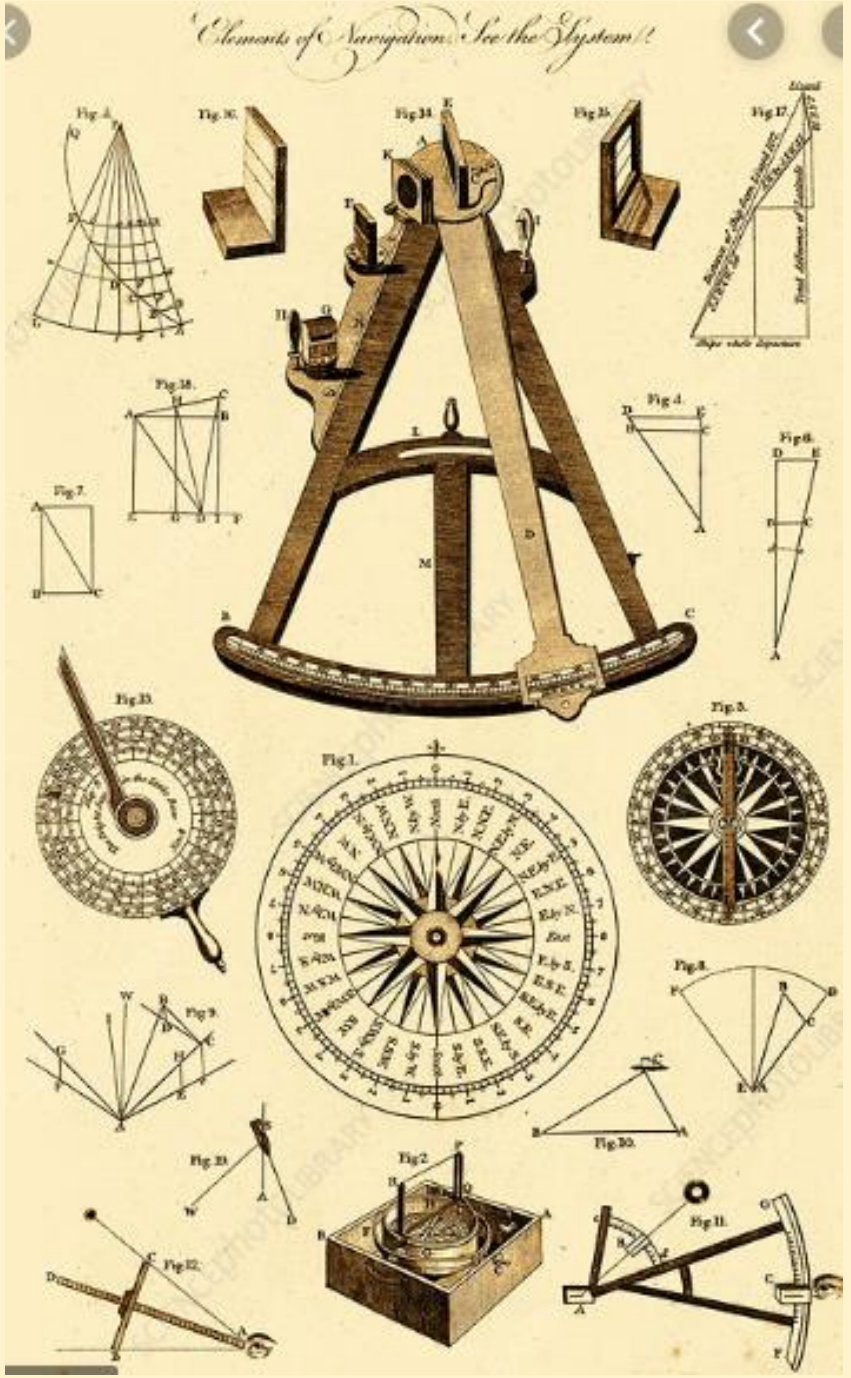
PASSAGE PLANNING

- Aims
- Definitions
- Hydrographic surveys
- Accuracy of paper charts and chart plotters
- Zooming on vector charts
- Chart information
- Navigational awareness
- Changing the plan
- Chart corrections
- ENC corrections
- Best practices
- Checklists

malta cruising club

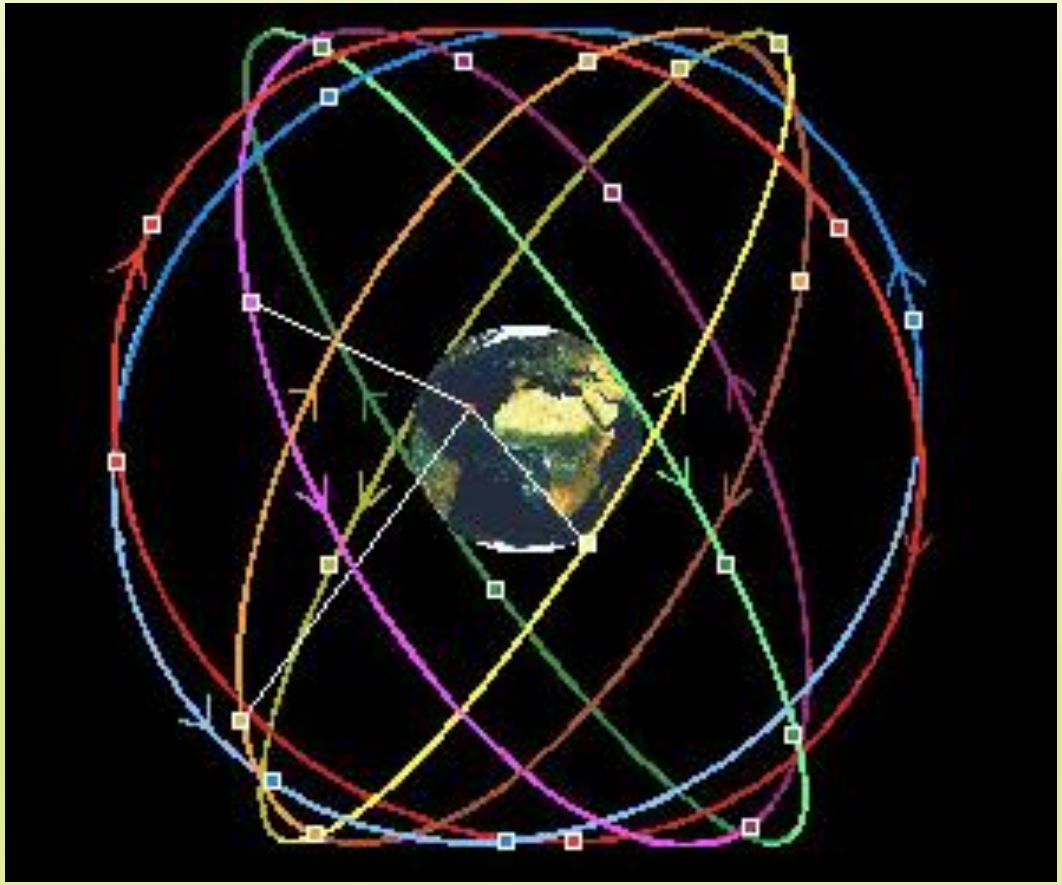
AIMS

- To show yacht navigators how a combination of paper charts and electronic chart plotters when passage planning can reduce risk
- To explain WGS84 and how it effects a vessels position in relation to the land
- Discuss the classic errors associated with electronic navigation
- Discuss best practices for passage planning



