$$\hat{D}_{imd} = \frac{n_{imd}}{T_{imd}\hat{v}_{imd}} \quad (1)$$

where D is density, n the number of click positive seconds (CPS), T the number of seconds of monitoring effort, v the effective detection area (EDA), the hat symbol ^ indicates an estimate and subscripts *imd* indicate that all quantities are for sampling location i in month m and diel phase d.

Results of density and abundance analysis are summarized in the table 1 below, where the estimate for Summer North-Eastern area is believed to represent the size of the Baltic Proper population of harbour porpoise.

Table 1. Density and abundance in the whole study area for winter (November-April) and in the North-Eastern and South-Western part of the Baltic Sea, respectively for summer (May-October). The border between these two subareas is shown in figure 1b.

Season/region	Density (animals/km^2)	95% Lower CI (D)	95% Upper CI (D)	Number of porpoises (N)	95% Lower CI (N)	95% Upper CI (N)
Winter (whole area)	0.06578	0.3323	0.14353	10958	5535	23910
Summer (NE area)	0.00375	0.00060	0.00823	497	80	1091
Summer (SW area)	0.62946	0.39613	1.1894	21390	13461	38024

Analyses of spatial distribution were carried out using General Additive Modelling, and the results showing probability of detection of porpoises during summer (May-October) and winter (November-April) are shown in figure 1a. Investigations on overlap between important areas for porpoises and anthropogenic activities were also carried out. In figure 1b is an example of catches in gillnet fisheries shown together with important areas for

harbour porpoises. The dashed line indicates a proposed delimitation border between a summer cluster of the Baltic Proper porpoise population found the central Baltic Sea and another cluster found in the south-west, with porpoises from the Belt Sea population.

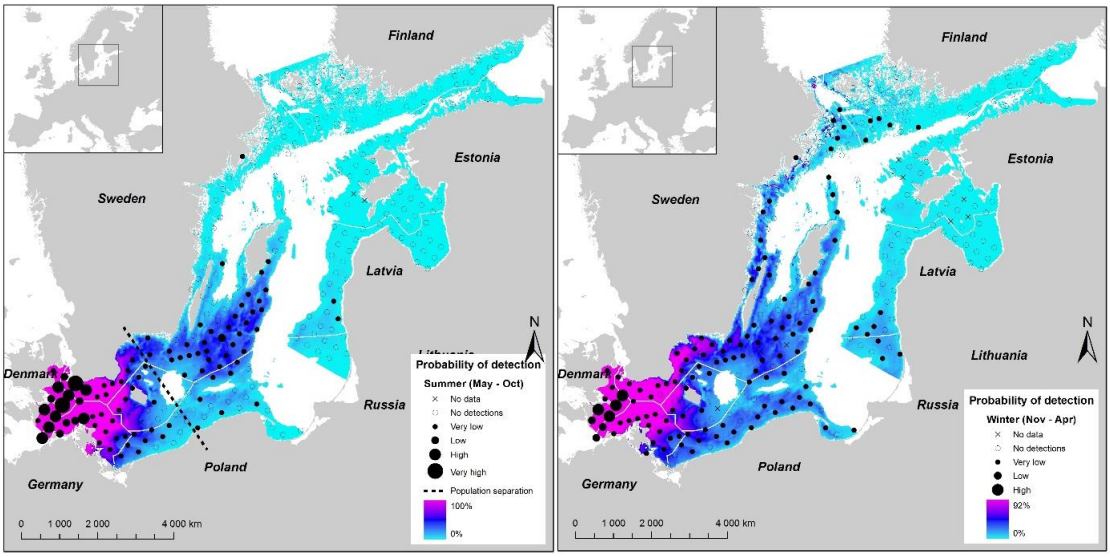

Figure 1a. Probability of detection of harbour porpoise in Summer (May-October) and Winter (November-April).

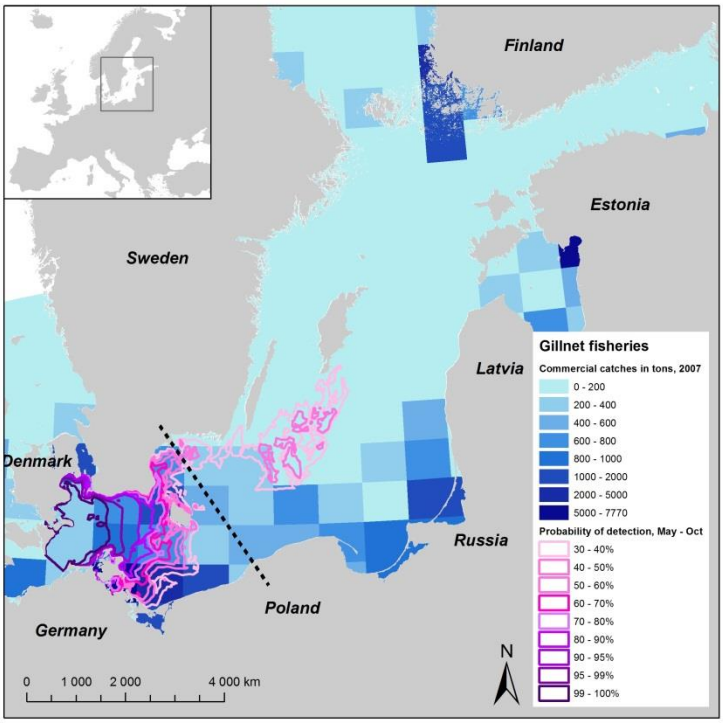

Figure 1b. Catches in gillnet fisheries per ICES square in 2007 shown together with important areas for harbour porpoises. The dotted line indicates the border between the North-Eastern and South-Western part of the Baltic Sea, dividing the two summer population clusters that were identified by SAMBAH.

Dissemination work

The aims of SAMBAH's dissemination activities were to increase public awareness of the Baltic Sea harbour porpoise and to disseminate and promote the SAMBAH results and

their implications for management of the Baltic Sea porpoise population to managers, stakeholders, policymakers and the scientific community.

SAMBAH targeted the general public and users of the marine environment through the project website, public information meetings and press releases, an exhibition about the project in all project languages and German, specific Polish dissemination activities, the Layman's report in all project languages and a non-technical report to managers, stakeholders and policymakers. The exhibition was set up at the three major tourist attractions involved in the project, namely Kolmården Wildlife Park in Sweden, Särkänniemi Adventure Park in Finland and Hel Marine Station in Poland.

Managers, policymakers, stakeholders and the scientific community were targeted through the project website, a workshop at the European Cetacean Society conference, and Polish dissemination, through presenting project results in external databases, and scientific publications, through the Laymans' report and the non-technical report to managers, stakeholders and policymakers, a Swedish workshop for relevant bodies and the end-of-project conference. In addition, SAMBAH was disseminated to managers, policymakers and stakeholders through the arrangement of the project start-up meeting in conjunction with the ASCOBANS Jastarnia group meeting in February 2010, and the participation of national competent authorities as beneficiaries in SAMBAH.

Evaluation of project work

The methodology applied in SAMBAH to survey the abundance and distribution of the Baltic Sea harbour porpoise using static acoustic monitoring, has been successful. In the years that have passed since the project was initiated, the methodology of estimating absolute density and abundance from static passive acoustic data has been developed further, and SAMBAH has played an important role in this development.

By conducting a survey using passive acoustic monitoring for a time period of two years, and by designing this survey to render data suitable for habitat modelling, SAMBAH has given unique insights to the spatio-temporal distribution of porpoises in the Baltic Sea, which could never have been achieved using traditional visual line transect survey methods. In this sense, SAMBAH has been very cost-efficient, considering the amount of survey effort that would have been needed to achieve the same knowledge using traditional methods. The resulting maps fit the data quite well and provide extremely valuable information that will be very useful in the management and conservation of the Baltic Sea harbour porpoise.

The direct conservation benefit from this project is primarily the new knowledge gained, on both abundance and distribution of porpoises in the Baltic Sea. The results on spatial and temporal distribution will allow for designation of Natura 2000 sites for porpoises, or the adding of porpoises on the species lists of relevant existing Natura 2000 sites. This process has already started in Sweden, and Denmark has also been waiting for the SAMBAH results before designating areas for porpoises in the project area, so the process to designate new areas here is expected to start within the near future. The knowledge on distribution will also make it possible to localise conservation measures to the areas where they have the most effect. The abundance estimates achieved in SAMBAH will serve as a baseline in future surveys, necessary for the evaluation of population status and the effects of conservation and mitigation measures taken. In the longer term we hope that these

actions will allow the population to recover, and significantly improve the conservation status of the Baltic Sea harbour porpoise.

The SAMBAH results will also have impact on the development of Baltic regional policies, such as the further development of indicators in the Marine Strategy Framework Directive (MSFD), the follow-up of the ASCOBANS Recovery Plan for Baltic Harbour Porpoises (the Jastarnia plan) due to take place in spring 2016, and the HELCOM Baltic Sea Action Plan, as well as national policies in the member states around the Baltic Sea.

3. Introduction

SAMBAH targets the Baltic Sea population of harbour porpoise (*Phocoena phocoena*). This population is small and has been drastically reduced during the last decades. The species is listed in Annexes II and IV of the EC Habitats Directive as well as in the national red lists of several Member States. When SAMBAH started, the conservation status of the species in combination with a complex of threats necessitated improved methodologies for collecting data on population size and range, and fluctuations over time. The overall objective of the project has been to launch a best practice methodology for this purpose and to provide data for a reliable assessment of distribution and habitats of the species. This would make possible an appropriate designation of SCIs for the species within the Natura 2000 network as well as other relevant mitigation measures. The project area encompasses waters between 5-80 metres depth in the Baltic Sea, approximately south of latitude 55° 50' N (in the Sound) and east of longitude 12° E (in the Fehmarn Belt) in the southeast, and south of latitude 60^0 20'N in the north.

SAMBAH objective 1 has been to estimate densities, produce distribution maps and estimate abundances of harbour porpoises in the project area. Density and abundance estimates and have been produced by season for the whole study area and within country. Distribution maps showing probability of detection have been produced per month while maps showing the spatial variation in density have been produced per season. Estimates of density and abundance are necessary to assess the conservation status of the population and the negative impact of anthropogenic activities such as bycatch. It will also serve as a baseline for possible future surveys to follow up the effects of conservation measurements taken. Distribution maps are essential to identify areas of importance and areas with higher risk of anthropogenic conflicts.

SAMBAH objective 2 has been to identify hotspots, habitat preferences, and areas with higher risk of conflicts with anthropogenic activities for the Baltic Sea harbour porpoise. In Swedish waters, these results has been used to identify appropriate areas for protection, and within these areas to suggest appropriate management of anthropogenic activities with known or potential negative impact.

SAMBAH objective 3 has been to increase the knowledge about the Baltic Sea harbour porpoise among policymakers, managers, stakeholders, users of the marine environment and the public, in the EU Member States bordering the Baltic Sea. This is necessary to reach the ultimate aim of the project, a favourable conservation status of the Baltic Sea harbour porpoise.

SAMBAH objective 4 has been to implement best practice methods for cost efficient, large scale surveillance of harbour porpoises in a low density area. The implementation of coherent methods throughout the distribution range of the Baltic Sea harbour porpoise aimed to facilitate future monitoring actions to follow up the effects of conservations measurements taken on a local, regional, national or transnational scale.

The expected longer term results of SAMBAH are firstly to have Natura 2000 sites in the Baltic Sea designated for harbour porpoises, which is already under way for example in Sweden. Secondly, results should be used to guide relevant conservation actions and mitigation measures within but also outside protected areas. In the even longer term we hope that these actions will allow the population to recover, and significantly improve the conservation status of the Baltic Sea harbour porpoise.

4. Administrative part

4.1 Description of the management system

Description of working method and project phases

SAMBAH was coordinated by Dr Mats Amundin at Kolmårdens Djurpark AB, assisted by project managers Dr Julia Carlström and Ida Carlén at AquaBiota Water Research. Scientific issues concerning the estimation of density and the modelling of the distribution of porpoises were discussed within working groups which consisted of, except for the project coordinator and managers, relevant representatives from project associated beneficiaries and subcontractors, for example experts from Aarhus University, Nick Tregenza from Chelonia Ltd (manufacturer of the porpoise click detectors used) and Dr Len Thomas from St Andrews University (subcontracted for density estimation) and experts from the German cooperative partner German Oceanographic Museum. In these working groups, all important decisions on methodology were taken. Administrative management was primarily carried out by AquaBiota under the supervision of the project coordinator.

Essentially, SAMBAH can be said to consist of three phases; preparation, field work and analyses. The preparation phase included preparation of field work such as acquiring permits to deploy equipment, readying equipment for deployment (action A1), and ensuring all sea-going personnel had necessary training (A3), preparing the database to receive field data (A4) and procurement procedures for external assistance and porpoise click detectors (A5-A9). Preparatory actions also included action A2 Ensuring comparability, the aim of which was changed once it was clear that the same porpoise detectors would be used throughout the study area. The field work included a two-year field period of collecting data on harbour porpoise presence using porpoise click detectors (actions C1a-C1e) and collecting auxiliary data using satellite tagged animals and other methods (C2 and A2 after the change of this action). The analyses phase included estimation of porpoise density (action C3) and distribution (C4) in the study area, and application of those results to identify suitable areas for protection in Swedish waters (C5).

Presentation of project beneficiaries

An organogram of the project management is shown in figure 2. Project coordinator Mats Amundin at Kolmårdens Djurpark AB has extensive experience in working with harbour porpoises and underwater acoustics, and is an adjunct professor at Linköping University in Sweden. Dr Amundin was, together with Cinthia Ljungqvist at Kolmårdens Djurpark,

responsible for the Swedish fieldwork in SAMBAH, and Daniel Wennerberg, also at Kolmårdens Djurpark, was responsible for the handling of all C-POD data from the project. AquaBiota was subcontracted at the start of the project to run the project administration, where Julia Carlström, Ida Carlén, and Mari Peters worked in close cooperation with Kolmården. AquaBiota has also been deeply involved in the technical management of SAMBAH.

When SAMBAH started, the Swedish EPA was the competent authority for the Habitats Directive and for both terrestrial and marine species in Sweden and was an associated beneficiary in SAMBAH. In 2011 a new agency; the Swedish Agency for Marine and Water Management, SwAM, was created, and replaced the Swedish EPA as the competent authority for marine species and habitats, and as a beneficiary in the project. The SAMBAH contact person at SwAM is Erland Lettevall, and the administrational/financial contact is Mathias Lööw.

Turku University of Applied Sciences, TUAS, was the national SAMBAH coordinator in Finland and Olli Loisa the national contact person. TUAS was responsible for C-POD deployments and information meetings in Finland. Penina Blankett was the person responsible for SAMBAH at the Finnish Ministry of Environment, YM, and Kai Mattsson was responsible for the actions concerning Särkänniemi's part of the project. TUAS were responsible for dissemination actions in Finland, with the participation of YM and Särkänniemi.

University of Gdansk, UG, was the national SAMBAH coordinator in Poland and Iwona Pawliczka was the national contact person. UG was responsible for the servicing of the C-PODs in Polish waters, while the Institute of Meteorology and Water Management, IMGW, was responsible for deploying and retrieving the equipment. The SAMBAH contact person at IMGW was Wlodzimierz Krzyminski. The Chief Inspectorate for Environmental Protection, CIEP, was responsible for arranging the Polish information meeting and the SAMBAH contact person there was Dorota Radziwiłł.

Aarhus University, AU, was the national SAMBAH coordinator in Denmark and Jonas Teilmann was the national contact person. AU was responsible for C-POD deployments in Danish waters, and collection of auxiliary data. AU has participated in all project meetings arranged by the project managers. The Nature Agency, Denmark, NST, was responsible for Public information meetings in Denmark. The contact person at NST was Maj Friis Munk.

Project meetings and workshops

The project management have arranged two project meetings per year throughout the project life-time. During March or April each year a meeting has been arranged in conjunction with the annual conference of the European Cetacean Society. Since most project personnel participate in this conference, this arrangement has minimised travel, which has both environmental and time-saving benefits. These spring project meetings have been limited to one day but has allowed for working meetings to be held during the conference days. During September or October, project meetings have been arranged at the premises of beneficiaries, with the exception of autumn 2012 when project management held separate meetings over Skype with national project coordinators. In addition to the regular project meetings, working group meetings have been arranged both as physical meetings in conjunction to project meetings and through Skype, when needed. Working group meetings have been arranged to discuss specific issues arising during project implementation, and the number of meetings per year has varied throughout the

project life-time. Two physical workshops have been arranged. The first one was arranged at Kolmården Wildlife Park before the start of the field period and dealt with practical anchoring methodology. The second was arranged at the premises of AquaBiota in Stockholm to handle a problem that had arisen with C-PODs during the field period. At this workshop, Nick Tregenza from Chelonia provided training to all field teams to solve the problem for each individual C-POD in the field.

