

JTSTB Digests

JTSTB (Japan Transport Safety Board)

(Issued in November, 2014)

Digest of Marine Accident Analyses

For prevention of “Collision Accidents in Congested Areas”

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1. Preface

Since Japan is surrounded by water all sides, marine transport rivals land transport as one of its primary transportation methods. There is a large industrial zone known as the “Pacific belt zone” extending from the Kanto region to northern Kyushu, with distribution of goods highly active in its surrounding areas. On the other hand, as there are also a number of excellent fishing grounds there, it is an area congested with many different vessels using the same waters.

It has been one year since operation of the “Japan-Marine Accident Risk and Safety Information System” (hereinafter referred to as “J-MARISIS”) was started at JTSTB in May 2013. Users of this system can use the Internet from a PC to create map displays for themselves, showing information about what types of accidents have occurred in the past in marine areas of interest, what kinds of risks exist in those areas, and what level of traffic density those areas have (refer to page 3 for an explanation of “traffic density”).

Looking at the Pacific belt zone using J-MARISIS shows that areas such as Tokyo Bay, Ise Bay, Osaka Bay, Bisan Seto, Kurushima Strait, and Kanmon Strait are displayed in blue to signify that they have high traffic density, and also that there are many marks indicating accidents in these locations, which suggests that these are areas with active marine traffic and a high frequency of accidents occurring in them.

Recent serious marine accidents have resulted in the loss of precious human lives as well as vessels and cargo. These include an accident that occurred in September 2013 in waters to the west of Izu Oo Shima, involving a collision between cargo ships leading to 6 fatalities with 1 vessel capsizing; and an accident in March 2014 at the mouth of Tokyo Bay, also involving a collision between cargo ships leading to 1 fatality, 8 people missing, and 3 people injured with 1 vessel sinking (both of these accidents are currently under investigation at JTSTB).

In this context, we will provide accident case studies, with statistical data, by using J-MARISIS while focusing on a frequently occurring type of accident that involves a collision between vessels in areas with high traffic density, especially areas where serious marine accidents occurred or areas where characteristic accidents occurred near the entrances or exits of traffic routes, etc. prescribed in the Maritime Traffic Safety Act (not including traffic routes themselves) (*1).

We hope that this digest will be used as teaching materials on various occasions such as safety seminars held by parties concerned, and will be able to contribute to the prevention of similar accidents.



(*1 Target marine areas)



Figure 1: Traffic density conditions according to J-MARISIS (http://jtsb.mlit.go.jp/hazardmap/index_en.html)

2. Statistics

Of the collision accidents between vessels for which JTSC conducted investigations sometime between October 2008 and March 2014 and published accident investigation reports, there were 50 accidents occurring in marine areas with high traffic density and characteristic occurrence trends (*2). The statistical data for those accidents is shown on charts below.

(*2 Target marine areas: from the mouth of Tokyo Bay to off the Iro Saki (13 cases), near the Akashi Kaikyo Traffic Route east entrance (9 cases), near the Bisan Seto East Traffic Route east entrance (10 cases), near the Kurushima Kaikyo Traffic Route west entrance (6 cases), and from near the Kanmon Passage east entrance to off the Ube City, Yamaguchi Pref. (12 cases))

By the type of vessel

The proportion of cargo ships and tankers is high

The breakdown of the 107 vessels involved in the 50 target accidents (target vessels) by vessel type is as follows: 39 cargo ships (36.4%), 28 fishing vessels (26.2%), and 12 tankers (11.2%) (See Figure 2).

On the other hand, out of 1,084 vessels involved in collision accidents in the 2012 and 2013 years, the breakdown of vessels by vessel type is as follows: 405 fishing vessels (37.4%), 201 cargo ships (18.5%), and 59 tankers (5.4%) (*3). This statistical data shows that the proportions of cargo ships and tankers in the target areas are roughly 2 times higher than in general areas.

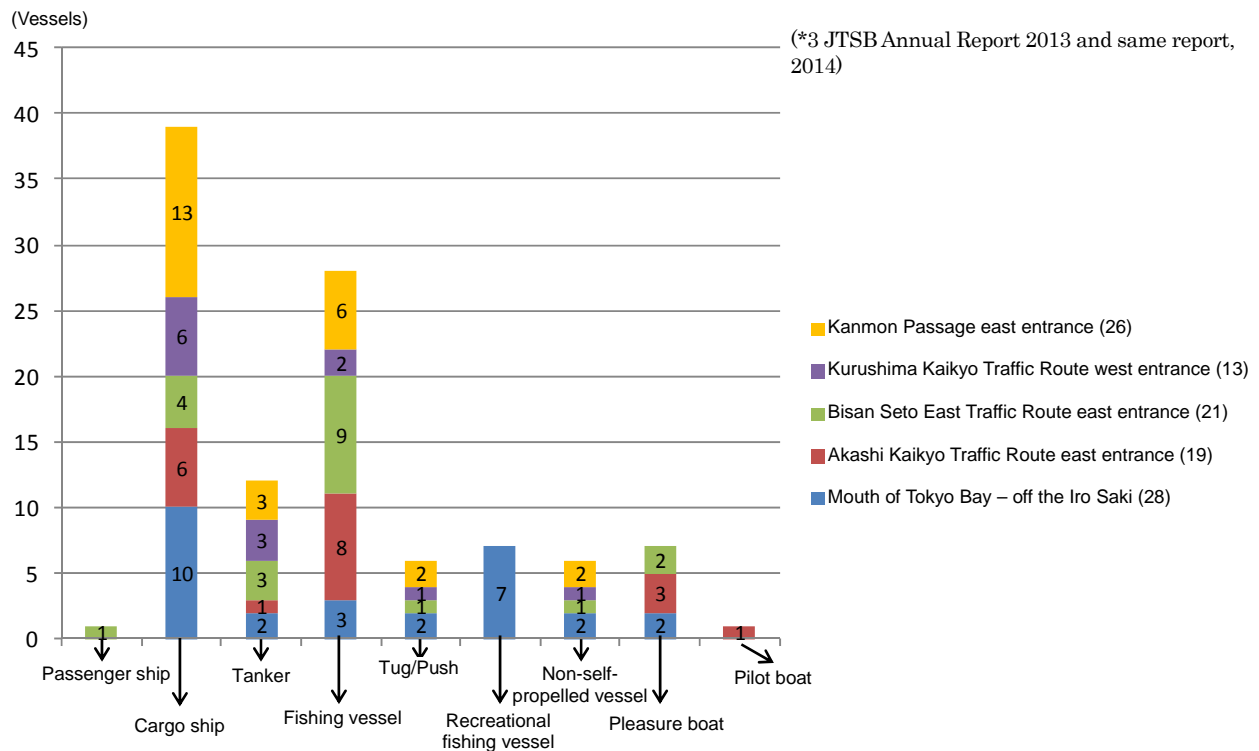


Figure 2: By the type of vessel

Breakdown of accidents by month

As for the number of accidents by month, there were 7 (14.0%) in November, followed by 6 (12.0%) in June. (See Figure 3)

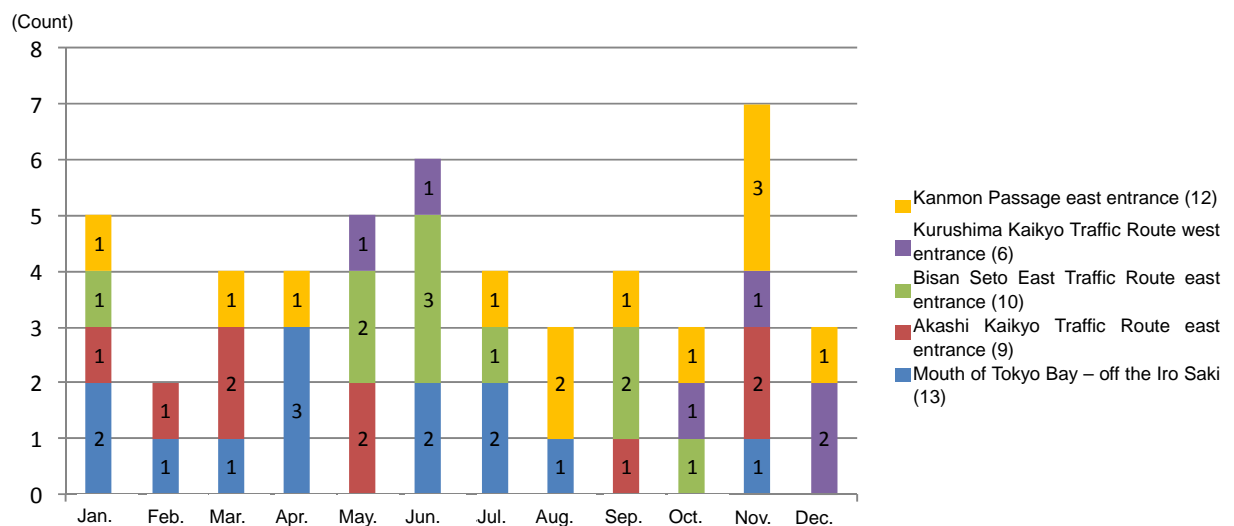


Figure 3: Number of accidents by month

Breakdown of accidents by the time of day and day/night conditions

Many accidents occurred between 11:00 and 13:00

As for the number of accidents by the time of day, 6 accidents occurred from 12:00 to 13:00 (12.0%), followed by 5 accidents each occurring from 11:00 to 12:00 and from 13:00 to 14:00 (10.0%) (See Figure 4).