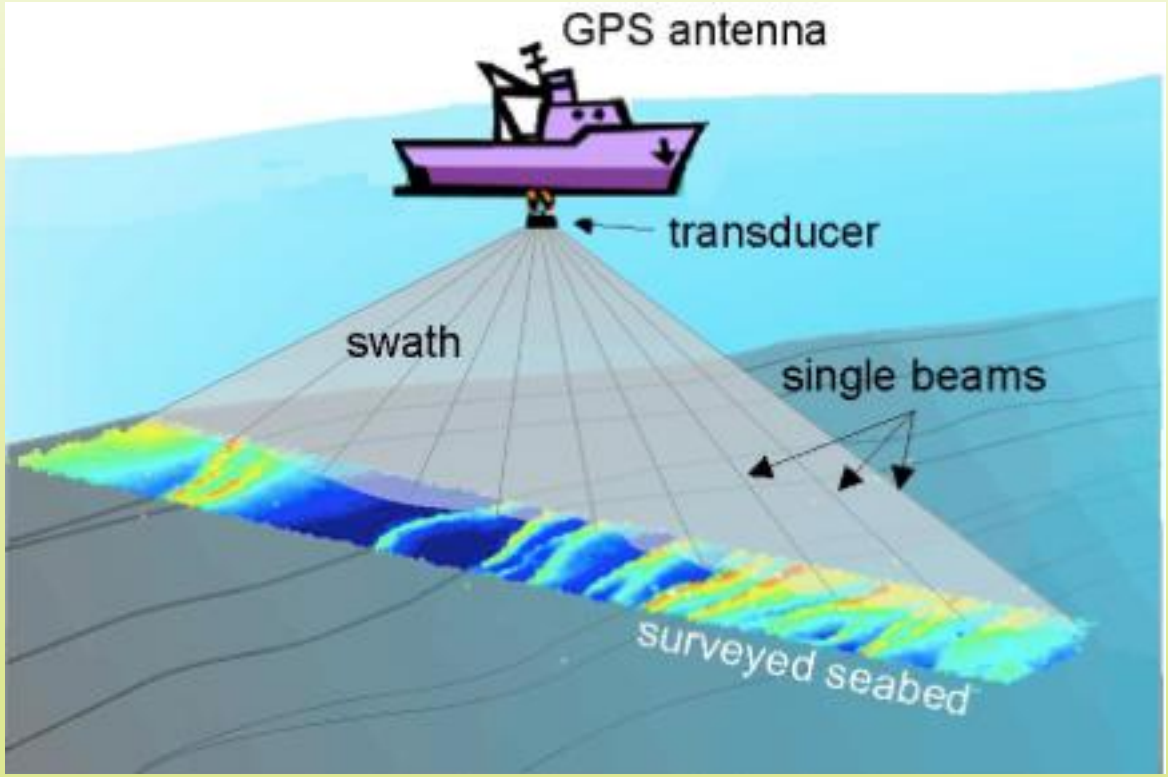
DEFINITIONS

- ECS-Electronic Chart System-chart plotter
- ENC-Electronic Navigation Chart used by a chart plotter or ECS.
- GPS-Global Positioning System, the system used to find by a position using satellites
- Vector chart-ENC with layered information
- Raster chart-ENC similar to direct copy of paper chart



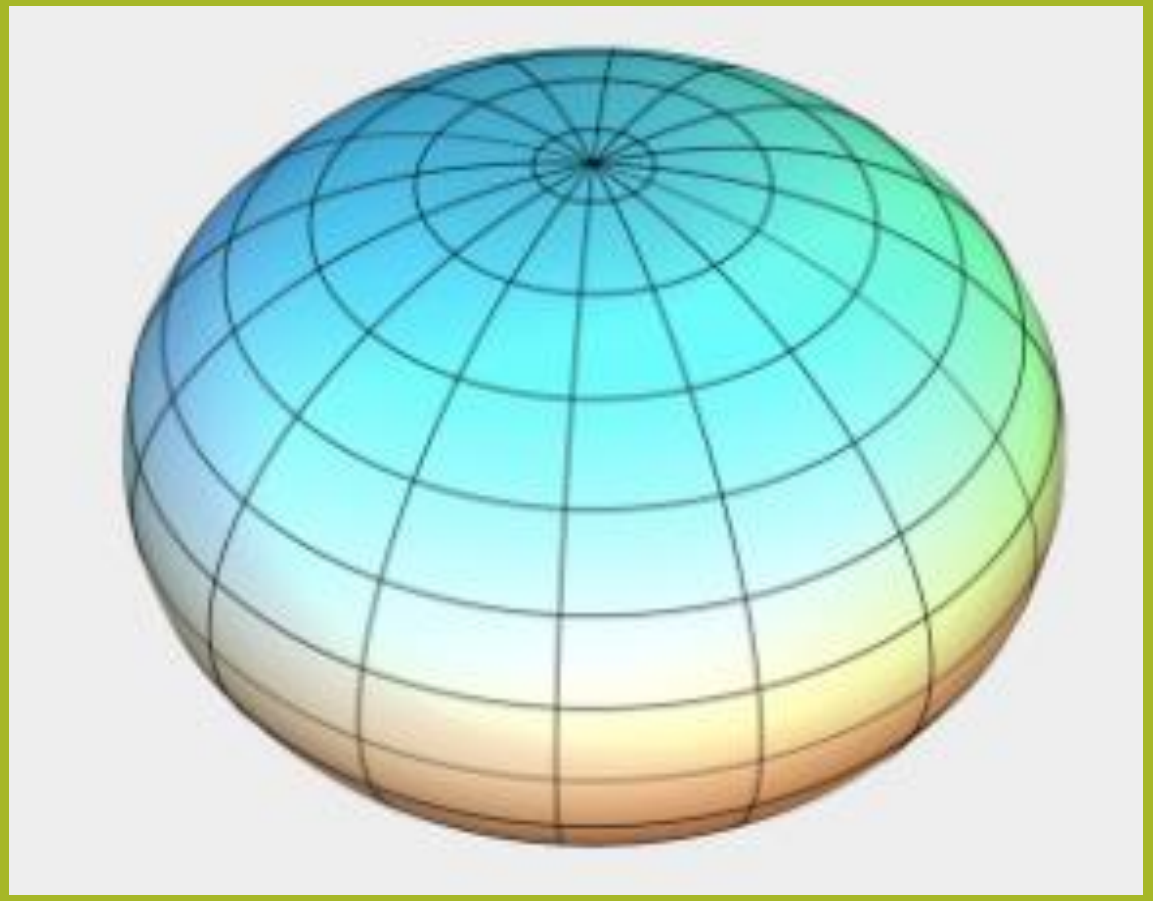
HYDROGRAPHIC SURVEYS

- Both paper charts and electronic navigation charts (ENC) use the same source of information for their charts.
- They both use hydrographic surveys which are produced by the hydrographic departments around the world.
- The hydrographic departments issue paper charts and Electronic Navigation Charts (ENC)
- Many surveys were carried out before GPS



WGS84

- World Geodetic System datum was agreed on in 1984 (WGS84). Global Positioning Systems use the WGS84 coordinates for their positioning.
- All surveys since 1984 have been using the same coordinates.
- Most paper charts that use surveys before 1984 have been corrected for the 1984 coordinates.
- Some charts have an note on them that GPS positions need to be adjusted by a certain amount so as to fit the survey positions.
- Some charts have not been checked. In those cases there is a note to warn the user that GPS positions need to be treated with caution.
- Some charts do not have a WGS84 magenta note on them. They are rare but they do exist. The surveys were made a very long time before the advent of GPS.



WGS84

- Seeing such a note on a chart means that your ECS is also accurate. As your ECS uses the same survey information that is used to make up a paper chart.
- If you do not have a chart this information will not be as easy to find.

"Satellite-Derived Positions
Positions derived by satellite navigation systems, such as the Global Positioning System are normally referred to the World Geodetic System 1984 datum. Such positions can be plotted directly on to this chart."

WGS84

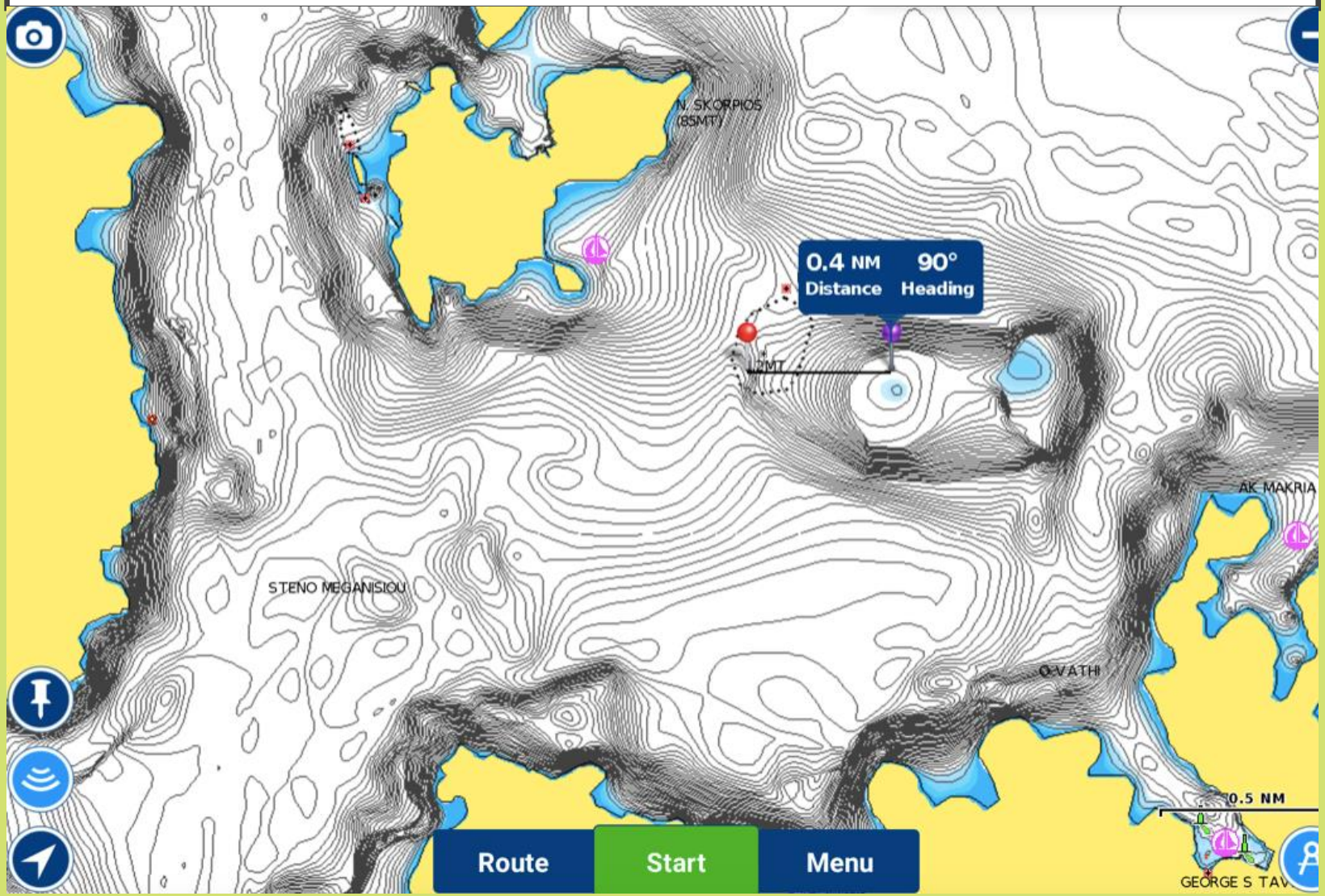
- The various hydrographic departments around the world are slowly carrying out new surveys to align their charts with WGS84.
- This means that your chart plotter shows where you are on the geodetic grid accurately BUT the land and navigation hazards will not necessarily be accurately positioned/displayed.
- It is therefore necessary to check your position using other means either using bearings or radar or stay further away from navigation hazards.

