

3.3 Chart reliability

The mariner should be clearly aware the chart is only **an aid** to navigation and **not an exact precision instrument**. The representation of reality may, for a variety of reasons, be incorrect.

Charted depths may be inaccurate and incomplete due to the lack of modern surveys.

Coastlines and islands may have positional errors due to older production methods.

Positions of permanent navigational aids and lighthouses may be incorrect due to the lack of modern survey methods. For the same reason the presentation of cables on the sea floor may be only approximate. Wharves, jetties, bridges etc. may have been added, demolished or significantly altered without any of the changes having been reported to the Administration.

In addition, the chart always has the 'built-in' cartographic errors which are inherently produced by representing curved surfaces on flat charts. The scale of a chart make it impossible to reproduce land contours in minute detail and cartographers are forced to generalise the image so that important features are retained and sometimes even accentuated.

The issues concerning the lack of perfect accuracy are relevant for all chart products currently on the market, both paper products and those presented in an electronic format.

In order to avoid detrimental and/or hazardous consequences from arising, the navigator should take the following precautions:

- Navigate using a wide margin. Do not cut corners near promontories and shoals. Keep well clear of depth contours that constitute a danger to the vessel. Depth contours are warning signals!
- Leading lines on charts are verified and are therefore reliable. No absolute guarantee of clearing shoals in close proximity to the line exist when plotting one's own leading lines.
- Charts of the largest available scale should always be used. In the areas represented by a larger scale chart or plan the ordinary chart contains comparatively limited information.
- Depths in Swedish charts are, with a few exceptions*, referred to the Mean Sea Level (MSL) of a specific year. Due to the post-glacial land rise actual depth may be as much as **0,5 m less** than indicated on certain charts. The end-user should always refer to the information indicated at the top right corner of each chart.

**The countries surrounding the Baltic Sea have now agreed on a common vertical reference system, 'Baltic Sea Chart Datum 2000' (BSCD2000), to be gradually introduced in charts and ENC's. The zero level in the new reference system is close to MSL and is expressed $\pm 0,0$ m BSCD2000.*

The Hydrographic Office of Sweden has started to introduce the BSCD2000 as an official Chart Datum in all charts and ENC's. The project is expected to be completed in 2021.

3.4 Depth information on charts

It is important that the navigator has adequate knowledge of how depth information is presented on charts. Overrepresentation of hydrographic data would make the chart unreadable.

Defined areas are used within which depth can vary between two limits. These areas are bounded by depth contours. The coastline represents the 0 m contour. A 3 m contour follows which in turn is supplemented by 6-, 10-, 15-, 20-, 30-, 50- and 100 m contours. Other depth contours may exist and in certain areas special contours adapted for a certain depth can be drawn. (as an example, a 7,6 m contour is shown on charts covering Lake Mälaren)

In the area between the coastline and the 3 m contour the depth may vary, quite irregularly, anywhere between 0 and 3 metres. Likewise between the 3 and 6 m contour the depth varies between 3 and 6 metres. Apart from soundings the chart gives no other depth information.

Where no soundings are given the depth must be assumed to be in the lower range.

The depth between soundings cannot be interpreted and the irregularity of the seabed makes interpolation impossible.

The current water level must always be taken into account. The Swedish Meteorological and Hydrological Institute's (SMHI) website, www.smhi.se, provides continual information on water levels around the Swedish coastline.

A large part of the Swedish coastline is affected by the post-glacial land uplift. The effect is most pronounced in the north where the uplift is about 1 cm/year.

The following table indicates the land uplift corrections for those charts where the correction in the year 2015 is 30 centimetres or more.

Chart	MSL ¹	Land uplift	Correction
4101 ³	1960	0,8 cm/year	40 cm
411 ²	1980	0,9 cm/year	30 cm
412 ²	1965	0,8 cm/year	40 cm
413 ³	1965	0,9 cm/year	50 cm
414 ³	1960	0,9 cm/year	50 cm
414S ³	1960	0,9 cm/year	50 cm
415 ³	1960	0,9 cm/year	50 cm
4151 ³	1960	0,9 cm/year	50 cm
421 ³	1962	1,0 cm/year	50 cm
4211 ³	1962	1,0 cm/year	50 cm
422	1970	0,9 cm/year	40 cm
511	1980	0,9 cm/year	30 cm
512	1970	0,9 cm/year	40 cm
5121	1970	0,9 cm/year	40 cm
513	1970	0,8 cm/year	30 cm
514	1970	0,8 cm/year	30 cm
522	1980	0,8 cm/year	30 cm
525	1980	0,8 cm/year	30 cm
532	1970	0,7 cm/year	30 cm
533	1970	0,7 cm/year	30 cm
5331	1960	0,7 cm/year	40 cm
534	1970	0,6 cm/year	30 cm
535	1970	0,6 cm/year	30 cm

