Grounding incidents in the Indonesian archipelago

There have been many grounding incidents in the waters within the Indonesian archipelago over the past few years and many have involved depth anomalies. Grounding incidents on charted obstructions are avoidable, but what about when obstructions such as shoals, reefs or rocks that are not charted? Through case studies we consider how such groundings occur and what can be done to minimize the risk of such incidents.

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Introduction

The Indonesian archipelago lies astride several main maritime trade routes. Daily, thousands of vessels ply between the Indian Ocean and South China Sea or Celebes Sea by transiting the narrow straits between the archipelagic islands and zig-zagging their way through them. Navigation in these waters is tricky given the high traffic density, lack of sea-room to manoeuvre, and more importantly, the presence of uncharted underwater obstructions and relatively old and sparse hydrographic data. These multiple aspects suggest the most obvious risk is grounding on uncharted obstructions, which is the core issue we will look at in this insight. The question we try to answer is – are such grounding incidents avoidable, and if yes then how?

To do so we first look at the traffic patterns in this area followed by a few case studies which Gard has handled in the recent past. All the case studies selected have multiple common denominators which we subsequently discuss. Finally, we provide some recommendations which mariners and shore management can consider.

Movement data and its application in passage planning

There is an old saying "The trodden path is the safest". It holds true in passage planning as well. To know whether a particular route is suitable for a given voyage, in addition to the conventional passage planning appraisal practices, consideration should also be given to past voyages of other vessels having similar dimensions and draft through that area.

Such historical track information can provide valuable insight such as mentioned below, all of which can be used for planning a safe passage:

- how frequently certain routes are followed
- do the routes follow published advice
- details of vessels transiting the relevant areas, such as draft and other dimensions
- seasonal traffic patterns
- speeds of transit

Thousands of vessels of various sizes enter and exit the Java sea each year using either the Sunda or Lombok Strait. We decided to analyze traffic flows for 2019 using historical AIS data of laden vessels having a draft of more than 12 metres entering this region through the aforementioned narrow straits.

Traffic flows for 2019 (vessels with draft ≥ 12 m)

Traffic data suggests that laden VLCCs and VLOCs also routinely use the passage through Sunda and Lombok Strait in addition to vessels having shallower drafts. The only exception was Selat Sape which was hardly used. Only 3 vessels in 2019 having a draft > 12 meters transited through Selat Sape even though the charted depths are shown to be around 100 meters. We discuss more about this route in our third case study.

Currently, not many owners or managers may be looking at exploiting such traffic related data, but as digitalization is making inroads into the marine industry, this trend may pick up.

Gard case studies

Case study 1: Grounding in the Karimata strait

Vessel: Bulk carrier Draft: 13 m Voyage: Indonesia to Japan via Karimata Strait

Master had proposed passing through the Makassar Strait, but the weather routeing service provider recommended passing Karimata Strait which was approximately 50nm shorter and brought the vessel close to Karang Cina and other reefs. The service provided the vessel with general waypoints. The proposed route took the vessel well away from the Archipelagic Sea Lane (ASL) and the usual route taken by other vessels. It grounded on an uncharted obstruction and it took 16 days to refloat the vessel.

Historical movement data showed that majority of vessels on a similar route chose to stay in the ASL and not exit it in a location so far South in Karimata strait. Image of the vessel's route and historical vessel movement can be accessed type: asset-hyperlink id: QWlU04mSPyJ3vGIZkt2fI.

Case study 2: Grounding in the Karimata Strait

Vessel: VLCC   Draft: 20 m   Voyage: US Gulf to Japan via Sunda Strait – Karimata Strait

The vessel was equipped with ECDIS and an approved passage planning software. The general track followed the axis line of the ASL, but at some point after passing east of Pulau Belitung island, the vessel's planned passage took her about 10 nm west of the ASL axis line, where she grounded on an uncharted obstruction. She had used the same route on many occasions before. It took 3 weeks to refloat the vessel.

Traffic analysis of vessels having similar draft and transiting the same area for the period prior to the grounding showed that these vessels chose to stay a few miles to the east of the location which later turned out to be an uncharted reef on which the vessel in above case study ultimately grounded. Image showing the vessel's route and historical vessel movement can be accessed type: asset-hyperlink id: 2PRFUzjcO38eaM7BPxLDz5.