"In Greece most of the surveys were carried out using celestial fixing in the 19th century. So errors exist, sometimes up to half a minute of longitude."

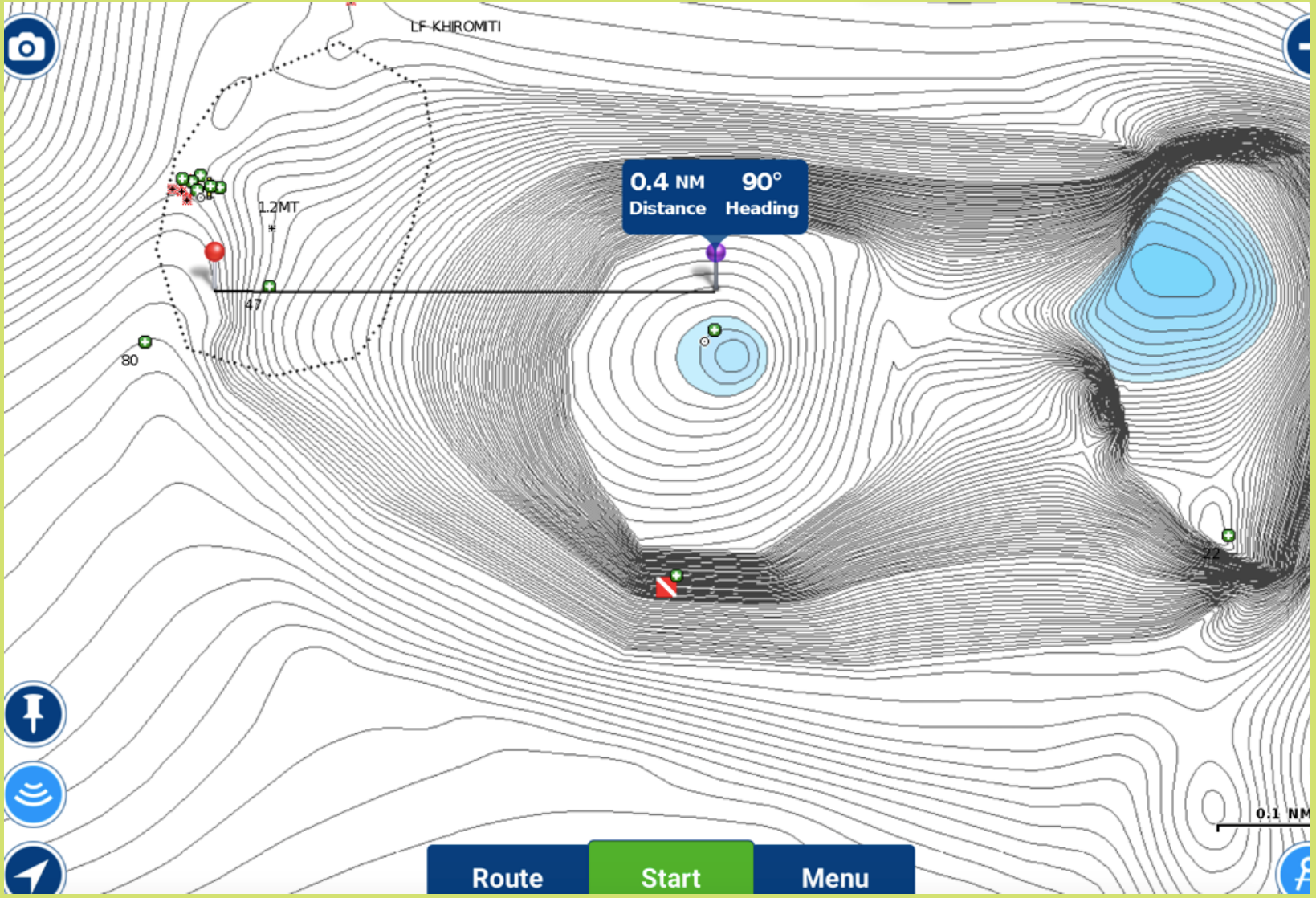
About half a nautical mile.

IFALOS HEIROMITI REEF ON RASTER CHART

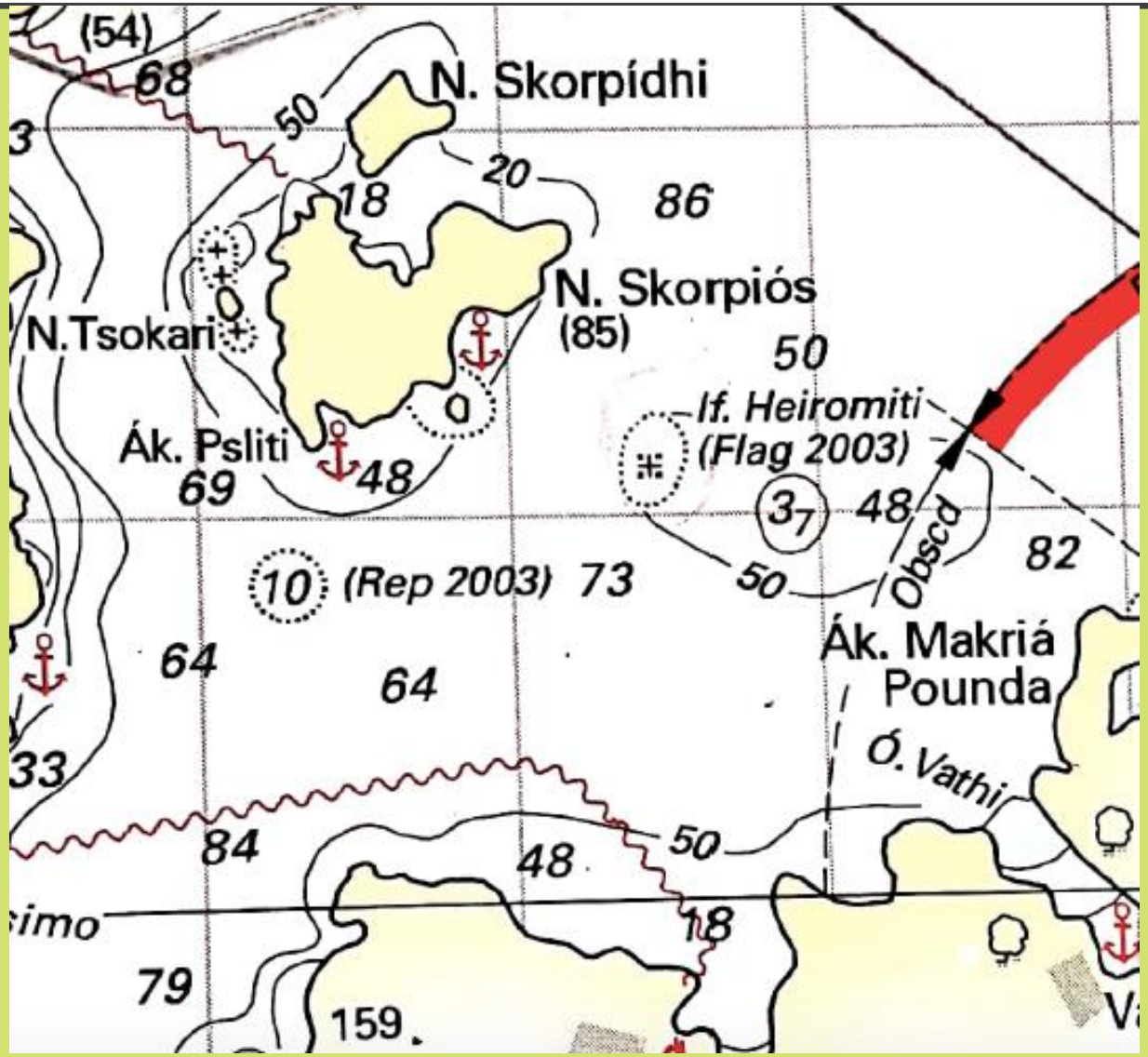
IFALOS HEIROMITI REEF ON NAVIONICS



IFALOS HEIROMITI REEF ON NAVIONICS



IFALOS HEIROMITI REEF ON CHART G121



IFALOS HEIROMITI REEF

- This is one of the busiest areas in the southern Ionian. There is only one serious navigation hazard. The reef south of Skorpios island, Ifalos Heiromiti. This reef is often not marked. Sometimes a small buoy is on it, often no marker.
- There are two distinct shallow patches marked on the chart plotter. With carefully drawn bathymetric lines. However the open source Navionics system has users reporting the rocks off the western shoal at a distance of 0.4 miles further to the west.
- The eastern most reef has no notes from users on it. Yet it is on the ENC as only 1.5 meters!
- The paper chart puts the reef in the same position as that of the users notes for Navionics. Therefore we can deduce the Navionics ENC is wrong. The 1.5 meter depth shown on the ENC is one mile different to the actual rock awash note on the paper chart.
- This reef is poorly charted in a very busy area. It claims yacht keels every year.

