

## CARTOGRAPHY

### PRINCIPLES TO BE OBSERVED IN THE COMPILATION OF CHARTS.

---

(Lecture delivered by Mr. G.B. STIGANT, M. Sc., *Superintending Cartographer* and *Assistant Superintendent of Charts*, British Admiralty, before the Fourth International Hydrographic Conference, Monaco, 21st April, 1937).

---

I am afraid I shall not be able to make my talk as interesting as Commander Southern's as I intend dealing with troubles in the office which usually are less entertaining than those in the field.

In training a staff, very often a staff with only a limited experience of surveying, and when trying to reach some criterion by which to judge what details should be inserted in charts and what should be left out, I have in the past few years tried to lay down general principles to guide draughtsmen and cartographers when they have to make that judgment. To my mind the most important criteria by which the value of a chart may be judged are its

ACCURACY  
ADEQUACY  
CLARITY.

If this view is correct it follows that a constant reference to these three considerations will form the best practical guide during chart compilation.

It is often necessary in chart work to get right back to fundamentals from the particular questions in hand. In order to answer the questions : Shall this or that be inserted on the chart ? How shall it be inserted ? etc., one has to get back to the basic question of what a chart is and what is its function. The most comprehensive answer to these questions is I think that the chart is a link between the surveyor on the one hand and the navigator and, to a lesser extent, the oceanographer on the other.



This conception of a chart reveals at once the central problem of Cartography, namely, the problem of Selection. The surveyor also meets that in the field and when preparing his fair sheet. Stated in the most general terms the problem is how can we best show, within the four borders of a chart, by means of symbols, abbreviations etc. those things which are of primary importance to the navigator ? Now in this process of selection what are the principles to be observed ? The answer, I suggest, is to be found in the three criteria already mentioned.

I shall now try to show how these principles can be applied, considering first the problem of compiling a large scale chart from the surveyor's fair sheet. Here we try to show correctly and as far as possible at least the substance of what the surveyor has thought it advisable to give on his fair sheet. But, naturally, regard must be paid to the limitations of space on the chart and to the exigencies of the various processes of reproduction. (In this statement you will notice that I have evoked the three principles of accuracy, adequacy and clarity but I must add that presiding over all must be a strict regard for the needs and safety of the mariner).

*COASTLINE AND TOPOGRAPHY.* — After drawing the projection, our practice usually is to commence drawing the High Water line and the topography. The principle of accuracy implies that the coastline must be drawn with details sufficient to show all prominent points, bends, changes of character etc. which might be of service to the navigator in fixing his position. On the other hand it might be important in a few instances to sacrifice a little accuracy in the interests of clarity. For example if it were known that a certain islet always appeared distinctly isolated from a nearby mainland, we should take particular pains to show that isolation even if it meant a slight distortion of size or shape.

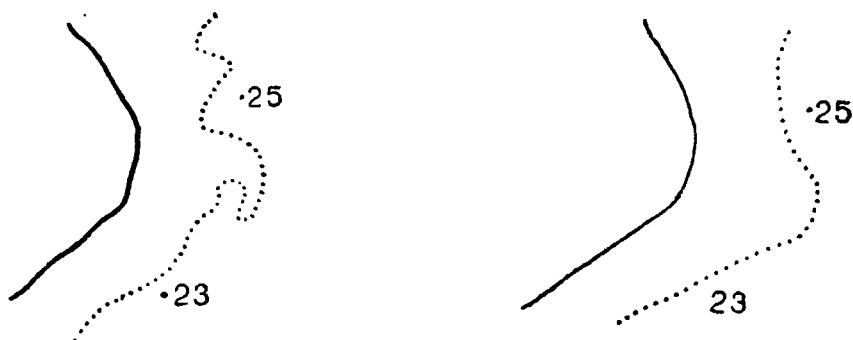
The selection of topography and buildings often presents many difficulties but here again the needs of the navigator come first so that certain remarkable features receive greater emphasis than they would on topographical maps.

*SOUNDINGS AND FATHOM LINES.* — The selection of soundings is often most difficult. Only a fraction of those taken by the surveyor are usually shown but the soundings selected must of necessity tell the navigator the correct position and nature of all submerged or drying dangers and give in addition as complete a picture of the relief and quality of the sea bed as the scale of the chart permits.

*NAVIGATIONAL AIDS.* — On the largest scale Admiralty charts we try to show all the navigational aids by means of the system of symbols and abbreviations. It is chiefly on the smaller scales that a selection has to be made both of which objects and which of the descriptive legends shall be inserted or omitted. Each chart is taken on its merits and its particular purpose considered. On the second scale chart for example, the descriptive legends to lights etc. may be merely abbreviated; on still smaller scale charts lights themselves, of less than say 15 miles visibility, may be omitted altogether. Buoys in inner waters are also omitted from many small scale charts. It is in problems of this kind that I have found the best and most rapid way of reaching a decision is to attempt a compromise between the three principles of accuracy, adequacy and clarity, always bearing in mind the use to which the particular chart will be put.