In comparison between the daytime and night-time there were 30 accidents occurring in the daytime (60.0%) and 20 in the night-time (40.0%). 8 out of the 9 accidents occurred in the daytime near the eastern entrance to the Akashi Kaikyo Traffic Route, and 5 out of the 6 accidents occurred at night-time near the western entrance to the Kurushima Kaikyo Traffic Route (See Table 1).

(*4 Day and night are differentiated according to the time of sunrise and sunset.)

Table 1: Number of accidents separated by day/night (Cases)

Marine area	Day	Night	Total
Mouth of Tokyo Bay – off the Iro Saki	8	5	13
Akashi Kaikyo Traffic Route east entrance	8	1	9
Bisan Seto East Traffic Route east entrance	5	5	10
Kurushima Kaikyo Traffic Route west entrance	1	5	6
Kanmon Passage east entrance	8	4	12
	30	20	50
	60.0%	40.0%	100.0%

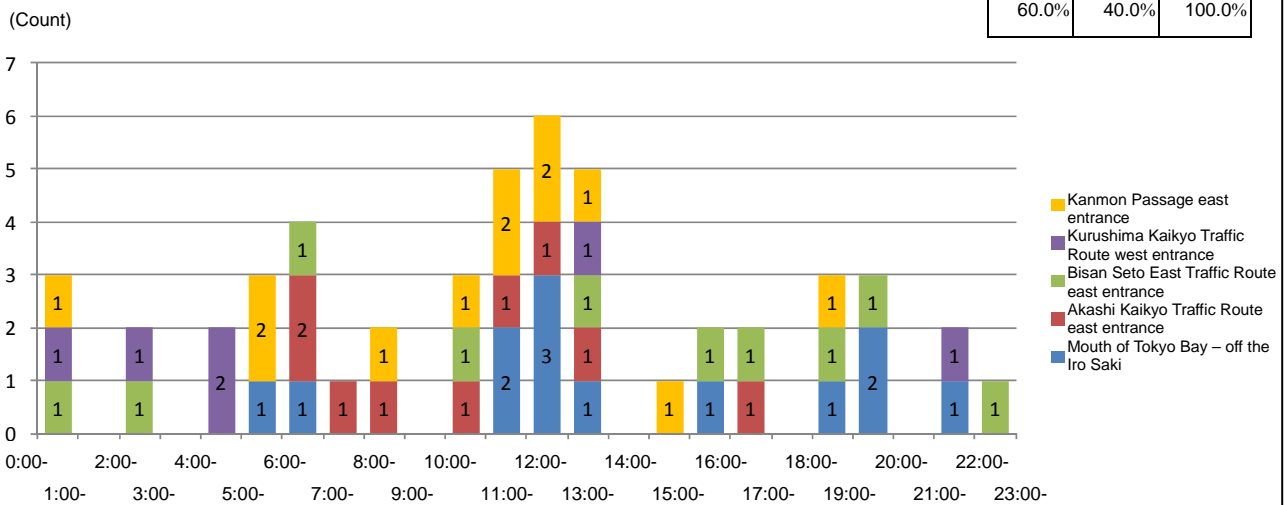


Figure 4: Number of accidents by the time of day

“Traffic density” in J-MARISIS

“Traffic density” is described in J-MARISIS as indicated below.

“A traffic density map, developed by the National Maritime Research Institute, produced by means of calculating the number of vessels passing through a mesh of one minute of latitude by one minute of longitude in 2012 based on AIS(*5) information provided by a vessel information company. Colors are used to represent density levels; 1-15, 16-30, 31-100, 100-300, and 301 and above. Please note that the traffic density map does not illustrate the exact traffic volume of vessels equipped with AIS since some data may be lost by the condition of radio propagation and other technical reasons.”

(*5 “AIS: Automatic Identification System” refers to the device that enables vessels to automatically send and receive information regarding vessels’ identification codes, types, names, positions, courses, destinations, etc. in order to exchange information between vessels and navigation aid facilities of shore stations. The vessel position refers to the position of GPS antenna.)

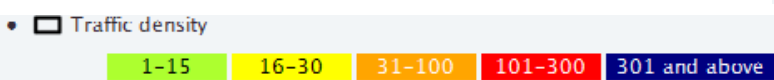


Figure 5: Explanation of “traffic density” in J-MARISIS

Conditions of target marine areas

We will now look into the relationship between traffic density in J-MARISIS and accident occurrence trends, and the courses of target vessels by vessel type for each target marine area (in the display of courses of target vessels by vessel type, the headings of vessels drifting or at anchor are indicated by ship symbols).

(1) From the mouth of Tokyo Bay to off the Iro Saki (13 cases)

Many accidents involving recreational fishing vessels on Saturdays and Sundays

- In J-MARISIS, an area shown in blue, indicating high traffic density, extends from off the Tsurugi Saki (Miura City, Kanagawa Pref.) to off the Mikomoto Shima (Shimoda City, Shizuoka Pref.) with a width of approximately 5 km (See Figure 6).
 - Many cargo ships and tankers sailed in the northeast to southwest direction. Fishing vessels and recreational fishing vessels sailed in different courses from those of cargo ships and tankers, with their courses intersecting (See Figure 7).
 - Among the 13 accidents, 5 accidents (7 vessels) involved recreational fishing vessels. 1 accident on Saturday and 4 accidents on Sundays occurred between 5:00 to 14:00. The states of movement of the recreational fishing vessels were as follows: fishing while in a drifting state (3 vessels), underway with the skipper asleep (2 vessels), and underway in order to move location (2 vessels) (There were no accidents involving recreational fishing vessels in the other target areas).
 - 9 people sustained fatalities or injuries: fishing visitors on recreational fishing vessels (1 fatality, 1 seriously injured, 3 slightly injured), a skipper (1 slightly injured), a skipper of a pleasure boat (1 slightly injured), and passengers (2 slightly injured).
- Refer to Case 1 on page 10.

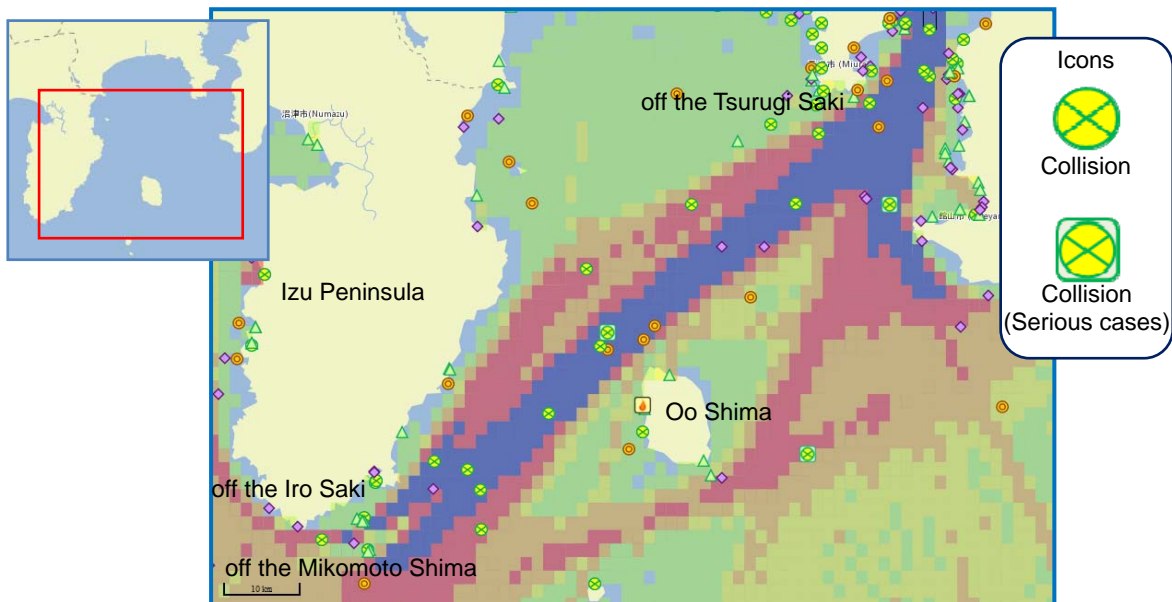


Figure 6: Traffic density and accident locations according to J-MARISIS (from the mouth of Tokyo Bay to off the Iro Saki)