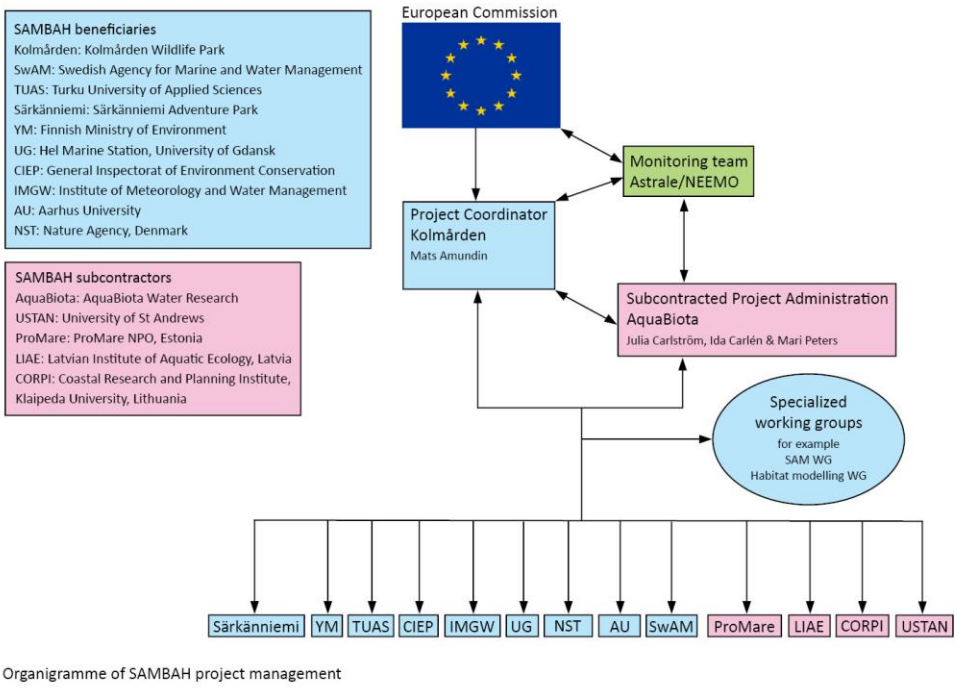

Figure 2. Organogram of the project management and organisation in SAMBAH.

Amendments to the Grant Agreement

Two requests have been submitted to the Commission for amendments to the Grant Agreement of SAMBAH. The first was submitted in October 2011 due to the change of legal status of four SAMBAH beneficiaries.

- The associated beneficiary Danish Forest and Nature Agency was, as of 1 January 2011, merged with the Agency for Spatial and Environmental Planning to form the new organization the Nature Agency, Denmark, NST, which is an institution within the Danish Ministry of the Environment.

- The associated beneficiary National Environmental Research Institute, NERI, was integrated into the Department of Biosciences, Aarhus University, AU.

- The associated beneficiary Swedish Environmental Protection Agency, Swedish EPA, transferred the role as beneficiary of SAMBAH to the new Swedish Agency for Marine and Water Management, SwAM, which, as of 1 July 2011, took over many of the responsibilities concerning marine and water management from the Swedish EPA and the Swedish Board of Fisheries. Also, the role as co-financier of SAMBAH was transferred from the Swedish EPA to SwAM.

- The coordinating beneficiary Kolmårdens Djurpark AB was, as of 1 January 2011, merged with its sister company Vildmarkshotellet AB, to form Kolmårdens Djurpark AB, with new legal registration number and VAT number.

This request for an amendment was granted and the Supplementary Agreement no 1 to Grant Agreement was signed on 7 January 2012.

The second request for amendment to the Grant Agreement was submitted in November 2013 and contained three parts.

- A request for budget modification, where the total project budget remained unchanged but funds were moved between cost categories.

- A request to postpone the project end date for nine months until 30 September 2015.

- A request for modification of the status of SwAM within the project. SwAM had previously been listed as both a project beneficiary and a co-financier in the project, but with this change SwAM was listed only as a project beneficiary with an own contribution that exceeded their costs in the project.

This request for amendments was granted and the Supplementary Agreement no 2 to Grant Agreement was signed on 5 March 2014.

Partnership agreements
Partnership agreements were submitted to the Commission with the Inception report in October 2010.

4.2 Evaluation of the management system

The project management process and problems encountered
The project management process in SAMBAH, with Mats Amundin at Kolmården as the project coordinator and Julia Carlström and Ida Carlén at AquaBiota as project managers has worked well. There has been regular communication between AquaBiota and Kolmården, mostly through Skype and phone but also physical meetings. Administrative decisions has mainly been taken within this small project management group, while for technical discussions representatives from other beneficiaries have been engaged in specialised working groups. The composition of the working groups has differed depending on the current subject and the area of expertise for different persons, which has proven to be highly functional. The intervals between project meetings have been well balanced, and with working group meetings as needed in between, project work has flown smoothly.

Problems encountered have primarily consisted of time-related issues. The budgeted amount for the administration and project management carried out by AquaBiota has not been sufficient, especially not since it was discovered that Kolmården cannot deduct VAT for services and items purchased, and Kolmården has contributed additional own funding to cover these costs. Also, many project beneficiaries have underestimated the time needed for project administration, and have had problems in keeping up with financial reporting deadlines.

Partnerships and their added value
The added value of the SAMBAH partners has been very high. All partners have added their specific knowledge, competence and network of contacts to the project, which has been immensely valuable, both for purely technical reasons such as handling C-PODs in the field (anchoring etc.) and estimating the detection function of C-PODs, but also for their local knowledge necessary for conducting fieldwork, and their national contacts which has helped spreading information about the project and gaining approval for project results among a wider group of stakeholders.

No significant deviations from the arrangements contained in the partnership agreements have occurred.

Communication with the Commission and the Monitoring team
The communication with the monitoring team, primarily Ms Camilla Strandberg-Panelius at Astrale/NEEMO, has worked very well, and has been of great benefit to the project beneficiaries. The communication with the Commission representatives, especially the financial desk officer and the technical desk officer, has also worked well. At times, project representatives have communicated directly (although always with the project monitor in cc) with desk officers at the Commission, which has simplified the process, as opposed to going through the Monitoring team at all times. The project visit by the technical and financial desk officers together with the monitor took place on 13-14 June 2013 at Kolmården, and the visitors had the opportunity to go out and visit one of the SAMBAH stations at sea.

Monitoring visits has taken place at the coordinating beneficiary each year. Additionally, in November 2012 the monitor together with representatives from the coordinating beneficiary visited UG and IMGW in Gdansk and Gdynia, Poland, and in July 2011 the monitor visited TUAS in Finland.

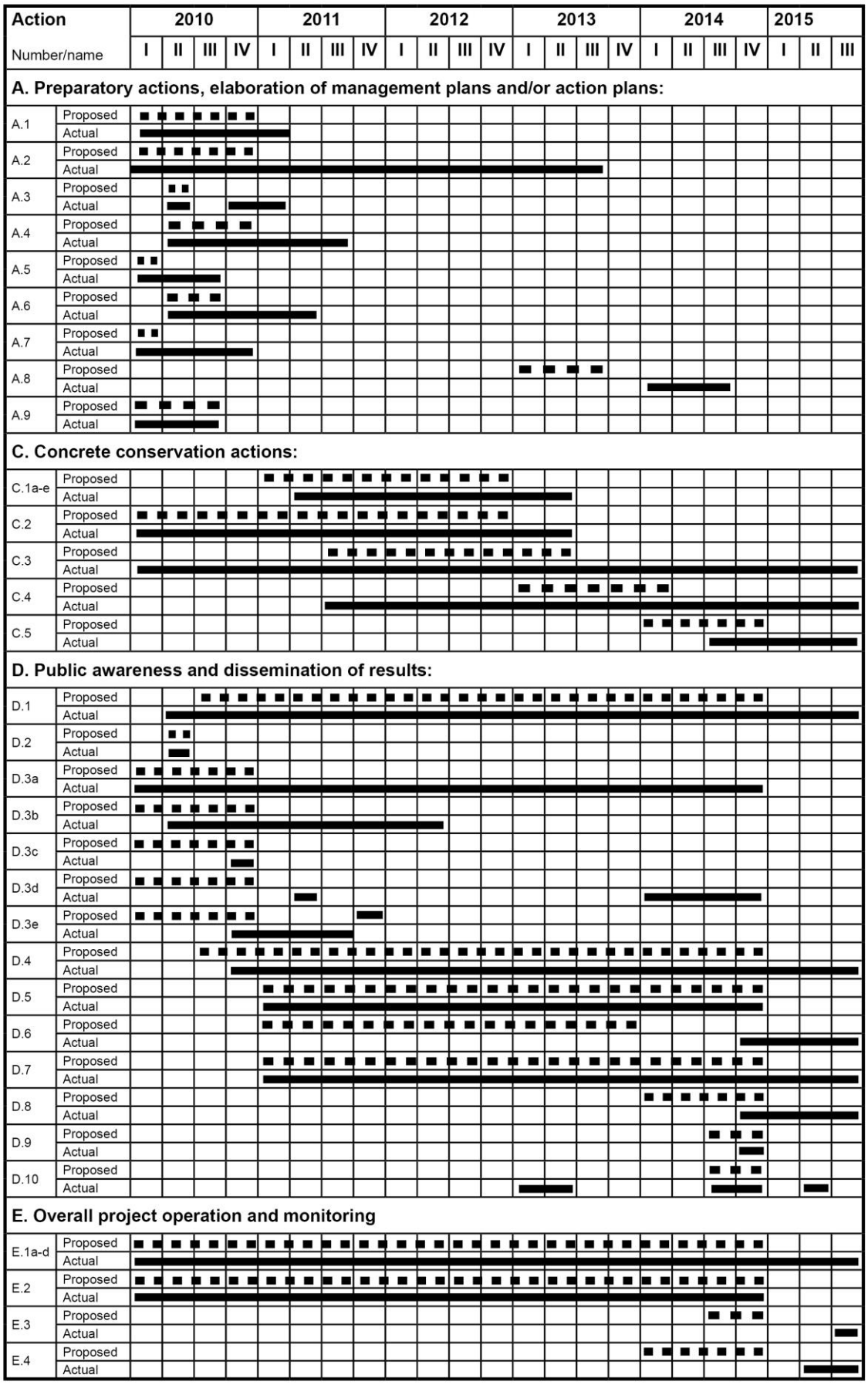

Figure 3. Gantt chart of proposed and actual timing of SAMBAH project actions.

5. Technical part

5.1 Technical progress

In the following, the SAMBAH preparatory and concrete conservation actions are described in the order of the proposal. Activities undertaken and outputs achieved are described together with problems encountered and perspectives for continuing the action after the end of the project, when applicable. The Gantt chart in figure 2 gives an overview of the proposed time plan for project actions and the actual time for implementation.

Action A.1 Setting up data collection logistics

In this action, practical preparations for field work in actions C1a-e were carried out. Permits for deployment of click detectors were applied for and equipment for field work was prepared.

General preparations for field period
Practical preparations for the field period included the purchasing of C-PODs (see action A9), batteries for C-PODs and anchoring equipment, the assembly of anchoring systems, and procurement of suitable vessels.

After the decision of selecting one type of SAM device for the project, a SAM working group with the foremost experts in the project was created to decide on the most appropriate device. SAM specifications were put together and a call for tenders was made in common for the whole project. After careful consideration the C-POD from Chelonia Ltd was chosen to be used in SAMBAH. The C-POD is well known and has already been used in several scientific studies. The price was also better than for the alternative detectors. A report describing the C-POD is available in annex 7.2.4.

Setting up positions and permits to deploy SAM units
In most of the SAMBAH countries, permits from national authorities were needed for the C-POD deployment. The process of identifying the final positions for deployment of porpoise detectors was as follows:

One grid with primary and one grid with secondary positions were identified within the project area in depths between 5-80 metres. In the first place, permits were requested for the primary positions. In some cases, national authorities would not give permission to deploy on a primary position. If a primary position could not be accepted, for example due to being placed in a shipping lane or a restricted military area, one of the up to four neighbouring secondary positions was randomly selected to replace it. However, systematically moving a large number of stations considerable distances away from anthropogenic activities that may influence porpoise distribution, such as shipping lanes, would compromise the random design, which in turn may affect density estimates. To avoid this scenario, in some cases primary positions were instead moved a short distance, for example to just next to the shipping lane. In those cases positions were moved < 2 km from the primary position.

In all cases where a primary position was not accepted, this procedure allowed finding an alternative position. The final 304 positions are shown in figure 4. The process of obtaining permits in all countries where this is necessary was completed by the start of the field period in April 2011. For more details on the design of the field experiment see the report in annex 7.2.2.

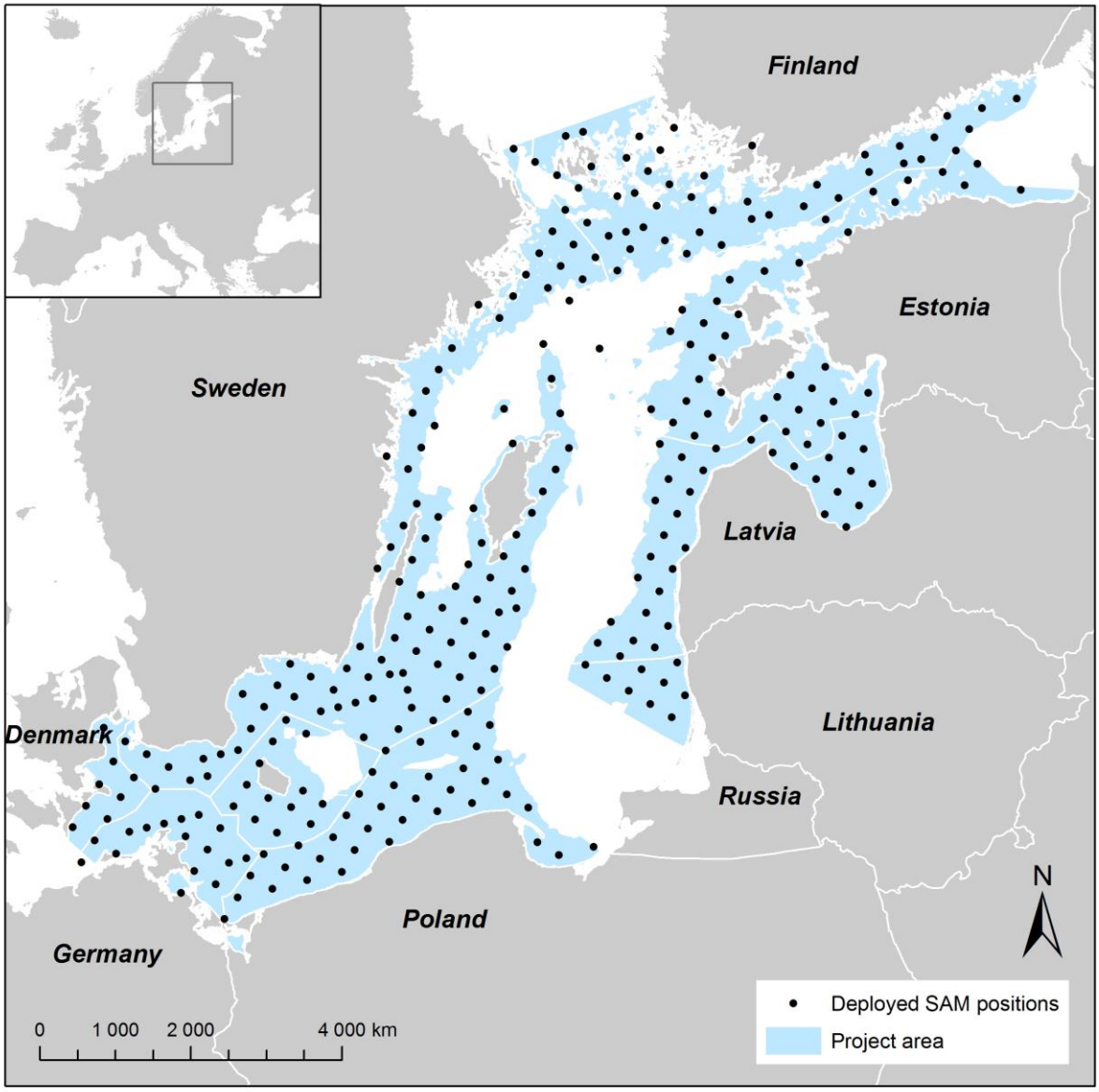

Figure 4. Final positions of the 304 SAMBAH stations.

In Finland, the Navy, maritime authorities, frontier guard and relevant ministries were contacted, and permits were achieved without many problems. Regional authorities and other relevant bodies (e.g. fisheries) were contacted and informed about SAM deployment.

In Sweden, 8 County Administrative Boards, the Swedish Board of Transportation, the Swedish Maritime Office and the Swedish Armed Forces were contacted.

In Denmark acoustic releasers was used, placed on the bottom of the sea without surface markers. In principle this does not require permission. However, to ensure general knowledge about the project and the positions for SAM deployment, the Maritime

Authorities were asked for comments and an official permission, which was received without problems.

In Poland, three Maritime Offices and the Ministry of Environment had to give permits for the C-POD deployments.

In Estonia, no specific permits were needed for deploying C-PODs. The Estonian Maritime Administration required information about location of obstructions that can affect marine traffic, however, there were no such obstructions from the SAMBAH C-PODs deployed in Estonian waters since all C-PODs were deployed using submerged systems. The Estonian Navy was informed of the project and positions of SAM stations were sent to them.

In Latvia the responsible authorities were informed, i.e. the State Environmental Service and the Latvian Maritime Administration, as well as the Navy and the Coast Guard. There were no regulations calling for any official permits for deployment of scientific equipment.

