

JTSTB Digests

JTSTB (Japan Transport Safety Board) DIGESTS

Vol. 37 (Issued in October 2021)



Digest of Marine Accident Analyses For prevention of Collision Accidents of Small Vessels —Let's Use AIS—

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1. Preface

From 2008, when JTSTB was established, to 2020, JTSTB investigated and published investigative reports on, 104 collision accidents between vessels (208 vessels involved) that resulted in fatalities or missing persons (hereafter referred to as "collision accidents with fatalities or missing persons"). The number of fatalities and missing persons resulting from these accidents was 127 and 38 respectively, for a total of 165.

Looking at the vessels involved in collision accidents with fatalities or missing persons by vessel type, 95 (45.7%) were fishing vessels, 35 (16.8%) were pleasure boats, and 34 (16.3%) were cargo ships. (See Fig. 1)

Furthermore, looking at the number of vessels involved in collision accidents with fatalities or missing persons by gross tonnage, small vessels (less than 20 tons) accounted for 158 (76.0%) of the total. (See Fig. 2)

In this Digest, we present the results of a questionnaire survey on the effectiveness of AIS (Automatic Identification System) together with the circumstances of accidents and case studies, for the prevention of collision accidents between vessels, especially small vessels, and summarize the key points for the prevention of the accidents.

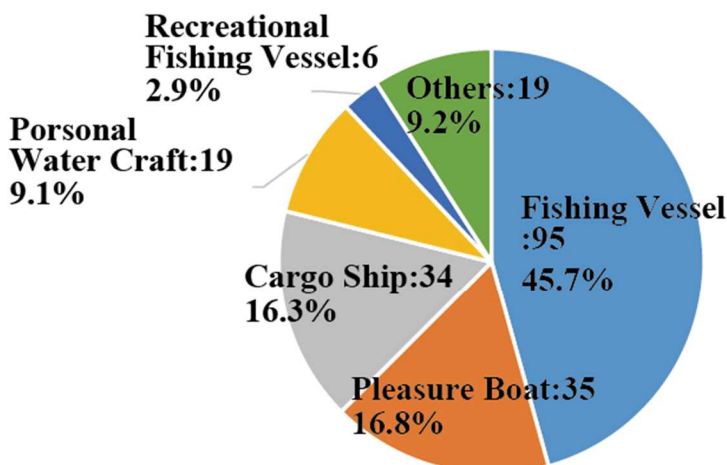


Figure 1 Number of vessels involved in collision accidents with fatalities or missing persons by vessel type

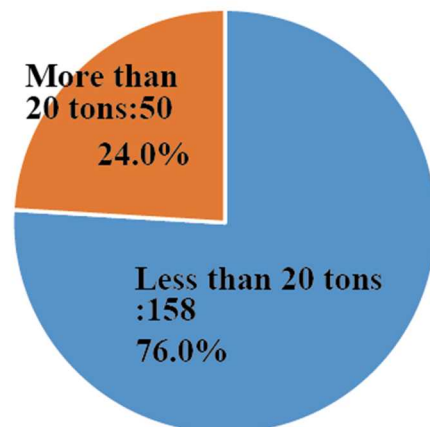


Figure 2 Number of vessels in collision accidents with fatalities or missing persons by gross tonnage

2. Statistics

Approximately 90% of vessels involved in accidents with fatalities or missing persons are small vessels

Of the vessels involved in collision accidents with fatalities or missing persons (208 vessels), 105 vessels sustained fatalities or missing persons. Among them, by vessel type, 56 (53.3%) were fishing vessels, 23 (21.9%) were pleasure boats, and 10 (9.5%) were personal water crafts. (See Fig. 3)

Looking at these vessels by gross tonnage, small vessels accounted for 95 (90.5%). (See Fig. 4)

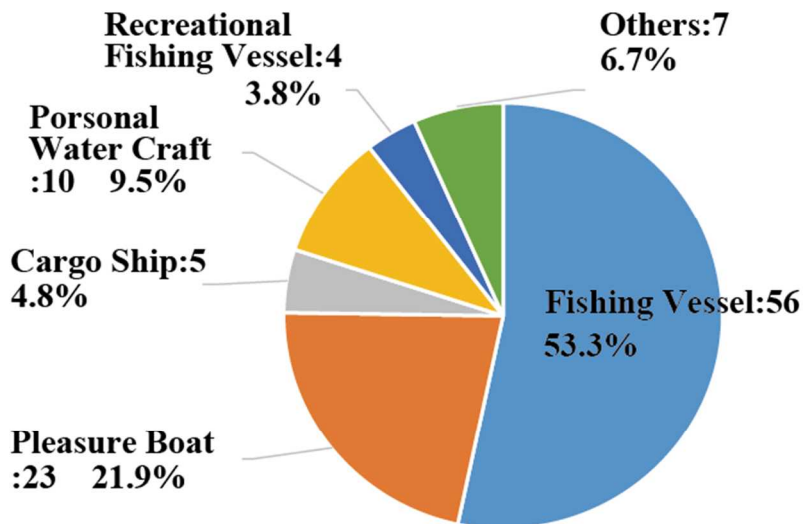


Figure 3 Number of vessels which sustained fatalities or missing persons by vessel type