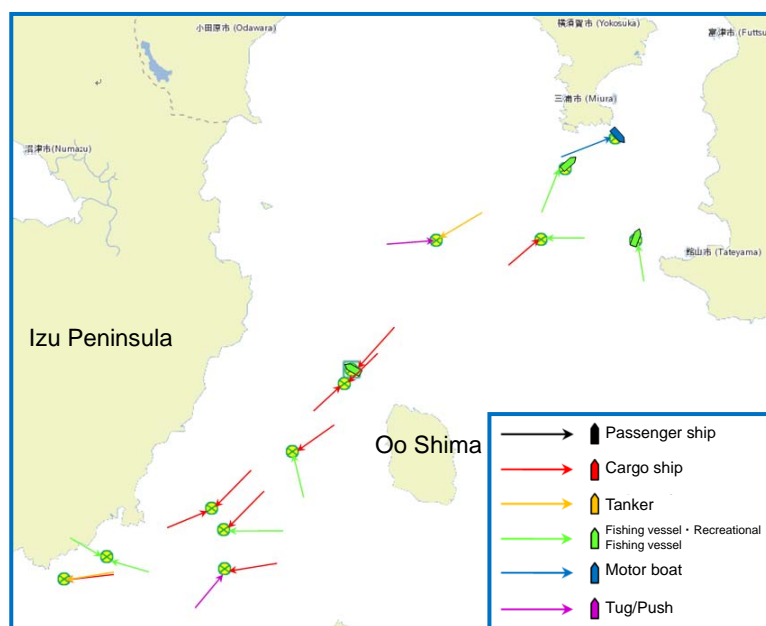


Figure 7: Vessel courses by vessel type (from the mouth of Tokyo Bay to off the Iro Saki)

(2) Near the Akashi Kaikyo Traffic Route east entrance (9 cases)

There were many accidents involving fishing vessels in the daytime

- In J-MARISIS, the areas near the eastern and western entrances to the Akashi Kaikyo Traffic Route are shown in blue and red, indicating high traffic density.
- Among accidents occurring near the eastern and western entrances to the route, a higher number occurred near the eastern entrance.
- Out of the 9 accidents, 8 occurred in the daytime. 7 of those accidents (8 vessels) involved fishing vessels, and their states of movement were as follows: fishing while sailing (5 vessels), fishing while in a drifting state (1 vessel), and underway in order to move location (2 vessels).
- Out of the fishing vessels that were sailing, excluding the 2 vessels that were engaged in two-boat trawling, all 4 of the remaining vessels were sailing toward the northwest.
- 5 people sustained injuries: skippers of pleasure boats (2 slightly injured) and passengers (3 slightly injured).

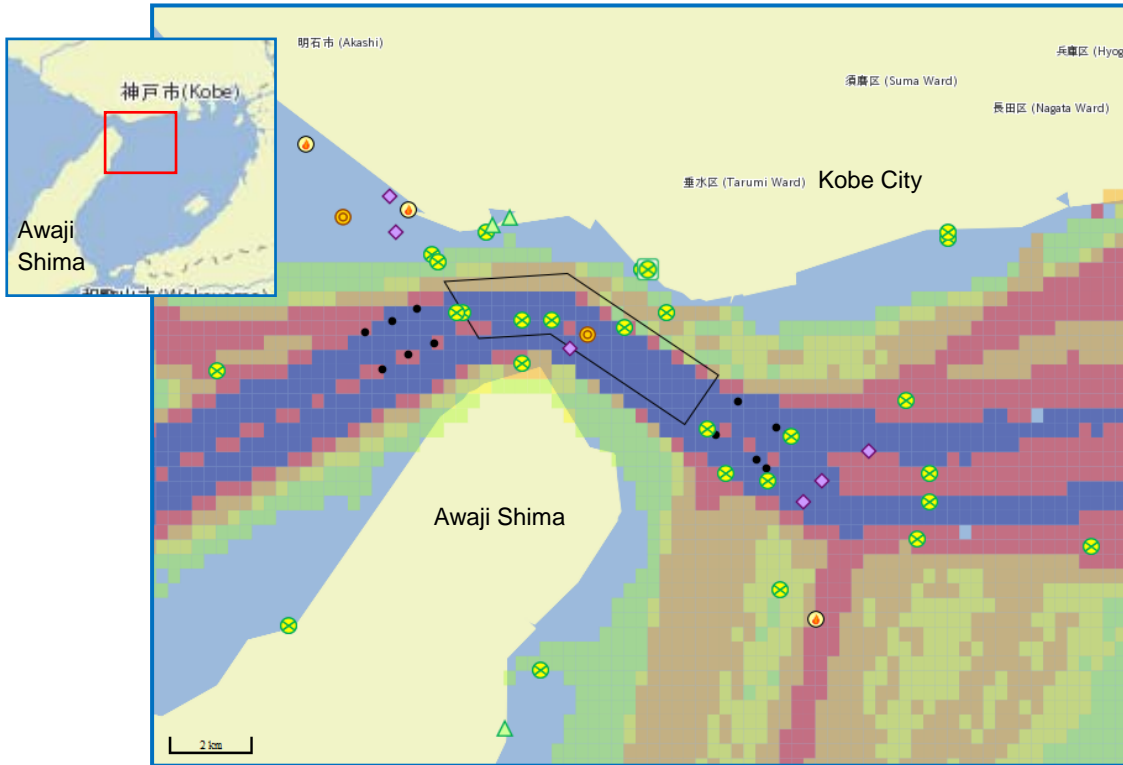


Figure 8: Traffic density and accident locations according to J-MARISIS (near the Akashi Kaikyo Traffic Route)

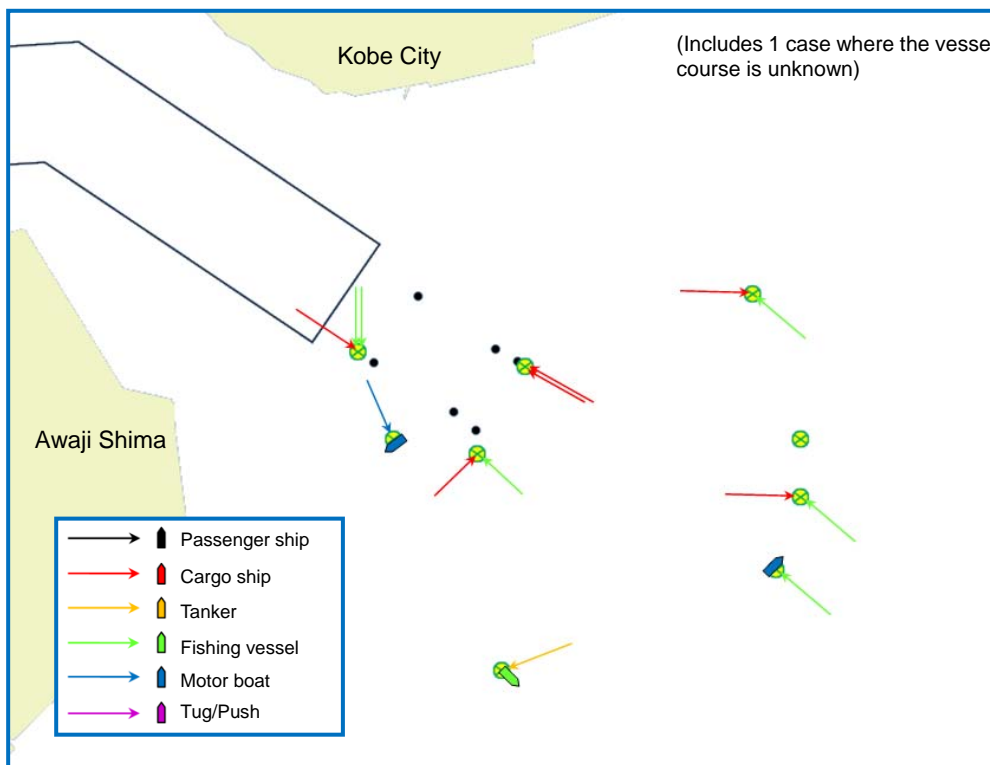


Figure 9: Vessel courses by vessel type (near the Akashi Kaikyo Traffic Route east entrance)

(3) Near the Bisan Seto East Traffic Route east entrance (10 cases)

There were many accidents involving small bottom-trawlers

- In J-MARISIS, the area along the recommended route extending from the Akashi Kaikyo Traffic Route shown in blue, and the area extending from the Naruto Strait shown in blue and red, both indicating high traffic density, converge near the eastern entrance to the Bisan Seto East Traffic Route with a width of approximately 2 km.
 - In this area, 12 of the 21 vessels were sailing toward the east-northeast and east.
 - Out of the 10 accidents, 8 accidents involved fishing vessels (9 vessels in total), 8 of which were small bottom-trawlers. All 9 vessels were underway, and the states of movement of those vessels were as follows: undergoing fish selection work (4 vessels), fishing (2 vessels), undergoing net washing work (1 vessel), moving between fishing grounds (1 vessel), and unknown due to the death of the skipper (1 vessel).
 - 2 people sustained fatalities or injuries, both of whom were skippers of fishing vessels (1 fatality and 1 slightly injured).
- Refer to Case 2 on page 12.