¹⁾ MSL - Mean Sea Level (year) for respective chart

²⁾ Newest edition (Spring 2016) of these charts use BSCD2000.

³⁾ New editions to be printed during the summer of 2016 will use BSCD 2000.

3.4.6 Quality of depths in charts and ENC

The quality of depth information in nautical charts can vary greatly between different areas. Fairways and other areas which are used by merchant ships, where the water depth may be a limiting factor, have generally been surveyed with modern methods to a high standard.

However, there are still large areas where depths have not yet been verified by any method other than hand lead. This method is inherently accurate in itself but the distance between the measurement points can be quite large and position accuracy for each sounding may thus be poor. Depth information in these areas should for that reason be considered to be fairly unreliable.

After 1940 hydrographic surveys have generally been performed using sonar technology.

Echo sounders provide considerably more data and the probability of detecting small shoals is far greater than when using hand lead.

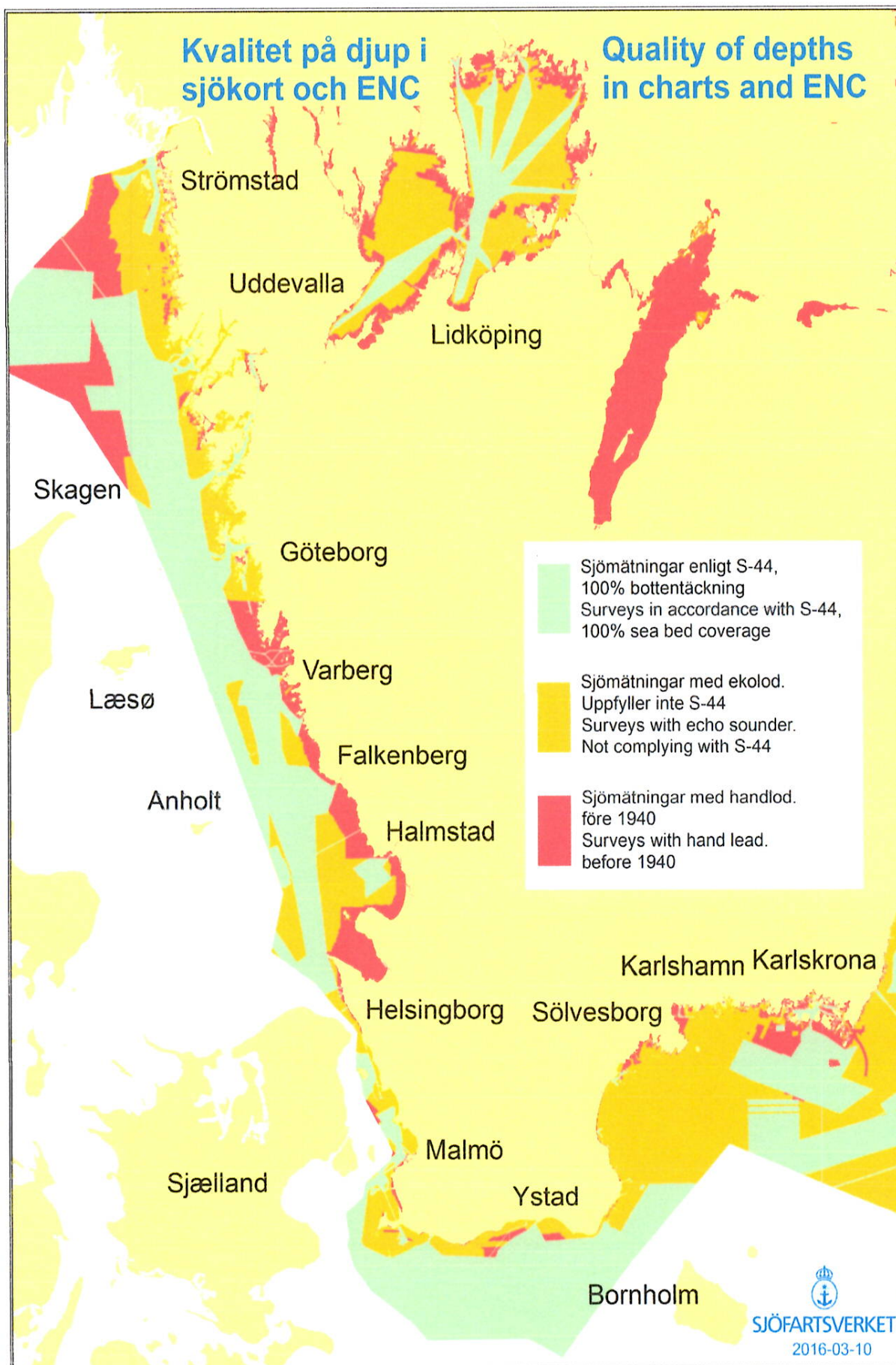
Advanced multi-beam echo sounders and computer processing are nowadays used during hydrographic surveying. This method produces a very detailed view of the seabed within the surveyed area. The maps on the following three pages provide an overview of the quality of depth in charts and ENCs covering Swedish waters.

