Summary of Results from the SCWG Questionnaire on the Use of Surface Current Data

Information Paper for Consideration by SCWG2

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1.0 Introduction

The Surface Currents Working Group (SCWG) of the International Hydrographic Office's (IHO's) Hydrographic Standards and Services Committee (HSSC) has been tasked to develop standards for the delivery and presentation of navigationally significant surface current information. As part of this effort, a questionnaire was produced to investigate how the data and/or products will be used by the mariner and what kinds of data are useful.

Notification of the questionnaire was distributed by the IHO to member states, and was available to the public as a PDF and an on-line version via SurveyMonkey® The questionnaire was open for responses from 1 Oct 2013 to 31 Dec 2013.
The questionnaire was made up of both open and multiple choice questions. Over 1400 responses were received.

This paper is intended to provide a summary of the results of the questionnaire and to inform subsequent discussions at the second meeting of the SCWG.

2.0 Summary of Results

2.1 Major Findings

USES
Route planning and manoeuvring were the two most likely uses of surface current data. The main reasons for not using surface current data was that users are unaware of the data's existence or that they couldn't find the data.

LOCATIONS AND CURRENTS TYPES
Coastal and confined waters were the most important geographic areas for users of surface current data.
For specifics on the current data itself, users choose (a) total current forecast for the most important current type, (b) 2 to 5 days (the maximum period) for the forecast horizon, (c) every hour for the forecast interval, (d) 0.5 knot for the minimum surface current speed, and (e) the top 5 metres of the water column for the most important layer. In general, the longer the forecast horizon, the lower the speed precision was preferred.

DISPLAY PREFERENCES

Most users wanted significant flexibility and/or user control over the display of currents, including being able to turn layers off, make them transparent, or remove numerical information (e.g., direction). Display-dependent resolution was also frequently mentioned.

For speed and directions, users preferred the display showing arrows with some numerical information. For flow pattern, users preferred the display showing speed depicted by arrow size, shape and background.

Users overwhelmingly chose current streamline visualization over simple gridded data visualization.

COMMUNICATIONS

For methods of utilization of surface current data, ECDIS, ENC and web-based display were more popular than hardcopy.

For mode of reception, internet, web service, and mobile devices were all about equally preferred. To receive data updates respondents chose on-demand and automatically almost equally.

COSTS

For the question on what one would be willing to pay for daily updates, most respondents chose 10 to 24 USD per year.

2.2 Demographics

In terms of the survey sample, the demographic information showed that a majority of respondents were non-professionals (56%). Of these most were recreational sailors and/or racers. Several expressed an interest in slack water times. Of the respondents that described themselves as professional (42%), most (>70%) described themselves as more experienced than average.

2.3 Use of data

2.3.1 Reasons for using or wanting to use surface current data

For the users of data (see figure 1), route planning/monitoring was the most important use, then manoeuvring and/or situational awareness. Responses to 'other' (14%) included racing, oceanographic research and engineering, diving, ship dynamics (drift, settlement and squat, under keel clearance), fishing and military planning.