In Lithuania, Klaipeda State Sea Port Authority, the Lithuanian Maritime Safety Administration, Cost Guards, Navy and Lithuanian State Pisciculture and Fisheries Research Centre were informed about the deployment of SAM devices. Permission had to be obtained from the Sea Port Authority for a single C-POD position situated in the main shipping lane in front of Klaipeda Sea port.

Anchoring
On 2-3 August 2010, an anchoring workshop was held in Kolmården, Sweden, with participants from all national field teams except the Finnish team. The goal of the workshop was to test and evaluate different types of anchoring systems for SAM units, with the aim of identifying suitable systems for different anchoring conditions. Anchoring of the C-PODs was done differently in different part of the study area, both due to budgetary restrictions and local conditions such as bottom complexity and the prevalence of bottom trawling. In Sweden the majority of positions were deployed with surface marker buoys (figure 5a) but some positions were deployed using acoustic releasers (figure 5c) or the “stealth system” (figure 5d). In the Baltic States Estonia, Latvia and Lithuania, all C-PODs were anchored using the “stealth system” using two anchors with a submerged float-line in between that can easily be dragged up for servicing (figure 5d). In Finland and Denmark the majority of positions used acoustic releasers (figure 5c) and in Poland a “trawl resistant” system for anchoring was developed and used with great success (figure 5b).

This action was originally foreseen to be finished in time before 1 January 2011, since this was the original date for C-POD deployment. However, due to the early formation of ice in the winter 2010-11, the start of the data collection was postponed to 1 May 2011 and C-POD deployment was mainly carried out in April 2011. The preparations in this action were slightly prolonged due to this. In general, no large technical obstacles were encountered. In some countries the process of obtaining permits took longer than expected but in all cases the procedure was finished by the start of the field period.

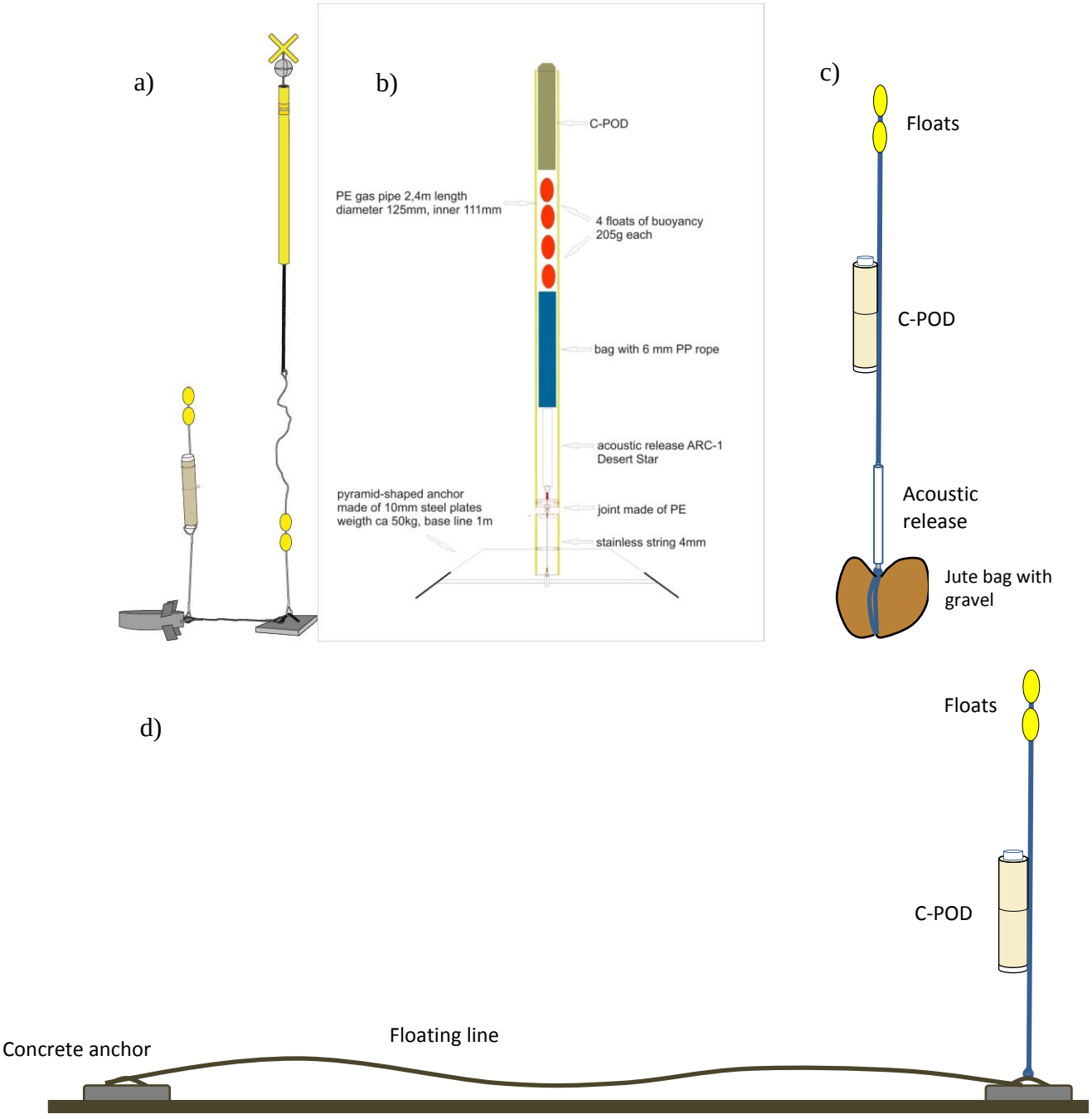

Figure 5. Different types of anchoring set-ups used in SAMBAH. a) Achoring with surface buoy, b) Polish "trawl resistant" anchoring, including acoustic releaser, c) anchoring with acoustic releaser and d) Estonian "stealth" anchoring without surface marker, requiring grapple for recovery.

Action A.2 Ensuring comparability

In this action, data collection and analyses were carried out to determine the detection function of the C-PODs, which was necessary for the density estimation in action C3. During the first months of the project, it was decided that only one type of SAM device should be used to collect data. The reason was purely scientific since the use of several types of SAM devices may increase the variance in the resulting density and abundance estimates. This change was considered acceptable in the letter from the Commission dated 8 July 2010. Since this change was accepted, the activities in this action focused on the task of determining the detection probability function of the C-POD, and the Commission has been informed of this change in previous project progress reports.

Since the choice of SAM device was made, the SAM working group activities have focused on the task of determining the detection probability function of the C-POD, i.e. the likelihood of that the C-POD will log porpoise clicks at various distances from the C-POD, hence determining the effective detection area (EDA). This information is necessary for calculating the density and abundance of porpoises from C-POD data in action C3. The following two complimentary methods were applied for determining the C-POD detection probability function for the Baltic harbour porpoise:

1) Playback trials. When approaching or leaving a C-POD deployed at a SAMBAH station, porpoise-like signals were transmitted and the distance between the transmitter and the C-POD was recorded using GPS. After downloading the C-POD data, the detection function was calculated based on the percentage of recorded playback clicks at each distance re. to the transmitted clicks. The trials gave information about the effects of physical properties of the water on the detection probability function. The advantage of the method is that it could be carried out throughout the project area during all seasons. However, the transducers used for the playback were omni-directional, and hence these recordings did not give information on how porpoise behaviour or echolocation click directionality may affect the C-POD detection function. The aim was to carry out playbacks at most C-POD positions once per season (summer/winter), which unfortunately could not be met; however, enough data for these analyses were collected. The purpose of this method was to achieve data on the detection probability function of C-PODs in the Baltic Proper where the density of porpoises is not high enough to carry out field experiments with free-swimming porpoises. The methodology for analyses of playback data was developed by AU and GOM together with USTAN.

2) Hydrophone arrays. This experiment was carried out by the COSAMM project. COSAMM was led by Jens Koblitz at GOM, who also coordinates the "German SAMBAH project". The experiment had a boat equipped with a sophisticated hydrophone array system to drift through an area where a matrix of C-PODs was anchored at the bottom. Porpoise tracks were calculated by using click time-of-arrival differences (TOADs) from the hydrophone array and then relate these tracks to the detections by the C-PODs. The advantage of this method is that it gives the detection function for wild free swimming harbour porpoises, although not within the SAMBAH area. COSAMM originally planned to run this experiment in Wales during summer 2012. However, unfortunately and unusually for the area, only bottlenose dolphins were present during the study period, which scared the porpoises away. Therefore the experiment was repeated in the summer of 2013, this time in the Great

Belt, just outside Kerteminde, Denmark. Here the porpoise density is high, and there were no bottlenose dolphins that interfered. A lot of array and CPOD recordings were obtained, but since the detection function is related to the distance of a single porpoise relative to the CPOD, only sequences with single animals were selected for analysis. A detection probability function based on clicks recorded within a one-second time window was calculated, to be used in the later population density analyses.

The data from playbacks and the hydrophone array experiment were combined to model the detection probability function of free-swimming porpoises in the Baltic Proper (see work reports from USTAN, annexes 7.2.8-7.2.13), and the results were used in the density estimation in action C3.

This Action was initiated in accordance with the project time plan, but continued throughout the data collection period and into the third quarter of 2013 (approximately May 2011 – August 2013).

Action A.3 Sea security course

In this action, sea safety courses were arranged for seagoing personnel participating in action C1a-e.

A sea security course was arranged for sea-going SAMBAH personnel on Öckerö in Sweden on May 17-18, 2010. The course was given by Öckerö Maritime Centre on the Swedish west coast, with 6 participants from Denmark (1), Finland (3) and Sweden (2). The course included emergency radio communication, emergency flares, first aid, ship fire extinguishing, and in-sea testing of life rafts and survival suits. The course was aimed at preparing the teams for work on board a variety of vessels, such as coast guard ships, fishing boats and research vessels. Among the teachers were a professional fireman, and an ambulance nurse, ensuring that the quality of the teaching was very high.

The subcontracted organisations in Estonia, Latvia and Lithuania already had the necessary education, and did therefore not need to take part in the course.

A separate sea security course was arranged for the sea-going personnel at UG during October 2010. During March 2011 all the IMGW sea-going personnel went through a safety course on individual rescue techniques provided by Marine Academy in Gdynia. A new employee of the Swedish team attended a sea safety course at Öckerö Maritime Centre in spring 2011.

This Action was initiated in accordance with the project time plan in the second quarter of 2010, but it took slightly longer than expected to ensure all seagoing personnel had the necessary training, and the action was finished in the first quarter of 2011.

Action A.4 SAM database
In this action, the database to receive all SAM data from action C1a-e was set up. The SAM database was set up on an FTP server belonging to Kolmården, and data was entered continuously by national field coordinators during and directly after the field period. The database is also were processed data was stored in preparation for density estimation.

This Action was initiated in accordance with the project time plan in the second quarter of 2010. The database was due to be finished in December 2010 but was delayed due to prolonged but necessary discussions regarding different needs for metadata, both at SAMBAH progress meetings and at SAM working group meetings. These issues were resolved, and the database could be implemented and put to use during the third quarter of 2011, in time for receiving the first C-POD data from the field.

Action A.5 Contracting administration

In this action, procurement was made by Kolmården for the subcontractor to assist Kolmården with project administration in action E1.

Since the administrative contractor would have to work closely with KD's administrative staff, for the contractor to be fluent in Swedish, besides English, which is the official language in SAMBAH, was imperative. Hence the tender was only written in Swedish, and thus largely limited to Swedish bids. The tender was sent to three organisations with experience of administration of EU project in conservation: Nordeconsult, Keep Sweden Clean and AquaBiota Water Research, all based in Sweden. Only one tender was received, from AquaBiota, which was judged to be satisfactory by Kolmården, and AquaBiota Water Research was chosen to carry out the administrative tasks in the project, in close cooperation with Kolmården. Due to finish during the first quarter of 2010, this action was completed slightly behind schedule and the contract was signed in September 2010.

Supporting documentation for this tendering procedure can be found in annex 8.6.

Action A.6 Contracting analyses

In this action, procurements were made by Kolmården and the Swedish EPA for the subcontractors to carry out actions C3 and C4.

A call for tenders on Action C3 (Calculating density) was announced on the international European Cetacean Society mailing list. One tender was received from the Centre for Research into Ecological and Environmental Modelling, University of St Andrews (USTAN), UK. The tender was satisfactory and Kolmården and USTAN signed the contract in April 2011.

After correspondence with the Commission in November 2010, the technical responsibility and the budget earmarked for Action C4 (Habitat modelling) was transferred from Kolmården to the Swedish EPA. This change was also implemented in the request for budget modification submitted in November 2013. It should be noted that at the time for procurement of the habitat modelling, AquaBiota had already started to be involved as subcontractor for the project administration (see action A5 and E1). However, AquaBiota was actively excluded from the discussions and preparations prior to tendering. In December 2010, the Swedish EPA contracted AquaBiota Water Research through an existing framework contract. As of 1 July 2011, SwAM had taken over all responsibilities of the Swedish EPA concerning the marine environment, including the framework contract and the contract for Action C4 with AquaBiota.

This Action was initiated in accordance with the project time plan in the second quarter of 2010. Completion was planned to take place during the third quarter but was delayed to the second quarter of 2011. The slight delay in signing the contracts did not affect the project time schedule negatively.

Supporting documentation for the procurements of calculation of density and habitat modelling can be found in annex 8.6.

Action A.7 Contracting Baltic States

In this action, procurement was made by Kolmården for the subcontractors to carry out action C.1e.

Subcontractors for field work and public information meetings in Estonia, Latvia and Lithuania were chosen after a public tendering procedure. The call for tenders was announced on the international European Cetacean Society mailing list and satisfactory tenders were received from all countries. By 1 November 2010, all contracts for Estonia, Latvia and Lithuania were signed. For information on subcontractors see table 2.

Table 2. Subcontractor and contact person for each of the three Baltic states.

Country	Organisation	Contact person
Estonia	Pro Mare NPO	Ivar Jüssi
Latvia	Latvian Institute of Aquatic Ecology	Anda Ikauniece
Lithuania	Coastal Research and Planning Institute, Klaipeda University	Darius Daunys

This Action was initiated in accordance with the project time plan in the first quarter of 2010. Completion was planned to take place during the same quarter, i.e. in March 2010, but was delayed to the fourth quarter of 2010. The delay in signing the contracts did not affect the project time schedule negatively.

Supporting documentation for the procurements of subcontractors in the Baltic States can be found in annex 8.6.

Action A.8 Contracting consultant

In this action, procurement was made by SwAM for the consultant to carry out action C5.

On 27 March 2014, SwAM issued procurement for the commission of identifying suitable areas for protection of harbour porpoises in Swedish waters. The procurement was carried out through a direct tendering procedure according to national public procurement rules, and was handled by the legal expert on tendering at SwAM, only involving the SAMBAH case administrative officer at SwAM for describing the task in question in the tendering documentation, to avoid conflict of interest. A contract with AquaBiota Water Research was signed on 27 June 2014.

This action was started a full year behind schedule, in March 2014 and was finished in June 2014, also one year behind schedule. The delay in signing the contract did not affect the project time schedule negatively.

Supporting documentation for this tendering procedure can be found in annex 8.6.

Action A.9 Purchasing SAM devices

In this action, procurement was made for the SAM units purchased by the Swedish EPA. As the Swedish EPA is a public agency, a separate procurement had to be made for the SAM units purchased by them. This was done using the same specifications as for the common project call for tenders (see action A1). The procurement was finalised in September 2010 and the C-POD from Chelonia Ltd was chosen as for the rest of the project.

This action was started and finished on time according to the project time plan.

Supporting documentation for this tendering procedure can be found in annex 8.6

Action C1 a-e SAM and basic analyses

In actions C1 a-e, passive acoustic data on harbour porpoise occurrence were collected for two full years, from May 2011 to April 2013, in waters 5-80 m deep throughout the project area. Data were uploaded to a common project database (action A4) and porpoise click trains were extracted using an algorithm specifically designed to minimise false positives in the Baltic environment.

In SAMBAH, C-PODs were deployed at 304 stations (see Fig. 4) including 16 in German waters, i.e. outside the LIFE-project. Detectors were deployed in spring 2011, serviced regularly and finally retrieved in May-June 2013. The pre-set start and end dates for data collection (after the initial delay due to the early setting of the ice in the winter of 2010-2011) were 1 May 2011 to 30 April 2013 (Fig. 6). Playback trials were carried out during the fieldwork period (see action A2). For a detailed description of the fieldwork see the work report in annex 7.2.3.

As expected some C-PODs were lost at sea, most of them likely due to trawling, others due to shipping or failing anchoring systems; buoys sinking or acoustic releasers failing to release. There were also some issues with C-PODs stopping prematurely because they failed to switch from the primary to the secondary stack of batteries. All these factors resulted in loss of data, but the data recovery rate of 68% is quite good for a project of this size and we consider this a success (Fig. 6).

