TeamSurv

•

Service Description for IHO CSBWG

Version:	Version 1.0
Date:	8th February, 2016
Authors:	Tim Thornton, TeamSurv

TeamSurv Ltd, 173 Curie Avenue, Harwell Oxford, Didcot OX11 0QG, UK

www.teamsurv.com

Revision History

Date	Version	Author	Description
8th February 2016	1.0	TT	First Issue

Distribution

Name	Title	Organisation
IHO CSBWG members	n/a	n/a

References

#	Title

Table of Contents

1 Introduction

1.1 Purpose

This document is to give an overview of the current TeamSurv system and ongoing activities, to inform members of the IHO CSBWG of TeamSurv's experience and activities in this area, and to highlight opportunities for interaction between TeamSurv and the IHO's plans to produce a "cookbook" and a data repository for crowd sourced data.

1.2 Scope and Structure

The document is structured as follows:

- Chapter 1 - Introduction
- Chapter 2 – Background gives a brief history of TeamSurv, and current activities
- Chapter 3 – The Crowd gives a summary and analysis of the crowd
- Chapter 4 – Data Collection describes the various ways in which we can collect data
- Chapter 5 – Data Processing describes how the collected data is processed, and the quality and accuracy of the end products produced
- Chapter 6 – Applications discussions typical application areas for CSB
- Chapter 7 – Conclusions sums up the document, and how TeamSurv sees itself in relation to the IHO work in the area of CSB

2 Background

TeamSurv began as the EU funded CoSuDEC research project in 2010-11, where the basics of the system were implemented, and the ability to produce accurate data was confirmed by validation against contemporaneous multi-beam surveys. Since then, with the support of the European Space Agency (ESA) incubator in Harwell, the number of vessels logging data has increased; the methods of acquiring data has increased; the data processing has improved; and the software has been transformed from being R&D to being operational. As our activity in crowdsourcing and related areas has increased in size, and when our current recruiting drive is complete we will be a team of 6 people.

Current R&D projects we are involved with are:

- EO Crowd – a feasibility study on combining crowd sourced and satellite derived bathymetry, combined with open data, for ESA (with Telespazio VEGA (UK)
- BASE Platform – an EU project with EO Map and others to develop methods for combining various types of satellite derived bathymetry and crowd sourced bathymetry, and perform user trials in a number of regions (initially the Waddensee (DE), Channel Isles, Mauritius and part of the Black Sea
- A-Sens – a project for ESA with Exact Earth and the Satellite Applications Catapult (and others) to trial the use of AIS from space to collect crowd sourced bathymetry
- SeaFront – a major 4 year EU project researching next generation anti-fouling paints, led by Akzo Nobel; our role is recording environmental data by extending the TeamSurv platform to include water quality measures, combining this with EO oceanographic data, and also developing low cost sensors that may be used in crowd sourcing

In addition, we are involved in a number of commercial projects for providing bathymetric data, either off the shelf or where we recruit the crowd for the customer.

3 Understanding the Crowd

3.1 Where can it be used?

To be able to have crowd sourced bathymetry, we need to have a fleet of vessels logging data, and we need to have (as a minimum) GPS and depth sounder data logged from the vessel.

The main limitation in sensors is the depth sounder. In small craft (whether leisure or commercial), depths sounders typically work at depths of 100 - 200m; on ships, the limit is more typically in the range of 1000 – 2000m. Coverage at deeper depths is restricted to the small number of research vessels and some deep sea fishing vessels. Dedicated survey vessels are excluded as their data is not crowd sourced.

This means that the majority of crowd sourced bathymetry will be over the continental shelf, with ships giving a lesser amount of data in adjacent waters. It is not capable of providing data in deep ocean waters.

3.2 Analysing the Crowd

The crowd can be broken down into a wide variety of vessel types, as shown in Figure 1. Table 1 gives approximate global fleet sizes.

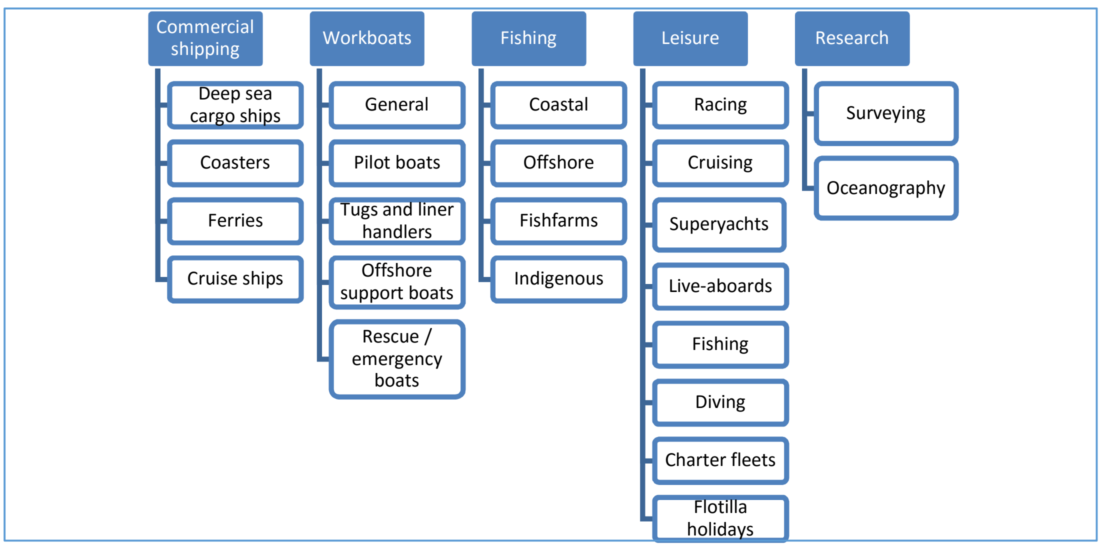

Figure 1 Taxonomy of the Crowd

In the EO Crowd project we carried out extensive research into the motivations for participation amongst the various sectors, and these were found to vary significantly both by vessel type, and also from cultural differences between different parts of the world. There was also a significant difference between “owner-drivers” (where the owner is also generally the operator) and “corporates” (where the vessel ownership and management is generally separated from the crew). In particular, the decision making process for the corporates is much more protracted. Through this analysis we have clear recruitment processes for each category of users.