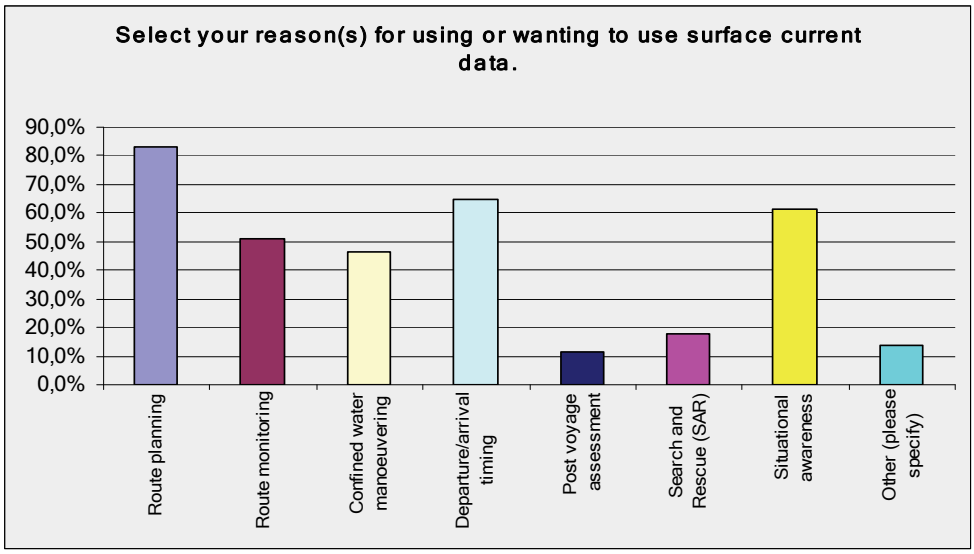

Figure 1: reasons for using or wanting to use surface current data

2.3.2 Reasons for not using or wanting to use surface current data

Most respondents were users (75%) of surface current data. Of those who were not, data were not available in their area or was not in a usable format. Figure 2 shows the main reasons for not using or wanting to use surface current data.

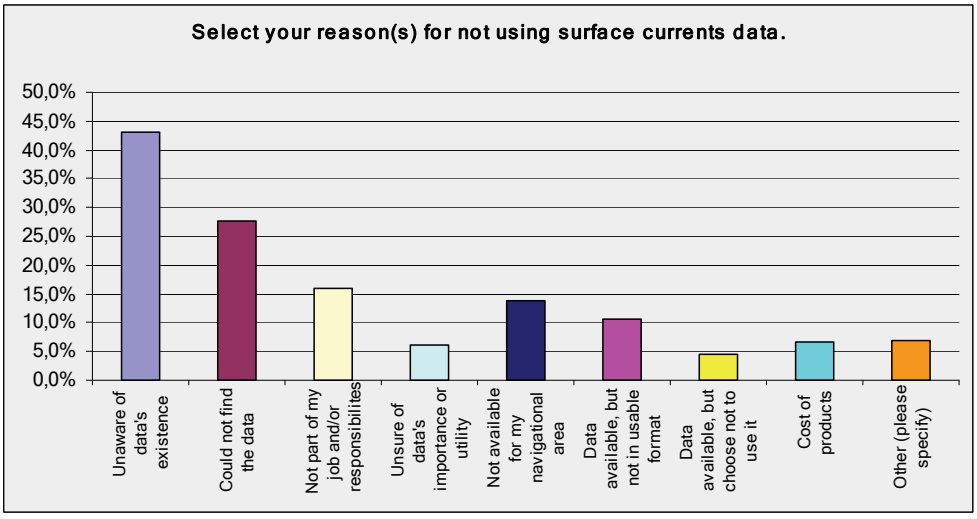

Figure 2: reasons for not using or wanting to use surface current data

Respondents not using surface current data cited poor geographic coverage (45%), lack of up-to-date information (43%), difficult or incompatible format (40%), lack of metadata (33%), inaccuracy (32%) and inaccessibility (21%) as most important reasons.

2.3.3 Use of ENC, ECDIS or ECS

Most of respondents (64%) have used an ENC, ECDIS or ECS. Professional users (83%) have used more often ENC, ECDIS or ECS than non-professional users (50%).

2.4 Current Types

On the question "select the type(s) of surface current data that you have used or would use," respondents answered that total current forecasts (78%), astronomical tidal current predictions (71%) and observed currents (71%) were more important than historical predictions and observations (~40%). Those selecting 'other' usually used paper or digital information and were often unaware of the type of current data they were using.

2.5 Area of coverage

Although coastal (90%) and confined waters (72%) were most important geographic areas for the use of surface current data, all listed areas were of interest. For those choosing 'other' , tidal rivers, straits, smaller seas (e.g., Persian Gulf),and polar regions were often mentioned.