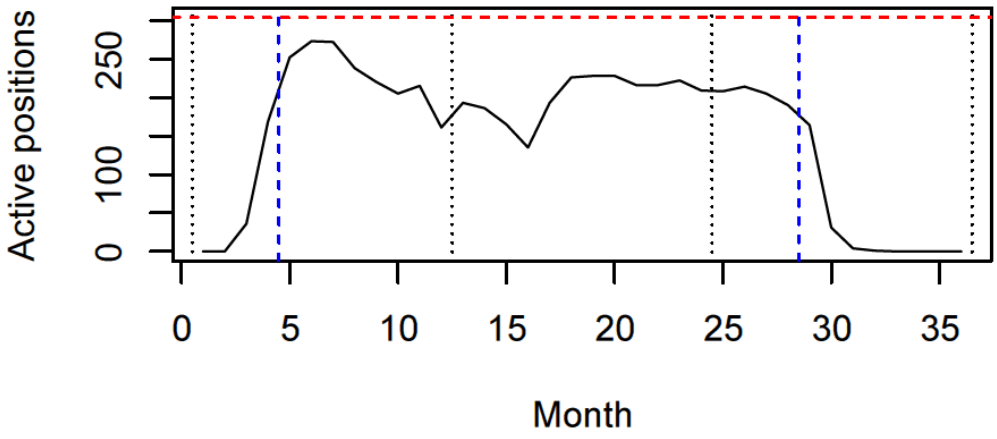

Figure 6. The number of positions with actively logging C-PODs during each month of the SAMBAH field period. Vertical black dotted lines indicate year boundaries; the time period shown is 1 Jan 2011 to 31 Dec 2013. Vertical blue dashed lines indicate the start and end of the SAMBAH field period, from 1 May 2011 to 30 April 2013. Horizontal red dashed line show the maximum number of positions (304).

Data and metadata have been continuously uploaded by project partners, the German cooperating partner and the Baltic states subcontractors to the SAMBAH database on the Kolmården FTP server, and data has been processed and quality controlled by the SAMBAH team, primarily Daniel Wennerberg at Kolmården. To minimize the false positive rate in low density areas (where the impact would be relatively higher than in high-density areas), an algorithm called “Hel 1” specifically designed for the Baltic environment, was developed by Chelonia Ltd together with SAMBAH personnel. Additionally, visual validations of click trains identified as harbour porpoise click trains by the “Hel 1” algorithm in the analysis software cpod.exe was carried out for files where

the detection positive minutes (DPM) were less than 60 per year. All data files have then been cropped to remove playback and servicing events, resulting in 65% of the 608 years of data being available for use for density estimation.

The quality control of CPOD data and metadata has been a larger and more complicated undertaking than was previously expected, and has taken more time than was originally planned for. However, the main bulk of data processing was completed during spring 2014, supplemented by some minor corrections in the summer of 2014. The final version of the data was then delivered to USTAN for the density and abundance calculations. For a detailed description of data validation and data logistics, see the work reports in annexes 7.2.5 and 7.2.6.

A problem encountered during the field period was that some C-PODs stopped because they failed to switch from the primary to the secondary stack of batteries. A workshop was arranged at the premises of AquaBiota in Stockholm, where Nick Tregenza from Chelonia Ltd provided training to all field teams to solve the problem for each individual C-POD in the field. This effort was a success and there were no further problems of this kind.

This action was delayed for four months due to the early setting of the ice in the winter of 2010-2011 which prevented C-POD deployment in December as had been planned. Also, the data logistics took slightly longer than expected. Hence, the action finished approximately six months later than expected.

Action C.1a SAM and basic analyses in Sweden

There were a total of 99 SAMBAH C-POD positions within the Swedish EEZ. All positions were deployed in April – June 2011, and recovered after 30 April 2013. For the main part of the field period, two trawlers were contracted for servicing the offshore positions, but for the last two trips the Swedish research vessel R/V Skagerrak was used. For the coastal positions a smaller boat owned by Kolmården was used.

Some problems were encountered during the Swedish field work. There were problems with the acoustic releasers from Desert Star not responding and hence not releasing equipment to the surface. This was most likely due to the batteries of the listening circuitry being worn out, despite the deployment time being within the manufacturer‘s specifications. Other lost positions were close to shipping lanes, so the buoys might have been run over by ships and sunk, and some may have been trawled up, although this could only be confirmed at one Swedish position. There, the trace in the bottom sediment from a trawl board could be clearly seen in a sidescan sonar image. At one instance the C-POD from this position was reported to be caught in a trawl by the fisherman, and could be retrieved. A few other lost units have been found floating in the surface or washed up on the beach. Thanks to a phone number on the unit, the finder could contact the Swedish field team and the unit could be retrieved. One such Swedish unit was found as far away as Lithuania.

Several actions were initiated to address problems with lost C-PODs, including contacts with the Swedish Navy, the Coast Guard and the Swedish Maritime Administration. A decision was taken to include sweeping with grapples in positions where C-PODs had been lost, and the anchoring was supplemented with an extra anchor and a connecting 100-200m float line, so that, if the buoy was lost or the acoustic release did not respond, it could more easily be hooked by grapples and the C-POD retrieved. Some of the self-made buoys used from the start turned out to lose buoyancy and sink, and were replaced with commercially manufactured buoys. Additionally, new acoustic releasers and new C-PODs were purchased with additional funding from SwAM, and Chelonia Ltd offered 20 C-PODs on a loan basis as replacement for losses.

The towed grapple system was several hundred meters long. During the grapple operation the ship was run in circles around the GPS position of the lost units in an attempt to catch the anchors so it could be hauled. In many occasions this was successful, and the grapples hooked the wire between the two anchors or the buoy rope. The acoustic release units were more difficult to rescue, since they were only “spot” targets, but still several that were thought to be lost could be recovered. Also, when a new system was deployed to replace what was thought a lost system, on several occasions the “lost” system was found entangled in the replacement one when this was retrieved.

Action C.1b SAM and basic analyses in Finland

To start with there was a total of 47 SAMBAH C-POD positions within the Finnish EEZ. This number was decreased to 46 since one position had to be removed early on. C-POD deployments in Finland started 23 March 2011, when two of the positions were deployed by drilling holes in the ice. The other positions were deployed using two 7-11 meter boats (one owned by TUAS and one charter boat) and a bigger coast guard vessel for the most offshore positions. The last position was deployed on 28 April 2011. The TUAS boat, charter boat and two coast guard vessels were used for all servicing trips and for recovery. Recovery took place in May 2013.

During the first servicing trip one acoustic releaser failed to release but the C-POD was retrieved with the help of a coast guard ROV and a diver. In total, only three C-PODs were removed by trawling, and two of these were eventually received back from the fishermen. The communication with the fishermen ran smoothly throughout the project.

After the first servicing round it was found that some of the data recovered was corrupted and needed to be fixed by the C-POD manufacturer. This was successful and data could be uploaded to the database.

Action C.1c SAM and basic analyses in Poland

There were a total of 39 SAMBAH C-POD positions within the Polish EEZ. All 39 stations were deployed between 19 March 2011 and 1 April 2011 using R/V Baltica, owned by the Institute of Meteorology and Water Management (IMGW). 9 stations in places where depth did not exceed 20m were deployed with heavy anchoring systems with steel anchors and additionally provided with concrete anchors. The remaining 30 stations in depths greater than 20 m were deployed with lighter anchoring with only steel anchors.

The deployments were very successful with only three C-POD losses (at three different positions). One position seemed to have been hit twice by a trawler but survived both times and was recovered, so the Polish "trawl resistant" anchoring seems to be working quite well.

Action C.1d SAM and basic analyses in Denmark

There were a total of 21 SAMBAH C-POD positions within the Danish EEZ, whereof 13 were in the area around Bornholm. All positions were deployed in the last week of April 2011 and were retrieved after 30 April 2013.

In Danish waters, losses due to trawling were a big problem. Around Bornholm, C-PODs were often lost at 10 positions. In total 16 C-PODs were lost and only 6 have been received back. All stations where C-PODs were lost were searched intensively without luck. The C-PODs that were handed back have been found washed up on beaches in Denmark, Sweden, Poland and Russia. To reduce the problem of losing C-PODs to trawling, the following actions have been taken:

- repeated contact with the local fishery association in Bornholm
- exchange of acoustic release systems without surface markers to visible surface buoys (which reduced but did not solve the problem)
- articles in the Danish Fishery Newspaper
- moving stations to less trawling intense locations nearby the primary stations (<2 km), with help from the Danish fishery organisations.

In addition to the trawling problem, there were some issues with acoustic releasers malfunctioning, not releasing the C-POD. One of those was retrieved by divers in September, 2011.

Action C.1e SAM and basic analyses in Baltic States

There were a total of 40 SAMBAH C-POD stations in the Estonian EEZ. The last Estonian position was deployed on 4 June 2011, the delay being due to remaining ice cover, and all stations were retrieved after 30 April 2013.

Loss of C-PODs due to trawling was a rather large problem in Estonian waters, especially in the Gulf of Riga. Towards the end of the field period some especially problematic positions were left empty, both due to lack of equipment and so as to avoid losing time and money deploying equipment which would very likely be lost. Also, there were problems with anchoring in some positions in shallow and open waters of the Baltic Proper west of the islands Saaremaa and Hiiumaa, where storms destroyed moorings.

There were 34 SAMBAH C-POD stations in the Latvian EEZ. 31 positions were deployed on 26-30 April 2011, while the three remaining positions were unavailable due to ice cover. The last Latvian position was deployed on 21 May 2011, and all stations were retrieved after 30 April 2013. The Estonian Marine Systems Institute R/V "Salme" has been used for most of the offshore servicings, while LIAE's own small boat has been used for the three most coastal positions.

Loss of C-PODs due to trawling was a rather large problem also in Latvian waters. Some positions were moved to try to avoid the most heavily trawled areas, while two positions were removed completely to avoid loss of equipment.

There were 9 SAMBAH C-POD stations in the Lithuanian EEZ. All Latvian positions were deployed in the end of April 2011, and all stations were retrieved after 30 April 2013. In total, seven C-PODs were lost at 4-5 very problematic positions, most were likely due to trawling.

Action C.2 Auxiliary data

In this action, auxiliary data necessary to estimate densities have been collected by providing wild harbour porpoises in Danish waters with acoustic recorders. The relevant parameters were the proportion of time a harbour porpoise is clicking and if and how the click rate varies throughout the day.

This action was carried out by AU in close cooperation with the SAM working group to ensure coordination between Actions A2, C2 and C3. From March 2010 to December 2012, 11 porpoises were tagged with acoustic recorders in combination with dive time-depth-recorders and satellite receivers/transmitters providing data on echolocation and diving activity for up to ten days, and surfacing locations for up to 1 year. In addition, six porpoises were tagged with a GPS and 3D dive logger, giving detailed information on diving behaviour. Valuable acoustic, dive and movement data were collected (Fig. 7). The long-term satellite data were also used for mapping porpoise distribution on the Swedish west coast under action C5.

The main use of this data was to estimate the proportion of PPM (porpoise positive minutes). Only six of the 11 acoustic data sets were used in the calculations due to failed recovery or problems in data collection. Taking only minutes when the porpoise was deeper than 2m for the whole minute, PPM was estimated to be 83% (CV=15%) of the time over all six porpoises. It has been found that short dives (less than 60 seconds and close to the surface) tended to be quiet. In the results found here, when the interval was reduced to 30 seconds, the proportion of PP-30 second intervals decreased to 76% (CV=18%). The estimated proportions of PP intervals by time of day were different for each animal and so it is difficult to draw general conclusions regarding diurnal changes in click patterns. There was some evidence that the number of clicks per second increased as a function of depth but, given the range of values in the numbers of clicks per second, these increases were small.

Further information on analyses and results are provided in the work report in annex 7.2.14. The results from this action were used as important input to the density estimations in action C3.

In this action, group size in the project area was also investigated using mostly opportunistic sighting data available through the HELCOM harbour porpoise database. However, in the final method used for density estimation this parameter was not needed. The results of the group size analyses are presented in a PowerPoint presentation available in Annex 7.2.17.

This Action was initiated in accordance with the project time plan at the start of the project, but was prolonged for six months to provide time for analyses after the final data was collected. The action was finalised in June 2013.

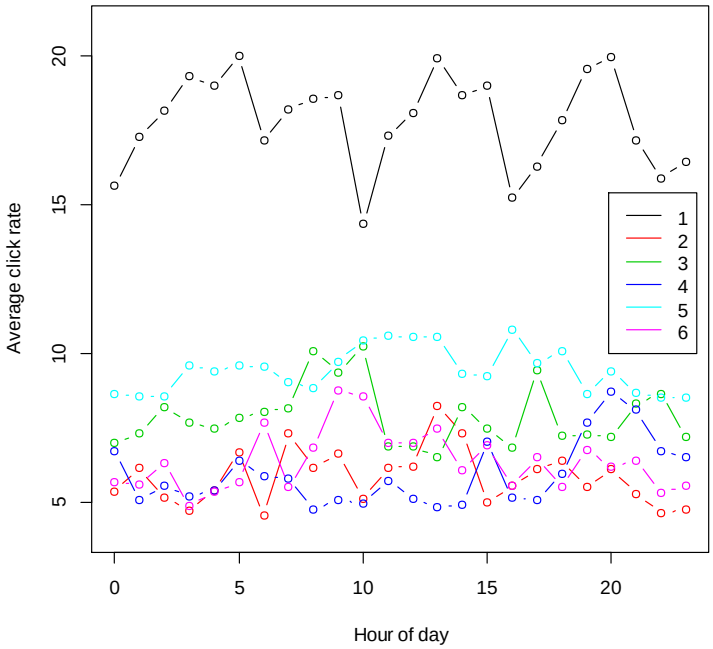

Figure 7. Average click rates (clicks/s) for each hour in the day by the six porpoises (HP 1 – HP 6) provided with acoustic tags and used in the density and abundance analyses.

Action C3 Calculating density

In this action, the density and abundance of porpoises in the study area were estimated. Density estimates were calculated per station and month as input for action C4 Habitat modelling, and abundance estimates were calculated per country and season and per population and season.

This action was started earlier than planned as the methods for density and abundance estimation was closely connected to Actions A2 (Ensuring SAM comparability), C1 (SAM and basic analyses) and C2 (Auxiliary data). To secure tight links between these Actions, the work was coordinated by the SAM working group.

Here we describe only the core of the density estimation methods. Much of the effort of estimating density and abundance has gone into estimating the effective detection area (EDA, here notated as ν). For more details on this and on density and abundance estimation please see the work reports by USTAN in Annex 7.2.7 – 7.2.16.

Density was initially estimated separately for each sampling location, month and diel phase (morning, day, evening and night, calculated using sunrise and sunset times for the 15th day of the month at each location), as follows

$$\hat{D}_{imd} = \frac{n_{imd}}{T_{imd}\hat{\nu}_{imd}} \quad (1)$$

where *D* is density, *n* the number of click positive seconds (CPS), *T* the number of seconds of monitoring effort, ν the effective detection area (EDA), the hat symbol ^ indicates an estimate and subscripts *imd* indicate that all quantities are for sampling location *i* in month *m* and diel phase *d*. Density per sampling location and month was estimated as a weighted mean of the diel phase density estimates:

$$\hat{D}_{im} = \sum_{d=1}^{4} w_{imd}\hat{D}_{imd} \quad (2)$$

where w_{imd} is the proportion of the 15th day of month *m* at location *i* that is made up of diel period *d* (1=morning, 2=day, 3=evening, 4=night). Density at higher levels of aggregation was estimated as the mean of the relevant location- and month-specific estimates. Abundance was estimated as density multiplied by the relevant survey area. Results on average density and number of animals per season and area are shown in table 3.

Due to the fact that data handling and quality control took longer than planned, final results from density calculation were delayed. However, preliminary results were presented by Louise Burt from USTAN at the SAMBAH progress meeting in Liège, Belgium, on 5 April 2014, showing that numbers of estimated density were indeed in the right range based on comparison with previous surveys such as SCANS and SCANS-II. Further results were presented at the SAMBAH progress meeting in Gothenburg, Sweden, on 6-7 Oct 2014 and on the SAMBAH end-of-project conference at Kolmården on 8-9 December 2014.

During spring 2015, an external review of the SAMBAH density estimation was carried out. The three external reviewers, chosen for their expertise in passive acoustics and density estimation methods, were

- Philip Hammond, SCANS and SCANS-II project manager at St Andrews University
- Jay Barlow, NOAA Southwest Fisheries Science Center, California, USA
- Sofie Van Parijs, NOAA Northeast Fisheries Science Center, Massachusetts, USA

In short, the reviewers found the overall project successful and the methodology used for density estimation satisfactory, but some comments were made on details in the density estimation methods, most of which could be addressed in some way.

Table 3. Estimates and confidence limits for density and abundance of harbour porpoises, for the whole study area during winter, and for the North-Eastern (NE) part and the South-Western (SW) part of the study area separately, during summer. The estimate for the NE part in the summer is considered the estimate for the Baltic Sea harbour porpoise population.

Season/region	Density (D)	95% Lower CI (D)	95% Upper CI (D)	Number of porpoises (N)	95% Lower CI (N)	95% Upper CI (N)
Winter	0.06578	0.3323	0.14353	10958	5535	23910
Summer/NE	0.00375	0.00060	0.00823	497	80	1091
Summer/SW	0.62946	0.39613	1.1894	21390	13461	38024

The results of density per station was used as input for Action C4 Habitat modelling, which meant the delay of density estimates delayed the conclusion of habitat modelling. However, preparations for modelling were well under way and started immediately when density results were ready.