Case study 3: Grounding off Selat Sape

Vessel: LPG Tanker   Draft: 8 m   Voyage: Indonesia to Australia via Selat Sape

The passage planning software recommended a route via Selat Sape, passing between islands of Komodo and Banta. This was 200nm shorter than the route through Lombok Strait. Sailing directions stated that the route through Selat Sape, though navigable is seldom used. It also indicated the presence of a drying rock very close to the planned route. Vessel was using ECDIS at the time, and the CATZOC for this area was assigned a 'C'. She ran aground on rocks at a speed of 18 knots. Information in the sailing directions was not taken into account by the passage planning software or the mariners onboard.

It may seem commercially more viable for a vessel to transit through Selat Sape if proceeding, for example from Makassar strait to a port in north western or western Australia. However, a traffic analysis (available type: asset-hyperlink id: 2IiBlMDcpfm5MIHf9Ss4E0) for all such vessels (irrespective of size and draft) for 2019 shows that the majority of the traffic chose to transit through Lombok strait instead of Selat Sape.

Case study 4: Grounding in the Makassar Strait

Vessel: Bulk carrier   Draft: 14.3 m   Voyage: Tabonao, Indonesia to South Korea

The passage plan took the vessel through numerous shallow reefs. At about 1900 hrs, the vessel ran aground while avoiding some fishing vessels just as she was about to enter the 25nm limit of the ASL. ECDIS showed the grounding location to be on a 30 metre depth contour line. The vessel had to be lightered before it could be refloated. The whole operation took nearly 60 days. The 'category of zone of confidence' at the grounding position was 'C' and the survey data was described as *"low accuracy survey or data collected…depth anomalies may be expected"*.

Traffic analysis for vessels having a similar draft when leaving Taboneao to enter Malassar strait shows that majority of the vessels chose a much southerly route where the depth is greater and occurrence of shallow reefs much less. Further information can be accessed type: asset-hyperlink id: 6fha6DfzduIJSXtpb0OVuE.

Archipelagic sea lanes Those who have navigated in and around Indonesian waters, would be very familiar with the magenta lines on charts which represent the central axis of the Archipelagic Sea Lanes (ASL). These were assigned for expeditious passage of ships. Although IMO has stated in its resolution MSC.71(69) that the ships can deviate upto 25nm limit on either side of ASLs, a look at the heat or traffic density map (available type: asset-hyperlink id: 1d3Zv2nHPfyWfKUtfho8Uz) for Karimata strait, suggests that majority of the ships prefer to navigate close to the centre axis line, although there are some deviations depending on vessel's draft. This is even though all the charts contain a note that the axis line of ASLs do not represent deepest water nor any recommended route. The heat map for the Makassar Strait shows that majority of traffic stays to the east of the axis line around the central part of the strait. Taking a look at the location of the grounding incidents it seems that many of these took place either near or outside the 25 nm limit extremity of ASLs, though there were also some which occurred close to the central axis of ASL, such as the incident discussed in the second case study that occurred 5nm west of the axis line.

Hydrographic data

The survey data for many of the areas in the Indonesian archipelago is old and many paper charts carry a note to caution the mariner. As an example in second case study, the charts were mainly based on surveys done in 1880-1909 per the source diagram (which gives information about the density and adequacy of the sounding data depicted on the chart) and also carried a note stating, *"uncharted dangers may exist due to inadequate depth information"*.

In digital charts (ENCs) information on hydrographic survey is encoded and referred to as CATZOC which provides estimated positional and depth accuracy. The majority of the grounding incidents happened in areas where CATZOC was assigned as 'C' that corresponds to a horizontal position accuracy of ±500 metres and a depth accuracy of 2 m + 5% depth. It is worth mentioning that the IHO is working on improving the presentation of quality data, but the new ENC data format 'S-101' may not be ready until atleast 2023.

Mariners should keep in mind that the CATZOC may not be accounted for in the ECDIS route check function or in electronic passage planning programs.

Mariners should also look out for sparse or unevenly distributed soundings as this indicates that the area was probably not surveyed in detail. There may be also inaccuracies between the information shown in local Indonesian paper charts, the BA paper charts and the ENCs. The discrepancy may be in the form of position of a certain feature or the presence or absence of it. Take for example the third case study where different charts gave contrasting information to the mariner for the area where the vessel finally ran aground:

- Indonesian chart ID 295 (scale 1:200,000) showed a rock symbol
- Indonesian chart ID 268-2 (scale 1:50,000) showed a shallow area with depth of 9 m
- BA charts 2903 & 2910 showed a rock awash symbol
- ENC cell (ID300295) displayed the symbol of an isolated danger close to the grounding location. The supplementary information mentioned that the rock is always submerged.

Sailing directions

The Sailing directions are a very useful source of information and their importance cannot be understated especially for regions such as in and around the Java Sea given the presence of numerous uncharted dangers and the absence of systematic hydrographic surveys.