Vessel type	Fleet size	Notes
Commercial shipping	85 000	
Workboats	1 500 000	Estimate – very few published figures
Fishing – non motorised	960 000	These are unlikely to have GPS and depth sounder. Fishing fleet figures from FAO.
Fishing motorised under 12m LOA	1 770 000	
Fishing motorised over 12m LOA	470 000	
Leisure	4 200 000	This is for sail and power boats that are cruisers rather than dayboats – depending on country statistics, they may be > 7.5m LOA or have accommodation
Research ships	400	

Table 1 Vessel fleet statistics

We have also looked at the “habitats” of different vessel types, i.e. the areas where they operate. Different vessel types tend to operate in different (overlapping) waters, so to build up good coverage it is necessary to build up the full range of vessel types in the crowd. This is shown in Figure 2, where we have used a month’s global AIS data (from ships and larger fishing vessels) to analyse ship track density, and plotted over bathymetry showing the depth ranges for small craft and ships. Similar analysis has been done for vessels not carrying AIS.

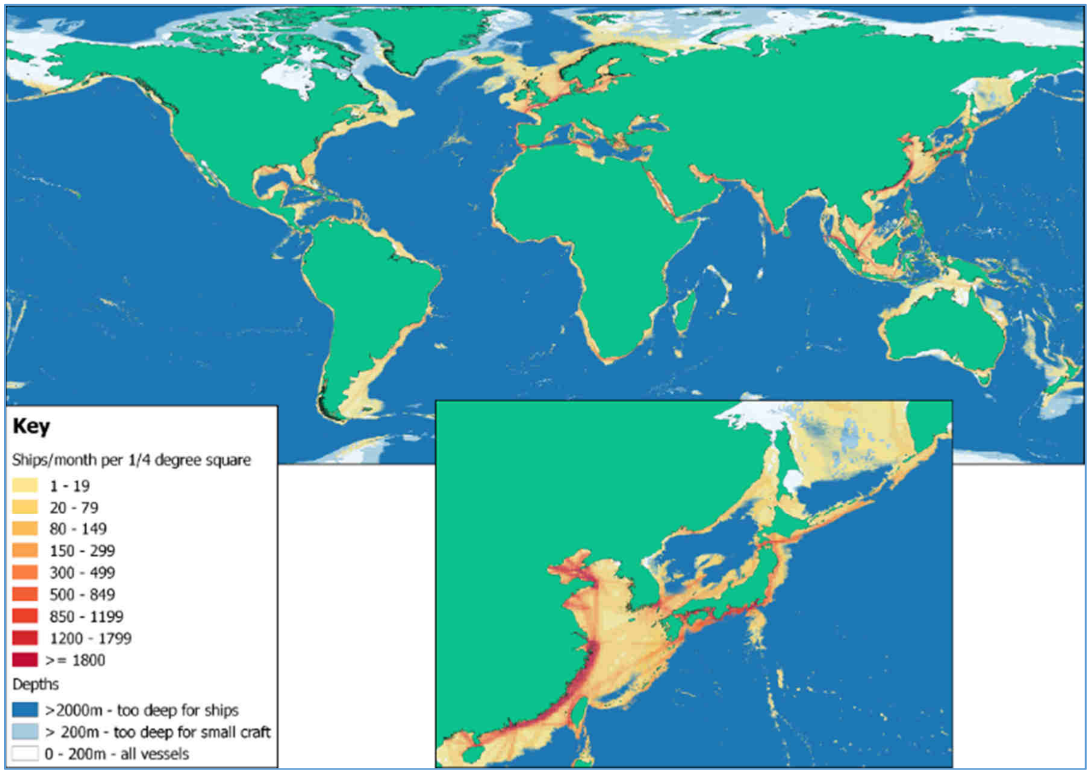

Figure 2 Shipping and fishing vessel distribution

4 Data Collection

We have found that different user groups have different requirements for the mechanics of data collection, but the following principles are common throughout:

- No cost to the logger – they are already providing access to their vessel, and time assisting with the project, so are reluctant to pay for any hardware, or for installation, or to incur any additional communications costs
- Ease of installation – the more complex this is, the more the vessel crew will decide that the whole project is too much of a burden, and will drop out. Also, they are generally reluctant to pay for professionals to fit equipment
- Ease of operation – it must be simple and not take much time
- Control over the data. There are times when vessels may not want to send data, or may want it delayed, e.g. if there is an incident, or they are a fisherman who has found new grounds. Also, data privacy is a concern – many require anonymity and good data protection. We offer full anonymity, and all data is held in the EU by EU registered companies, so benefit from the EU's strong data protection legislation.
- Clarity on data ownership and potential liabilities. Does the vessel operator own the data, or the data repository? What can be done with it once uploaded, and what elements can be made available to others? Can data be deleted once uploaded? Is the vessel liable if an incident occurs using crowd sourced bathymetry to which they have contributed? All of this needs addressing by any CSB project before it accepts any user data
- Provide feedback to keep people engaged – the feedback varies, e.g. fishing boats want to use the data, shipping companies want it to do press releases showing how green they are, and many owner drivers just find it an interesting and useful project, and want to keep track on what is happening

The last three points are specific to each CSB project, and it suffices to say that they are properly and fully addressed in TeamSurv.

For the mechanics of data collection, we currently offer, or will later this year, the methods given below. In addition, a calibration procedure is required of the user so that their data can be fully processed.