2.6 Water Column

On the question "which part of the water column is the most important for you", respondents most often chose the shallowest category (the top 5 metres of water) (60%), with fewer choosing the options as depth increased: (0-12 metres) (26%) and (0-25 metres) (11%). Non-professionals most often chose the shallowest category (77%) and professionals most often chose the top 5 metres of water (38%) and the top 12 metres of water (38%).

For choosing 'other' (2%), several respondents were interested in the top 500 m, or even the total water column, often for military, salvage, or mineral extraction reasons.

2.7 Timeliness

Figure 3 shows the surface currents forecast horizon that best suits users needs.

1) 2 to 5 days (40%)
2) 1 day (28%)
3) 12 hours (13%)
4) 6 hours (11%)

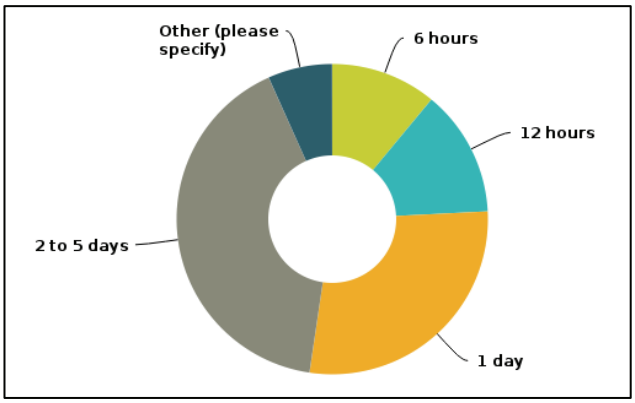

Figure 3: surface current forecast horizon that best suits users needs

For those choosing 'other' (6%), respondents requested forecasts out to at least 7 days, and as much as 1 month.

Figure 4 shows the forecast interval that best suits users needs.

1) every hour (33%)
2) every 30 minutes (22%)
3) every 15 minutes (15%)
4) every 6 hours (11%)
5) every 3 hours (10%)
6) every 6 minutes (4%)

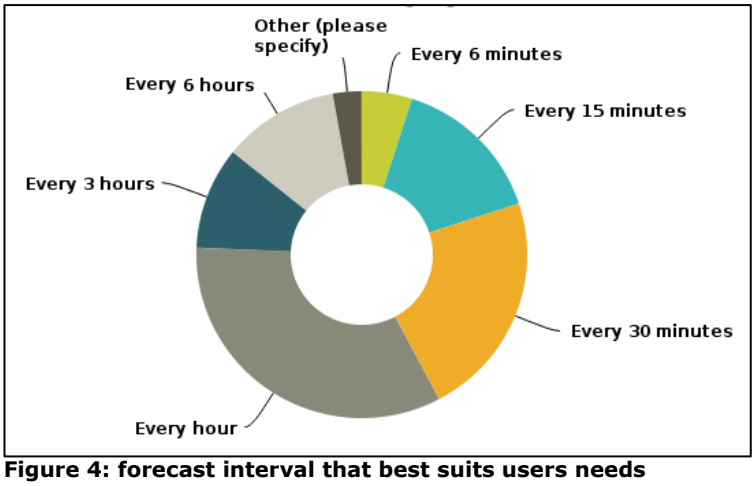

Figure 4: forecast interval that best suits users needs

For those choosing a forecast interval of 6 minutes 34% chose a surface current horizon of 6 hours. For those choosing a forecast interval of every hour 43% chose a forecast interval of 2 to 5 days.

2.8 Spatial resolution

All resolutions (see figure 5) were relatively equally popular, but especially display-dependent. For 'other', respondents wrote that it depends on the size/type of the area. Coastal and confined area would need higher resolution than the open ocean.