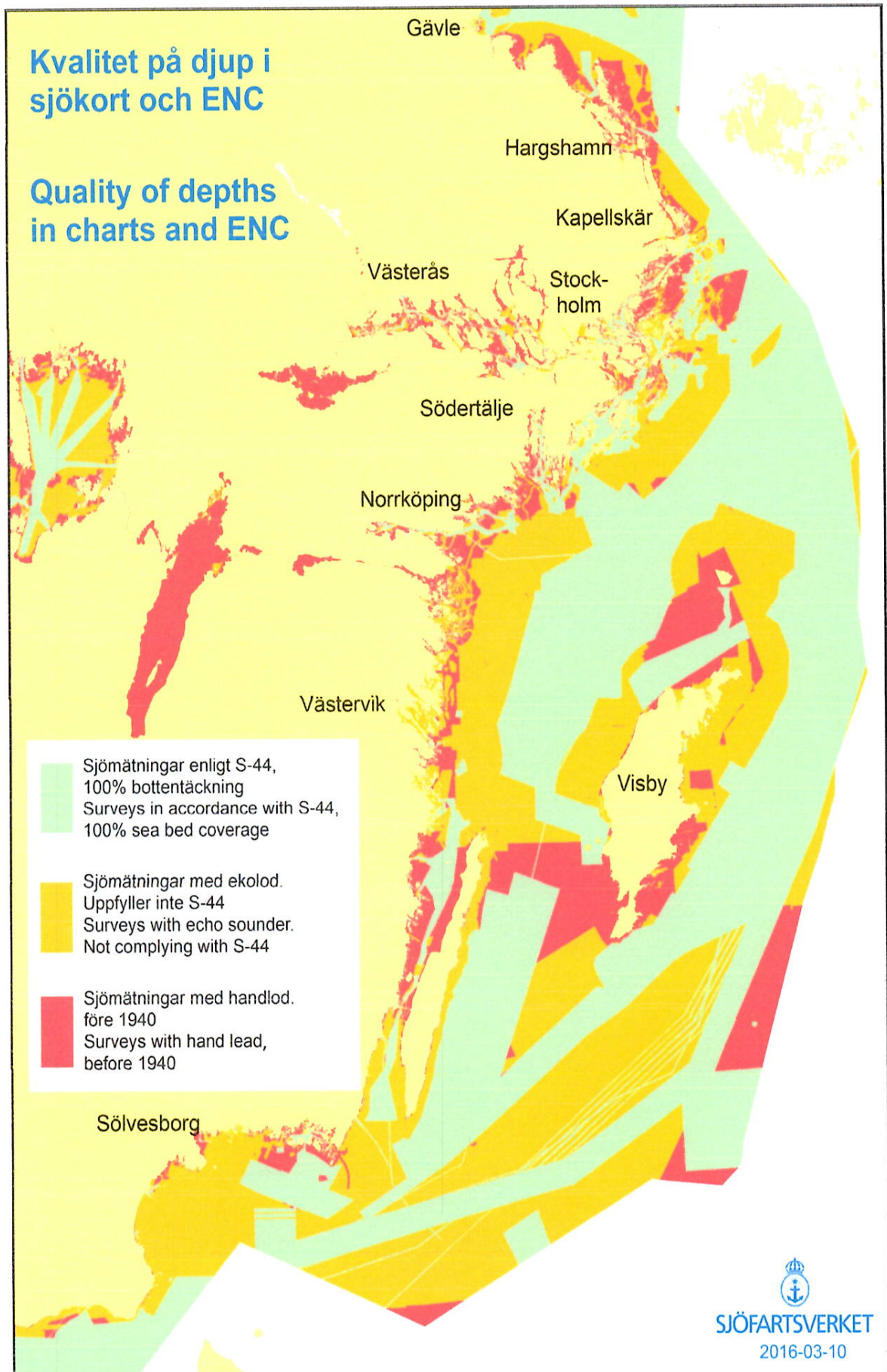
The light green-coloured areas have the highest quality of depth information and these surveys are meeting the requirements of the international standard S-44 (which in Sweden and Finland is referred to as FSIS-44). 100% bottom coverage is achieved by multi-beam or by bar sweeping.