For more details on the methods used and for estimates per country and season, please see the work reports by USTAN in Annex 7.2.7 – 7.2.16

Action C4 Habitat modelling

In this action, the spatial and temporal distribution of porpoises in the project area were investigated. Habitat preferences and environmental determinants for observed density patterns were investigated. Important and high-density areas and areas with higher risk of conflict with anthropogenic activities have been identified.

AquaBiota was contracted by SwAM to carry out habitat modelling in cooperation with the habitat modelling working group and Len Thomas at USTAN. The habitat modelling working group consisted of Len Thomas (USTAN), Ida Carlén (AquaBiota), Julia Carlström (AquaBiota), Jakob Tougaard (AU), Jacob Nabe-Nielsen (AU), Line Anker Kyhn (AU), Jonas Teilmann (AU) and Signe Sveegaard (AU). The working group met on Skype when needed.

A literature review on the Baltic Sea harbour porpoise, its ecology and the environmental characteristics that can be expected to govern its distribution in the Baltic Sea was completed in preparation for modelling, and is available in Annex 7.2.18.

Static environmental covariates for habitat modelling, such as depth, slope, aspect, bottom complexity and topographic position were derived from the best available bathymetry for the Baltic Sea. Oceanographic covariates for habitat modelling were acquired from the Swedish Meteorological and Hydrological Institute, as grids of monthly means of a number of dynamic oceanographic variables such as salinity, temperature and water movement (see detailed description in annex 7.2.19). The spatial resolution of oceanographic covariates is 3 nm, approximately equal to 5.5 km, and this also determines the spatial resolution of the resulting distribution maps. The temporal resolution of one month enabled creating monthly maps of harbour porpoise distribution in the study area.

Two models were created using general additive modelling (GAM). The first model described the probability of detections of porpoises in the study area, based on presence or absence of harbour porpoise detections per station and month, and hence used a binomial distribution. Time surveyed was added as a weight to avoid giving stations with low effort too much influence on the model. This model was stable enough to provide predictions for each calendar month.

The second model used a negative binomial distribution to describe the density of porpoises and was based on the number of click positive seconds per station and month, together with the effective detection area and time surveyed as offsets. This model gave predictions of density in animals per km^2 for the summer and winter seasons.
A more detailed description of the methods used for modelling can be found in the work report in annex 7.2.19.

Results
Based on the pattern of detection rate per station and month in the data, the summer season was determined to last from May – October and the winter season from November – April. During the summer, detections were concentrated in two areas; one in the South-Western Baltic Sea and one on and around the offshore banks in the central Baltic Proper. There was an area with fewer detections between these two congregations, while detections were more widespread during winter. The separation of the two areas with higher concentration of detections during summer, coupled with information from Danish

studies of satellite tagged animals from the Belt Sea population (Sveegaard et al. 2015), also led to dividing the study area into two population areas for the summer season (Fig. 8). The Belt Sea population of porpoises was thought to dominate in the south-western part while the Baltic Proper population mainly occured in the north-eastern part. During winter, these populations seemed to overlap and no separation was evident in the data.

Predictions of probability of occurrence are assumed to be closely correlated to the probability of occurrence of porpoises. Results show that during the summer season, high probability of detection of porpoises occurred on and around the offshore banks south of Gotland and east of Öland. The aggregation of animals in this area was most obvious during May – August, i.e. the reproduction period. This is also the period when the separation from the cluster in the southwest between Denmark, Germany and Sweden is the most clear. During the winter season, especially during January – March, animals were more spread out, and intermediate probabilities of detection occurred along the coasts of Poland and the Baltic states, along the Swedish east coast and also in Finnish waters.

Predictions of probability of detection were used in an overlay analysis to investigate the overlap of high porpoise occurrence with anthropogenic activities. An example map showing overlap with gillnet fisheries is shown in figure 8. The entire analysis is available in annex 7.2.19. A more thorough analysis for Swedish waters, where more anthropogenic layers were available, was carried out in action C5 (see annex 7.2.20, in Swedish, with English summary).

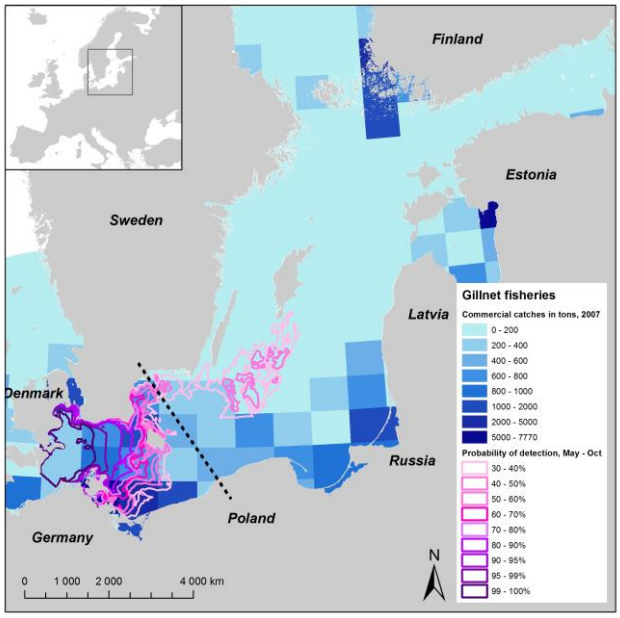

Figure 8. Overlap between important areas for porpoises and catches in gillnet fisheries per ICES square from 2007.

Predictions of density (Fig. 9 a-d) reflects the seasonal pattern in the prediction probabilities, with two main clusters of animals during summer and more dispersion during winter.

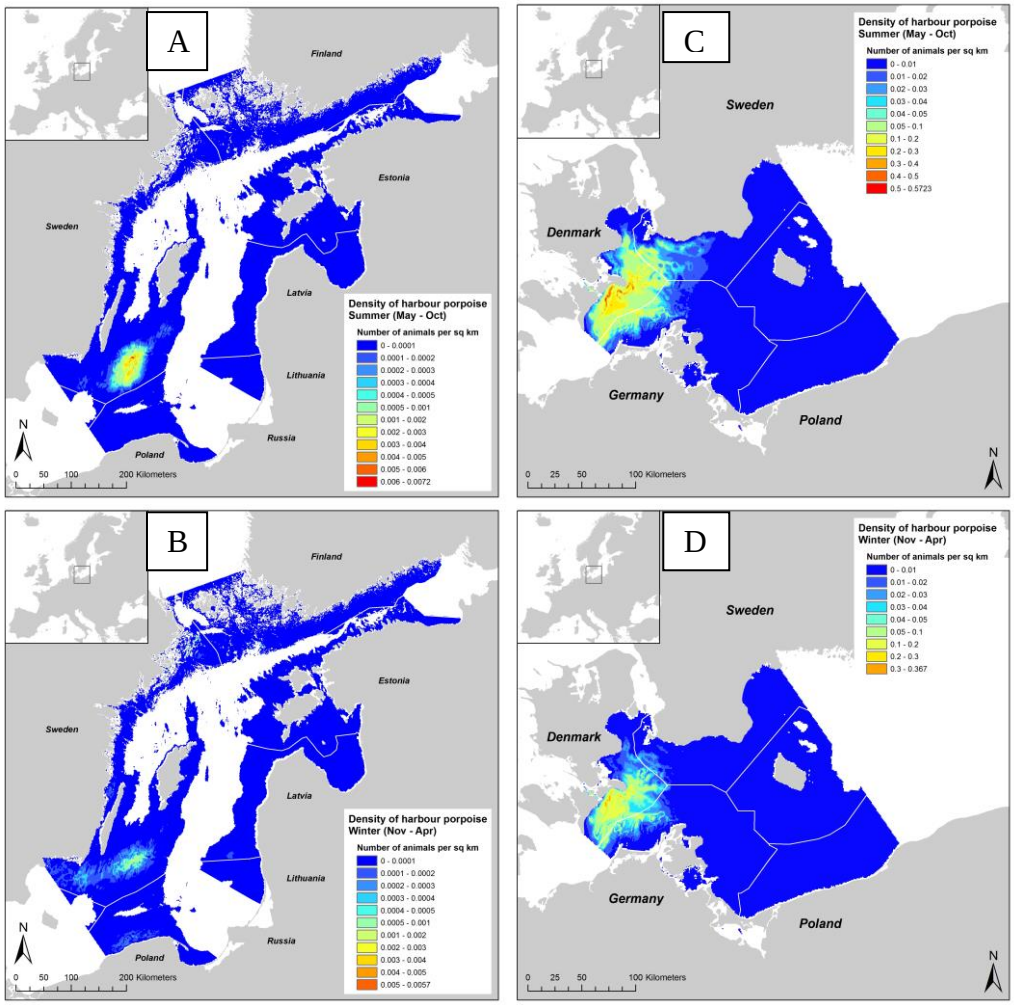

Figure 9. Predicted density of porpoises (in number of animals per km^2) for each season and for north-eastern (A – Summer, B – Winter) and south-western (C – Summer, D – Winter) part of the study area, respectively.

It was also investigated which environmental covariates that had the largest influence on porpoise density distribution. In conclusion, porpoises seem to

- occur primarily in waters 20-40 m deep, including the offshore banks in the Baltic Proper
- occur in higher numbers in areas of higher salinity
- occur more frequently in areas which are neither lower nor higher compared to surrounding areas
- be less common in areas with bottom temperatures below 2 degrees
- tend towards areas with turbulent waters in the bottom layers

A more detailed description of the results from modelling can be found in the work report in annex 7.2.19.

This action was initiated well before the planned starting date, to make sure environmental covariates were in order before occurrence and density data were available for modelling. However, due to delays in data handling and in density estimation, the finalisation of this action was delayed until autumn 2015.

Action C5 Identification of areas for protection in Sweden

In this action, areas suitable for the protection of porpoises in Swedish waters were identified, the main anthropogenic activities in these areas were identified and suggestions for management of activities with potentially negative effects on porpoises were made.

In the SAMBAH area, important areas for harbour porpoises were identified based on likelihood of occurrence of harbour porpoises. In the Skagerrak and Kattegat Seas, the areas were based on available maps of kernel densities of animals equipped with satellite receivers/transmitters in Danish waters. International surveys such as SCANS and SCANS II were considered but did not give enough detail to identify important areas at this scale. The identified important areas were prioritised based on during what season they are important for harbour porpoises; priority 1 for the summer half-year when calving and mating take place, priority 2 for the entire winter half-year, and priority 3 for half of the winter half-year.

In total, eight important areas were identified for harbour porpoises in Swedish waters (figure 10):
(1) Northern tip of Jutland, which is used by the Skagerrak population.
(2) Fladen and Lilla Middelgrund, (3) Stora Middelgrund and northern Öresund, and (4) the south-western Baltic Sea. These areas are primarily used by the Belt Sea population, at least during summer.
(5) Hanö Bight, (6) South of Öland, (7) Midsjöbankarna and Hoburgs bank, and (8) Northern Öland, which are used by the Baltic Proper population.

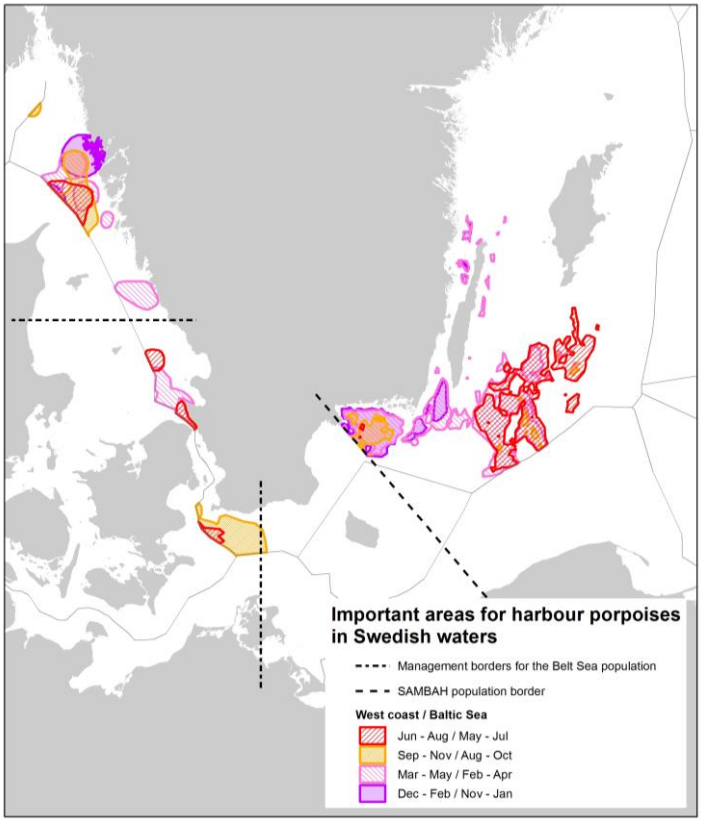

Figure 10. Important areas for harbour porpoises in Swedish waters.

In addition to important areas for harbour porpoises, the spatio-temporal distribution on anthropogenic activities that may have negative impact on harbour porpoises were compiled, together with existing marine protected areas and areas of relevant national interests. The anthropogenic activities include selected gillnet fisheries, vessel traffic (AIS data), military activities and marine installations. For fisheries and underwater noise, general information on impacts and mitigation measures for harbour porpoises were presented in the report.

For each of the identified important areas a description is given in the report. This includes which harbour porpoise population(s) that uses the area during what times of the year, occurring anthropogenic activities, existing protected areas, areas of relevant national interests, and locally important mitigation measures.

All of the above is presented in a report aimed at managers and policymakers in Sweden. For easy access for this target group, the report is in Swedish with an English summary, see annex 7.2.20.

This action was initiated behind schedule due to the delay in contracting a consultant (action A8) and was finalised with a delay. The final delay was more due to the delay in density estimation (C3) and habitat modelling (C4) than to the contracting phase. The action was finalised during autumn 2015.

Action E2 Networking with other LIFE projects

The SAMBAH consortium networked not only with ongoing LIFE projects, but also with previous LIFE projects and ongoing relevant projects with other sources of funding.

As in SAMBAH, spatial modelling is a key methodology applied in the MARMONI (http://marmoni.balticseaportal.net/wp/) and FINMARINET (http://www.ymparisto.fi/default.asp?contentid=350008&lan=en&clan=en) LIFE projects. As SAMBAH and MARMONI overlap geographically and AquaBiota is centrally involved in the spatial modelling in both projects, information is exchanged between the projects. YM is also involved as a partner in both SAMBAH and FINMARINET.

The BIAS LIFE-project, which started in September 2012, was very interesting from the marine mammal point of view, and SAMBAH had a very regular dialogue with this project. SAMBAH and BIAS had several people and one partner in common, and AquaBiota acted as subcontractor in both projects, so communication was very smooth.

Some of the SAMBAH team members were also participating in the BIAS project (http://biasproject.wordpress.com), monitoring underwater noise in the Baltic in order to produce a simulated "soundscape" of the Baltic. Making use of the logistics in the servicing of the monitoring units, CPODs were added in order to collect additional porpoise presence data, which can be directly correlated to the recorded noise.

SAMBAH has also been networking with the LIFE Blue Reef project (www.bluereef.dk), in which Chelonia T-PODs were used to monitor harbour porpoise echolocation. Lonnie Mikkelsen at AU were involved in the Blue Reef project and participated in the SAMBAH SAM WG on analyses of playback data, so information flowed easily between the projects.

SAMBAH established contact with the Italian project Arion (http://www.arionlife.eu/), which developed a wireless hydrophone buoy system for acoustic monitoring of dolphins in Italian waters. Communication was limited to exchange of technical information.

SAMBAH was networking with Philip Hammond, project coordinator of the previous LIFE projects SCANS and SCANS II, , concerning sharing of data and publication of results in the light of Common Provisions Article 22 (Ownership and exploitation of results), and data for spatial modelling of harbour porpoise group size. For the latter, SAMBAH also made contact with HELCOM who acts as a web host and several organisations owning data on harbour observations in the Baltic region (see Action C4 Habitat modelling). Philip Hammond was also one of three persons involved in the SAMBAH external review (see action C3).

HELCOM has great interest in SAMBAH and the project has presented at several different HELCOM working groups. See Annex 7.2

SAMBAH participated in the LIFE platform meeting in Denmark in September 2010, and in the LIFE platform meeting in Västerås, Sweden, in September 2011.

On 15 August 2011, Olli Loisa from TUAS presented SAMBAH at the partner meeting of Interreg IV A project BalticSeaNow.info.

SAMBAH collaborated extensively with the “German SAMBAH project” (http://www.meeresmuseum.de/wissenschaft/forschungsprojekte/sambah.html), which was coordinated by Jens Koblitz at GOM and financed by Bundesamt für Naturschutz (BfN) and the European Association of Zoos and Aquaria (EAZA). Especially the SAM WG also collaborated significantly with the German COSAMM project (see Action A.2 Ensuring SAM comparability), which was also led by Jens Koblitz at GOM.

SAMBAH was networking with experts from the EUSeaMap project (http://jncc.defra.gov.uk/page-5020) funded by the European Commission’s Directorate-General for Maritime Affairs and Fisheries. SAMBAH used several GIS layers on environmental parameters produced by EUSeaMap in Action C4 Habitat Modelling.