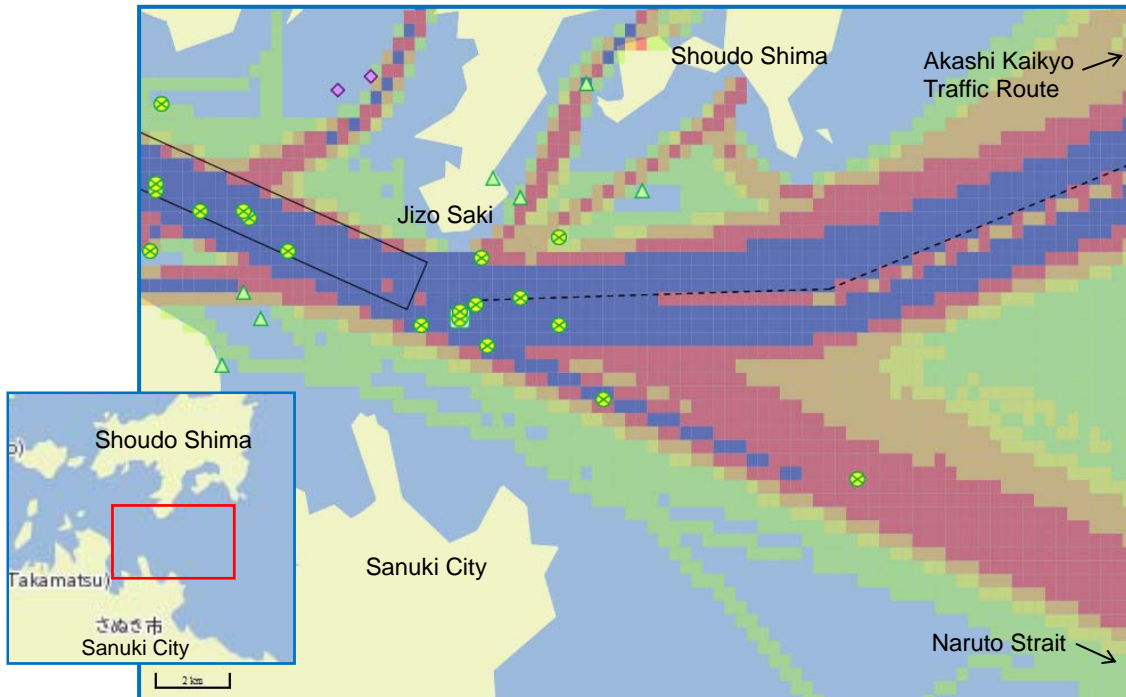


Figure 10: Traffic density and accident locations according to J-MARISIS (near the Bisan Seto East Traffic Route east entrance)

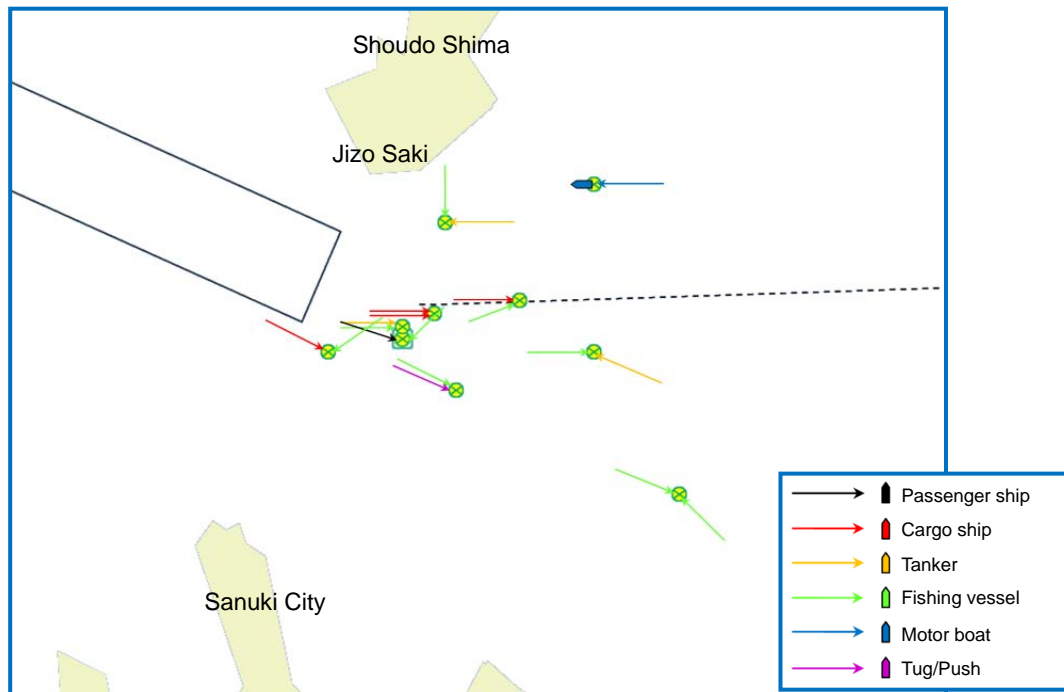


Figure 11: Vessel courses by vessel type (near the Bisan Seto East Traffic Route east entrance)

(4) Near the Kurushima Kaikyo Traffic Route west entrance (6 cases)

A 3-vessel collision accident occurred at night-time involving a tanker and cargo ships

- In J-MARISIS, the areas near the eastern and western entrances to the Kurushima Kaikyo Traffic Route are shown in blue and red, indicating high traffic density. At the west of the route, there are areas of blue extending in the southwest to northeast direction on the Shikoku side (off the Kajitorinohana) and in the west-southwest to east-northeast direction between Oosakishimo Shima and Itsuki Shima, converging near the western entrance with a width of approximately 2 km.
- Among accidents occurring near the eastern and western entrances to the route, a higher number occurred near the western entrance.
- Out of the 6 accidents, 5 occurred in the night-time. 1 of which was a collision accident involving 3 vessels (1 tanker and 2 cargo ships). ○ Refer to Case 3 on page 14.
- There were also accidents that occurred partially due to the Kurushima Kaikyo Traffic Route's unique rule: "Sail Naka Suido along with the tidal current, sail Nishi Suido against the tidal current". ○ Refer to Case 4 on page 17.
- 1 person sustained a fatality: the skipper of a fishing vessel.

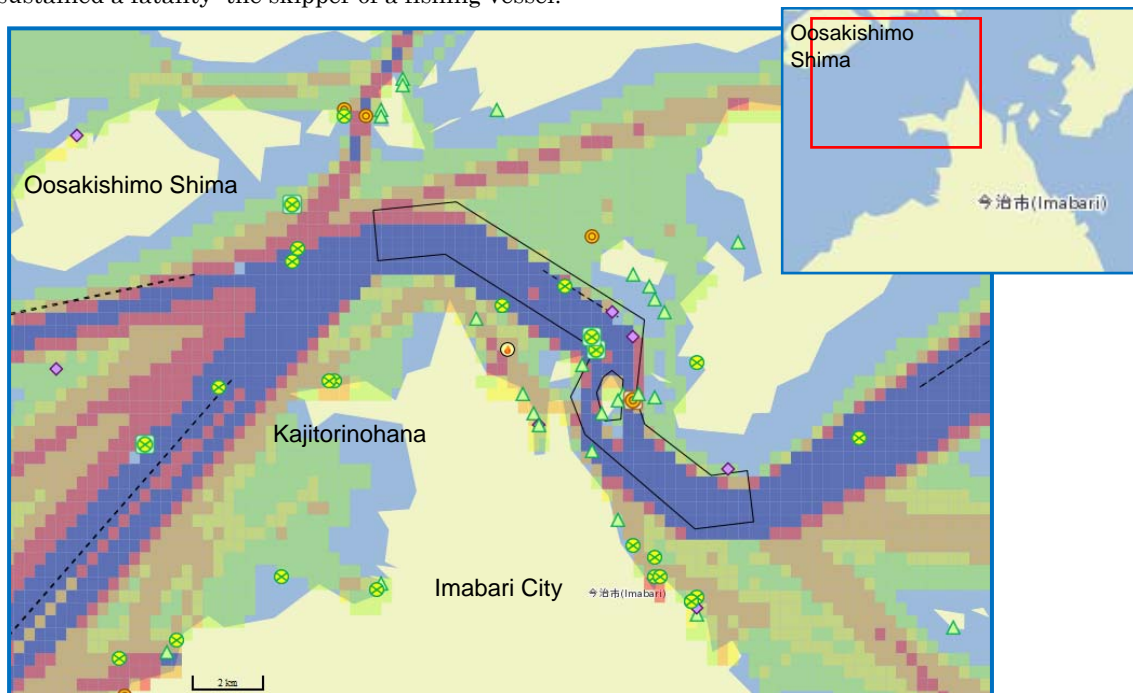


Figure 12: Traffic density and accident locations according to J-MARISIS (near the Kurushima Kaikyo Traffic Route)