4.1 Log Data

Use of data direct from the log of the vessel's navigation system, be it an ECDIS, OLEX, an electronic chart plotter, or a navigation app. In many ways this is the simplest approach, as no hardware needs to be installed. We support an increasing range of products and file formats, and some navigation systems are including support for logging and/or uploading data for TeamSurv within their products. We also offer a Windows program that logs data and offers a basic display.

The logged data is uploaded to us through a number of ways:

- Uploading files through the web site

- A Windows application to upload files, more highly featured than the web site
- A tool for periodically automatically uploading files, geared towards vessels using VSAT

There are caveats, though. The data sampling rate is often lower than the raw instrument data, and some applications can be quite loose in their interpretation of depth, not always distinguishing between depth below waterline, transducer or keel.

4.2 AIS

Class A AIS transponders, and from later this year Class B as well, have the ability to transmit binary messages with custom data. We are working with Exact Earth to interface instruments to the ship's AIS transponder and send messages, for collection by their satellite and transmission to TeamSurv (at present, shore based AIS vessel tracking systems ignore these binary messages). This system will be easy to install, and will require no effort from the crew, or cost to the vessel owner, to operate. Confidentiality is ensured by the data being encrypted. The trials will show how feasible this is, and in particular what sort of data collection rate is achievable.

4.3 USB Data Logger

This interfaces to 1 or 2 channels of NMEA0183 or Seatalk data, and records all of the data to a USB stick. The user periodically removes the USB stick, and uploads the data as in 4.1 above. The logger is powered by 12/24V DC, and is fully CE and FCC type approved.

Figure 3 Data Logger

Cost is a major issue. When we started the project back in 2010, we assumed that we would be able to buy a logger cheaply, but the cheapest available (buying at trade prices) were over US$400. In the light of this, we developed our own hardware for a fraction of this price, so we can provide them on free loan to all participants (they sell, with distributor's and reseller's mark-ups, at about US$300). We are working on a further design iteration this year, which will bring out another significant price drop.

In areas where many local craft do not have a GPS and depth sounder, we can provide an integrated device that has a GPS at the top, a depth sounder at the bottom, and a data logger and battery in the middle. This can just clamp to the gunwale of the boat when it goes to sea, and be removed and the data uploaded on its return.

4.4 Wi-Fi and Apps

With the increasing use of smartphones and tablets on small craft, we are producing an app (for iOS and Android) that will log and display the instrument data, using TeamSurv bathymetry. Once on a shore-based phone or Wi-Fi network, the data can be uploaded, and the bathymetry in the app updated.

The problem with apps is that by default they just have access to the phone's GPS, and not the vessel's instrument data. Also, present Wi-Fi interfaces are expensive (up to US$500), so take-up has been limited. As with the logger, we are developing a Wi-Fi interface at a much lower price point, so uptake of the app will be significant. The hardware and the app will support NMEA0183 and NMEA2000 over TCP or UDP; the app will also support a number of proprietary data formats. The hardware will be able to act as an Access Point or join an existing Wi-Fi network, and will be self-powered by NMEA2000, or run off a 12/24V DC power supply. Approvals will be CE, FCC and NMEA2000.

Within this, we are aiming to have a $5 IMU, that will give us heel, pitch and heave (none of which are available from standard instruments) to sufficient accuracy to correct a single beam depth sounder.

4.5 Installation

To aid installation, we have produced instructions for a wide range of navigation systems, covering both physical wiring and configuration requirements. These are made available to each user, who normally self-installs any hardware. As the user base expands, and so the range of devices increases, this database is extended.

4.6 Calibration

All users are required to undergo a simple calibration process – they can upload data before this is completed, but it is not processed. This covers:

- Horizontal and vertical separation of GPS antenna and depth sounder transducer
- Depth sounder transducer below waterline
- Make and model of instruments, to correct any "quirks" in NMEA data and give us depth sounder beam characteristics
- Ship dimensions to enable correction for squat

In addition, when a vessel is of variable draft, we ask for the draft forward and aft at the start of each voyage where the load has changed.

This is done through a paper worksheet, with the data entered into the website, or as part of our app or Windows software, with the data being uploaded automatically. The system can cope with the data being recalibrated at different times through the life of the vessel.

5 Data Processing

5.1 System Overview

TeamSurv has been designed to provide an easily scalable system for large scale, near real time, automated processing of crowd sourced data. Although concentrating on bathymetry for now, we have done initial work in showing that it can be used for surface currents and for wind speed and direction, and the SeaFront project shows its use for water quality measures.

Uploaded files are ingested into a geospatial database and processed, with tracks reduced to chart datum being made available within a couple of minutes through the separate display processing server and database. Another process identifies regions where new tracks have been uploaded, and they are automatically gridded within 12 hours. The output of this data to the web site and as data files in a number of GIS and navigation formats will also be automated later this year. We will also have a portal and web interface whereby users can select and download data sets, and approved 3rd party applications and systems can also acquire data automatically (with suitable security and tracking processes in place in both counts).