ASCOBANS (Agreement on the Conservation of Small Cetaceans in the Baltic, North East Atlantic, Irish and North Seas) is an agreement under the auspices of the UN Convention of Migratory Species. Several SAMBAH team members are active as national experts in ASCOBANS, especially in the so called Jastarnia group, which focuses on the conservation of the Baltic harbour porpoise, but also in the Advisory Committee. SAMBAH has been presented to the ASCOBANS Jastarnia working group at three occasions.

Action E3 Audit

This action was carried out during December 2015 – February 2016. The auditor was Deloitte AB. The contact information for the auditor is:

Deloitte AB
Rehnsgatan 11
113 79 Stockholm
Sweden
Phone: +46 75 246 20 00
Fax: +46 75 246 24 01
Website: www.deloitte.se

Action E4 After-LIFE Conservation Plan

The SAMBAH After-LIFE Conservation Plan has been finished and is available in English in annex 7.2.22. Translations to other project languages are under way and will be made available on the SAMBAH project website.

5.2 Dissemination actions

5.2.1 Objectives

The aims of SAMBAH dissemination activities were

- to increase public awareness of the Baltic Sea harbour porpoise and
- to disseminate and promote the SAMBAH results and their implications for management of the Baltic Sea porpoise population to managers, stakeholders, policymakers and the scientific community.

SAMBAH targeted the general public and users of the marine environment through six dissemination actions; D.1 Project website, D.3a-e Public information meetings and press releases, D.4 Exhibition, D.5 Polish dissemination, D.6 Results in databases and D.8 Layman's report and Non-technical report to managers, stakeholders and policymakers. Action D.4 was expected to reach approximately 3.5 million visitors to the three major tourist attractions involved in the project, namely Kolmården Wildlife Park in Sweden, Särkänniemi Adventure Park in Finland and Hel Marine Station in Poland. The other general public dissemination actions were expected to reach a total of 8000 persons directly. In addition, press releases and media events were expected to result in newspaper articles, radio commentaries and a Polish TV-spot, reaching an even wider audience.

Managers, policymakers, stakeholders and the scientific community were targeted through eight dissemination actions; D.1 Project website, D.2 Workshop at the ECS conference, D.5 Polish dissemination, D.6 Results in databases, D.7 Scientific publication, D.8 Layman's report and Non-technical report to managers, stakeholders and policymakers, D.9 Swedish workshop for relevant bodies and D.10 Promotion of results and end-of-project conference. These were expected to reach a total of approximately 1000 concerned professionals. In addition to the dissemination actions, SAMBAH were disseminated to managers, policymakers and stakeholders through (1) the arrangement of the project start-up meeting in conjunction with the ASCOBANS Jastarnia group meeting in February 2010 (see Action E.1), and (2) the participation of national competent authorities as beneficiaries in SAMBAH.

5.2.2 Dissemination: overview per activity

D.1 Project website

The SAMBAH project website was launched in April 2010, and is found at www.sambah.org. The site has been updated regularly, more often than the minimum of two times per year mentioned in the proposal. Project information material is available for download on the website.

Website statistics show that the SAMBAH website had on average 5747 unique visitors per year since 2012 (Fig. 11), unfortunately there are no statistics available from before December 2011. The visitors were from all over the world, mostly within Europe but also from China, Brazil and the United States.

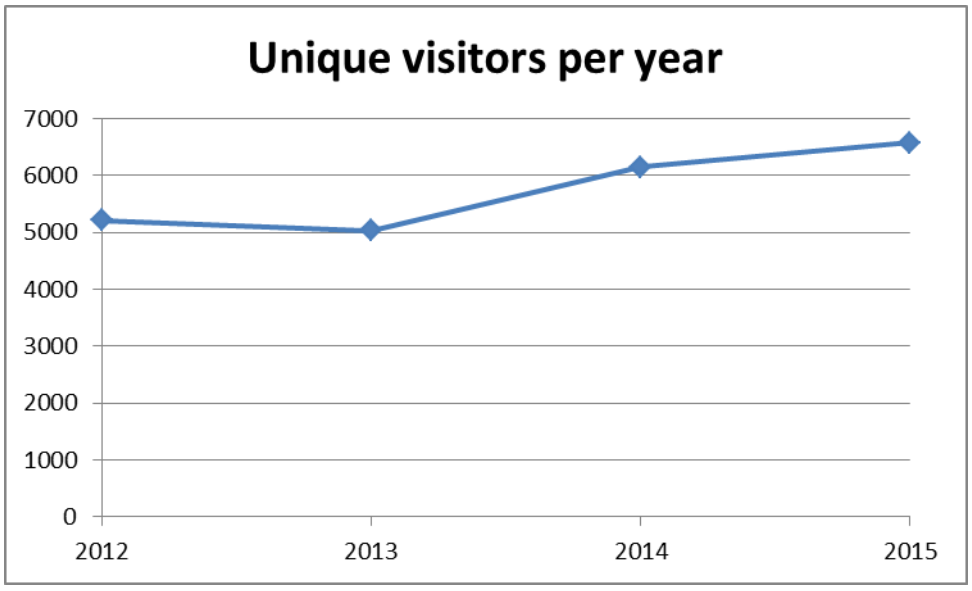

Figure 11. Number of unique visitors per year for www.sambah.org.

This action has been running throughout the project period and the website will be kept active for five years after the end of the project.

Kolmården was responsible for this action.

D.2 Workshop at the ECS conference

A public workshop was arranged in conjunction with the annual ECS conference in 2010, held in Stralsund, Germany. The workshop was attended by 55 persons. Presentations were given on the aims and methodology of the project, which were followed by discussions on the different topics. The project consortium established useful contacts with e.g. other ongoing and planned SAM projects and providers of environmental data layers that would be useful for the habitat modelling. The outcome of the workshop was also presented to the audience of the ECS conference.

In addition to the outcome of the ECS workshop, the outcome of the joint session with the Jastarnia Group of ASCOBANS in Hel, Poland, in conjunction with the SAMBAH kick-off meeting was important for the communication with managers, policymakers and stakeholders. The recommendations from this meeting are presented in Annex 7.3.3.

This action was carried out during the second quarter of 2010 in accordance with the project time plan.

Kolmården was responsible for this action.

D.3a-e Public information meetings and press releases

This action was extended over a longer period of time than originally planned, mainly since several beneficiaries saw the need to not only disseminate information at the start of the project (when the aim was to spread information on the project and the equipment deployed at sea) but to also spread information on the results of the project. The planned number of information meetings and the expected number of participants are shown together with the actual number of meetings and participants in table 4, below. As evident here, the number of people reached by this action were twice as many as expected.

Table 4. Expected and actual number of meetings and participants of public information meetings.

Action	Country	Responsible beneficiary/subcontractor	No of planned meetings	No of participants expected	No of meetings carried out	Approximate no of participants
D.3a	Sweden	KD	7	7x40	13	1000
D.3b	Finland	TUAS	3	3x40	12	255
D.3c	Poland	UG	1	1x40	2	70
D.3d	Denmark	NS	2	2x40	4	80
D.3e	Estonia	ProMare	5	5x40	6	200
	Latvia	LIAE	3	3x40	3	85
	Lithuania	CORPI	1	1x40	1	30
TOTAL			**22**	**880**	**41**	**1720**

Three common press releases have been issued within the project. These have been written within the project group, translated to each project language and released at an agreed date over the whole project area. The common press releases were:

- April 2013: Regarding the imminent completion of the SAMBAH field period
- February 2014: Here are the Baltic porpoises!
- December 2014: Potential breeding area revealed for the critically endangered Baltic Sea harbour porpoise

In some countries additional press releases have been issued. For more information see annex 7.3.2.

D.4 Exhibition

The exhibition contained information about SAMBAH as a project, Baltic harbour porpoises, echolocation, the methods used in SAMBAH and had a section with nationally specific project information that varied depending on site where the exhibition was shown. In total, nine copies were printed; four in Swedish, one in Finnish, one in German and two in Danish, each copy consisting of 5 rollups in the dimensions 85x200 cm. The exhibition in Polish was produced separately, and two additional copies in Swedish were printed by the Swedish Museum of Natural History and Kolmården.

In Sweden the exhibition was shown in five locations; Naturum Västervik, Naturum Stenshuvud, Marint centrum in Simirishamn, the Swedish Museum of Natural History, and the Laguna at Kolmården Dolphinarium. The Swedish Museum of Natural history has approximately 500 000 visitors each year, and Kolmården Wildlife Park has approximately 550 000 visitors during a season (2011-2013:400 000, 2014: 550 000, 2015: 720 000). Two of the five rollups were also shown at a temporary exhibition in Ängelholm, southern Sweden, during the summer of 2014.

The Finnish version of the exhibition was permanently set up in the Dolphinarium lobby at Särkänniemi Adventure Park since the beginning of November 2011, where it has been exposed to approximately 910 000 visitors during this time. Two more copies of the exhibition in Finnish were produced. One was set up at Maretarium aquarium at Kotka from May to September 2012, and one was circulating at environmental NGO "Luonto-liitto" dissemination training events during fall 2012.

The German exhibition was on display in the German Oceanographic Museum on a couple of occasions in connection with the "Days of the Sea" in October 2011, during a public presentation "Film und Meer" in March 2012, and during the "Progress in Marine Conservation in Europe 2012" conference in June in Stralsund.

In Denmark, the exhibition was on display at the Fjord&Bælt Centre in Kerteminde and at NaturBornholm. The copy which was shown at NaturBornholm in the summer was shown in other locations on Bornholm during the winter season when NaturBornholm is closed. This copy was shown at three departments of Bornholm Library and at Bornholm Gymnasium.

The SAMBAH exhibition setup at Hel Marine Station in Poland was finished in the beginning of 2012. It was presented to the public in April 2012, when the tourist season started. Till the end of 2012, 379,064 visitors to the sealarium at Hel Marine Station had seen the exhibition. After the end of 2012 the exhibition was moved to a new location at Hel Marine Station, namely the House of the Harbour Porpoise, which promotes the protection needs of the Baltic Sea porpoises. This is publicly available, situated on the way to the beach in Hel, and therefore it is not possible to give a number of visitors, but it is very popular during summer season, and very likely the yearly number of visitors has increased compared to when the exhibition was in the sealarium.

Kolmården was responsible for this action, although partners in each project country have been involved in creating, translating and setting up the exhibition at different locations around the Baltic Sea.

D.5 Polish dissemination

Two different leaflets presenting the Baltic Sea Harbour porpoise and SAMBAH project in Poland were produced before 31 May 2011. One was addressed to the general public and contained general information about Harbour porpoises and the SAMBAH project. The leaflet was available for visitors to the Hel Marine Station and was presented to the general public on informational and educational events. The second leaflet was addressed to the users of the sea and contained geographical positions of deployed SAM devices as well as description of surface markings of the CPOD positions, together with a request to report any findings of SAMBAH equipment. This leaflet was sent to Fisheries Inspectorates on the Polish coast and, wherever possible, was attached to the fishing licences issued to fishermen every year.

A TV spot promoting the SAMBAH project was produced and broadcasted in Polish national TV. The TV spot is available at www.youtube.com/watch?v=elir7dF88uk. A SAMBAH website in Polish is available at www.sambah.pl. News concerning the SAMBAH project are also published on www.morswin.pl (Hel Marine Station webpage dedicated to Harbour porpoise).

UG was responsible for this action.

D.6 Results in databases

In the SAMBAH project, we have produced results of great relevance to the scientific realm, and as stated in SAMBAH action D7, we aim to publish project results in scientific journals. Due to the fact that scientific journals often require that the results have not been published before, we asked for the permission from the designated LIFE desk officer to postpone the publication of the full SAMBAH Final report on the project website, as well as the publication of results on external databases until the two main papers have been published,.

The response received on 19 February 2016 was positive, and hence the publication of results on external data bases will be postponed until the main project results, i.e. the two manuscripts prepared, have been published in scientific journals. Meanwhile, data from the project are made available on the website of the Swedish Meteorological and Hydrological Institute, and the After-LIFE conservation plan and the Layman's report, which contains a limited part of the results, are made available on the project website www.sambah.org.

The main body of SAMBAH data will be stored at the Swedish Meteorological and Hydrological Institute (SMHI), where it will be available to the public and researchers.

- The bathymetric derivatives used in SAMBAH modelling are available at: https://ecds.se/dataset/sambah-bathymetric-derivates.
- The monthly oceanographic variables are available at: https://ecds.se/dataset/sambah-monthly-oceanographic-variables.
- The C-POD data (and eventually also the distribution maps) will be available at: http://www.smhi.se/klimatdata/oceanografi/havsmiljodata

After the scientific publication of the main results, distribution maps will be submitted to the Ocean Biogeographic Information System Spatial Ecological Analysis of Megavertebrate Populations; OBIS Seamap (http://seamap.env.duke.edu/) and the HELCOM biodiversity map service (http://helcom.fi/baltic-sea-trends/data-maps/biodiversity).

Kolmården was responsible for this action.

D.7 Scientific publication of results

Conference presentations
SAMBAH has been presented at a number of different scientific conferences through both oral and poster presentations. For titles and authors please see Annex 7.3.2.

SAMBAH was presented at three scientific conferences during 2011. A poster on auxiliary data for density estimation was presented at the 5th International Workshop on Detection, Classification, Localization, and Density Estimation of Marine Mammals using Passive Acoustics on 22-25 August 2011 at Timberline Lodge, Mount Hood, near Portland, Oregon, USA, and the same poster was also presented at the 4th International Conference on the Effects of Sound in the Ocean on Marine Mammals, organized by TNO and hosted by the Royal Netherlands Navy, at the historical base in downtown Amsterdam on 5-9 September 2011. At the Society of Marine Mammalogy conference in Tampa, Florida, USA, in November-December 2011, SAMBAH was represented by an oral talk about the first results of spatial predictive modelling of group size of harbour porpoises in the Baltic Sea, and a poster on the whole SAMBAH project.

During 2012, SAMBAH was presented at the European Cetacean Society conference in Galway, Ireland, by an oral speed talk on the first results of spatial predictive modelling of group size of harbour porpoises in the Baltic Sea, with a poster on calculation of the C-POD detection function for the harbour porpoise, and with a poster on the whole SAMBAH project.

During 2013, SAMBAH was presented as a poster at the European Cetacean Society conference in Setubal, Portugal, as an oral presentation at the 20th Biennial Conference on the Biology of Marine Mammals in Dunedin, New Zealand, and as an oral presentation at the StUK conference in Berlin, Germany, 30-31 October 2013.

During 2014, SAMBAH was presented as oral presentations at the European Cetacean Society conference in Liège, Belgium and at the conference on Spatial Ecology and Conservation in Birmingham, United Kingdom.

During 2015, SAMBAH was presented in two oral presentations at the European Cetacean Society conference in Malta, and was also presented at the 21st Biennial Conference on the Biology of Marine Mammals in San Francisco, USA in December 2015, although this presentation took place after the end of the project.

Scientific papers
So far, there are two articles using SAMBAH data published in peer-reviewed scientific journals:
Foote, A. et al., 2012. Investigating the Potential Use of Environmental DNA (eDNA) for Genetic Monitoring of Marine Mammals. PLoS ONE, 7(8), e41781. This paper is not mainly based on SAMBAH data but uses data from a few SAMBAH stations in the analyses.
Sveegaard, S. et al, 2015. Defining management units for cetaceans by combining genetics, morphology, acoustics and satellite tracking. Global Ecology and Conservation, 3 (2015), 839-850. This paper uses SAMBAH data from Denmark, Germany and southern Sweden together with data from satellite tagged animals to investigate suitable management borders for the Belt Sea harbour porpoise population.

In addition, two manuscripts are being prepared, communicating the main results of SAMBAH to the scientific community. The first manuscript will describe the spatiotemporal distribution of porpoises in the SAMBAH study area and the implications for conservation of the Baltic Proper population. This manuscript will be submitted to Biological Conservation. The second manuscript is on the density and abundance of porpoises in the project area, describing briefly the methods for estimation of density but mainly focusing on the conservation implications of the results. This manuscript will be submitted to Plos Biology.

Kolmården was responsible for this action, although all project partners have provided relevant and necessary input.

D.8 Layman's report and Non-technical report to managers, stakeholders and policymakers

To facilitate the dissemination of results to the general public and to managers, stakeholders and policymakers, respectively, a Layman's report and a Non-technical report for managers, stakeholders and policymakers have been produced.

The Layman's report is in the form of an 8-page brochure and presents the project and its results to the general public. The English version of the Layman's report was printed in 100 copies. English, Swedish, Finnish, Polish, German and Danish versions are available as pdf-files on the SAMBAH website www.sambah.org.

The Non-technical report to managers, stakeholders and policymakers focuses on interpretation of the project results in the context of assessment of population status and conservation measures such as the designation of protected areas and mitigation of threats. This report was printed in 200 copies, and is available as a pdf on the project website www.sambah.org.

Kolmården was responsible for this action.

D.9 Swedish workshop for relevant bodies

The Swedish workshop for relevant bodies took place in Kolmården on 9-10 December 2014, directly following the end-of-project conference. The workshop was divided into two parts. During the first half day, information was presented by SAMBAH representatives on the biology of porpoises and the results from SAMBAH, including abundance (action C3), distribution (action C4) and recommendations for suitable areas for protection in Swedish waters (action C5). Also, representatives and experts of different anthropogenic activities with potential detrimental effects on porpoises gave short presentations on offshore windfarms (Mathias Andersson, Swedish Defence Research Agency), fisheries (Tore Johnsson, Swedish Fishermen's Association), military activities (Gunnar Möller, Swedish Armed Forces), leisure boating (Mats Eriksson, SwedBoat) and environmental contaminants (Anna Roos, Swedish Museum of Natural History).