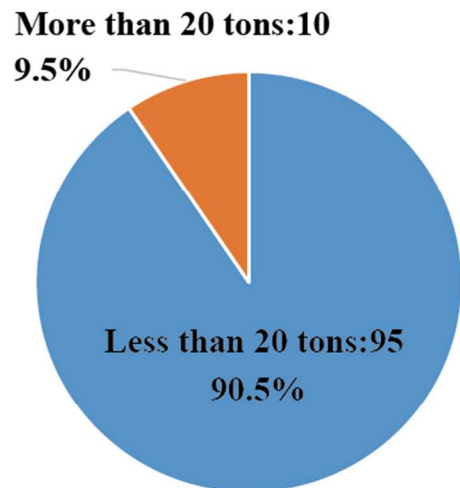


Figure 4 Number of vessels which sustained fatalities or missing persons by gross tonnage

Approximately 60% did not recognize the other vessel

Of the 208 vessels involved in collision accidents with fatalities or missing persons, 132 were able to confirm whether or not they knew the other vessel. Of these, 56 vessels (42.4%) recognized the other vessel while 76 vessels (57.6%) did not. (See Fig. 5)

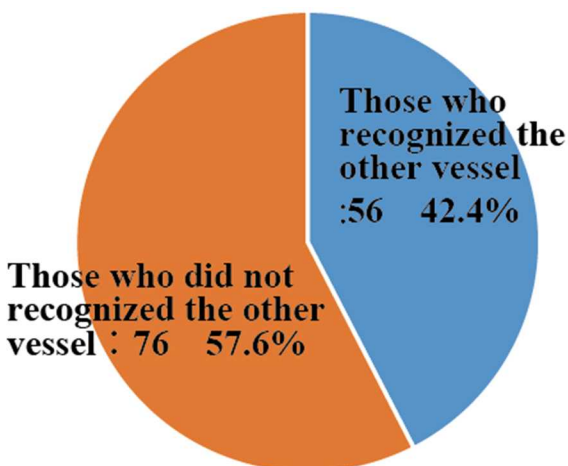


Figure 5 Status of recognition of the other vessel

Main factors of collision despite recognition of the other vessel

- Considered it was safe to sail.
- It was thought that the other vessel would avoid. (an anchoring or drifting vessel)
- It was thought that the other vessel should avoid from a navigational point of view.

Main factors for not recognizing the other vessel

- There was a blind spot on the bow.
- Paid attention to other vessels, etc.
- Presumed that there were no other vessels.

3. Case Studies of Collision Accidents between Vessels Resulted in Fatalities or Missing Persons

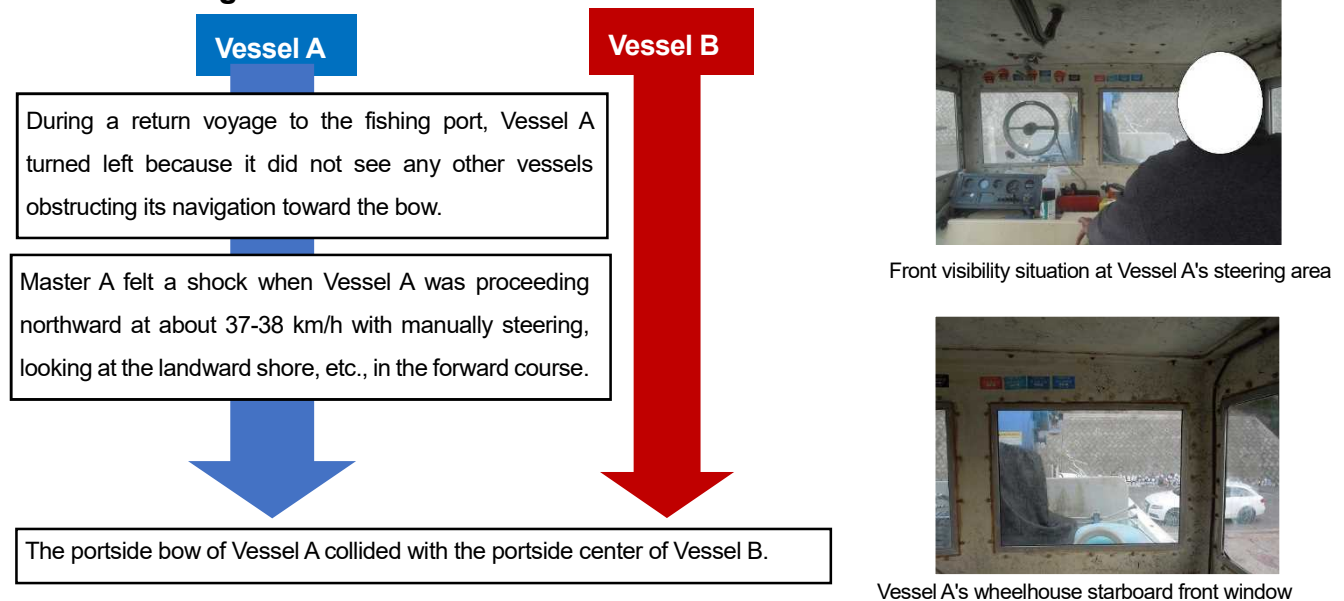
This chapter presents cases of collision accidents with fatalities or missing persons. Please take a look at the circumstances surrounding the accident, the cause of the Probable Causes, and safety Actions.