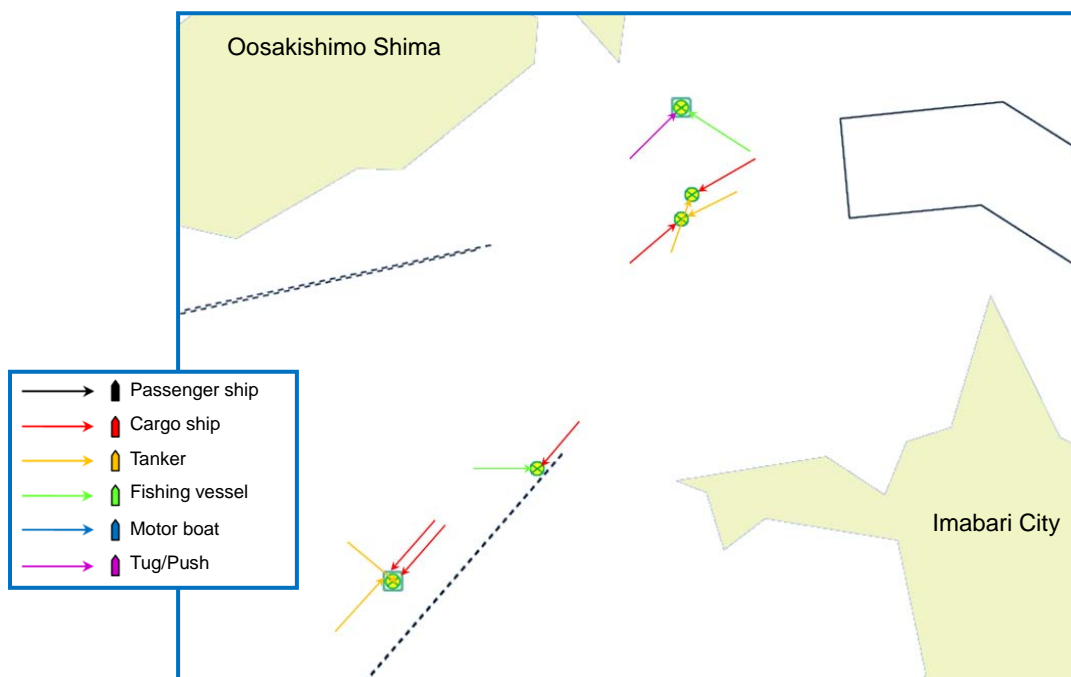


Figure 13: Vessel courses by vessel type (near the Kurushima Kaikyo Traffic Route west entrance)

(5) From near the Kanmon Passage east entrance to off the Ube City, Yamaguchi Pref. (12 cases)

Accidents occurred involving vessels that were at anchor

- In J-MARISIS, the area along the recommended route from near the eastern entrance to the Kanmon Passage to off the Ube City, Yamaguchi Pref. is shown in blue and red, indicating high traffic density.
- Out of the 12 accidents, 3 accidents (4 vessels) involved vessels that were at anchor (3 cargo ships (waiting for the tide to turn, waiting for entry into port, and unknown) and 1 fishing vessel (fishing using diving apparatus)). For 3 of the 4 vessels, the accidents occurred north of the recommended route (there were no accidents involving vessels at anchor in the other target areas).
- Out of the 12 accidents, 4 occurred between vessels sailing in the same direction, all of which were underway in the southeast direction.
- 1 person sustained injury: a deckhand of a fishing vessel (slightly injured).

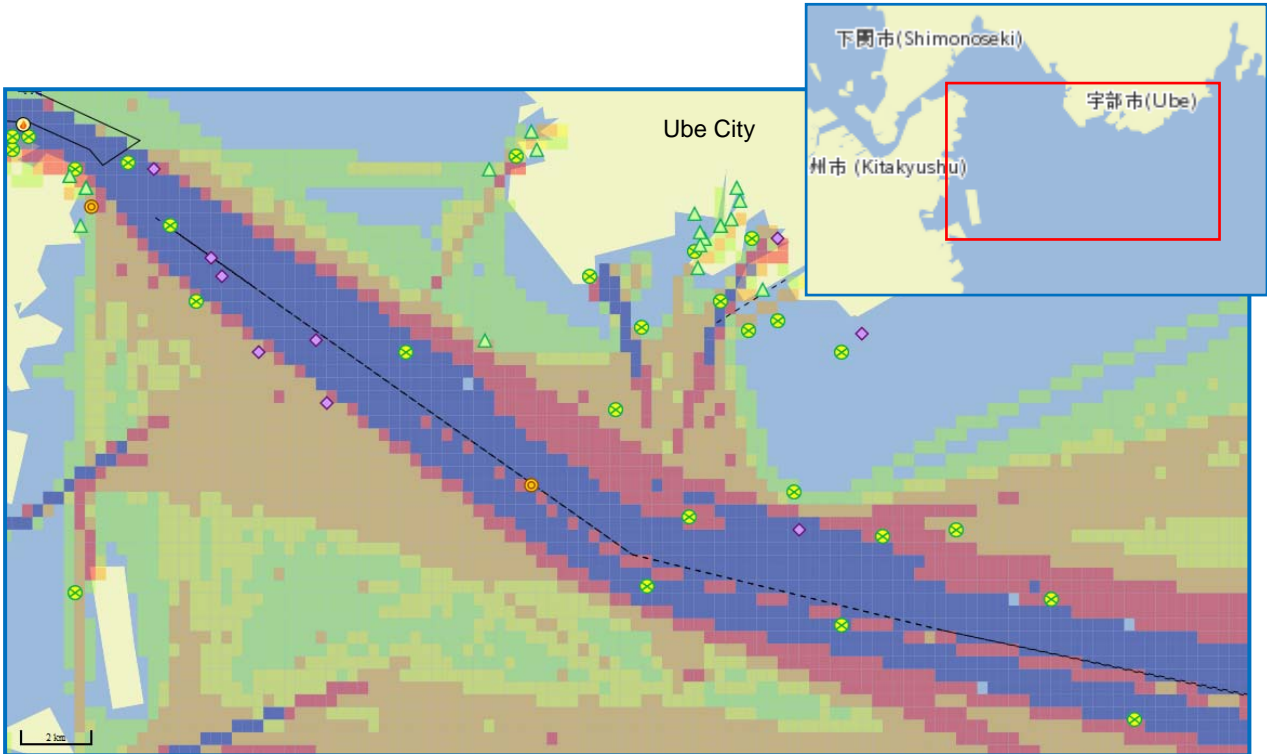


Figure 14: Traffic density and accident locations according to J-MARISIS (from near the Kanmon Passage east entrance to off the Ube City, Yamaguchi Pref.)