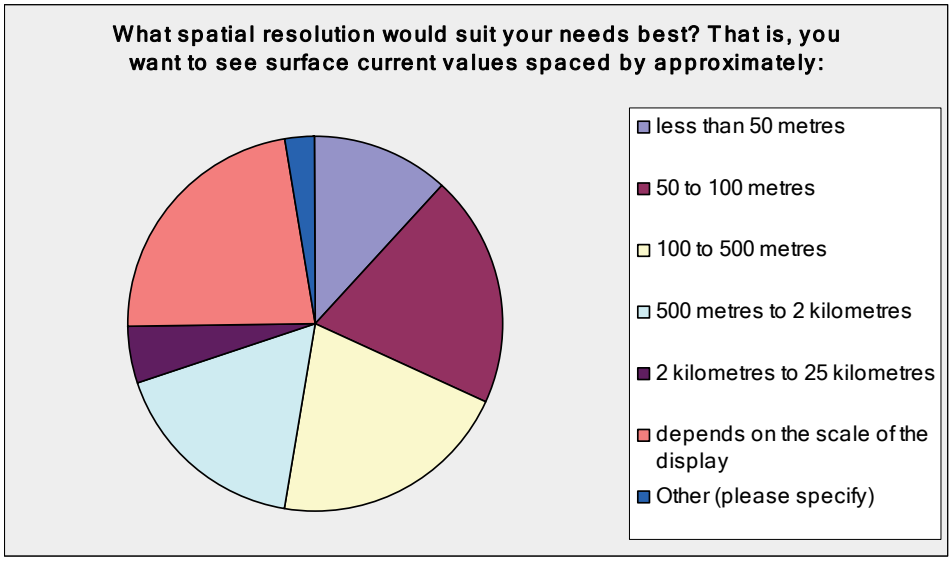

Figure 5: spatial resolution that best suits users needs

For those choosing a forecast interval of 6 minutes, a spatial resolution less than 50 metres (35%) and a spatial resolution 50 to 100 metres (31%) were most popular. For those choosing a forecast interval of every hour, the answers 'depends on the scale of the display' (27%) and a spatial resolution of 100 to 500 were most popular.

2.9 Minimum speed

On the question "select the minimum surface current speed that affects your navigational decisions", 0.5 knot was the most popular choice (42%). For 'other', respondents wrote that it depends on the size of region.

For those choosing a forecast interval that best suits your needs of every 6 minutes, 0.5 knot (35%) and 0.1 knot (33%) were the most popular minimum surface current speeds. For those choosing a forecast interval that best suits your needs of every hour, 0.5 knot (44%) and 1 knot (27%) were the most popular minimum surface current speeds.

For those choosing a minimum surface current speed that affects your navigational decisions of 0.1 knot, the spatial resolution of less than 50 metres (21%), 50 to 100 metres (20%) and 100 to 500 metres (20%) were most popular.

For those choosing a minimum surface current speed that affects navigational decisions of 0.5 knot, the spatial resolution of 50 to 100 metres (21%) and 100 to 500 metres (21%) were most popular.

2.10 Graphical representation & visualization

For speed and directions, users preferred the display with the option of showing numerical information (see figure 6). For flow pattern, users preferred the display showing speed depicted by arrow size, shape and background (see figure 7).