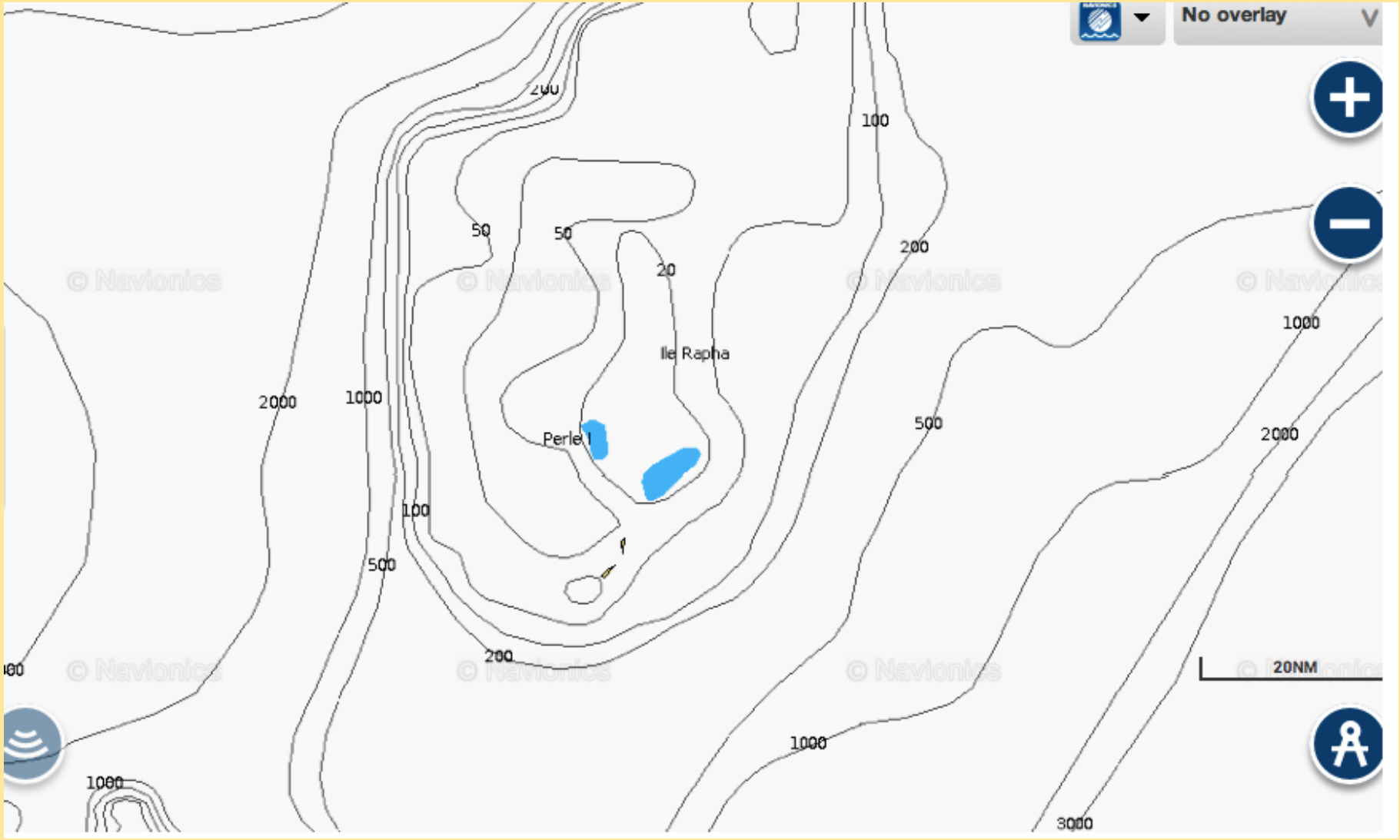
ZOOMING ON CHART PLOTTERS WITH VECTOR CHARTS

- When using ECS for passage planning every section of the plan must be zoomed in on maximum. Only by using maximum zoom can you be sure that you have seen all the details on the ENC.
- It is this issue that has caused many commercial ships and yachts to founder on rocks. Usually at full speed.
- I strongly suggest that using paper charts for planning a passage is a better idea than using a chart plotter. Then transfer the passage to your ECS.

TEAM VESTAS ON CARGAGOS CARAJOS SHOAL

- A yachting example was that of Team Vesta in the Volvo Ocean Race 2014.
- The vessel hit a reef at 19 knots in the night. This was in the Indian Ocean off Mauritius.
- They were religiously following the course plotted for the night crew straight over a reef.
- The reef was clearly displayed on all paper charts. However on the ENC used by Vesta it was not shown on the level of magnification they were using for navigation and passage planning. Team Vesta were using C-Maps for their ENCs.

CARGADOS CARAJOS SHOAL NOT ZOOMED IN ON NAVIONICS.



CARGADOS CARAJOS SHOAL ZOOMED IN ON NAVIONICS.