1 A fishing vessel on a return voyage was navigating with a blind spot toward the bow, and collided with another fishing vessel underway.

Summary of the Accident: Vessel A (fishing vessel, 9.55 tons, one-man crew) was proceeding north and Vessel B (fishing vessel, 2.17 tons, one-man crew) was proceeding west (estimated). The two vessels collided at around 07:30.

Master B died of thoracic aortic dissection.

Events Leading to the Accident



- When Master A stood in front of the helm wheel on the starboard side of Vessel A's wheelhouse, which is the usually maneuvering location, and looked at the forward course, **a wide area in front of the portside was blinded by the crane prop portside.**
- Master A did not accurately understand the blind spot created by the crane prop, and recognized after the accident that **even if he stood at the maneuvering area and kept watch on the forward course as usual, a blind spot would be created in the range of approximately 20 to 30 degrees toward the portside bow.**

Probable Causes : It is probable in this accident that, while Vessel A was proceeding north, Master A **thought that there were no vessels in the forward course that would interfere with navigation**, and continued to **navigate with a blind spot** toward the portside bow, and was unaware that the Vessel was approaching Vessel B, which caused the collision between the portside bow of Vessel A and the portside center of Vessel B.

In order to Prevent Recurrence

- After this accident, Master A decided to **assign two persons to watch over Vessel A in order to eliminate a blind spot** caused by the crane in the forward way watch.
- The operator should be on watch **with an accurate understanding of the blind spots** created by the structures on deck.
- When a blind spot caused toward the bow of the vessel, the operator should **keep a lookout to compensate for the blind spot** caused by constantly swinging the bow to the left or right, or by moving from the maneuvering location whenever possible, rather than keeping a lookout from a single location.

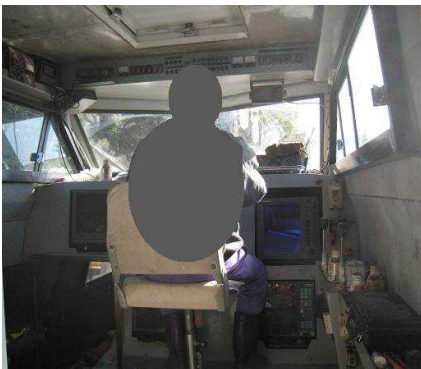
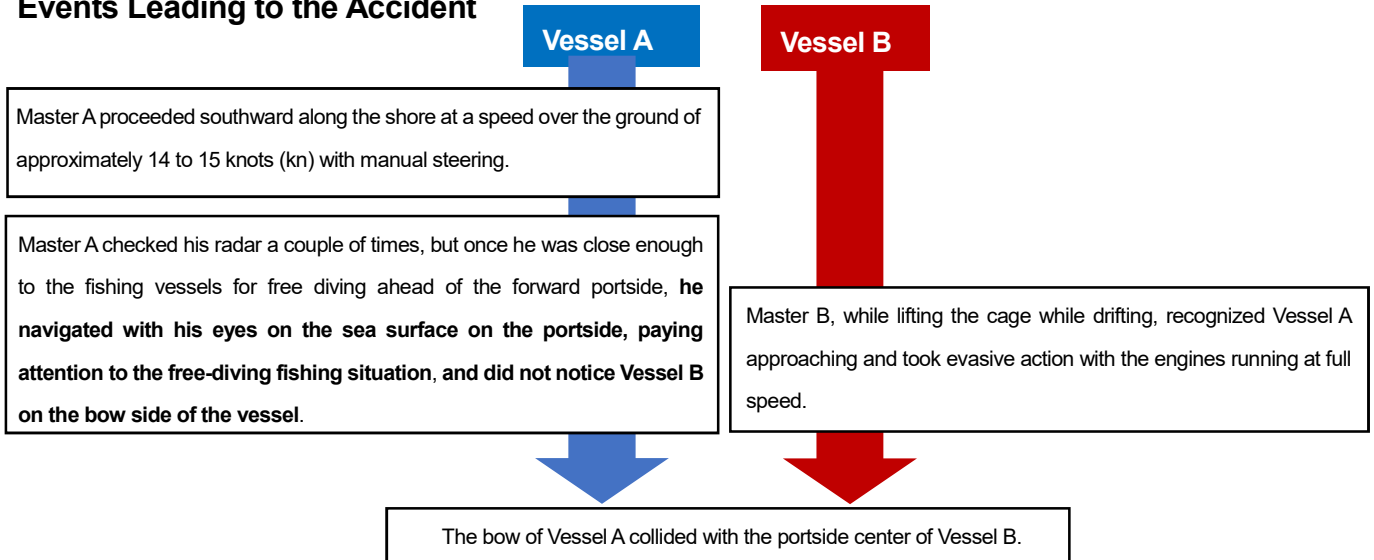
The investigation report of this case is published on the Board's website (issued on November 26, 2020)