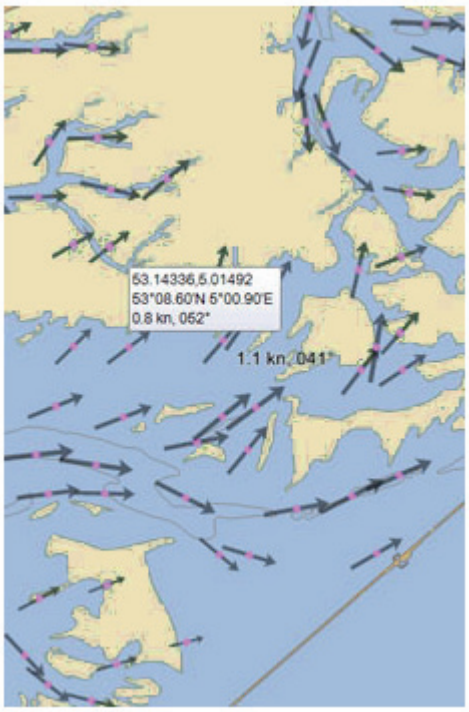

Figure 6: speed depicted by arrow size, mouse over text

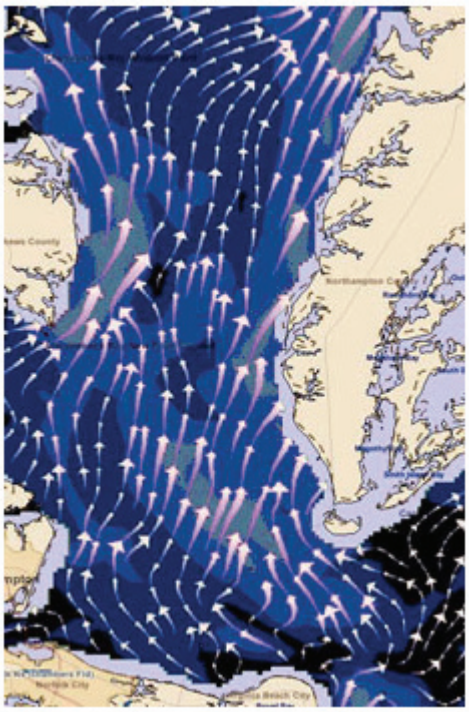

Figure 7: speed depicted by arrow size, shape, background

The answers on the question "Please select which type(s) of current information you would prefer to see displayed, other than vectors", were somewhat hard to interpret. Maximum speed and speed at a selectable-time were the most popular. Respondents also preferred that speed data (maximum and at a selectable time) be available on a mouse-over.

Respondents overwhelming chose streamlines (87%) visualization over gridded data (13%) visualization (see figures 8 and 9).

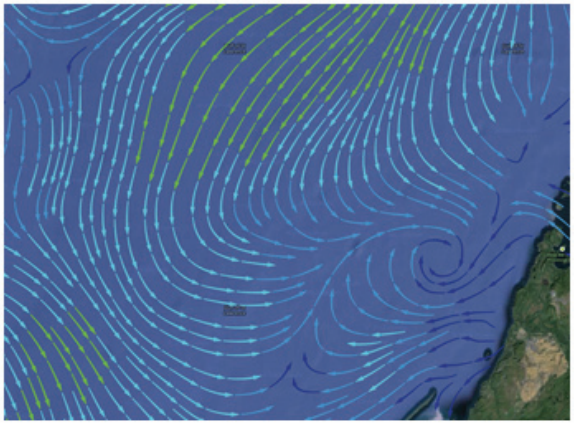

Figure 8: current vectors aligned along streamlines

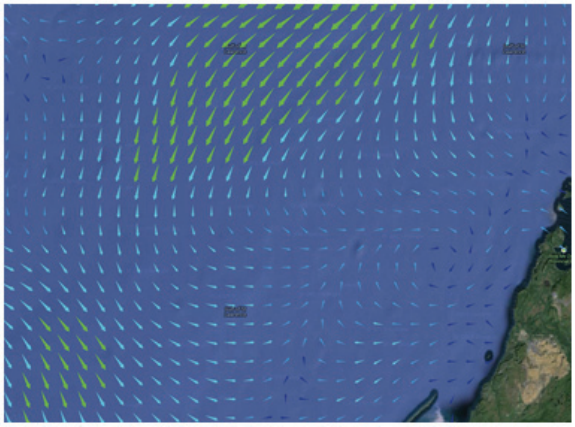

Figure 9: current vectors at grid points

2.11 Methods of utilization of surface current data

Methods ECDIS, ENC and web-based display (all ~ 52%) were more popular than hard copy (20 %). For non-professional users, the stand alone web-based display method (63%) was more popular than the methods involving ENC (53%) and ECDIS (43%). For professional users, the ECDIS method (65%) was more popular than the ENC (46%) and the stand alone web-based display (33%).