The dark yellow-coloured areas have been surveyed using sonar technology but are not meeting the requirements of the standard S-44.

In the red-coloured areas depths in charts and ENCs are based on hydrographic surveys conducted with hand lead before 1940.




The SMA website www.sjofartsverket.se provides more detailed information on the quality of depth information stored in the depth database (DIS), which is the basis for the depth of the chart database (SJKBAS), which in turn form the basis of all depths in the official charts and ENCs covering Swedish waters.

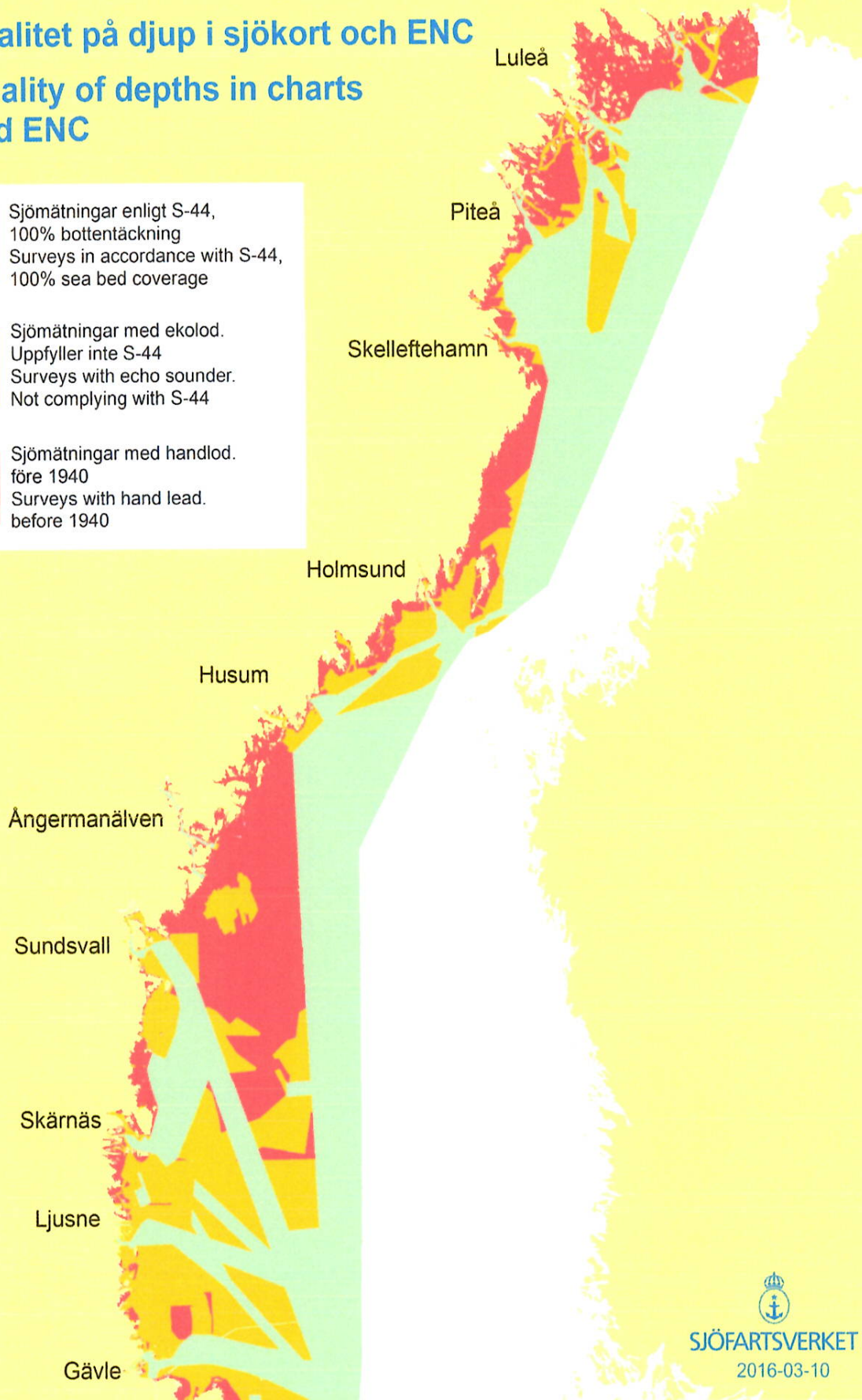




Kvalitet på djup i sjökort och ENC

Quality of depths in charts and ENC

-  Sjömätningar enligt S-44, 100% bottenäckning
Surveys in accordance with S-44, 100% sea bed coverage
-  Sjömätningar med ekolod. Uppfyller inte S-44
Surveys with echo sounder. Not complying with S-44
-  Sjömätningar med handlod. före 1940
Surveys with hand lead. before 1940



3.5 Swedish charts and nautical publications

General charts	1:500 000	-	1:1 600 000
Coastal charts	1:180 000	-	1:250 000
Archipelago charts	1:50 000	-	1:125 000
Special and harbour charts	1:10 000	-	1:30 000

Small craft charts cover the mainland coastline, the largest lakes and some of the canals. These are double-sided, spiral-bound folios on durable paper in A3-size intended for pleasure craft and include certain supplementary information.

Nautical publications

INT 1 / KORT 1 contains symbols, abbreviations and terms used on Swedish and international charts.

Swedish Notices to Mariners (Underrättelser för sjöfarande/Ufs) is generally published on a weekly basis and contain chart corrections and other information of importance to navigators. It is available in pdf-file format at www.sjofartsverket.se/ntm. Subscription is available by e-mail.