https://www.mlit.go.jp/jtsb/ship/rep-acc/2020/MA2020-10-24_2019hs0139.pdf

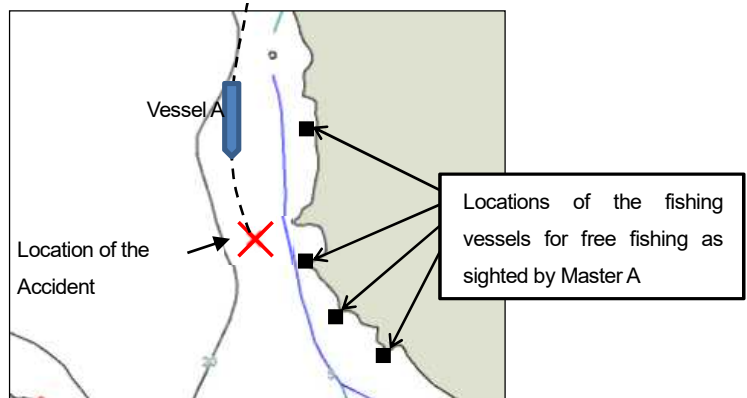
2 A fishing vessel continues to navigate with attention to fishing conditions and collides with a drifting fishing vessel

Summary of the Accident : Vessel A (fishing vessel, 9.7 tons, two crewmembers) was proceeding south and Vessel B (fishing vessel, 2.0 tons, one-man crew) was drifting. The two vessels collided at about 15:30. Master B sustained a left renal artery injury, resulting in died from exsanguination.

Events Leading to the Accident



Maneuvering situation of Master A
(reproduced)



Schematic diagram of the vicinity of the accident

Probable Causes : It is probable that, Vessel A was collided with Vessel B because while the vessel A proceeding south, Master A **continued to navigate** visually **observing the situation of free-diving fishing** near the portside, and **did not notice Vessel B on the side of bow**, It is probable that while Vessel B was lifting its baskets while drifting, Master B saw Vessel A approaching and took evasive action with full ahead, but Vessel B collided with Vessel A despite this action.

In Order to Prevent Recurrence

• Keep a proper watch on the surroundings at all times, because **paying too much attention to a particular object may cause you to miss other vessels or objects in the surroundings.**

The investigation report of this case is published on the Board's website (issued on June 25, 2020)

https://www.mlit.go.jp/jtsb/ship/rep-acci/2020/MA2020-5-44_2019ns0092.pdf

3 Both vessels collided while navigating with keeping course and speed without noticing the other vessel

Summary of the Accident : Vessel A (car carrier, 58,250 tons, 22 crewmembers) was moving east-northeast, while Vessel B (fishing vessel, 19 tons, nine crewmembers) was moving southeast. At about 09:44, the two vessels collided.

Events Leading to the Accident

Vessel A

Third Navigation Officer A (Third Officer A, sole lookout duty) encountered a shower and the visibility deteriorated to the extent that the bow mast was only slightly visible.

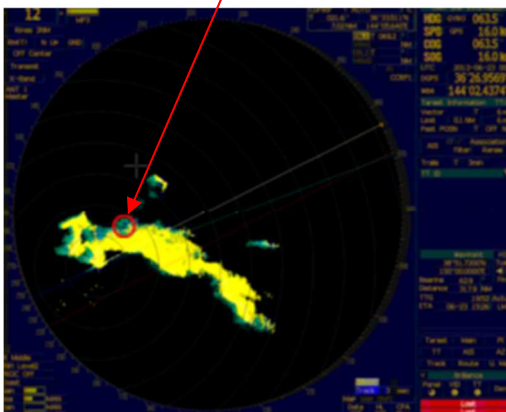
Third Officer A **thought that there were no other vessels in the surroundings** as he didn't recognize any images of other vessels on the radar screen affected by the rainfall, there was no information display of other vessels by AIS, and the vessel was on an ocean voyage.

Vessel B

Ordinary Seaman B (sole lookout duty) did not recognize any images of other vessels ahead of the beam on the radar screen in the wheelhouse.

Ordinary Seaman B went up to the lookout room and sat on the floorboard with his back against the rear wall, keeping watch from about 45° of the forward starboard **with the rear wall creating a blind spot.**

Vessel B's Position (Estimate)



Radar image of Vessel A

(Images of other vessels are not recognized)

The bow of Vessel A collided with the starboard center of Vessel B.

- Third Officer A did not notice Vessel B due to **the lack of images of Vessel B on the radar screen affected by the rainfall.**
- Ordinary Seaman B was on visual watch in the lookout room with a blind spot caused by the wall, and did not notice Vessel A because **Vessel A was approaching from approximately 83° on the starboard bow, which was a blind spot caused by the wall.**
- Ordinary Seaman B could see the radar screen, but had no authority to adjust the radar.
- Both vessels **were not conducting acoustic signaling** in the restricted visibility conditions.