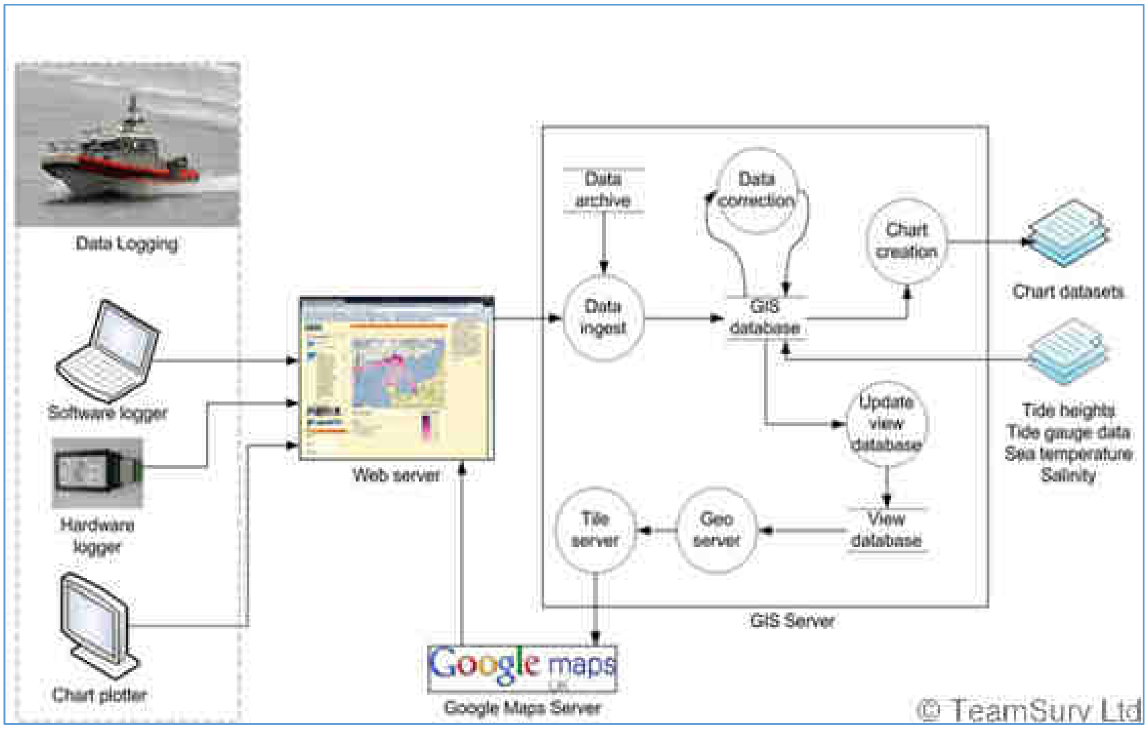

Figure 4 TeamSurv System Architecture

A number of ancillary processes are also going on, such as running a global tidal model, and automatically ingesting tide gauge data from a multitude of sources, and producing reports on logger activity so we can ensure new recruits start contributing data, that calibration is done, and we contact loggers who stop contributing data.

To deal with a large scale crowd sourced system, this IT centric approach is essential. The system would not be scalable, either economically or in terms of manpower, if it relied on the traditional manual processing – a room full of cartographers/hydrographers is expensive, even if outsourced offshore to a cheaper location.

5.2 Track Processing

Track processing follows the normal routines for processing single beam survey data, namely:

- Filtering of bad sensor data
- Correct position to depth sounder transducer, and depth to depth below WL
- Apply speed of sound correction
- Apply tide height correction

In addition to filtering out data when the GPS position is having a glitch, or the depth sounder has lost track of the seabed, we have found that a number of instruments have “quirks”, such as problems with GPS position at start-up or on loss of signal (giving the impression that some GPS manufacturers are also ports), or problems with date/time at start-up or on date changes, and many depth sounders apply the user entered depth offset to the purported depth below transducer. We have built up a comprehensive database of these, and so we can deal with them, as we know the details of the vessel’s instruments.

For the position and depths correction, we use compass heading where available, otherwise course over the ground. Heel, pitch and yaw will also be used once we have these available.

For ships, we also correct for squat (which can be up to 2m for a large ship in shallow waters). In doing this, we assessed most of the available squat prediction formulae against actual measurements, and selected the one with the best consistent results. Most of them made significant over-estimates of squat, as would be expected in the interests of safe navigation.

In the absence of heel, pitch and yaw data, we have estimated the errors introduced. The approach was to take wind and wave data from weather buoys at a number of locations, together with monthly mean weather data, and vessel motion characteristics from computational fluid dynamics (CFD) models of a number of vessel types. Then, assuming the vessel travels an equal distance in each direction, to determine the error introduced. For most vessels, given enough data, there is no nett error; the exception is sailing boats, who have prolonged times at an angle of heel. However this error was not as large as expected, as in many conditions the angle of heel is less than the beam angle of the depth sounder (typically 10° - 12°), so this effectively removes much of the heel effect initially, and then reduces it at larger angles.

For speed of sound, there are two aspects to consider: the speed of sound set in the sensor, and the correction applied on the server. Most of the depth sounders on our vessels have a fixed speed of sound, and our instrument database holds the values used. For the speed of sound correction, offshore we use Carter’s Tables for want of anything better. Inshore, we are building up an atlas of monthly mean temperature and salinity, which we use to compute a speed of sound value. With a large number of samples, the errors introduced by our assumption that the waters are well mixed is small at inshore depths.

For tides, we have a two stage process. First, we have a global tide model which is a composite of a gridded model offshore (reduced to LAT to minimise datum shift errors), and tidal stations inshore, that calculates data in real time, with interpolation being similar to NOAA’s TCARI, though optimised for faster performance at a slight loss of accuracy.

Secondly, we ingest data from many tide gauges, and determine the residual between predicted and measured sea level at each gauge location. This is then also interpolated, and applied to the tracks. As many tide gauge sources are only updated monthly, or in some cases annually, as new data is ingested any affected areas are automatically reprocessed. We are also considering the use of satellite altimetry data to provide virtual offshore tide gauges.

Although all depths are currently to the local chart datum, this obviously gives errors at boundaries – even when adjacent HOs nominally use the same nominal datum, in practice they are often different, as the BLAST project showed in the North Sea. To this end, our aim is to move all depths to using a geoid as a globally consistent vertical datum, and from there to move to the vertical datum required by the user, be it a tidally defined datum such as LAT, a quasi-tidal datum such as LAT defined by a particular hydrographic office, or a land based datum.