During the second half day, group discussions were held on mitigation methods for decreasing the negative impact on porpoises. Participants circulated to spend approximately 20 minutes discussing each of three themes, and discussions were moderated by experts or representatives for each theme. The themes were:

- Fisheries, bycatch and alternative fishing methods, moderated by Sara Königson, SLU Aqua (Swedish Museum of Agriculture)
- Shipping and leisure boating, moderated by Reidar Grundström, Swedish Maritime Administration
- Wind and wave energy, oil and gas pipelines, moderated by Emelie Johansson, Renew Consulting & Construction

Group discussions focused on ways of mitigating these potential threats, and followed a certain methodology described together with the results in the workshop report. Discussions during the workshop were positive and constructive, including researchers, managers and stakeholders, and we consider this action a success.

SwAM was responsible for this action.

D.10 Promotion of results and End-of-project conference

As described in an email to the SAMBAH technical desk officer Ms Maja Mikosinska at the EC LIFE-unit on 24 January 2013, and also confirmed by Ms Mikosinska in an email on 18 February 2013, an addition was made to this action so that it, apart from the End-of-project conference and the presentation of SAMBAH during the Brussels Green week, also encompassed a stakeholder workshop held in Gothenburg, Sweden on 15 April 2013. This workshop invited stakeholders and managers to take part in a discussion on how to use the SAMBAH results in taking management action, and on how to involve stakeholders in the process of finding relevant conservation measures. The workshop was successful but underlined the need to continue this dialogue with stakeholders. Within SAMBAH, this was done at the End-of-project conference, and also at the Swedish workshop (action D9; Annex 7.3.4).

The SAMBAH End-of-project conference took place at Kolmården on 8-9 December 2014. In total, 83 persons from 11 countries, plus representatives of the EC and the UN participated.

At the End-of-project conference, SAMBAH results, including abundance estimates and animal distribution maps, were presented. Participants took part in discussions on how the SAMBAH results can be used in the management and conservation of the Baltic Sea harbour porpoise. Group discussions were held on the subject of threats and how to mitigate them, and participants were asked to write a "X-mas wishlist" on what issues they would find most important regarding the harbour porpoise in the Baltic region for the next five years.

The report from the End-of-project conference (annex 7.3.5) contains all relevant documents from the conference, including the program, list of participants, presentations held during the conference and summaries of the group discussions and the "Baltic porpoise X-mas wishlist".

SAMBAH was presented at the Marine biogeographic seminar for Natura 2000 on 5-7 May 2015 in St Malo, France, on the knowledge market. Here, two roll-ups and a PowerPoint presentation were shown.

At the Green Week, organized on 3-5 June 2015 in Brussels, SAMBAH was presented in a stand showing different kind of information on Baltic Sea harbour porpoises and the project itself. Two roll ups, an inflatable porpoise and an interactive survey on porpoise knowledge were presented. For more information see the report in annex 7.3.6.

In this action, Kolmården was responsible for the stakeholder workshop and the End-of-project conference, while YM was responsible for presenting the project at the Marine biogeographic seminar and at the Green Week.

List of deliverables

All C-PODs and acoustic releasers were equipped with the LIFE-logo sticker, which turned out to be quite water resistant. All documents, reports and brochures, as well as the website, the Polish TV spot and the SAMBAH exhibition, all listed below, also had the LIFE logo in clear view.

Notice boards were replaced by the SAMBAH exhibition which is described in detail above under Action D4.

The SAMBAH website (action D1) is available at www.sambah.org.

The SAMBAH exhibition, replacing the notice boards, was produced in action D4.

A newsletter was produced during the project, and was made available through the website, but was also distributed to stakeholders via email.

A video was produced with pictures of harbour porpoises and the Swedish fieldwork. This video is available at www.sambah.org.

A Polish TV-spot was produced as part of action D5.

A digital folder with photos was created on the project ftp server and is available for use by all project partners.

The following brochures and leaflets have been produced:

- An information leaflet about SAMBAH produced together with ASCOBANS, in all project country languages, was printed during autumn 2010. The text and layout has been made by AquaBiota in dialogue with the ASCOBANS secretariat, and all printing costs were paid by ASCOBANS. This leaflet was used during information meetings and other contacts with press and the public.
- A leaflet addressing the users of the sea (action D5), containing geographical positions of deployed SAM devices as well as description of surface markings of the points, together with a request to report any findings of SAMBAH equipment. This leaflet was sent to Fisheries Inspectorates on the Polish coast and, wherever possible, was attached to the fishing licences issued to fishermen every year.
- A leaflet addressing the general public, containing general information about Harbour porpoises and the SAMBAH project (action D5). The leaflet has been available for visitors to the Hel Marine Station and is presented to general public on informational and educational events in which Hel Marine Station is involved.

Work reports of methods used in SAMBAH are thought to be among the most important deliverables from the project. These are available as annexes 7.2.2 – 7.2.20.

5.3 Evaluation of Project Implementation

The methodology applied in SAMBAH, to survey the abundance and distribution of the Baltic Sea harbour porpoise using static acoustic monitoring, has been successful. In the years that have passed since the project was initiated, the methodology of estimating absolute density and abundance from static passive acoustic data has been developed further, and SAMBAH has played an important role in this development. The biggest challenge in this method has been to achieve a satisfactory estimate of the C-POD detection function, which is necessary to calculate the density of animals. Since the detection function varies with several variables such as water depth, bottom sediment, water temperature, salinity and stratification, it has been necessary to gather data from the whole project area, which was done through playbacks, see action A2. Relating the results of playback trials to the detection function for real porpoise clicks meant having to do field experiments in areas where wild porpoises were more abundant than in the project area, which led to the hydrophone array experiment being carried out off Kerteminde, Denmark. The results of these experiments did give the information needed to estimate densities of porpoises in the project area, although more data from the same type of experiments would have given a more solid ground for the estimates and would likely have resulted in smaller confidence intervals around the estimates.

By conducting the survey using passive acoustic monitoring for a time period of two years, and by designing this survey to render data suitable for habitat modelling, SAMBAH has given unique insights into the spatio-temporal distribution of porpoises in the Baltic Sea, which could never have been achieved using traditional visual line transect survey methods. In this sense, SAMBAH has been very cost-efficient, considering the amount of survey effort that would have been needed to achieve the same knowledge using traditional methods. While the specific methods for habitat modelling in SAMBAH can be further developed, the resulting maps fit the data quite well and provide extremely valuable information that will be very useful in the management and conservation of the Baltic Sea harbour porpoise.

Table 4. Objectives and achievements are evaluated for the "core" actions of the project, i.e. those actions that were designed to produce the desired results on abundance and distribution. The effectiveness of dissemination actions is discussed below.

Action	Objectives	Achieved	Evaluation
A2. Ensuring comparability	(revised objective) to collect and analyse data to determine the detection function of the C-PODs	Playback and hydrophone array experiments carried out and analysed to render a model of C-POD detection function and how it varies in time and space.	The goal was achieved, although more data from hydrophone arrays would have made estimates more robust.
C1. SAM and basic analyses	To give representative	Static Acoustic Monitoring data	All in all, the SAM fieldwork went very well,

	samples of harbour porpoise biosonar activity and hence their presence, enabling estimation of density, abundance and distribution.	collected, and 67% data coverage achieved, which is considered a success.	despite some problems with lost equipment and C-PODs stopping prematurely. Mostly, these are things that have to be taken into account when doing this type of fieldwork at sea.
C2. Auxiliary data	To provide the auxiliary data for density calculations	17 porpoises tagged and the necessary data collected and analysed.	The data collected is sufficient but density estimates may have been more robust had more data on the diurnal variation in porpoise click rates been available.
C3. Calculating density	To estimate density and abundance of harbour porpoises within the project area	Density estimates were calculated per station and month, and abundance estimates have been calculated per country and season and per population and season	The goal of estimating density and abundance of porpoises in the project area in the Baltic Sea has been met.
C4. Habitat modelling	To estimate spatio-temporal distribution, habitat preferences, important areas and areas with higher risk of conflict with anthropogenic activities	Spatial and temporal distributions of porpoises have been modelled, habitat preferences and important areas have been investigated and areas with higher risk of conflict with anthropogenic activities have been identified.	Spatio-temporal distribution of probability of detection per month and of density per season has been achieved, and models can be considered quite robust. Analyses of habitat preferences gave indicative results, but some conclusions could be drawn. For spatial data on anthropogenic activities covering the whole project area, especially fishing effort, which is thought to be highly relevant for conservation measures to be taken, is lacking. A more thorough analysis has been made for

			Swedish waters.
C5. Identification of areas for protection in Sweden	To identify suitable areas for protection of the harbour porpoise in Swedish waters	Areas to be prioritised for protection of porpoises in Swedish waters have been identified. Overlap with anthropogenic activities has been investigated and suitable mitigation measures have been proposed.	The goal of identifying suitable areas for protection of porpoises has been met, and additionally the results have been presented and discussed with Swedish regional authorities.

Project results that are already visible are firstly the direct results, i.e. density and abundance estimates and information on spatio-temporal distribution of animals. These results have been well received by managers and policymakers both within SAMBAH countries and within international bodies such as ASCOBANS and HELCOM. The next step, where SAMBAH results are used in management of the Baltic Sea porpoise population, for example to designate new Natura 2000 sites for porpoises, will take a while longer. In Sweden this process is under way and a huge new Natura 2000 area on and around the offshore banks in central Baltic Proper was proposed by the Swedish Government in December 2016. This proposal is now pending evaluation and approval by an EU expert forum. In the even longer perspective, the aim is for SAMBAH results to be used as a baseline for monitoring of the population, and for a diversity of management actions to be based in the knowledge gathered within SAMBAH on the abundance and spatiotemporal distribution of porpoises in the area. We also hope that efforts will be made to further this new knowledge by investigating the possible breeding ground on and around the offshore banks in the Baltic Proper, and by carrying out surveys to gain more detailed information on porpoise distribution which can help in designing relevant mitigation measures for the population. Additionally, we hope that SAMBAH results will be used in more detailed investigations on effects and mitigation of anthropogenic activities, such as spatial analyses of bycatch risk on the scale of the Baltic Proper.

The amendments 1 and 2 to the grant agreement in SAMBAH have enabled the project to complete its actions despite delays and changes in the costs compared to the original budget. Had the amendments not been granted the project results in relation to the objectives would have been compromised, which is clearly seen in the Gantt chart, figure 3.

Dissemination actions have largely followed the plan and have, if anything, reached more people than was originally anticipated, especially since action D3 was expanded to include more information meetings. Additionally, the SAMBAH stakeholder workshop, included in action D10 was well-received and reached a target group that is sometimes difficult to reach. Several of the participants at this workshop also participated in the End-of-project workshop (D10) and the Swedish workshop for relevant bodies (D9). The

SAMBAH End-of-project-conference must be considered a success, with 83 participants from 11 countries and very fruitful discussions on the use of project results and future directions. No major drawbacks were experienced in the dissemination work, however, the dissemination work has been slightly more time consuming than was originally expected, and for example the number of project newsletters produced has been fewer than anticipated. The communication with fishermen which was primarily aimed at informing about deployed equipment at the start of the field period, worked quite well for example in Poland and to some extent (after an initial minor set-back with the Swedish Fishermen's Association) in Sweden. In other countries, for example the Baltic States and Denmark, trawling of gear was a big problem and communication with the fisheries sector only had minor effects on this problem.

5.4 Analysis of long-term benefits

Environmental benefits

The direct conservation benefit from this project is primarily the new knowledge gained, on both abundance and distribution of porpoises in the Baltic Sea. The results on spatial and temporal distribution will allow for the designation of Natura 2000 sites for porpoises, or the adding of porpoises on the species lists of relevant existing Natura 2000 sites. This process is already underway in Sweden, and Denmark has also been waiting for the SAMBAH results before designating areas for porpoises in the project area, so the process to designate new areas here is expected to increase within the near future. The knowledge on distribution will also make it possible to localise conservation measures to the areas where they may have the most effect. The abundance estimates obtained in SAMBAH will serve as a baseline in future surveys, necessary for the evaluation of population status and the effects of conservation and mitigation measures taken.

SAMBAH and its results are relevant for several industries and sectors in the marine environment, for example fisheries and marine constructions such as offshore wind mills, in that the results may affect in where and how they will be able to execute their activities. Results will also impact Baltic regional policy development such as indicator development for the Marine Strategy Framework Directive (MSFD) in HELCOM, and in the member states around the Baltic Sea, as well as regional conservation policy efforts such as the ASCOBANS Recovery Plan for Baltic Harbour Porpoises (the Jastarnia plan; http://www.ascobans.org/en/document/ascobans-recovery-plan-baltic-harbour-porpoises). The designation of Natura 2000 sites obviously has impact on the member states ability to fulfil the demands of the Habitats Directive in relation to the harbour porpoise.

Concerning the Habitats Directive, the harbour porpoise is listed in Annex II. This Annex covers species requiring the designation of Special Areas of Conservation (SAC), which are part of the Natura 2000 network. They must be chosen by the member states from the Sites of Community Importance (SCI). An SCI is a site which contributes significantly to the maintenance or restoration to a favourable conservation status of a natural habitat type or a species and/or of the biodiversity in the region. SCIs are proposed to the Commission by the member states and once approved they can be designated as SACs by the member state. As mentioned above, the results of SAMBAH are highly relevant in the efforts of Member States to designate Natura 2000 sites for porpoises in the Baltic Sea.

The harbour porpoise is also listed in Annex IV of the Habitats directive, which includes species that need strict protection. This implies that member states, in addition to designating SACs for the harbour porpoise, must also ensure that the species is appropriately protected in the rest of its distribution, e.g. against by-catch in commercial fishery. If necessary, action plans must be set up for the management of the species, and laws and regulations implemented that ensure that the ecological needs of the species are met. The conservation action plans should include measures to prevent degradation of the habitat and detrimental effects of anthropogenic disturbances, such as underwater noise from shipping, from air-guns used for gas and oil prospecting and from pile driving during the construction of offshore windmill parks, and should take into account the distribution of the harbour porpoise, presence of hotspots such as important breeding grounds, and areas important for the gene flow between separated sub-populations. The SAMBAH results are vital in this type of work, considering the new information on

density and distribution provided. Additionally, the conservation status of the harbour porpoise should be monitored over its whole distribution, i.e. not only within the SACs. Every 6th year the member states must report on measures taken according to the Directive, and reports should include a description of the necessary measures that were implemented in the SACs and of the strict protection system introduced in the whole distribution area and an assessment of the effects of these measures on the conservation status of the porpoise. Reports should also include the most important findings from the monitoring of the porpoise population. The Directive also requires the member states to exchange information and make sure that transnational activities are well coordinated. SAMBAH will serve as a baseline to the requested monitoring, and the SAMBAH methodology can be used in the efforts to monitor the population. Also, SAMBAH has laid a foundation for a closed international cooperation around this species in the Baltic region.

The Marine Strategy Framework Directive (MSFD) aims at protecting and preserving the marine environment, preventing its deterioration or, where practicable, restoring marine ecosystems in areas where they have been adversely affected, and at preventing and reducing inputs into the marine environment, with a view to phasing out pollution, so as to ensure that there are no significant negative impacts on or risks to marine biodiversity, marine ecosystems, human health or legitimate uses of the sea. To achieve this, eleven qualitative descriptors for the determining of good environmental status have been defined; of these the harbour porpoise is affected by descriptors 1, 4 and 11.

1. Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions
4. All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity
11. Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment

The MSFD requires the member states to carry out coordinated monitoring programs in order to evaluate the state of the marine environment. These programs include actions to specify the cause of changes and identify possible correction measures that can restore good environmental status, actions that confirm that the correction measures result in the intended improvements and the development of technical specifications and standardized methods for EU-level monitoring ensuring comparable information. SAMBAH and the methods used within the project have been discussed, for example within HELCOM, as one option for monitoring of the Baltic Sea harbour porpoise.

The MSFD requires the member states to design and implement action programs necessary to achieve good environment status in their territorial waters. These programs should include spatial measures that will ensure a cohesive and representative network of marine protected areas according to the Habitats Directive and other international agreements, and again, SAMBAH provides the information needed to achieve such a network of protected areas for porpoises.

SAMBAH also has bearing on the 7th EU Environment Action Programme which has, as two of nine priority objectives

(d) to maximise the benefits of Union environment legislation by improving implementation
(e) to improve the knowledge and evidence base for Union environment policy

SAMBAH has significantly improved the knowledge base on the Baltic Sea harbour porpoise, thereby improving the possibilities to execute legislative decisions such as designating Natura 2000 sites for the species.

SAMBAH also has relevance to the efforts taken within the Marine Spatial Planning Directive, in that project results are one of many spatial inputs that need to be taken into account when discussing the sustainable use of the marine environment. The directive focuses on four objectives; environment, fisheries, maritime transport and energy, all of which are highly relevant to harbour porpoise conservation.

Concerning fisheries, SAMBAH and the attempts to investigate spatial and temporal overlap with anthropogenic activities, highlights the lack of available information on fishing effort and fisheries bycatch. This knowledge gap is discussed in relation to the Fisheries Data Collection Framework (DCF) and the possible replacement of regulation 812/2004 on incidental catches of cetaceans in fisheries. SAMBAH results also relate to the fisheries issue by underlining the need for bycatch mitigation measures in important areas for porpoises in the Baltic Sea.