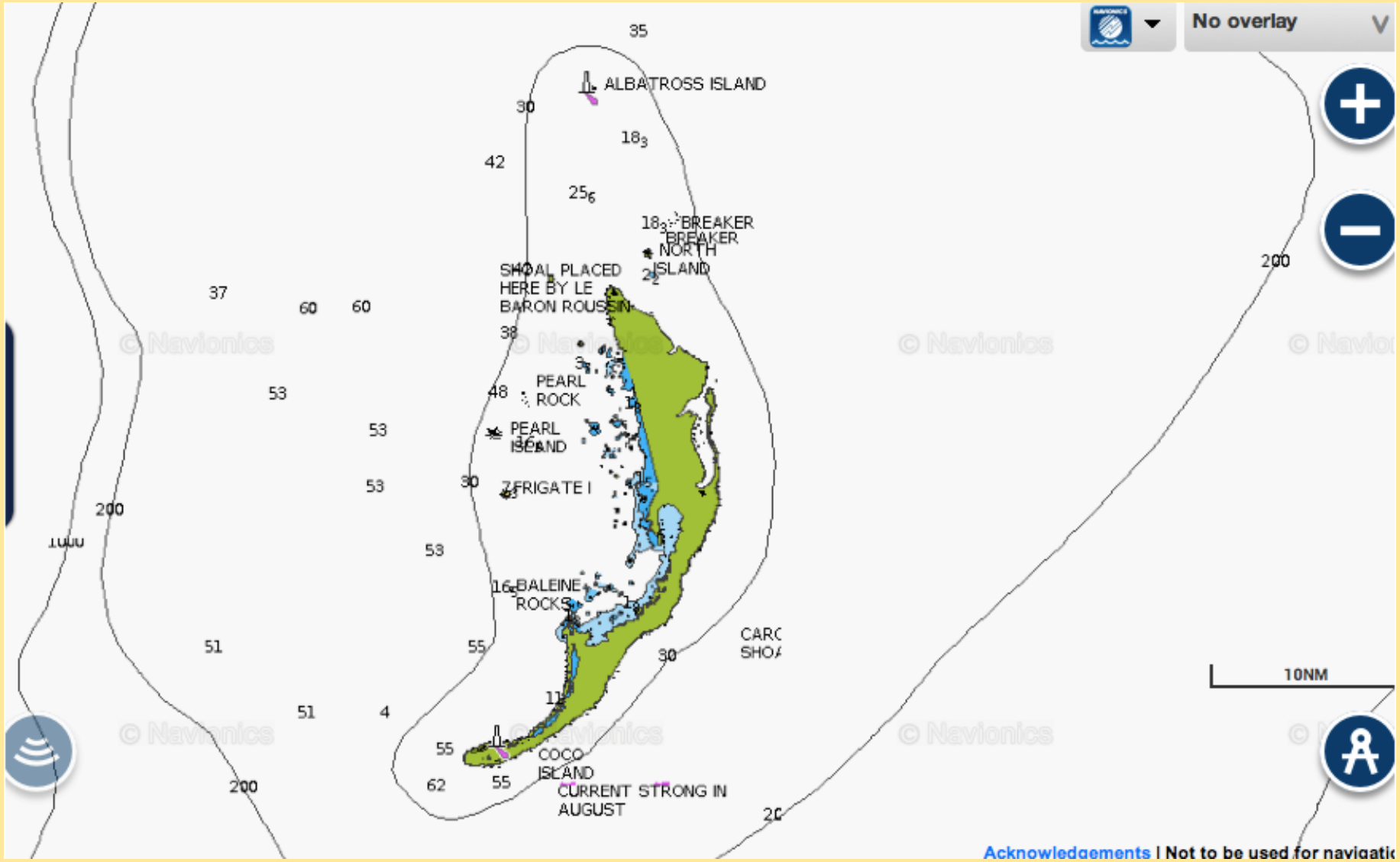


CHART INFORMATION

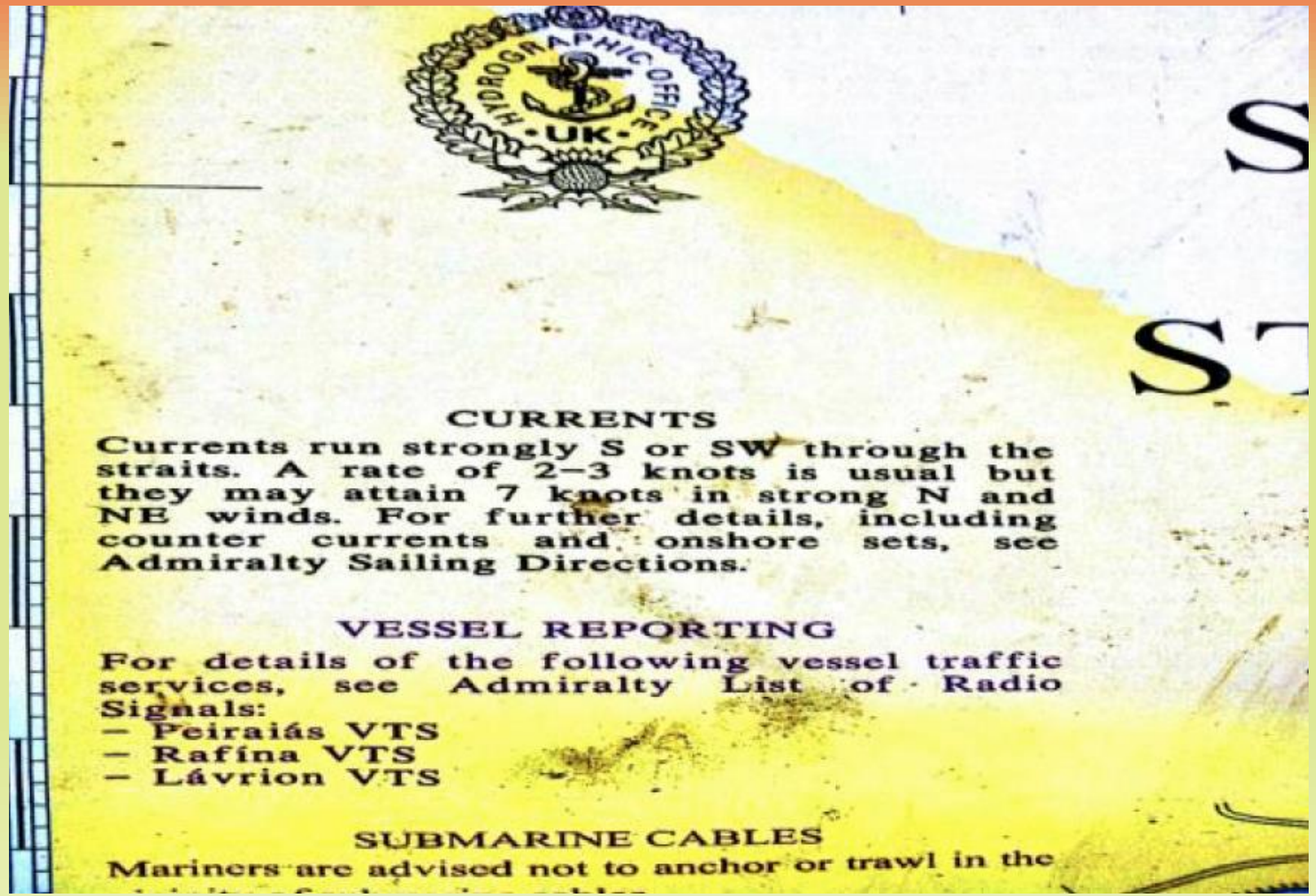
- There is a mass of information written on charts. It is often very relevant to the navigator. Although we have many examples where the navigators have been unaware of the information.
- Sometimes GPS positions will need to be moved a specific amount to match the chart. This information will be given.
- Sometimes local winds will be warned about.
- Sometimes local currents will be highlighted by some narrative.
- This information is not as easy to find on your ECS with vector charts

TOTAL LOSS OF A SHIP IN THE STENO KEFIRA STRAIGHT.

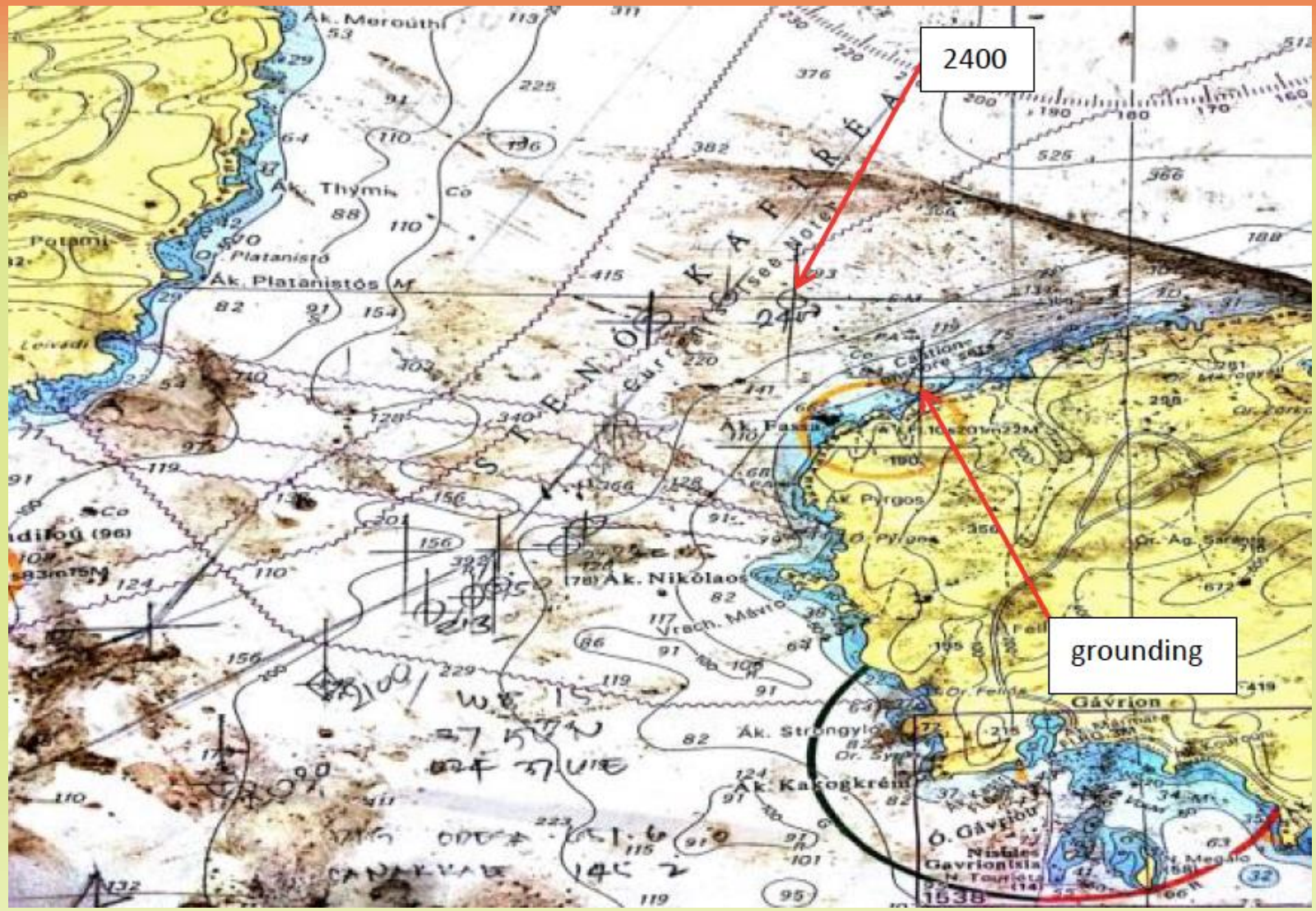
STENO KEFIRA STRAIGHT AEGEAN SEA

This was a well found vessel steaming into a storm.
They were unaware that a specific current would set them towards the rocks when a northerly wind blew.
The vessel was a total loss and had to be cut up on the rocks so that it could be salvaged.