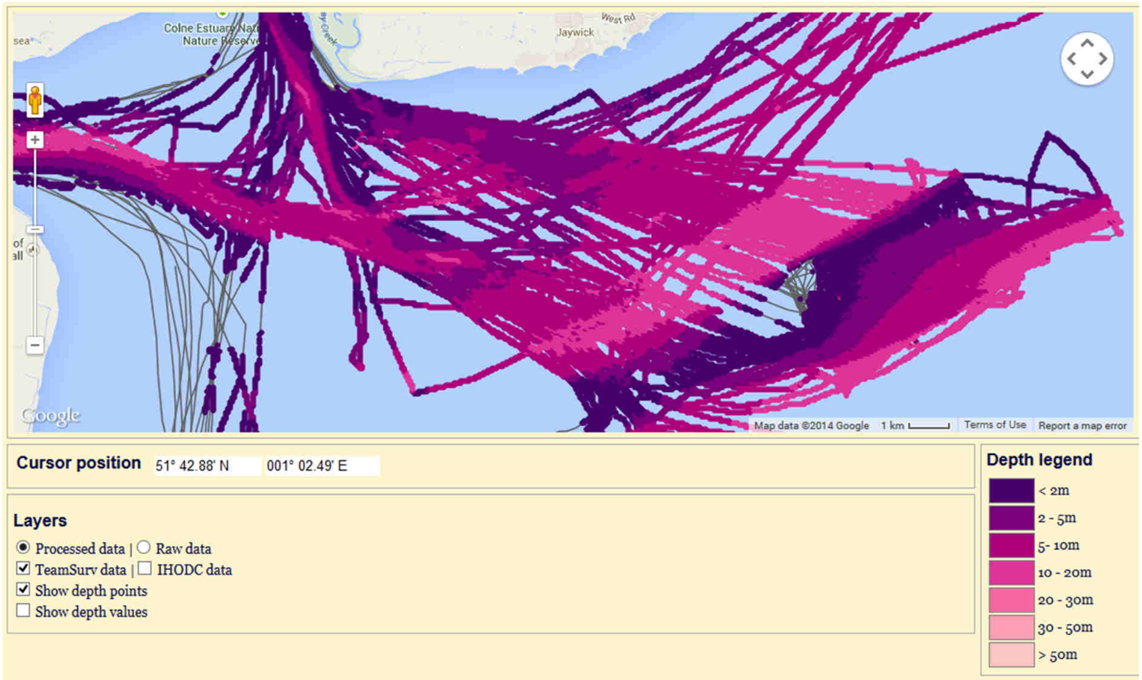

Figure 5 Tracks reduced to chart datum

5.3 Gridding

Analysis of crowd sourced data shows that, as expected, it is noisier than data from professional hydrographic surveys. Also, it does not generally follow a normal distribution, so common statistical methods such as standard deviation cannot meaningfully be applied. We have developed a set of algorithms that specifically deals with the characteristics of crowd sourced data.

The approach begins with the premise that the desired end product is a gridded model of the sea bed – whether to put into a DTM, BAG or whatever. Also, we assume that the number of soundings in each grid cell is large, which is essential if we are to use a statistical approach to remove noise from the data set.

We establish a quad tree in the area of interest (typically a 0.5° square cell), with grid sizes varying from 2m to 256m. Within each cell we reduce the influence of outliers, and then calculate a data quality metric based on the data density and consistency. Where there is no data, or the data quality falls below a threshold, that cell is discarded. We then generally use a heuristic to determine an optimal grid, with cells of variable size – where the data quality is good enough the grid is subdivided until either the quality deteriorates, or the subdivision gets too fine and starts introducing random noise. Alternatively, where customers desire, we can output a fixed resolution grid. For each cell in the output grid, there is the mean depth, the cell size, the data quality metric, and a number of other indicators such as the number of data points and their variability. Any shoal bias should, in our opinion, be applied in the creation of the nautical chart, and not in the bathymetric data, as the amount of bias depends upon the intended use of the chart, and many users of bathymetry do not want the distortions introduced by applying a shoal bias.