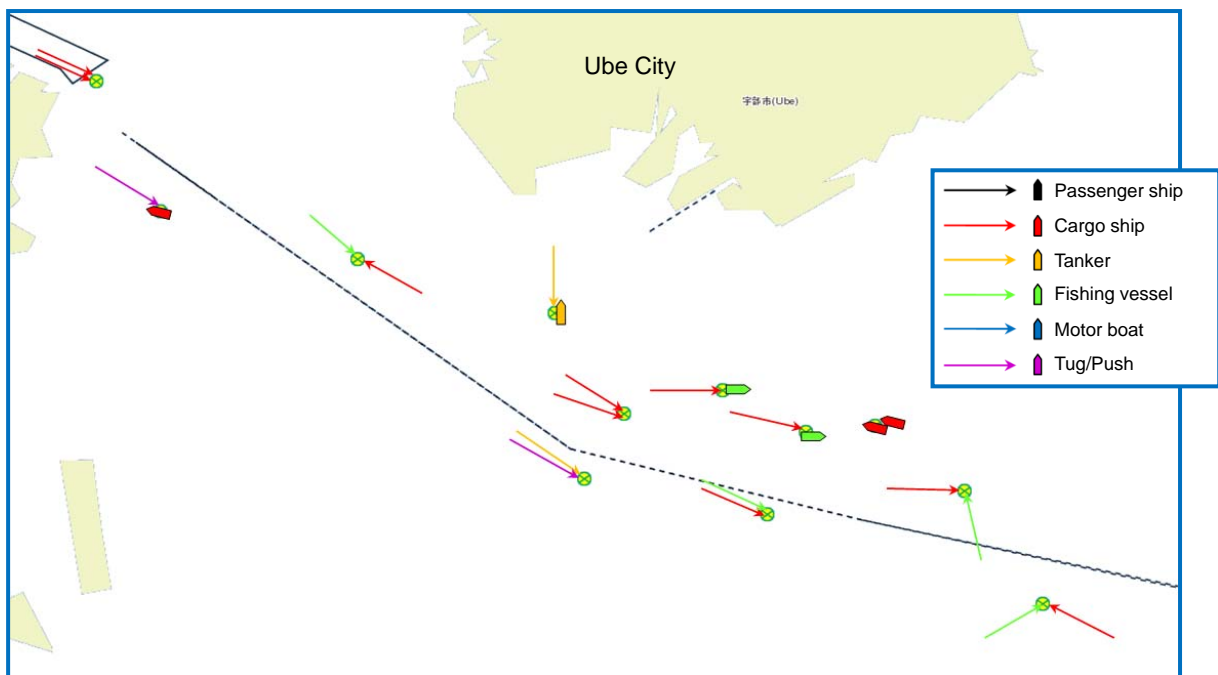


Figure 15: Vessel courses by vessel type (from near the Kanmon Passage east entrance to off the Ube City, Yamaguchi Pref.)

Human factors contribute to all the accidents

When the accident causes described in accident investigation are categorized into human factors, mechanical factors, environmental factors, and organizational factors, the number of accidents caused by human factors is 40 (80.0%), and the number by human/environmental factors is 8 (16.0%). All of them involved “human factors or a combination of multiple factors involving human factors” (See Figure 16).

Moreover, categorizing the vessels involved in the 50 human factor-related accidents into “failed in detection”, where necessary elements were not identified; “judgment errors” including wrong assumptions and presumptions; “inappropriate actions” including carelessness, omission of confirmation, and sloppy operational practices; “unsafe actions” (*6); and “falling asleep”, there were 40 vessels with “inappropriate actions” (44.0%), 33 vessels with “judgment errors” (36.3%), and 9 vessels with “unsafe actions” (9.9%) (See Figure 17) (excluding vessels for which the cause is unclear, and non-self-propelled vessels).

*6 Any deliberate action which might impede the safety of oneself or others without its intention. (This is the original definition of this digest.)

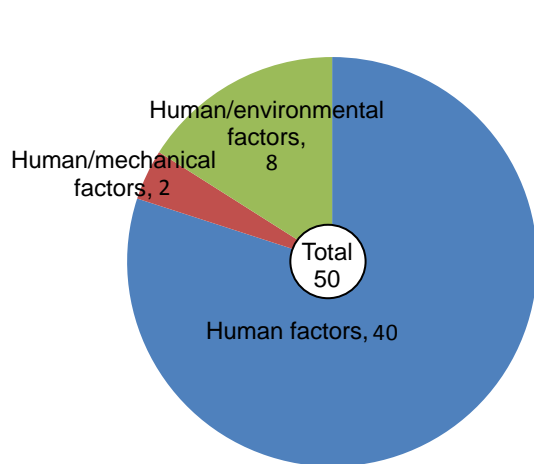


Figure 16: Breakdown of cause categories

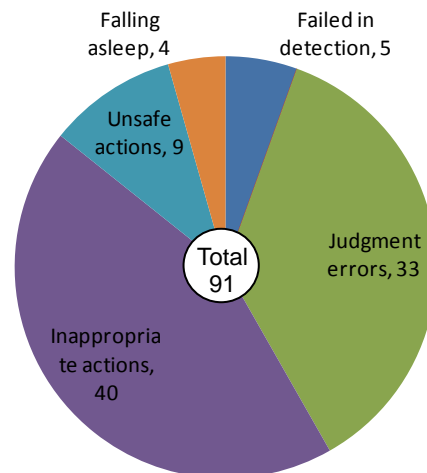


Figure 17: Number of vessels by human factor error types

“Judgment errors”, the most frequent cause following “Inappropriate actions”, are characterized by a fact that 32 of the 33 vessels made “wrong assumptions.” When these cases are categorized by the size of the vessels involved, i.e., vessels less than 20 tons and those 20 tons and larger, there were 7 vessels less than 20 tons where “after confirming the surroundings, we did not see any other vessels that would be obstacles to our passage, and therefore believed that there were no other vessels in the vicinity”; and 7 vessels 20 tons and larger where “after confirming the other vessel, we believed that we could pass-by safely.” The thought of “being able to pass-by safely” was only made by vessels 20 tons and larger (See Figure 18).

Examples of factors

Failed in detection

- Failed to notice the other vessel until collision occurred.

Judgment errors

- Assumed that the other vessel would take evasive actions, and continued to sail while maintaining course and speed.
- Assumed that there were no coastal vessels sailing amid a group of fishing vessels, and did not keep a proper lookout to starboard.

Inappropriate actions

- Turned to port under restricted-visibility conditions due to fog.
- Did not keep a lookout to compensate for blind spots caused by surfacing of the bow.

Unsafe action

- Did not confirm the proximity with the other vessel.

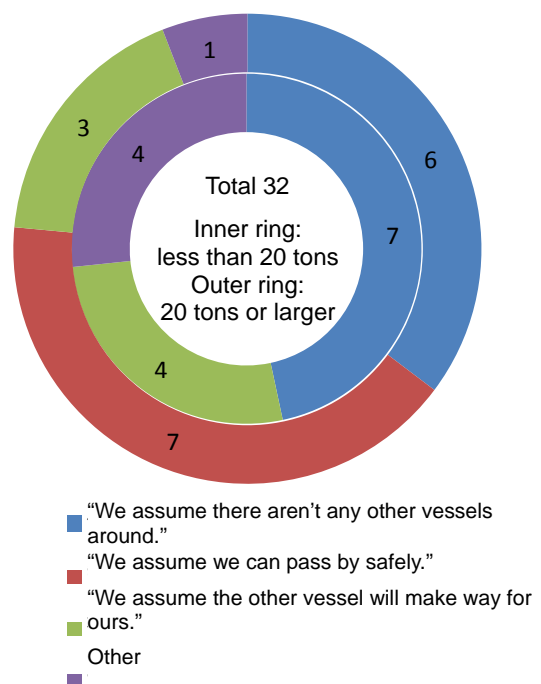


Figure 18: Content of “mistaken assumptions”

3. Case Studies of accidents

Case 1

Collision caused by an assumption, while only keeping a lookout visually under hazy conditions, that there were no other vessels in the vicinity

Summary: The Vessel A, manned with the Master A and 4 crew members, departed Keihin Port and was proceeding southwestward, and the Vessel B, manned with the Skipper B and 3 passengers on board, was engaged in fishing while in a drifting state. The two vessels collided with each other at around 11:00, June 12, 2011, off the northwestern coast of Oo Shima.

One of the passengers on the Vessel B was injured and her starboard was cracked. The Vessel A sustained scratches on the bow.

Events Leading to the Accident

Vessel A (Cargo ship)

Gross tonnage: 498 tons
L×B×D : 74.92m×12.50m×6.86m
Hull material : Steel
Engine : Diesel engine
Output : 1,471kW

Vessel B (Recreational fishing vessel)

Gross tonnage : 3.84 tons
Lr×B×D : 9.20m×2.45m×0.71m
Hull material : FRP (Fiber Reinforced Plastic)
Engine : Diesel engine
Output : 65 (Engine Performance Index by Fishing Vessel Act)

Around 07:00

Vessel A departed the Kawasaki Section of Keihin Port, heading toward Takuma Port, Mitoyo City, Kagawa Pref.

After proceeding south in Tokyo Bay and passing through Uruga Suido, Vessel A sailed on a southwest course.

Under hazy conditions, since there were many recreational fishing vessels and fishing vessels in the area from the south of Tsurugi Saki, Vessel A sailed at a speed of approximately 11.5 kn while confirming her position using two radars and a GPS plotter, and avoiding fishing and other vessels by manual steering.

Passing-by north of Oo Shima, the vessel switched to automatic steering, sailing toward the south of Mikomoto Shima.