Ufs A General information published once a year containing comprehensive terms and specific information about Swedish conditions that may be useful to the navigator.

Winter navigation General information on the icebreaking service and navigation in icy waters (available for download in pdf-file format from www.sjofartsverket.se)

Additional information about other products are found in the product catalogue which is distributed free of charge by respective sales agent.

3.6 Electronic charts

3.6.4 Preliminary and temporary changes in ENC

Temporary and preliminary information, which are described in P- and T-notices in Ufs (Swedish NtMs), is now generally shown in ENC. Exceptions may exist if the temporary or preliminary condition:

- is not possible to display in ECDIS in a clear way,
- is of short duration and is also promulgated through a navigational warning,
- affects an area which has previously been charted as an working area (e.g. restricted area, works in progress etc.),
- only affects a few ships that are assumed to receive relevant information from port authorities, pilots or VTS-centres
- affects an extremely large number of ENC-cells,
- affects waters which are normally not used by vessel fitted with ECDIS, or
- is a warning about firing exercises within charted firing practice areas

P- and T-notices which are not shown in ENC are clearly marked by 'Not shown in ENC' in respective NtM.

Preliminary and Temporary changes are distributed to shipping in the same way as regular ENC updates.

P and T changes may be presented in ECDIS in different ways depending on the specifics of respective update. Below are some examples of how presentation may be done:

- a) Dredging operations, cable laying and similar works may be shown by a *caution area* which covers the affected area. By clicking inside the area a short text is made visible which briefly describes the work in question.