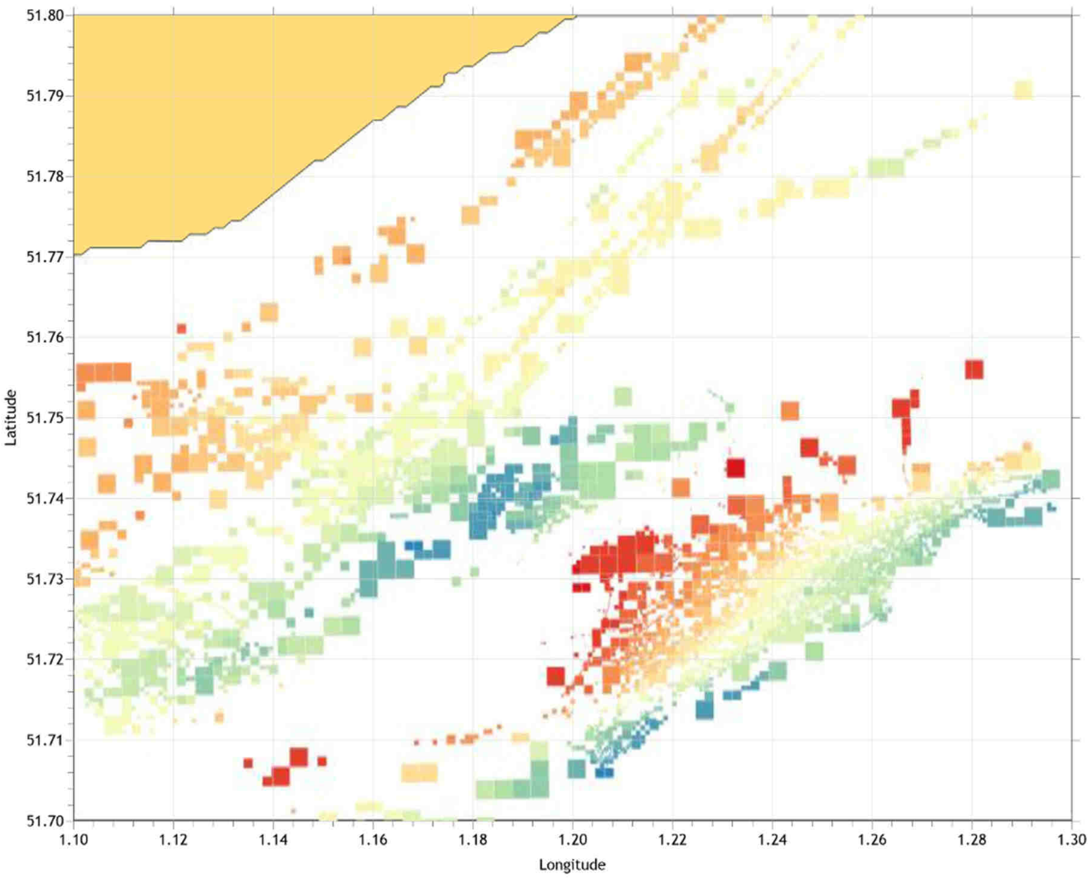

Figure 6 Gridded depth data

From this point, there are the well-known processes for tasks like surfacing and contouring the data, changing vertical or horizontal datum or projection, and transforming the output data set into a variety of different file formats.