STENO KEFIRA STRAIGHT AEGEAN SEA

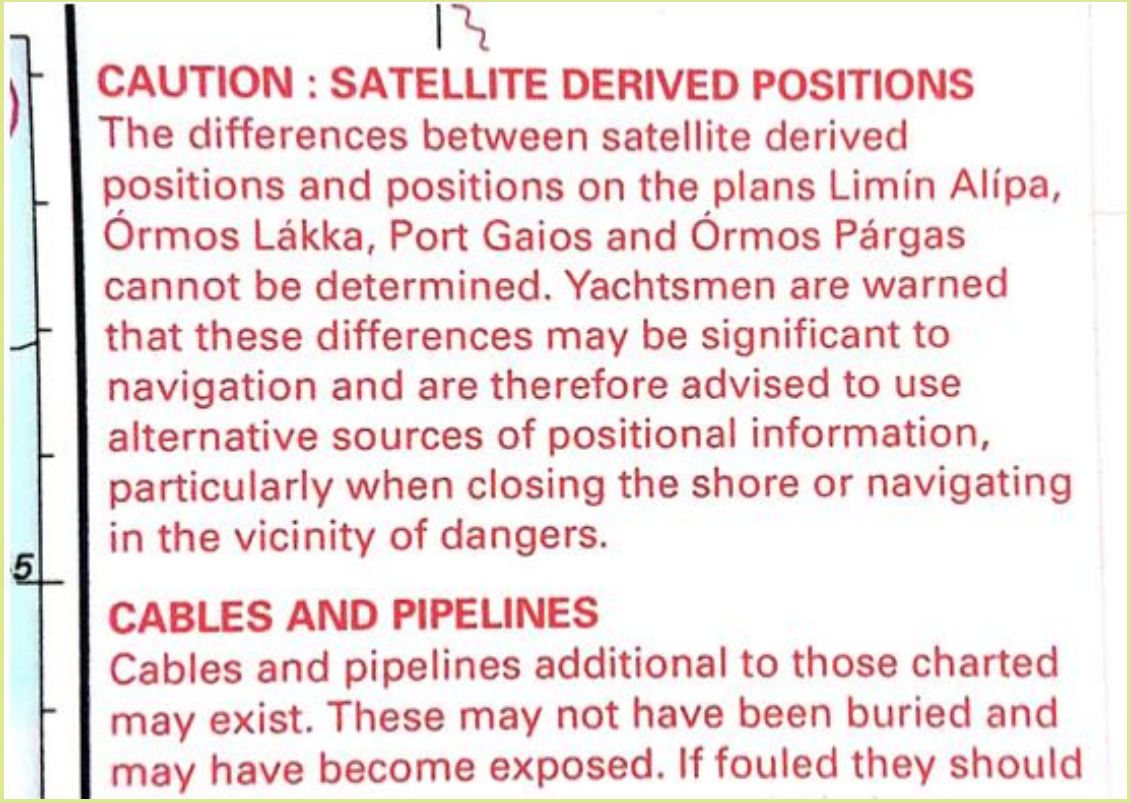


STENO KEFIRA STRAIGHT CHART



NORTHERN IONIAN CHART G11

- Here is another example of the varied information on charts.
- Often there are inserts/plans of ports which are a more detailed area of the survey.
- In the case of chart G11 we also have "sketch plans".
- They are sketches and are not necessarily taken from the original survey.
- Although it is what we yachtsmen use to enter the ports mentioned on G11.



CAUTION : SATELLITE DERIVED POSITIONS

The differences between satellite derived positions and positions on the plans Limín Alípa, Órmos Lákka, Port Gaios and Órmos Párgas cannot be determined. Yachtsmen are warned that these differences may be significant to navigation and are therefore advised to use alternative sources of positional information, particularly when closing the shore or navigating in the vicinity of dangers.

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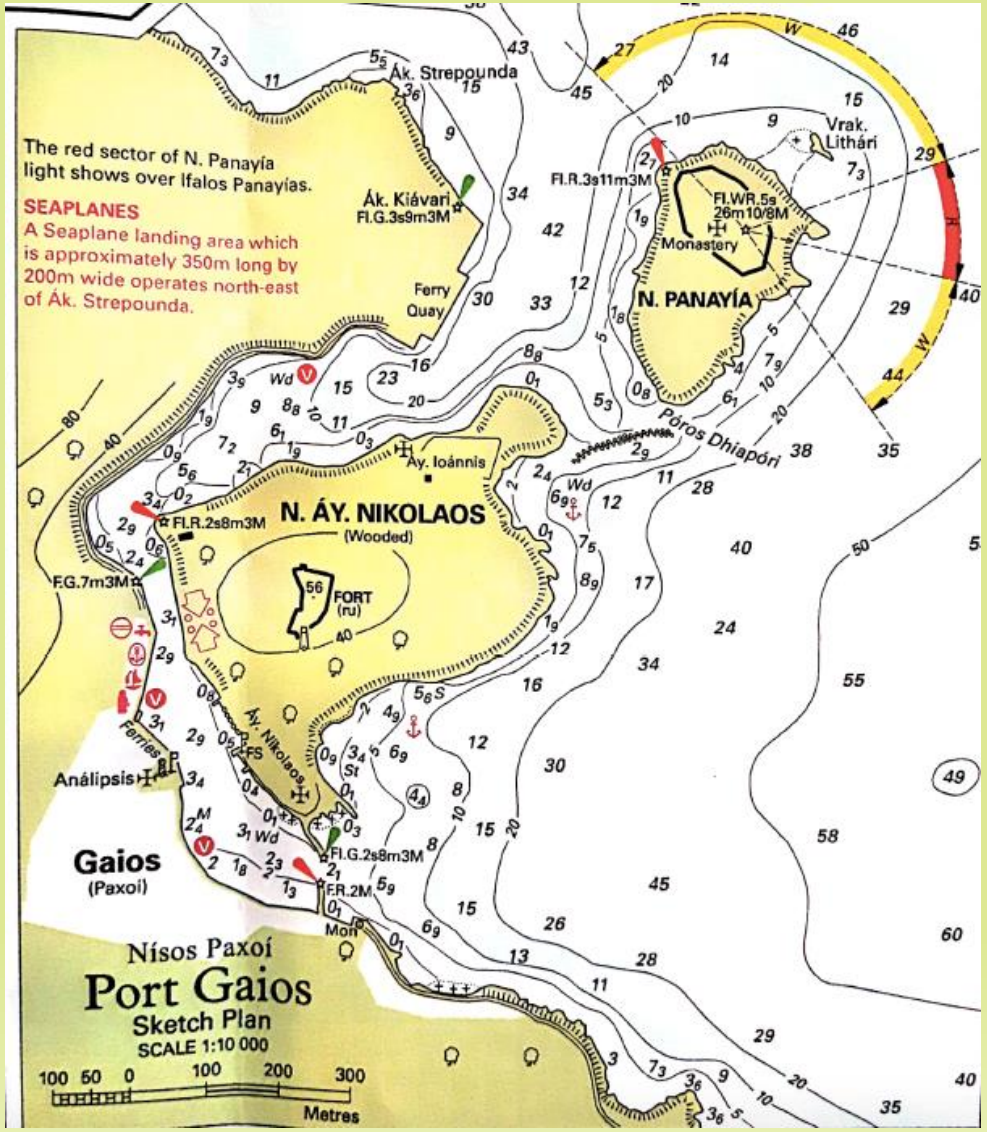
CABLES AND PIPELINES