Probable Causes: It is probable that the bow of Vessel A collided with the starboard center of Vessel B when Vessel A was proceeding east-northeast and Vessel B was proceeding south east, because either Third Officer A or Ordinary Seaman B **did not notice the other vessel**, because the visibility was restricted due to a shower and they navigated with keeping their course and speed.

In Order to Prevent Recurrence

- When a restricted visibility condition occurs, the management company of vessel A should **increase the number of bridge duty personnel** and familiarize the crew of the operating vessels with **the acoustic signals to be made** during the restricted visibility condition.
- In the event of a restricted visibility condition, the owner of Vessel B should **report to the master and reinforce the personnel on bridge duty**, as well as **establish a system for acoustic signaling** in the restricted visibility conditions on the operating vessel. It is also desirable to **equip** the operating vessel **with an AIS.**

The investigation report of this case is published on the Board's website (issued on February 26, 2015)

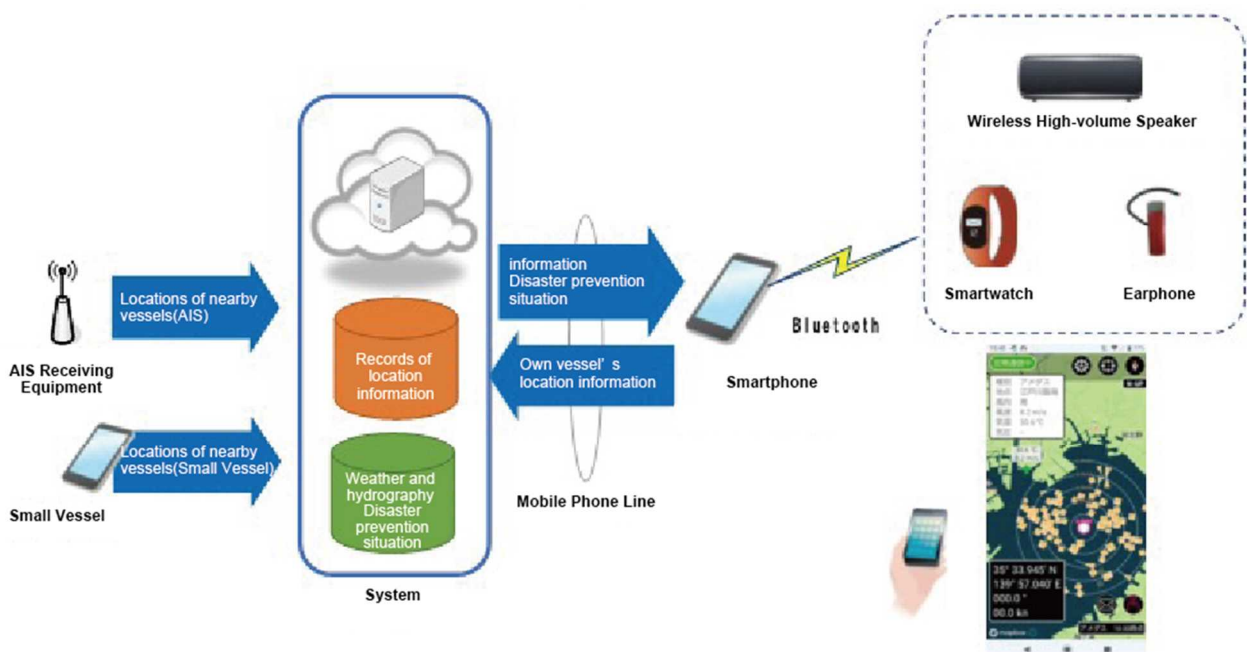
https://www.mlit.go.jp/jtsb/eng-mar_report/2015/2013tk0018e.pdf

Verification of Effectiveness of Alerts for Collision Avoidance Using a Smartphone Application

The Fisheries Agency, as part of its FY 2020 project to promote the spread of safety measures for small fishing vessels, conducted a demonstration test using an on-board smartphone application in the fishing vessels operating in the Seto Inland Sea, as a model sea area, an area with particularly heavy vessel traffic, in order to prevent collision accidents involving small fishing vessels, etc. The following is a description of the test.

➤ Overview of Device Used

Using smartphones, which are becoming dissemination, the surrounding information was monitored and warning notifications (screen display, warning sound/vibration) were made based on the location information of the smartphone, location information of nearby vessels, and weather and hydrographic information.



➤ Demonstration Method

Fishermen bring smartphones (in their possession and with the project eligible apps installed) on board the vessel during operations, activate them at all times, and use the functions provided by the smartphones.

➤ Demonstration Result

"Smartphone apps can contribute to collision avoidance as much as AIS devices."

- It is required that the base station be able to reliably receive AIS vessels and **be within range of the smartphone's signal.**
- Just like AIS devices, it is important to understand that not all vessels are displayed and **not to neglect the visual lookout.**
- Smartphone apps are effective for collision avoidance, especially for fishing vessels not equipped with radar.