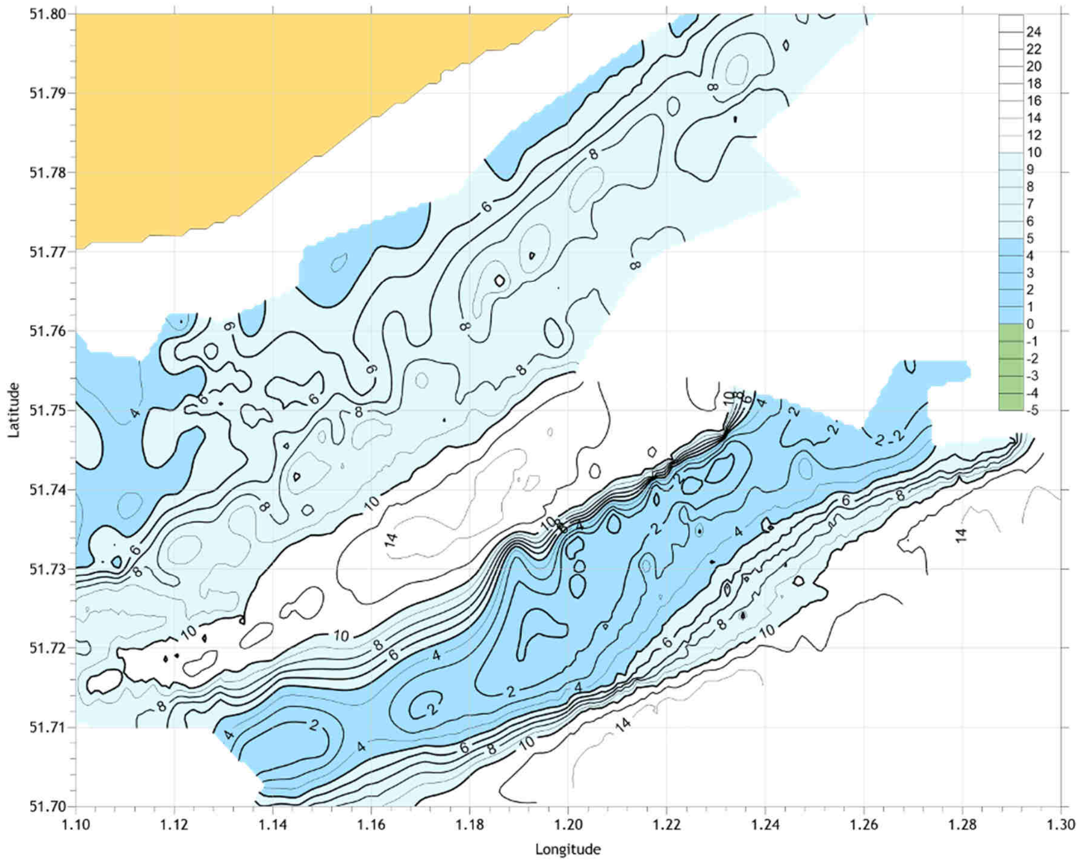

Figure 7 Contoured depth data

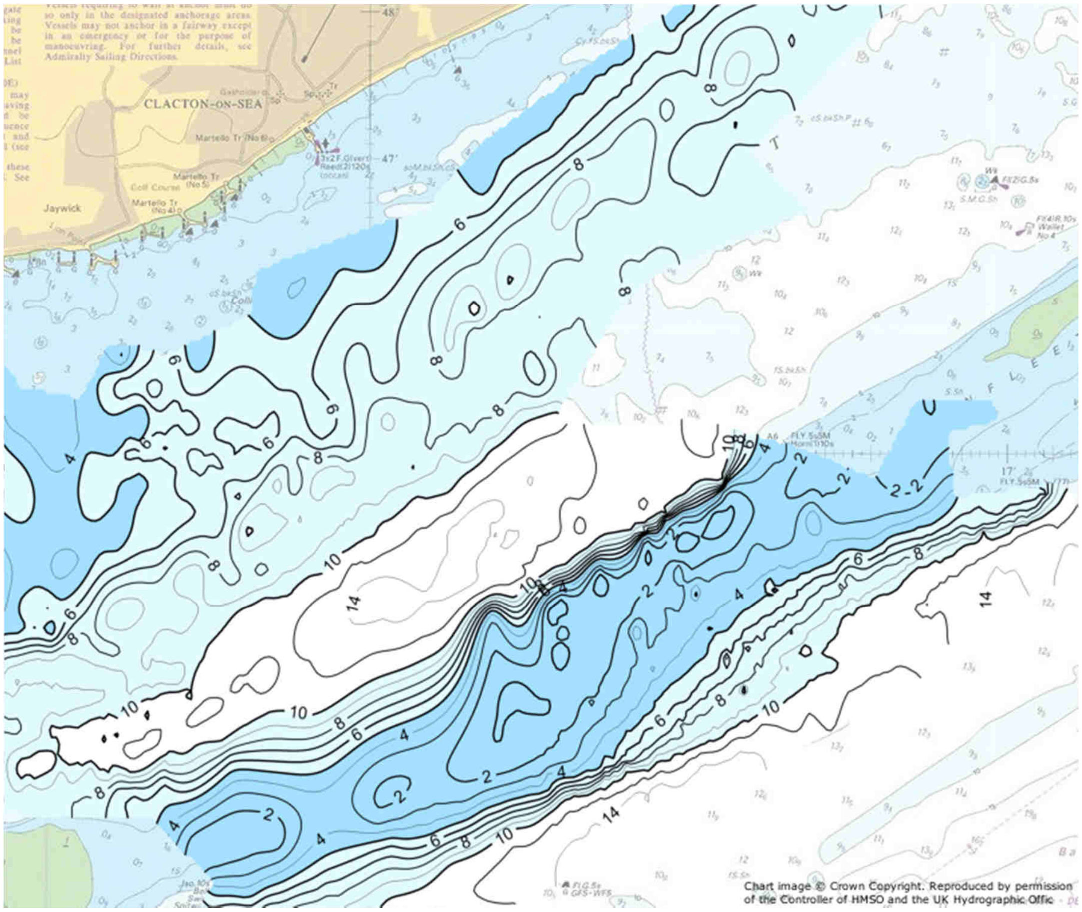

Figure 8 TeamSurv data over UKHO chart

A spider on the server traverses the database, identifying areas where new tracks have been uploaded, prioritising the areas with most new data, and then automatically re-gridding. When a new track is uploaded, that area is generally re-gridded within 12 hours.

5.4 Sea Bed Change

The process as defined above assumes a static sea bed, which of course is not always the case – a prime example is the Wadden See in the North Sea, one of the trials areas for the BASE Platform project.

We are developing algorithms for detecting changes in the sea bed over time, by time slicing the data but weighting the data with time, rather than just splitting it into buckets of equal time slices; we are also looking at how to determine the optimal trade-off between a finer time step with sparser data, and longer time steps with greater accuracy but slower detection of changes.

This will enable the crowd sourced data to be compared automatically against a given base bathymetry, so the end user is just notified of any significant changes.

5.5 Accuracy

We have assessed the accuracy both overall by comparison against contemporaneous multi-beam surveys, and also by looking at the accuracy of the individual sensors and stages in the data processing chain.

Trials with a number of typical general marine navigation GPS receivers show that the 95% RMS2 error can be taken as below 5m, regardless of the cost of the GPS receiver. Depth sounder accuracy figures are seldom quoted by manufacturers, and we have not conducted our own tests, but the figures available suggests that errors are within 1% of depth. Where they differ from survey equipment is in beam angle, with most being in the region of 10° – 12°. This is both good and bad: bad because the position of the returned depth is known less accurately, but good because the wide beam angle compensates for most of the errors from the vessel's motion.

We have undertaken two comparisons against multi-beam surveys. In Klaipeda, in the Baltic, we did a trial in sheltered, non-tidal waters, and 95% of the depths were within 0.2m of the multi-beam survey. Another trial in the more exposed and tidal waters of the English Channel showed 95% of the data was within 0.8m – there was a common offset across this test, which suggested that much of the error may be have been due to differences in tidal corrections, which have since improved.

Because of the characteristics of its data, CSB cannot provide full bottom overage as defined in S-44, but all of the data produced by TeamSurv meets Order 2, and where we have a reasonable quantity of data we meet Order 1b. The plots below show the results of the trials in Klaipeda; overall the comparison is good, though in this case we have a couple of artefacts circled in red, due to insufficient density of data in the region.

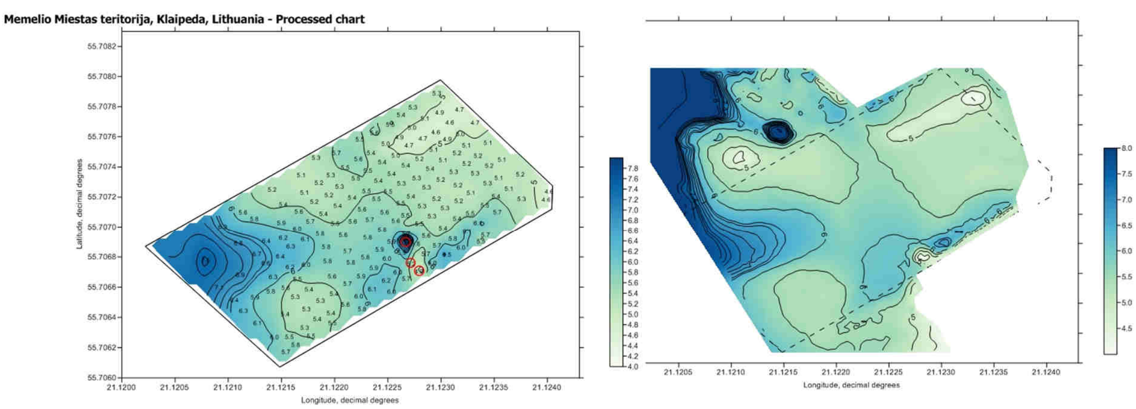

Figure 9 Klaipeda trials. Left TeamSurv, right multibeam

6 Applications

From our extensive experience, we see the following as the most suitable areas for the application of crowd sourced bathymetry in terms of applications for Hydrographic Offices.

6.1 Validating Other Data Sources

TeamSurv can provide bathymetry to help validate data you may have from other sources, e.g. you may have old lead line or SBES data whose accuracy is in doubt, or a new survey doesn't match existing data (I was surprised at the large differences in the common data set at last year's Shallow Survey Conference, where presumably the manufacturers are doing their utmost to provide the best quality data).