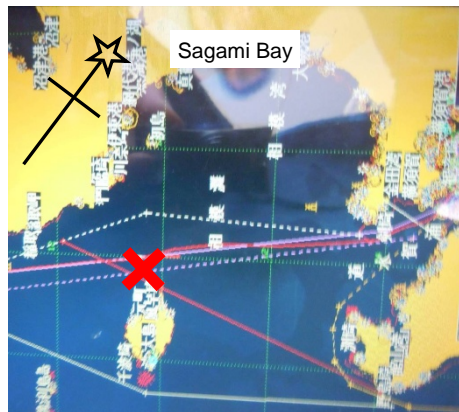
Master A did not use the radar, only keeping a lookout visually, and since no other vessels were visible ahead, he began to work organizing the vessel's charts.

Chief Engineer A saw the mast of a fishing vessel moving in the bow direction, and then turned toward Master A, who was on the bridge, calling to him in a loud voice and waving his hands.

Master A saw Chief Engineer A waving his hands and saw the mast of Vessel B in the bow direction, and immediately engaged the clutch to astern.

Around 11:00

The display of the GPS plotter (Vessel A)



Around 05:00

For purposes of recreational fishing, Vessel B departed Futo Fishing Port, Ito City, Shizuoka Pref. and arrived off the northwestern coast of Oo Shima.

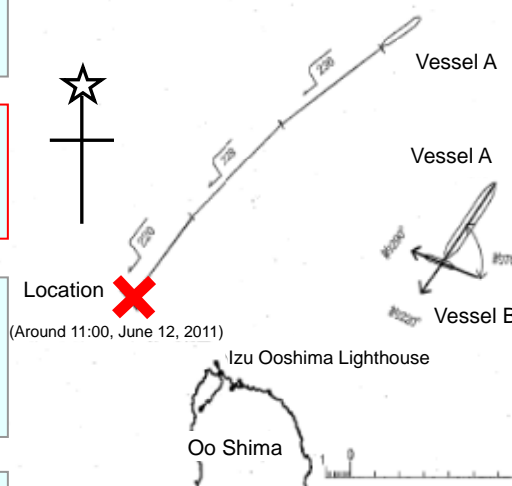
Although the conditions were hazy, Skipper B believed that it would be sufficient to only keep a lookout visually; therefore, he stopped the radar and kept a lookout in the control compartment while the vessel was drifting.

Passenger B₁ was seated at the starboard side of the mid-section, Passenger B₂ at the port side of the aft section, and Passenger B₃ at the starboard side of the aft section.

There was a request to Skipper B from Passenger B₁ for adjustment of his reel, and Skipper B began some work including adjustment of the connecting cord. Approximately 3 to 4 minutes after he started the work, he heard the voice of passenger B₂ saying "A vessel is coming straight for us".

Looking in the bow direction, Skipper B saw the bow of Vessel A approaching at approximately 45° ahead to port. When he immediately engaged the engine to full astern, the stern of Vessel B swayed to the starboard side as the vessel moved to astern.

Estimated Vessel Track



Weather and sea conditions

Weather: cloudy, **hazy** with light and dark areas (Visibility about 2 - 5M)
Ocean current and tide: northeastward to eastward current about 0.5 - 1.2kn

Collision

State of the damage (Vessel A and Vessel B)



Conditions of lookout kept on Vessel A and Vessel B

Vessel A

Master A was standing navigational watch alone. Although 2 radars were in operation, he **did not use the radars and only kept a lookout visually**. He did not see any other vessels ahead, and therefore mistakenly assumed that there were no other vessels in the area. He then began to work on organizing the charts on the chart table at the aft port side, and was not keeping a lookout.

Vessel B

When Skipper B was intending to return Vessel B to the original position she had before drifting, there was a request from passenger B₁ for adjustment of his electric reel. Skipper B **did not use the radar**, and did not see any other vessels aside from the consort vessel **by visual observation**; therefore, he mistakenly assumed that there were no other vessels in the area. He crouched and began adjustment work on the connection cord, etc. in the starboard side passageway, and was not keeping a lookout.

Probable Causes: It is probable that the accident occurred involving a collision of two vessels, Vessel A and vessel B, because both Master A and Skipper B were not keeping a lookout under hazy conditions off the northwestern coast of Oo Shima, with Vessel A proceeding southwestward and Vessel B drifting.

It is probable that the reason why both Master A and Skipper B were not keeping a lookout was that under hazy conditions, they both were looking out only visually without using the radar and did not see any other vessels, mistakenly assuming that there were no other vessels in the area.

In order to Prevent Recurrence

- Keep a proper lookout, effectively using radar and other available means and not relying solely on visual observation.
- When performing work other than maneuver of a vessel, only after accurately understand the situation of surrounding vessels and safety has been confirmed, complete that work quickly so that it does not interfere with a proper lookout.

The investigation report of this case is published on the Board's website (issued on May 25, 2012).

http://www.mlit.go.jp/jtsb/ship/rep-acci/2012/MA2012-5-2_2012tk0009.pdf

(This report is a translation of the Japanese original investigation report. The text in Japanese shall prevail in the interpretation of the report.)

Case 2

Collision caused by an assumption, without keeping a proper lookout while sailing, that it would be possible to cross ahead of the other vessel

Summary: The Vessel A, manned with the Master A and 24 crew members, and with 296 passengers and 89 vehicles on board, was proceeding eastward in waters southeast of Jizo Saki, Shoudo Shima, Kagawa Pref. The Vessel B was manned with 1 person, Skipper B, who, after completing fishing operation, was proceeding southwestward toward Tomari Fishing Port, Sanuki City, Kagawa Pref. The two vessels collided with each other at around 02:37, June 7, 2010.

On the Vessel B, Skipper B sustained slight injury, and a portion of the vessel's bow was crushed. On the Vessel A, the collision caused some scratches at the portside mid-section. However, there were no fatalities or injuries.

Events Leading to the Accident

Vessel A (Passenger ferry)

Gross tonnage : 9,975tons
 L×B×D : 163.57m×25.60m×13.21m
 Hull material : Steel
 Engine : Diesel engine ×2
 Output : 19,858kW

Vessel B (Fishing vessel)

Gross tonnage : 4.95tons
 Lr×B×D : 10.37m×2.76m×0.79m
 Hull material : FRP (Fiber Reinforced Plastic)
 Engine : Diesel engine
 Output : 48kW

Officer A was sailing on the Bisan Seto East Traffic Route on a course of approximately 110°.

Around 02:15

Vessel B began net hauling near 145° true, 2,200m from the Jizo Saki Lighthouse.

Around 02:33

In the vicinity of the area 0.4M west of the Bisan Seto East Traffic Route center No.7 light buoy, Officer A saw the lights of Vessel B sailing at a low speed, near 5° 1.3M on the port bow, and believed that she was in the process of towing nets.

Around 02:21

After the net hauling was completed, Skipper B navigated Vessel B southwestward at a speed of approximately 1.7 kn while performing net washing work.

About 10 minutes before a collision

Although Skipper B saw the lights of Vessel A while sailing near the Bisan Seto East Traffic Route center No.6 light buoy, he assumed that the net washing work would be completed before Vessel A approached.

When the distance to Vessel B became about 1M, Officer A confirmed the state of Vessel B's movement using a radar set to a 3M range scale. He assumed that Vessel A could pass ahead of her leaving a gap of approximately 0.2M, and then kept a lookout visually.

After that, Skipper B left the control room and continued sailing while staying on the aft deck, checking the condition of the removal of mud from a cod end released from the stern.

About 30 seconds before a collision

Officer A felt that the speed of Vessel B had increased, and therefore steered 15° to starboard. However, he returned the helm to midships again, because he believed that the stern of Vessel A would collide with Vessel B.

Since there was more mud than usual adhering to the cod end, Skipper B increased speed to approximately 3.0 kn to remove the mud more quickly.

About 20 seconds before a collision

Officer A turned on the searchlights and displayed an attention signal to Vessel B.

Since Skipper B's attention was focused on checking the condition of mud removal from the cod end, he did not notice the illumination of the searchlights of Vessel A.