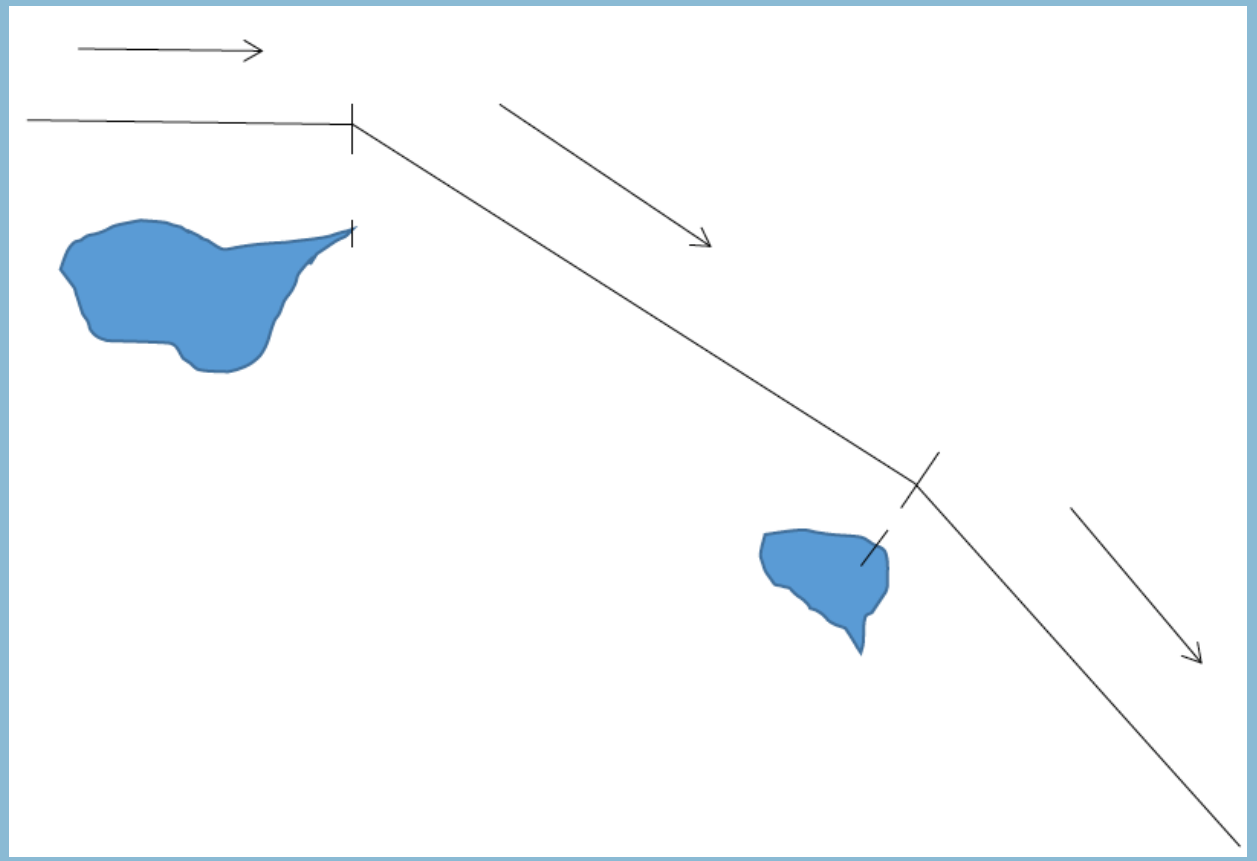
Cables and pipelines additional to those charted may exist. These may not have been buried and may have become exposed. If fouled they should

NORTHERN IONIAN CHART G11



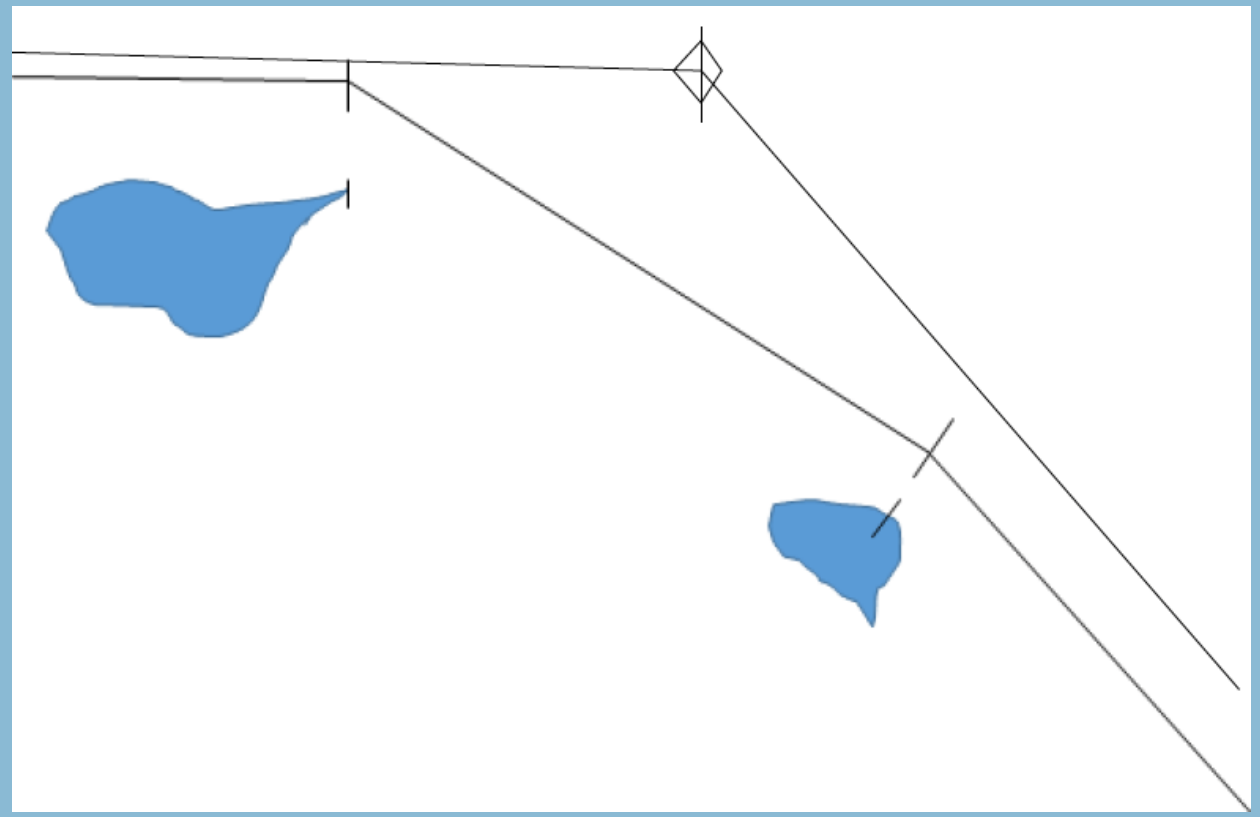
NAVIGATIONAL AWARENESS

- By plotting a course on a chart we become more aware of the land around us. By using waypoints on a plotter we often become less aware of what we are navigating near.



NAVIGATIONAL AWARENESS

- I have observed deck officers following a GPS course and unaware of the names of the land and islands they are passing. They were unaware of the depth of water either side of them. They did not know if it was safe to alter course off the track as they did not have electronic charts. They were just going to the next waypoint.
- Altering course on a headland can be useful for the yachtsman. Rather than working on a waypoint.



NAVIGATIONAL AWARENESS

- In the picture is the chart used on a ship that plowed into a reef at full speed. The ECS had initially been used to plan the passage. Then the passage had been put onto the chart. The vessels passage was going to miss the reef by the width of a pencil line.
- Two waypoints are highlighted in orange. They really do not make any sense and in this case the vessel ran straight into the rocks. In this case the second officer and eventually the whole navigating team had managed to lose all situational awareness and were just concentrating on keeping the ship on the course which unfortunately ran over the rocks.

NAVIGATIONAL AWARENESS

- Recording at regular intervals your position on a paper chart is a good discipline.
- The overall passage plan is easier to discuss with the crew when using a paper chart.
- Keeping the crew informed of progress on the plan helps prevent the team from losing navigational awareness.

CHANGING THE PLAN

- Especially in sailing we often change the plan.
- Having alternative plans worked out in advance can help reduce risk.
- Often a new plan will be worked out when you are tired.
- Groundings have often occurred on yachts and commercial vessels after a change in the passage plan.
- NOTE these grounding accidents usually happen at full speed and are usually catastrophic.

CHANGING THE PLAN

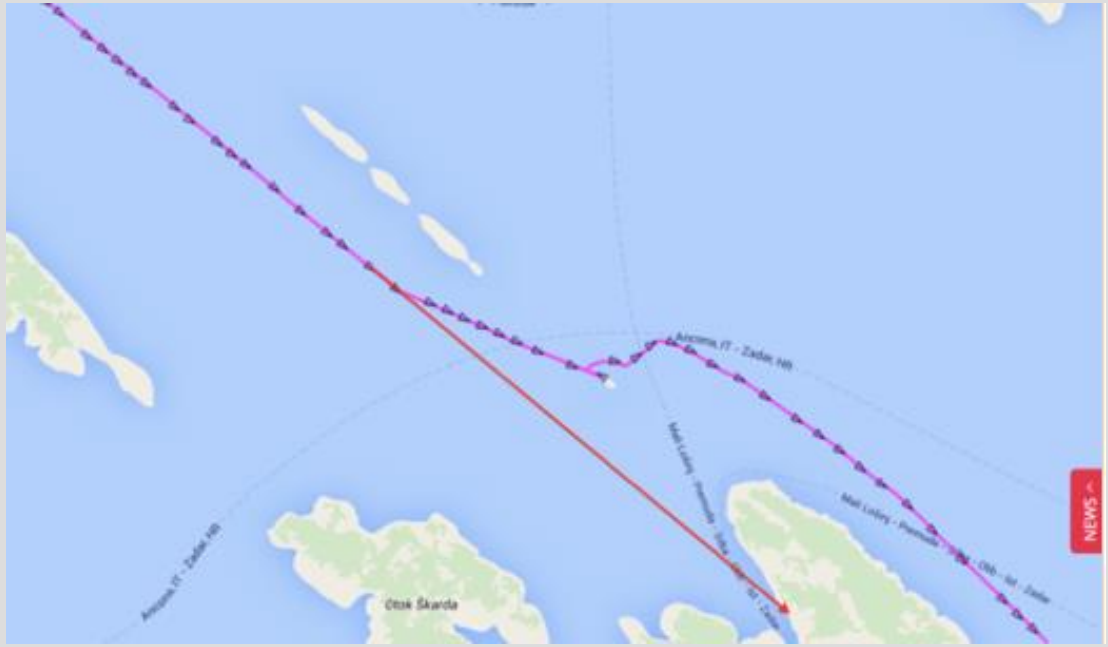
- The vessel was a 16.5M "Discovery" class yacht.
- Equipped with radar, chart plotters each with repeaters in the wheelhouse and cockpit. There was also a fixed night vision system on the mast. Also night vision glasses.
- The plan was to sail from Venice to Corfu down the Italian coast.
- A professional skipper was hired for the voyage.
- The owner gave verbal instructions to the skipper over the phone to only go down the Italian side of the Adriatic and to avoid the Croatian coast.