【Report on the Commissioned Project in 2020 for Dissemination and Promotion of Safety Measures for Small Fishing Vessels, etc. in the Promotion of Measures to Strengthen Occupational Safety in the Agriculture, Forestry, Fisheries, and Food Industries】

https://www.ifa.maff.go.jp/j/kenkyu/pdf/attach/pdf/130515qizyutsukaihatsu_a-34.pdf

4. Questionnaire Results Regarding Effectiveness of AIS Device

JTSB conducted a questionnaire survey of fishing vessels in Okinawa Prefecture, where the installation of simple AIS* is widespread, on the use and effectiveness of simple AIS, with the cooperation of the prefecture's fishing cooperatives.

The survey included items such as if AIS is useful, the degree to which AIS contributes to the reduction of accidents, and areas for future improvement. The following is a summary of the responses received from a total of 378 owners of vessels equipped with simple AIS (52.7% response rate) through fishery cooperatives (717 vessels belonging to 37 cooperatives).

These survey results suggest that **the installation of AIS** on small vessels, such as fishing vessels, as an aid to lookout, is effective **in preventing collisions**.

* "Simple AIS" refers to a device with a smaller output than AIS, which is required by the international convention to be installed on certain ships (all passenger ships, vessels of 300 tons or more engaged in international navigation, and vessels of 500 tons or more not engaged in international navigation). Simple AIS limits the information items transmitted and received to the vessel's name, position, speed, course, type, etc.

What you feel by installing AIS

When asked if they thought the installation of AIS had reduced the number of accidents, **156 respondents (41.3%) answered "Yes, it has"**, followed by **118 respondents (31.2%) who answered "Yes, I think it has"**, accounting for approximately 70% of the total respondents. (See Fig. 6)

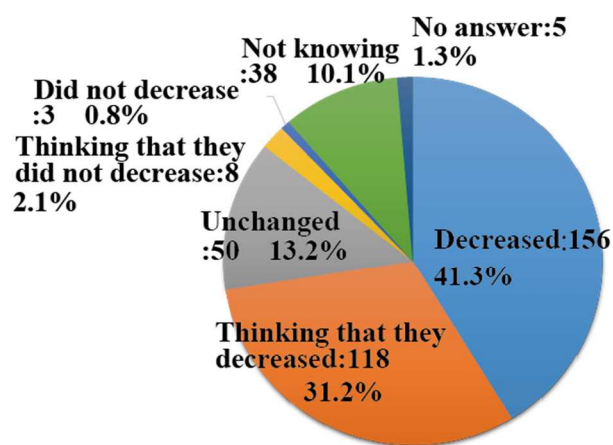


Figure 6: Responses to the question, "Do you think accidents have decreased?"

When asked if the installation of AIS had reduced the number of times they got a fright, **202 respondents (53.4%) answered "Yes, it has"**, followed by **75 respondents (19.8%) who answered "Yes, I feel it has"**, accounting for about 70% of the total respondents. (See Fig. 7)

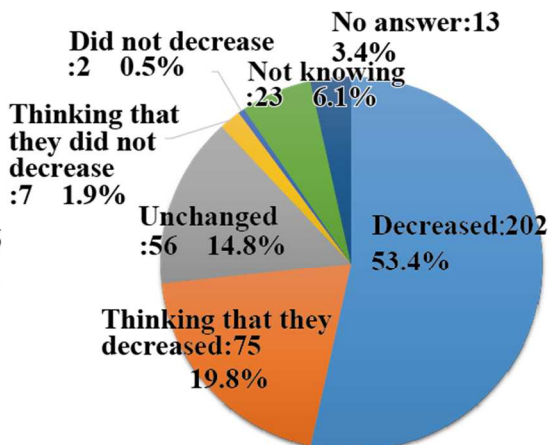


Figure 7: Responses to the question, "Do you think you have fewer frights?"

Specific examples of frights

- When visibility is poor, such as on foggy days
- When there is a vessel or other object that is difficult to detect on radar
- When there is a lack of mutual communication that results in an abnormal approach
- When the distance with the other vessel was quite close without knowing it
- While we were taking a nap, a large ship did not notice us, and when the radar alarm went off, we hurriedly avoided the ship.
- Many vessels do not have AIS on.
- AIS installation allows us to see the movements of the other vessel, so when the other vessel comes closer than necessary

When asked if they thought AIS was "helpful," **305 (80.7%) responded "helpful," followed by 50 (13.2%) who responded "A little useful," making up approximately 90% of the total respondents.** (See Fig. 8).

When asked about the specific benefits of AIS installation (multiple responses), the most common response was "knowing the position of other vessels" (306 respondents), followed by "informing the position of my vessel" (247 respondents), and so on. (See Fig. 9)

In addition, specific examples of how they found AIS to be useful were: "It shows the heading speed of other vessels," "It shows up before radar," "It can recognize vessels that are not on radar," and "It has helped large ships avoid my vessel."