Long-term benefits and sustainability
The long-term environmental benefit of SAMBAH is primarily the new knowledge gained, on both abundance and distribution of porpoises in the Baltic Sea. With these results, the chances of implementing relevant conservation measures for this population increases infinitely, and the outlook for the population improves greatly, although such measures has to be taken without further delay given the small size of the Baltic proper population and the need to mitigate the most immediate threats towards it. The actions within SAMBAH are considered finished but results will be continued to be disseminated by the SAMBAH project partners in different ways, for example through scientific publications and through information being available at the three public destinations active as project partners (Kolmården, Särkänniemi and Hel Marine Station). SAMBAH data has been made available through action D6, and the wealth of information in this dataset ensures that it will be used for further studies in the future. For example a small study on the spatial distribution of feeding behaviour has been funded by ASCOBANS and will be carried out during 2016-2017.

There are requirements, from both the Habitats Directive and the MSFD, to monitor harbour porpoises. Here, SAMBAH results serve as a baseline, and the methods used in SAMBAH are likely to be used in future monitoring. The national competent authorities were partners in SAMBAH, and they are therefore well informed on results and methods when faced with the task to carry out this monitoring. Monitoring is currently being discussed both nationally and within regional bodies such as HELCOM, and the issue has been raised in the ASCOBANS Jastarnia group to have repeated SAMBAH-like surveys every ten years or so. In relation to the requirements of the Habitat directive to designate Natura 2000 sites for porpoises and to implement management plans for these sites and for the species, SAMBAH results are highly relevant.

Through EU regulations such as the Habitats directive, the management of the harbour porpoise population in the Baltic Sea rests on the shoulders of national authorities, and efforts are also taken within the framework of HELCOM. The results of SAMBAH will be used extensively in the management planning and in carrying out conservation actions in the project area. All competent authorities in the SAMBAH countries were involved as partners in the project and the project results have been anticipated by both national bodies and international organisations such as HELCOM and ASCOBANS.

The threats to the Baltic Sea harbour porpoise remain the same as before SAMBAH; by-catch in fisheries is the most immediate threat, but environmental contaminants, underwater noise and ecosystem changes are also serious threats.

There are no significant economic or social benefits foreseen to emanate from the SAMBAH project, except the nature conservation values associated with the continued presence, and possible increase, of harbour porpoises in the Baltic Sea.

Replicability, demonstration, transferability and cooperation
The methods used in SAMBAH are clearly replicable and could be transferred to other geographical areas all over the world. They are well suited for studies of abundance and distribution of small cetaceans that emit echo-location clicks, especially so for low-density populations, where visual or towed acoustic survey methods do not render sufficient data. Economically, the methods are cost-efficient compared to other methods in the case of low-density populations.

Similar methodology have already been implemented to assess the status of the vaquita (*Phocoena sinus*) population in the Gulf of Mexico, and discussions are underway to investigate the distribution of the Fransiscana dolphin (*Pontoporia blainvillei*) in Brazil, where SAMBAH project coordinator Mats Amundin visited in fall 2015. SAMBAH has been presented at numerous scientific conferences both in Europe and internationally, and this has raised the awareness about the project and the methods used in the scientific community, which has rendered great interest. The scientific community is the primary target group for the spreading of the methods used in this project, since this type of surveys are not a commercially viable product at this point in time.
Best practice lessons
The best practice measures used in SAMBAH were well established practical methods for local or regional monitoring of relative densities of cetaceans using Static Acoustic Monitoring, (SAM), combined with recently developed or refined analytical methods for estimating absolute density and abundance and established species distribution modelling methods. Estimation of absolute density was based on distance sampling methods extended to deal with SAM data. General Additive Modelling was used to investigate spatial distribution of porpoises in the study area.

The strategy for density estimation within SAMBAH was changed, from using three different approaches, as mentioned in the proposal, to using one of those three options. The reasons for this are discussed in the working reports for action C3. Also, adaptations of methods for estimating the detection function of SAM devices for areas of low animal density were made. The adjustments done in SAMBAH may very well lead to changes in best practice methods in the future. For example, it seems likely that ranging SAM devices, that were discussed in the SAMBAH proposal but never used due to lacking technology, will be developed in the not too distant future.

Innovation and demonstration value
The innovative elements in SAMBAH were primarily the use of auxiliary data (playback, hydrophone arrays and data from satellite tagged animals, see actions A2 and C2) to estimate the detection function and the absolute density and abundance in a low-density area.

The demonstration value added by this EU funding has been quite large. Firstly, a survey of this size would very likely not have been carried out at all without the financial support of LIFE+, especially not since it was the first ever attempt at such a large scale SAM survey, and the global demonstration value of seeing this project finish with successful results should not be underestimated. Also, the transnational co-operation between all EU member states around the Baltic Sea to carry out this project has a large demonstration value, and we hope that this common effort will continue to work as an encouragement for all involved countries to keep their focus and use the SAMBAH results in management of porpoises in the Baltic Sea. In general, SAMBAH has rendered much attention both nationally in the participating country, but also within the global scientific community and among relevant managers in the EU. Without the EU funding the impact would surely not have been as large.

Long-term indicators of project success
Here we list a few long-term indicators of project success that we think would be suitable to evaluate the impact of SAMBAH. The first two indicators are directly linked to the SAMBAH objective to enable designation of protected areas for porpoises, while the following four target management and conservation measures taken, hence linking to the objective to enable effective management actions.

- The number and total area of Natura 2000 sites designated for porpoises in the project area.
- In Swedish waters, how much (in percent and in absolute terms) of designated Natura 2000 sites coincides with priority areas of class 1, 2 and 3 from the report produced in action C5.
- Number of Natura 2000 sites with harbour porpoise on the species list that has management plans with conservation or mitigation measures specifically designed for the conservation of harbour porpoises.
- Number of mitigation measures taken to prevent porpoise bycatch in the project area, both within and outside relevant Natura 2000 sites.
- Number of mitigation measures taken to prevent porpoises being harmed by underwater noise in the project area, both within and outside relevant Natura 2000 sites
- Ultimately, the number of porpoises estimated during the next similar survey.

6. Comments on the financial report (not included)

6.4 Summary of costs incurred

In SAMBAH, almost all cost categories have exceeded the budget. Table 5 shows the costs incurred in relation to the budget amendment agreed in Amendment no 2 to the Grant agreement. Personnel costs were exceeded with 23% of the budgeted cost, Travel with 75% of the budgeted cost, External assistance with 5%, Consumables with 103% and Other costs with 83%. The only cost category that did not exceed the amended budget was Equipment. The budgeted amount from Equipment that was used for other cost categories was 9,783 €, which does not exceed the stipulated limits for flexibility neither in the number of Euros (30,000 €) nor in the percentage (10%) allowed.

In general terms, the reasons that the budget was exceeded were several, including underestimation of the man hours needed, the travel costs required, and notably the cost of anchoring material, which accounted for the main part of the costs under Consumables. The costs reported were, in full, necessary to complete the project in accordance with the Grant Agreement.

In Travel costs, it should be noted that many project beneficiaries report costs to travel to and from the European Cetacean Society Conference. This is due to the fact that one project progress meeting each year has been located to occur in conjunction with this conference, to save time and to decrease the environmental impact of excessive travelling, since many of the project participants participate in this conference. The decision to hold project meetings in conjunction with the conference has also led to increased visibility of the SAMBAH project in the European cetacean scientific community.

It should be noted that the Swedish EPA and SwAM has shared the same budget, since SwAM took over the partnership from the Swedish EPA. Costs reported for these two beneficiaries should be added together to arrive at the sum in the budget for SwAM in amendment no 2 to the Grant Agreement.

Personnel costs at the Polish beneficiaries UG and IMGW have been discussed with the Commission, and further documentation has been requested by the Commission. All the requested documentation is available in financial annex 8.8.

Table 5. Summary of costs incurred.

PROJECT COSTS INCURRED				
	Cost category	Budget according to the grant agreement*	Costs incurred within the project duration	%**
1.	Personnel	1 080 578	1 329 326	123%
2.	Travel	86 771	151 711	175%
3.	External assistance	2 118 610	2 232 634	105%
4.	Durables: total non-depreciated cost	-	-	-
	- *Infrastruc sub-tot.*	-	-	-
	- *Equipment sub-tot.*	506 692	496 909	98%
	- *Prototypes sub-tot.*	-	-	-
5.	Consumables	155 112	314 858	203%
6.	Other costs	42 524	77 623	183%
7.	Overheads	251 726	283 429	113%
	TOTAL	**4 242 013**	**4 886 492**	115%

6.2. Accounting system

This section is presented per beneficiary below.

Kolmården employs an electronic accounting system called Balans, where costs are inserted by the project coordinator Mats Amundin and signed for approval electronically by him and his superior. SAMBAH is identified by the code 7201 in the accounting system, and costs are assigned to the cost categories stipulated by the LIFE financial reporting system. Invoices are checked by the project coordinator for a clear reference to the LIFE project before signing. Kolmården uses the LIFE time sheets for time registration, and time sheets are signed by the employee and his/her superior a few days after the end of the month in question.

SwAM uses an electronic accounting and time registration system called Agresso, where costs are inserted by Erland Lettevall or Mathias Lööw and signed by them and a superior for approval. Agresso is also used for daily time registration and the time registered is signed by a superior weekly.

TUAS uses SAP-system for electronic accounting (Webhansa-system until December 31th 2010), and SAMBAH project costs are identified by clear accounting codes (to Dec 31th 2010 "146391776", Jan 1st 2011-Dec 31th 2013 "38704/600230" and from Jan 1st 2014 "60924/602209"). Invoices have a clear reference (LIFE08 NAT/S/00261) to the project and are checked and signed electronically by project manager Olli Loisa and one or two of his superiors, depending on the sum. TUAS has used the LIFE+ timesheets for the purpose of recording and declaring the time used by each employee to work on the project and the claimed personnel costs are calculated using the LIFE+ financial reporting template. Time sheets are signed by the employee and his/her superior a few days after the end of the month in question.

YM uses an electronic system RONDO for invoices and M2 for travel costs. Invoices are checked and signed electronically by Penina Blankett and her superior. YM has used the LIFE+ timesheets for the purpose of recording and declaring the time used by each employee to work on the project. Time sheets are signed by the employee and his/her superior a few days after the end of the month in question.

Särkänniemi has used the LIFE+ timesheets for the purpose of recording and declaring the time used by each employee to work on the project. Time sheets are signed by the employee and his/her superior a few days after the end of the month in question. Invoices are countersigned by Kai Mattsson and his department director.

UG has used the LIFE+ timesheets for the purpose of recording and declaring the time used by each employee to work on the project. Time sheets are signed by the employee and his/her superior/project manager a few days after the end of the month in question. UG uses an electronic accounting system called XPERT, where costs are inserted to the system by the project accountant - Katarzyna Górniak. SAMBAH is identified by the code 1058 and 0809 in the accounting system depending on the source of funding, and costs are assigned to the cost categories stipulated by the LIFE financial reporting system. Invoices are checked by the project coordinator for a clear reference to the LIFE project and are signed under the description of the document which has also reference to

the LIFE project, next the document is checked and signed by the Financial Department, paid and accounted.

IMGW employed the electronic accounting system PROGRESS until 2014, while the SIMPLE system has been implemented from 2014. The costs have been booked by autorised person at financial department after approval of project leader, accountant officer and director. The project costs have been identified in the analytical accounting system through dedicated account no 502-54-3147 for SAMBAH project. N.b. each of any other project, contract etc. has its own account number. For the project time recording, the time sheets have been used. Moreover, the electronic Program PLAN has been used for registration of all hours per month, incl. working hours, travels, absence, holidays, sick leave etc. Print outs from the PLAN have been confirmed by the head of appropriate department next month. Time sheets have been signed by the employee and his/her superior (project leader) a few days after the end of the month in question in accordance with internal IMGW's procedures. These, after approval by head of the department, have been recorded by financial person in charge. First, the invoices have been checked by the project coordinator for a clear reference to the LIFE project before signing. Next, invoices have been stamped accordingly with dedicated stamp.

CIEP has not declared any personnel costs for the project. The electronic accounting system is called Krezus. Project costs are checked and initiallized by the employee dealing with the SAMBAH project (Dorota Radziwiłł) and her superior; the director of Department of monitoring and environment information. Costs are then signed by chief accountant, the general director of CIEP and finally by the Chief inspector of environmental protection.

AU employs an electronic accounting system called NAVISION, where costs are inserted by the project coordinator Jonas Teilmann and signed for approval electronically by him and his administrator. SAMBAH is identified by the code 911194 in the accounting system, and costs are assigned to the cost categories stipulated by the LIFE financial reporting system. Invoices are checked by the project coordinator in either the invoice system "IndFak" or the Travelling cost system "AURUS" for a clear reference to the LIFE project before signing. AU has used their own electronic time registration system for the purpose of recording and declaring the time used by each employee to work on the project. Time sheets are signed electronical by the employee and his/her superior a few days after the end of the month in question in the time registration system "ARS and Promark".

NS has not declared any personnel costs for the project. The accounting system used is dictated by the Ministry of Finance, and the analytic system is "Navision". The project SAMBAH was in Navision defined by a code "430004" until 2012 when the agency was changed from the Nature and Forest Agency to the Nature Agency. Then the code became "412353". The two codes are unique for SAMBAH and ensure the traceability of the invoices etc. When approving costs the invoice is first confirmed and approved by the person responsible for the project, Maj Friis Munk. Before the invoice can be paid by the finance unit it also needs to be approved by the head of unit.

6.3 Partnership arrangements

Transactions between the coordinating beneficiary and the associated beneficiaries have taken place twice during the project lifetime; once at the pre-financing payment in 2010 and once at the Midterm payment in 2012. Payments were made directly to the bank accounts of associated beneficiaries, and in full, i.e. beneficiaries each received 40% of the total budget in 2010 and 30% in 2012. After the final payment has been made to Kolmården, associated beneficiaries will receive the outstanding balance for the LIFE funding, based on their total eligible and approved costs.

Financial reporting has been implemented by each beneficiary themselves entering the information in the financial tables. The project administrator at AquaBiota has been available for questions and comments but each beneficiary is responsible for their own reporting.

6.5 Auditor's report/declaration

The audit was carried out during December 2015 – February 2016 by Deloitte AB. The contact information for the auditor is:

Deloitte AB

Rehnsgatan 11
113 79 Stockholm, Sweden
Phone: +46 75 246 20 00
Fax: +46 75 246 24 01
Website: www.deloitte.se

The audit report follows the standard audit report form and is available in annex 8.7.

7. Annexes

7.1 Administrative annexes

7.1.1 Updated Project Monitoring Protocol
7.1.2 SAMBAH meetings
7.1.3 Deliverables and milestones

Partnership agreements were included as annex 7.1 to the SAMBAH Inception report which was submitted in October 2010.

7.2 Technical annexes (not included, pending publication of scientific papers)

7.2.1 List of keywords and abbreviations used
7.2.2 Report on the design of the main field experiment
7.2.3 SAMBAH field work report
7.2.4 Listening to echolocation clicks with PODs
7.2.5 Notes on the data validation in SAMBAH
7.2.6 White paper on data logistics and integrity
7.2.7 Work report on encounter rate analysis
7.2.8 Work report on assessment of C-PODs to detect porpoise in hydrophone array study
7.2.9 Work report on free-swimming porpoise detection function analysis
7.2.10 Work report on estimating the effective detection area for C-PODs from playback experiments
7.2.11 Summary of the environmental covariates used to model playback experiments
7.2.12 Work report on the further analysis of hydrophone array playback experiments
7.2.13 Work report on the further analysis of SAMBAH playback experiments
7.2.14 Summary and analysis of data collected on A-tags attached to harbour porpoise
7.2.15 Work report on the sensitivity of C-PODs
7.2.16 Work report on the density and abundance estimates
7.2.17 PowerPoint presentation on the results of group size analyses
7.2.18 Literature review on the Baltic Sea harbour porpoise
7.2.19 Work report on species distribution modelling
7.2.20 Report on important areas for porpoises in Swedish Waters (in Swedish with English summary)
7.2.21 Ideas for scientific papers in SAMBAH
7.2.22 After-LIFE Conservation Plan

7.3 Dissemination annexes

7.3.1 Layman's report (available at www.sambah.org).
7.3.2 Dissemination activities in SAMBAH
7.3.3 Recommendations from the ASCOBANS Jastarnia group meeting in Hel, Poland, in March 2010

7.3.4 Report from the Swedish workshop for relevant bodies (available from SWaM)
7.3.5 Report from the end-of-project conference
7.3.6 Report from the marine bio-geographical seminar and the Green Week
7.3.7 Scientific manuscript on density and abundance of porpoises in the Baltic Sea (not included)
7.3.8 Scientific manuscript on spatial distribution of porpoises in the Baltic Sea (not included)
7.3.9 Photos and videos (not included)
7.3.10 Leaflets
7.3.11 The SAMBAH exhibition in all languages
7.3.12 Non-technical report for managers, stakeholders and policymakers (available at www.sambah.org).

7.4 Final table of indicators

8. Financial report and annexes (not included)