Historical movement data can help analyze whether the advice in the Sailing Directions is being followed. For instance, historical AIS data for the first five months of 2020 (image available type: asset-hyperlink id: fZrhAKW94PsYfEbCe2BjO) for ships entering the Karimata strait from Sunda strait shows that majority of the vessels do follow the advice given in section 8.6 of e-NP 36 (10^{th} edition, 2019). However, on many other occasions such important advice is not followed and the underlying reason is perhaps the Sailing Directions are not referred to when planning the passage.

Most companies do state in their passage planning procedures, that sailing directions must be referred to, however there seems to be a disconnect between procedural requirements and practice.

There is a good possibility that all the incidents discussed in our case studies could probably have been avoided had the information from Sailing Direction publications been given due consideration. An example is the third case study, where the Sailing Directions cautioned against using the route through Selat Sape. It was stated in e-NP 34 that passage through Selat Sape *"is navigable but seldom used"* and also provided information about the presence of drying rocks very close to the position where the vessel grounded, but the voyage planning software did not incorporate this information when suggesting a route.

We see that increasing numbers of vessels nowadays are being provided with digital publications instead of the hardcopy versions. Whilst the information content is the same, the manner in which an officer browses through these electronic publications looking for relevant information is very different when compared to the hardcopy version.

Digital voyage planning seems to be becoming a norm and it has to be ensured that reference to valuable information in the Sailing Directions is not left out in the process. It must be borne in mind that the route check function in ECDIS and digital voyage planning programs may not take into account the information in sailing directions.

Recommendations to reduce risk of groundings on uncharted obstructions

Survey data and CATZOCs:

There is no doubt that in many parts of the Java sea and adjoining regions, significant depth anomalies exist. The Indonesian Hydrographic Centre is trying to improve this, but given the vast sea area, it will take time.If there is a choice of multiple routes for a certain voyage, then more weight should be given to passing through an area where the survey data is more recent and has a higher position and depth accuracy. If a route is chosen which has a low position and depth accuracy (eg. having a CATZOC value of D or U) over a route which had a relatively high position and depth accuracy (eg. having a CATZOC value of A or B), then reasons for the same should be logged. Sparsity of sounding data is also something that should be considered. Also, mariners should bear in mind that the ECDIS route check function and many voyage planning programs do not take the CATZOC value into account when performing checks on the route. As such any necessary allowance has to be made manually at the passage planning stage.

Sailing Directions:

There is a plethora of useful information in these publications which does not appear on charts or in ECDIS, which makes the Sailing Directions very valuable. The only way to know whether there is information relevant for a particular passage, is to read the relevant sections of the applicable publications. If a certain advice is not followed, then it is advisable that reasons for the same are recorded.

Digital and paper publications:

It should be borne in mind that information in the digital publications, such as Sailing Directions, may not be incorporated into the ECDIS. Whether using paper publications or digital, it is critical that these publications are studied when planning the passage and the relevant information presented in a digestible format for the bridge team.

Choice of route:

When evaluating whether a particular route is safe, in addition to the conventional passage planning appraisal practices consideration can be given to past traffic movement through the area to know the route taken by other vessels having similar dimensions and draft. Heat or traffic density maps filtered to show movement of traffic matching own vessel's particulars, especially draft can also be helpful in getting abroad oversight of routes commonly taken. A shorter route may not always be safe, as has also been stated in MGN 72 and numerous other navigational guides. Commercial concerns should never override safety.

How to present information obtained from sailing directions and other sources:

Attention of the mariner should be drawn to the relevant parts of the applicable Sailing Directions, for example by having a short summary on the chart or in the passage planning document. This also applies when presenting relevant information from other sources, such as Ocean Passages of the World and T&P notices. Officers responsible for planning a passage should refrain from practices such as only mentioning the publication number in the passage plan printout or attaching bulky print outs to it because the likelihood that the Officer of the Watch (OOW) will refer to the actual publication decreases if information is presented in an indigestible manner.*We would like to thank Capt.Bruce Ewen of Aulis Insights Pte. Ltd. for contributing to this insight.*

Notes

[1] The charts accompanying this insight are not to be used for navigation.

[2] The information contained in this insight is for loss prevention purposes only and should not be used for commercial or dispute resolution purposes.

[3] The number of vessels indicated in traffic analysis may vary depending on the service provider used. Also, the numbers mentioned in the traffic analysis may not represent the actual number of vessels in that area for various reasons, such as loss of AIS signal.