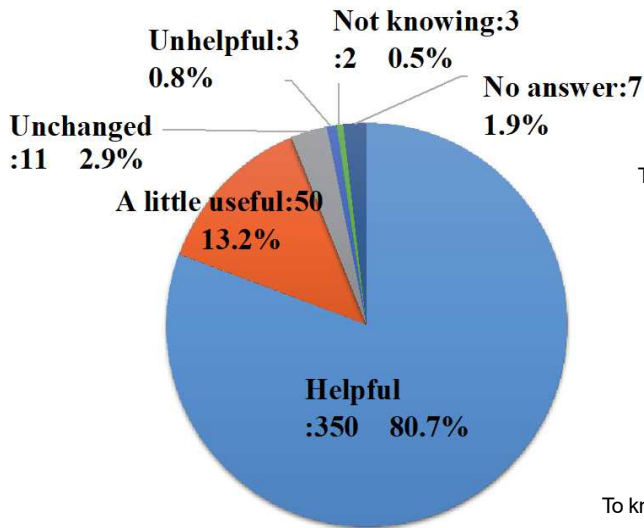


Figure 8: Responses to the question "Do you think AIS is helpful?"

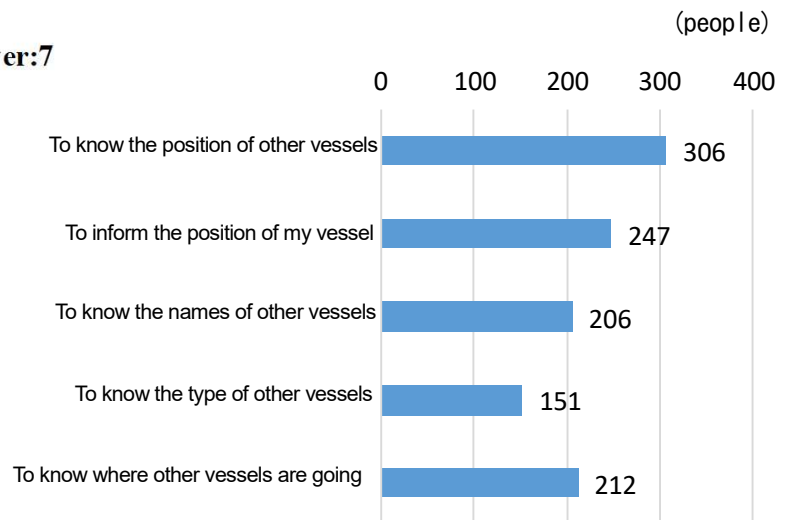


Figure 9: Responses to the question "What are specific benefits of AIS installation?"

When asked if they no longer feel threatened by other vessels approaching their vessels, **97 respondents (25.7%) answered "No" and 191 respondents (50.5%) answered "Less", accounting for about 80% of the total.** (See Fig. 10)

When asked if it was easier to know what other vessels are like, **251 respondents (66.4%) answered "easier to know," followed by 47 (12.4%) who answered "a little easier to know," together accounting for about 80% of the responses.** (See Fig. 11)

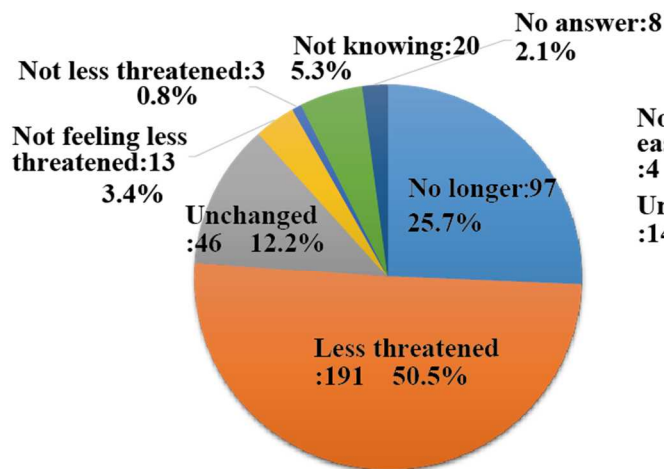


Figure 10: Responses to the question, "Do you no longer feel threatened?"

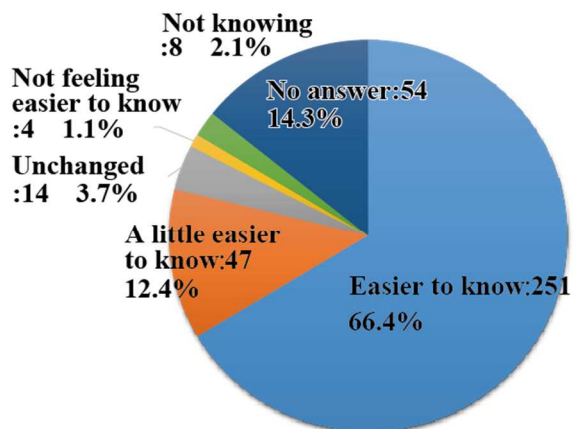


Figure 11: Responses to the question, "Is it easier to know what other vessels are like?"