May I add in conclusion that these ideas were continually in my mind during our discussions on the Charts Committee, and never left me in doubt on which way to vote.

V.-Adm. NARES: There is one point that rather strikes me, and that is that we might ask Mr. Stigant to elaborate on the question of selection of soundings to be shown on the published chart. In my recent study on the progress of hydrography I have found the different nations vary so much as regards the number of soundings they show on a published chart. In some cases you can tell when a place has been pretty accurately surveyed, because if you have the coast here, with a point in this place, and the fathom



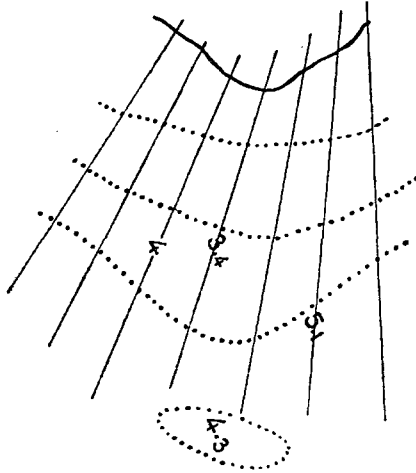
line off it is obviously very zigzag, you can assume, although only one or two soundings are there, that that area has been closely sounded, although the chart may show only one or two soundings, while, if you get a smooth fathom line, you may assume there were not many soundings in the original survey, otherwise no smooth curves would have been made, as nature very seldom runs in smooth curves.

Mr. STIGANT: I do not know whether I recollect enough examples to illustrate this question sufficiently off-hand. Submarine formation is so very varied. One general principle we try to follow is to show by the selection of the soundings the very point that Admiral Nares referred to whether, in fact, the information is derived from a thorough survey, or whether the chart is a compilation of sketchy material. The problem can be treated, I think, by reference to the principles of accuracy, adequacy and clarity, of which adequacy is important here. We make it an absolute rule for navigational reasons to show all shoals, and we extend the meaning of the word "shoal" to include the outermost sounding of a given depth. The danger line is the 6-fathom line though in practical navigation you would practically keep outside the 10. We shall have on the fair chart lines of soundings something like this: (See next page).

Most cartographers draw in the 6-fathom line in pencil first, and select the outermost sounding which by its depth showed a protuberance of a shoal from a certain point of the land; the first stage would be as I have shown on the board.

Our next step after showing the shoalest soundings, is to insert if possible the deepest soundings, and to give as much information about the submarine relief as the scale of the chart permits. Supposing for example

there is an isolated shoal of depth less than 6 fathoms : we should insert the least depth, say 4 fathoms 2 feet and between that isolated shoal and the shoal bank we should try to show the deepest sounding, say 9 fathoms



in order to represent the bottom of the submarine valley. The next stage is to fill in other soundings. If it is a new chart we keep a pretty uniform spacing, rules for which have been laid down by Admiral Edgell; I could not give you the distance in centimetres, though I might give a number to the square inch for charts of a given scale. We try to get a greater concentration over the one-fathom and three-fathom banks and diminish this concentration slightly for the 6-fathom bank and still more for the 10-fathom bank and so on, thus obtaining a certain fan-like distribution of the soundings.

Adm. EDGELL : The soundings on charts are influenced to some extent by the age of the survey. I am not necessarily going back 40 or 50 years when appliances were more primitive, when power boats had less power or were maybe non-existent, when I say that it has often been exceedingly difficult to get anything like deep soundings or say soundings even over 10 or 11 fathoms from a boat. The consequence is that the shallow areas have often received more intense attention than did the deep-water areas, and whereas now we devote much time and attention to waters with a depth of between 5 and 15 fathoms, we are more inclined these days to leave the shallower parts less carefully attended to and to sound other areas.

Some of the older charts gave a relatively large number of soundings over the banks, but the soundings outside were sparse, and the fathom line, although it is shown is not nearly so well supported by the survey as nowadays. Admiral Nares referred to the zigzag line or smooth contour; in different parts of the world you may get a smooth or an interrupted contour. But as far as the Admiralty is concerned, fathom lines when put on the chart, should at the same time be *adequately* supported by soundings. I do not like the idea of putting in a fathom line and not putting soundings near it. That is not our method of working now. In the case of an isolated shal-

low bank, such as that on the board, we would thicken up the soundings on that area and draw the attention of the navigator to its existence.

Kom. Kap. JENSEN (Denmark): It has been a great pleasure to hear you draw attention to the outside of the 5— or 6— fathom line, because when 10 years ago we started wire drag sweeping, we selected for that purpose the water between 10 and 20 metres. We found that in these special cases a number of stones came up from the bottom with perhaps 8 or 9 metres of water above them; they had never been found before because the surveying had never been carried outside 10 metres.

V.-Adm. NARES: I should like to thank those officers who this afternoon have given us the benefit of their many years' experience in surveying, and I am quite certain that talks of this kind constitute a most valuable part of the Conference in that they provide opportunities for a full exchange of views.