6.2 Use with Satellite Derived Bathymetry

Crowd sourced bathymetry works very well in conjunction with satellite derived bathymetry (SDB). It extends the depth ranges, and where the two systems overlap not only do they fill in the gaps in coverage that both approaches can have, but it can also be used as ground truth data to enhance the accuracy of the SDB, so avoiding the expense of deploying a survey vessel (if that is possible in the area being surveyed).

6.3 Provision of Non-Critical Survey Data

There are many applications where Order 1a or Special Order surveys are not required. Examples include areas outside of shipping lanes or in water too deep not to be a hazard to navigation, surveying for environmental and oceanographic purposes such as habitat mapping or creating bathymetry for a hydrodynamic tidal model. Here crowd sourced bathymetry can be a useful tool in gathering the required data.

6.4 Use as a Pre-Survey Tool

In critical areas, a multi-beam survey to Order 1a or Special Order is required. But sometimes there is no or minimal existing bathymetry data, and at present it is only after completing the survey that it is discovered that not all of the area needed the full multi-beam survey – particularly with the tendency to specify a slightly larger area, just in case.

In this situation, crowd sourced bathymetry can be used as a pre-survey tool, to better define the area requiring the multi-beam survey, and possibly to identify any previously unknown hazards in the survey area.

6.5 Monitoring Changes in the Sea Bed

Once a crowd is established in an area, it effectively provides a continuous resurvey of the area. This can be time sliced to detect changes in depths. Examples include areas of silting or erosion by prop wash in berth areas; movement of channels and spits or bars; and monitoring of underwater sand dunes. The TeamSurv data can be used either in its own right, or as a trigger for a professional survey of the area.

6.6 Managing the Data

From discussions with a number of HOs, a key concern of theirs with crowd sourced data is the potentially large drain on resources, as with their operating procedures all submitted data has to be assessed in case it indicates an impact to safety of navigation.

TeamSurv can help address this by offering a complete data management service. We pull together tracks from our own fleet, the IHO DCDB, and other data providers, and process and manage that data. You can then select data for your areas of interest in a managed way, as and when required. We can also provide a service where, if you supply us with a base bathymetry for an area, we notify you if any data we process indicates a significant difference in depth; this ensures that if any important data is uploaded, it is not missed.

We can also use our expertise in crowd recruitment and management to identify, recruit and manage a crowd in areas that are of interest to you. In our experience, passively waiting for vessels to join in results in a very low uptake – compared to OpenStreetMap, the density of potential loggers is much, much lower, so to build up sufficient numbers to give meaningful data an active recruitment campaign is required.

7 Conclusions

TeamSurv offers a complete, end to end crowd sourcing solution that can be used on vessels of all types, from a small RIB to a supertanker. It has also built up considerable expertise in managing the logged data, and in processing it to provide the highest accuracy of data from the logged data, complete with comprehensive data quality metrics.

Whilst the IHO's objectives are laudable, we feel that there is a significant amount of reinventing the wheel, and we question whether this is the best use of member states' funding, when there are already existing solutions available. Having said that, we believe that the IHO's endorsement of crowd sourcing could be a significant lever in facilitating involvement by commercial shipping, if carried through the IMO to its member organisations. However, as the fleet analysis shows, commercial ships are a small minority in terms of the total size of the crowd, and for a lot of the time they are operating in waters that are too deep for their depth sounders to operate.

We are, in principle, willing to support the IHO extending the DCDB to include crowd sourced data from commercial ships, by recruiting ships into TeamSurv, and giving them an option for their data to be submitted to the DCDB as well as into the TeamSurv database. However the IHO's proposition must be much more clearly developed before any sort of firm commitment can be made.

To be able to provide accurate data, and to manage the much larger, relatively uncontrolled, volumes of data that can come from crowd sourcing, a lot more needs to be done than to just provide a data repository. There are many technical challenges to be overcome, with the need for automated data processing, and for a statistical approach to be used to get the best data out of the relatively noisy data from the fleet. The traditional "ping to chart" approach is not suitable, and TeamSurv have developed algorithms for this that are analogous to the CUBE algorithm developed for processing multi-beam data. It also requires a significant data density to have confidence in the data – if just one ship sails through an area, even if of the "approved vessel" approach proposed by some, there is no means of knowing whether (for example) one of the crew has adjusted the depth offset on the depth sounder, whereas if 1000 ships have traversed the area then errors such as this can be handled.

There are also all the soft issues. For example, data ownership, licencing and potential liabilities are currently not really addressed at all in the DCDB as it stands, which is not really an issue where the data is just from a few research vessels in deep waters, but is an issue as the number of vessels increases and, due to the nature of crowd sourcing, increasing amounts of data are submitted for shallow waters. Also, the whole issue of recruitment, support and retention of logging vessels needs to be addressed. All of these aspects need to be addressed and resolved if a significant amount of crowd sourced data is to be acquired.

As we see it, the member states need more data, and this can be provided through crowd sourced bathymetry, with or without the IHO initiative. TeamSurv offers a complete, end to end solution, covering all of the points given above. We are willing to discuss providing this to the IHO, or working with national HOs and using the IHO repository (when available) as one source of data.

For those HOs wishing to gain experience with crowd sourced bathymetry, we are shortly starting a number of trial/demo areas as part of the BASE Platform project. Initial areas are being finalised, but will probably be the WaddenSee (in the North Sea), the Channel Isles, Mauritius, and part of the Black Sea; at a later stage we will be extending into new trial areas. In the trial areas the project will be using crowd sourced bathymetry together with optical, SAR and altimetry based satellite derived bathymetry. If you wish to be an observer for these initial trials, or are interested in having one of the subsequent trials in your waters, or have a specific project in mind which you think could benefit from crowd sourced bathymetry, please feel free to contact us.