5. Summary (Conclusion)

The following characteristics were found in the occurrence of collision accidents with fatalities or missing persons.

- Of the vessels which sustained fatalities or missing persons in collision accidents, **approximately 50% were fishing vessels and 20% were pleasure boats** by vessel type.
- **Approximately 90% of vessels which sustained fatalities or missing persons were small vessels of less than 20 tons.**
- Of the vessels involved in collision accidents with fatalities or missing persons for which the recognition status of the other vessel is revealed, **about 40% recognized the other vessel and about 60% did not recognize the other vessel.**

The case studies of collision accidents with fatalities or missing persons revealed that the following points are mainly important in preventing accidents.

- To keep **a proper lookout at all times**
- For the operator to accurately assess the blind spot situation and, if a blind spot exists, keep a lookout to compensate for the blind spot
- To perform **acoustic signaling in restricted visibility conditions**

The questionnaire results on the effectiveness of AIS device revealed the following.

- When asked if they no longer feel threatened by other vessels approaching their vessels, **a total of about 80% said "No" and "Less" together.**
- When asked if they thought AIS was useful, **a total of about 90% answered "Yes" and "A little."**

AIS installed on small vessels, such as fishing vessels, as a lookout aid, is effective in preventing collisions.

A word from Director for Analysis, Recommendation and Opinion

I am sure that all operators of vessels operate their vessels with due consideration for safety on a daily basis, taking appropriate precautions such as keeping a proper lookout to prevent accidents.

Although the installation of AIS is subject to some restrictions such as locations to be installed and costs, the recent development of smartphone applications, in addition to simple AIS, has made information more readily available for collision avoidance.

I hope that the accident prevention measures described in this Digest will help to ensure safety for all of you.

JTSB Secretariat, MLIT
15F Yotsuya Tower
1-6-1, Yotsuya2-1-2, Shinjuku-ku
Tokyo, 160-0004 Japan
(Staff in charge: Director for
Analysis, Recommendation and Opinion)

TEL 03-5367-5030
URL <https://www.mlit.go.jp/jtsb/index.html>
e-mail hqt-jtsb_bunseki@gxb.mlit.go.jp

We welcome your comments on "JTSB Digests" and requests for dispatching lecturers



Japan-Marine Accident Risk and Safety Information System (J-MARISIS)

~Accident, risk and safety information that can be found on the map~

With J-MARISIS, check out the areas where accidents frequently occur!



J-MARISIS

search

<https://jtsb.mlit.go.jp/hazardmap/>



Small ship Engine Trouble Search System(S-ETSS)

You can search for small vessel engine failure cases!

Be sure to perform a pre-sailing inspection to prevent engine failure!

小型船舶(20トン未満)機関故障検索システム Small ship - Engine Trouble Search System

故障部位件数ランキング

故障部位	件数
機関本体	14
電気系統	3
燃料系統	3
機関本体	2
機関本体	2
機関本体	2
機関本体	1
機関本体	1

No.	事故番号	発生日時	機関種類	噸位	主機駆動方式	機関駆動型式	故障部位	原因
1	ズルビート-Sm Deagun乗用艇	2018/11/08 12:09	プレジャーボート	50未満	50未満	船外機	電気系統	本エンジン外注。乗組員が乗組員がエンジン本体の配線を確認できなかったため、乗組員がエンジン本体の配線を確認できなかったことにより発生したものと見られる。
2	ズルビート-Sm Deagun乗用艇	2017/11/28 14:00	プレジャーボート	50未満	110	船外機	燃料系統、電気系統	本エンジン外注。乗組員が乗組員がエンジン本体の配線を確認できなかったため、乗組員がエンジン本体の配線を確認できなかったことにより発生したものと見られる。
3	ズルビート-Sm Deagun乗用艇	2017/09/03 10:09	プレジャーボート	50未満	50未満	船外機	電気系統	本エンジン外注。乗組員が乗組員がエンジン本体の配線を確認できなかったため、乗組員がエンジン本体の配線を確認できなかったことにより発生したものと見られる。
4	ズルビート-Sm Deagun乗用艇	2017/07/29 18:38	プレジャーボート	50未満	50未満	船外機	電気系統	本エンジン外注。乗組員が乗組員がエンジン本体の配線を確認できなかったため、乗組員がエンジン本体の配線を確認できなかったことにより発生したものと見られる。
5	ズルビート-Sm Deagun乗用艇	2017/06/20 11:06	プレジャーボート	50未満	37	船外機	機関本体	本エンジン外注。乗組員が乗組員がエンジン本体の配線を確認できなかったため、乗組員がエンジン本体の配線を確認できなかったことにより発生したものと見られる。
6	ズルビート-Sm Deagun乗用艇	2017/05/03 20:46	プレジャーボート	50未満	44	船外機	燃料系統、電気系統	本エンジン外注。乗組員が乗組員がエンジン本体の配線を確認できなかったため、乗組員がエンジン本体の配線を確認できなかったことにより発生したものと見られる。

S-ETSS

search

https://jtsb.mlit.go.jp/hazardmap/s_etss/