CHANGING THE PLAN

- Early on in the voyage the skipper decided it would be better to go down the Croatian side due to the weather. But he did not complete a plan.
- He had no paper charts of the area. He did not think that was necessary.
- The vessels electronic charts were a year out of date. He did not know this.
- The skipper had a hand held Ipad with Navionics. He was not aware of any errors on them.
- He did not believe it was necessary to check visually where he was. He believed by comparing two GPS systems he would be fine. Incorrect
- He was not aware of the existence of the night vision. The mate was regular but she did not tell him about them.
- He did a quick course over to the Croatian islands and told the mate to call him then he would complete the plan

CHANGING THE PLAN

- The plan actually stopped at the islands during the night.
- The mate called the skipper. This was at a critical point between two islands at around 0200.
- The skipper got up and by eyeball in the moonlight turned the vessel between two islands. Then left the cockpit to work out the rest of the passage plan.
- The mate in the cockpit continued to keep a look out. But did not look at the radar or the chart plotter. Both of which were showing a low lying island right in front of them.
- The skipper for his part turned his plotter in the cabin to planning mode and began planning the rest of the passage.

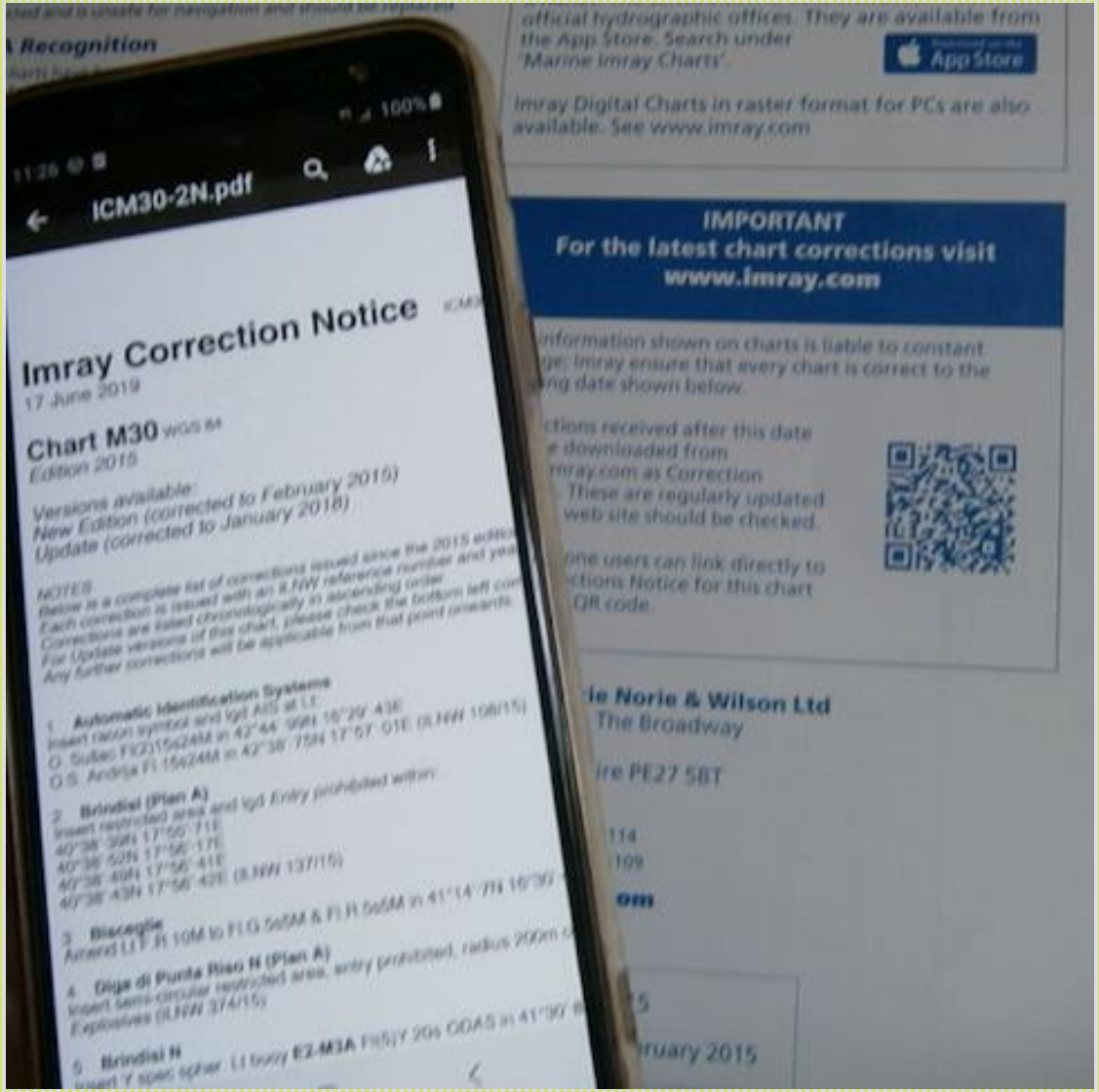


CHANGING THE PLAN

- No positions were being recorded, they had no charts
- At this point neither of them knew where the vessel was. Neither of them knew where it was heading. They had lost all situational awareness.
- The mate just saw the island seconds before they hit it.
- The yacht was very heavily built and had a watertight bulkhead forward which saved the day!

CHART CORRECTIONS

- There is now a very easy way to check on the corrections for paper charts. This is the QR reader.
- More recent paper charts now have a QR code on them. Using a smart phone that is linked to the internet the code can be read and the chart corrections for that chart will be shown on the phone. Some may be relevant for the passage.



ENC CORRECTIONS

- An ECS should have its ENCs kept up to date. Each system uses different ways to do this. So you will need to check the instructions on this.
- Navionics system is a very tactile system. Very handy and easy to use. It does seem to have more errors in it than others I have seen. It should be treated with a healthy skepticism! Over the years I have been using it I have wondered where they get their ENC information from as it is occasionally dangerously incorrect. This in in the areas that I know. Ryde harbour on the Isle of Wight shows a dredged channel one meter deep on Navionics ENC. However none exists and there has never been a dredged channel.

PILOT BOOKS

- These are absolutely essential. They are again of use in keeping the team interested in the plan.
- Again they have mistakes in them also omissions. They are part of the navigators tools.
- It is a good idea to put your own notes straight on to the pages of these books for future reference.
- I recently treated myself to Rod & Lucinda Heikells latest Ionian pilot. Mine was getting further out of date. Lucinda was around when I was buying the book and kindly sketched in a number of new corrections on various pages.

BEST PRACTICES

- Appraising all the information
- Planning the voyage
- Executing
- Monitoring/logging

APPRAISING THE INFORMATION

- Charts and corrections
- ECS and corrections, back up ECS if needed.
- Vector or Raster charts and associated corrections
- Navigation equipment status and suitability, radar, AIS, compass and errors, log and echo sounder, NAVTEX
- Pilot books and corrections, notes from other yachtsmen, google earth
- Weather web sites to be used. Ability to receive weather information
- The vessel and its condition
- Fuel capacity and consumption
- Ability, size and experience of crew and skipper. Their ability to carry out night passages.
- Emergency and communication equipment suitability

PLANNING THE VOYAGE

- Overall plan on chart and/or ECS. ECS to be fully zoomed in on for the whole route
- Navigation hazards, no go areas, margins of safety, clearing lines, tides and currents
- Parallel indexing
- Port entrances and draft. Swell at which the port should be aborted
- Ports of refuge. These are ports which will not likely be used but will offer an reasonable alternative should they be needed
- Options should the weather dictate a different course
- Fuel, water and supplies. Minimum fuel remaining on board on arrival and accuracy of gauges
- Watches at sea and night watches
- Distance off land to avoid fishing buoys at night
- Communications within a flotilla
- Tool box meeting with the crew

EXECUTING

- The crew and skipper working to the plan
- Deviations to the plan to be carefully examined
- Checking the crew are fit for watch
- Checking the rig and sail trimming is adequate

MONITORING/LOGGING

- Recording regularly the position on the track
- Monitoring the weather and forecasts
- Logging actual weather
- Logging regularly course etc
- Logging changes to the plan
- Watch handover
- Monitoring any issues within the flotilla

QUESTIONS

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