How to receive surface current data. Internet, web service, and mobile devices were all about equally preferred (~81%), although storage media (71%) was not far behind. To receive data updates, respondents chose on-demand (51%) and automatically (48%) almost equally. For non-professional users, on demand data updates were more popular (60%) than automatic data updates (37%). For professional users, automatic data updates (65%) were more popular than on demand data updates (33%).

For those choosing fully integrated with ECDIS or ECS as the method of utilization of surface current information automatically data updates (55%) was more popular than on demand data updates (43%). For those choosing stand alone web-based display as the method of utilization of surface current information on demand data updates (57%) was more popular than automatically updates (41%).

2.12 Costs

The provision of surface current information may require additional cost. On the question what would you be willing to pay for daily updates most respondents chose 10 to 24 USD per year. Many comments were generated: a common one was that the service should be free (tax dollars create it, so $0.00), while others remarked that the cost was not an issue since it would be borne by their employer. Another common response was that the service should be free to recreational users.

Most respondents of non-professional users chose 10 to 24 USD per year to spend on daily updates. Most respondents of professional users chose less than 10 USD per year to spend on daily updates.

2.13 Additional comments

1) display should be user configurable to suit their requirements. Many respondents expressed the preference for a layer that can be turned off, made transparent, or otherwise have user-adjustable features.
2) Several expressed interest in integrating current data with tidal (elevation) data.
3) how would standards apply to existing vendors/sources such as Nobeltec, HYPACK, ArcMap, WinFrog, SeaMax, TheCaptain, OpenCPN, Coastal Explorer, Garmin, Admiralty Digital Products and VTMS.

2.14 Comments on Survey

Most enjoyed taking the survey, and thought it would be helpful. Many of the comments have been covered in the response to ‘other’ in the other questions.

Of those not covered elsewhere: The wording of Q15 was unclear, the survey should have had professional review before going public, and the Figures in Q17 should have used the same data.

50% of the respondents said they would be willing to be contacted.

3.0 Discussion topics

After the analysis of the survey, the authors had a few questions for the WG:

1) Do we have to develop a standard for all users (i.e., professional and recreational), or only for professional users?

2) What are the advantages and disadvantages of displaying current vectors at grid points compared to current vectors along streamlines?

3) The main reasons for not using surface current data is that users are unaware of data existence or that they couldn't find the data. Do we need a world wide data centre for surface currents?

4) If surface currents are available as averages of the upper water layers, which are more significance to shipping? At which level of the top of the water column do we have to calculate the surface currents? Recreational sailors are interested in the top 5 metres of the water column, but bulk carriers are interested in the top 25 metres of the water column.

The SCWG discussed these questions, and the consensus was as follows. For (1), SCWG should develop standards for all users, but recognize that ECDIS and ECS were more likely to be used by professionals. For (2), SCWG decided to focus initially on the display of gridded data, since the display of streamlines was a more difficult task. For (3), better advertisement of the availability of surface current data should be undertaken (possibly using the Notice to Mariners). For (4), perhaps both layer-averaged currents (at variety of depths) and currents at specific depths should be made available.

After the discussion of the survey, the SCWG had a question and observation:

1) Was it possible to separate the needs of ship-based users from those of shore-based users, especially as pertains to route planning and monitoring? The answer may assist in determining the amount of data required and in designing the encoding schemes.

With the SurveyMonkey® software the answers of ship-based (in Q1, professional mariners) respondents and shore-based (in Q1, professionals in a related field) respondents were compared. For most questions, the answers were close to each other. For those respondents who chose route planning as the most important use for surface current data in Q8, there was a small difference between those likely to be based on a ship (in Q1, professional mariners) (80%) and those less likely to be based on a ship (in Q1, professionals in a related field)

(63%). Thus it seems that ship-based users prefer to have as much data as possible.

2) It should be kept in mind that data transmission and display methods should be flexible enough to be used on older, legacy ECDIS equipment.