Around 02:37

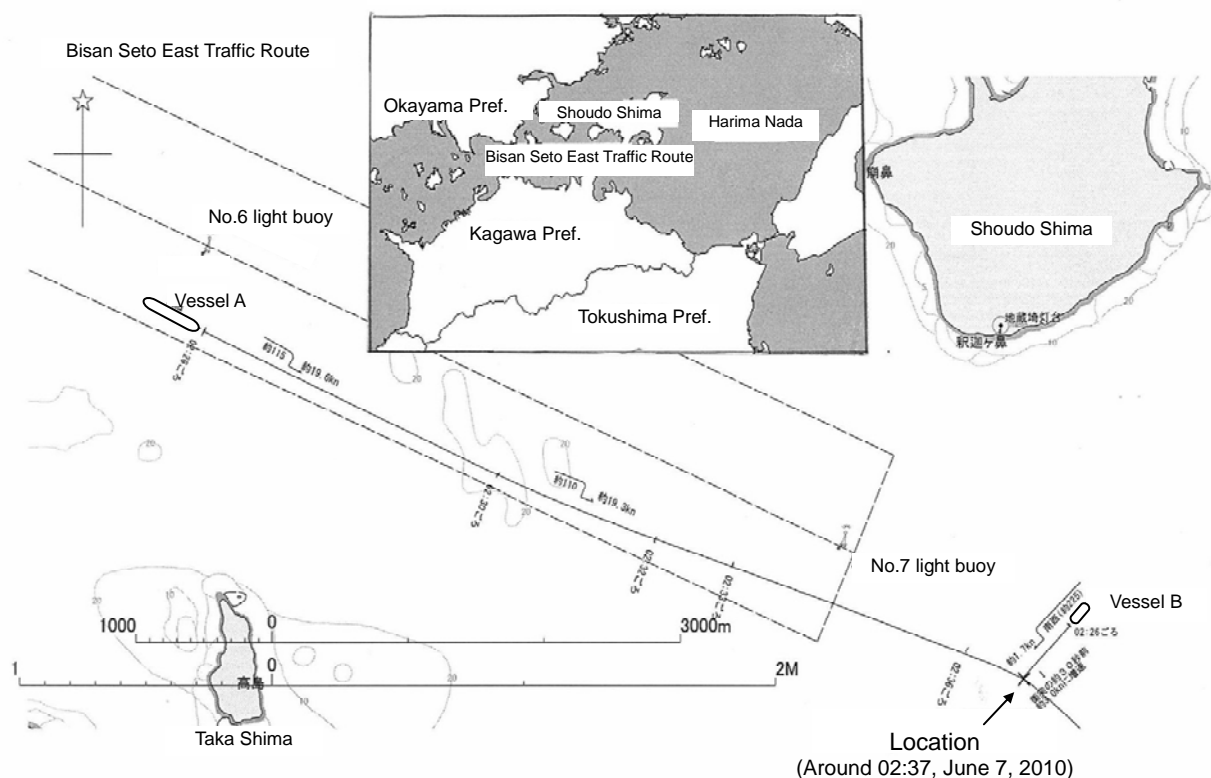
Skipper B noticed the approach of Vessel A by hearing the sound of waves created by a vessel and then engaged the engine to astern.

Collision

Weather and sea conditions

Weather: Cloudy Winds direction: NE Wind: about 5m/sec
 Visibility: Fair Tide: Middle stage of rising
 Current: Weak westward current

Estimated Vessel Track



Conditions of lookout kept on Vessel A and Vessel B

Vessel A

It is probable that when Officer A saw the lights of Vessel B, Officer A assumed that she was a fishing vessel engaged in net towing, judging from the condition of the lights and the low speed she was sailing at, and he mistakenly presumed that Vessel A would be able to cross ahead of Vessel B. It is also probable that after this, Officer A was not keeping a proper lookout for Vessel B's movement.

Vessel B

It is probable that Skipper B assumed that the net washing work would be completed before Vessel A approached. And, it is also probable that he was not keeping a lookout for Vessel A, concentrating on the net washing work and focusing his attention on checking the condition of mud removal from the cod end.

Probable Causes: It is probable that the accident occurred involving a collision of two vessels, Vessel A and vessel B, because Officer A was sailing without keeping a proper lookout and Skipper B was also not keeping a lookout while Vessel A was proceeding eastward and Vessel B was proceeding southwestward at night in waters south of Jizo Saki, Shoudo Shima, Kagawa Pref.

It is probable that the reason Officer A was not keeping a proper lookout was that due to the condition of the lights on Vessel B and the low speed she was sailing at, he assumed that Vessel B was a fishing vessel engaged in net towing, and that Vessel A would be able to pass ahead of her leaving a gap of approximately 0.2M.

It is probable that the reason Skipper B was not keeping a lookout was that he assumed that the net washing work would be completed before Vessel A approached, and that he was concentrating on that work on the aft deck.

In order to Prevent Recurrence

- When crossing paths with other vessels, continue to keep a proper lookout in order to judge the risk of collision properly.
- If the other vessel does not take action to avoid a collision, immediately give a warning signal.
- If one's own vessel shall become the stand-on vessel, take such action as will best aid to avoid collision.
- If one's own vessel shall become the give-way vessel, take early and substantial action in order to keep sufficient distance from the other vessel.

The investigation report of this case is published on the Board's website (issued on January 28, 2011).

http://www.mlit.go.jp/itsb/ship/rep-acci/2011/MA2011-1-1_2010tk0024.pdf

(This report is a translation of the Japanese original investigation report. The text in Japanese shall prevail in the interpretation of the report.)

Case 3

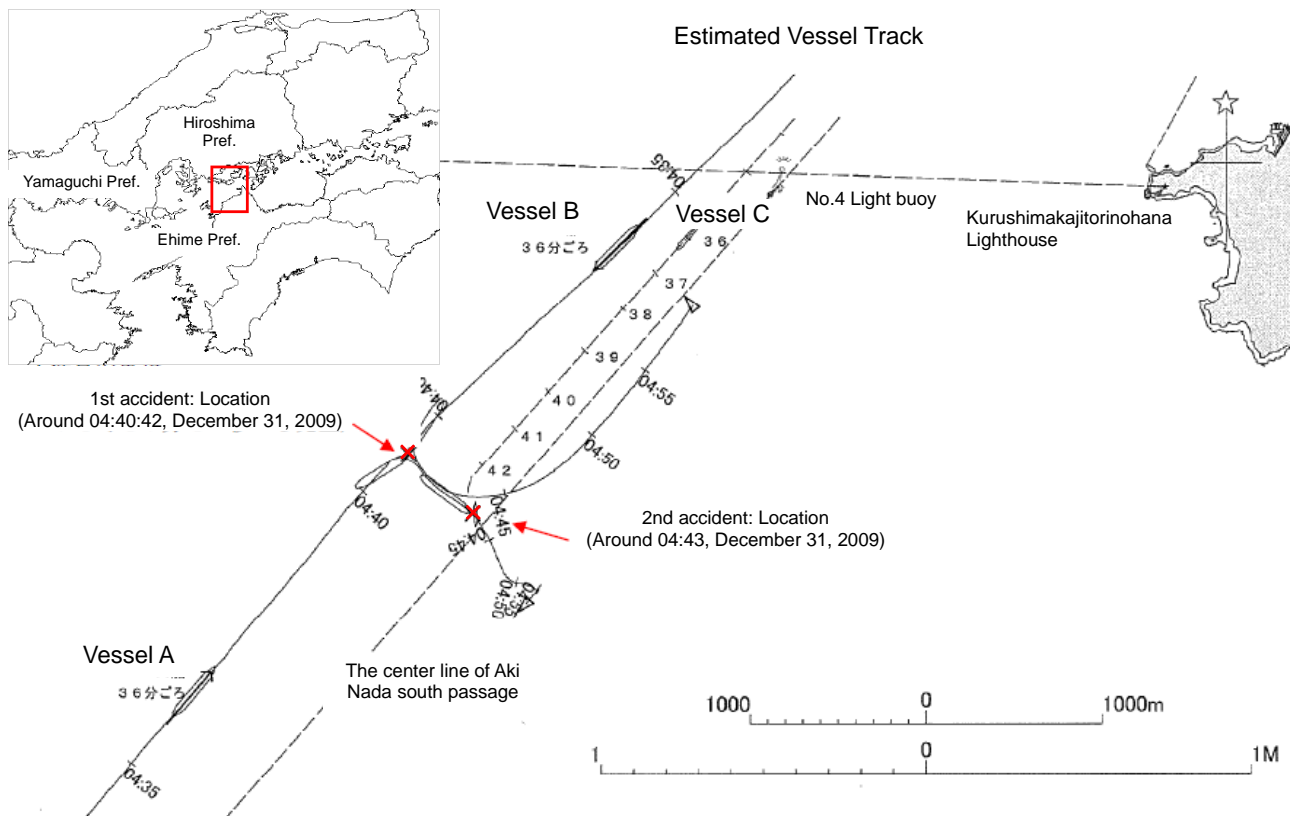
After a collision between Vessel A and Vessel B caused by a failure to keep a lookout, Vessel A collided again with Vessel C while Vessel A was turning to starboard due to her residual momentum

Summary (1st accident): The Vessel A, manned with the Master A and 19 crew members, was proceeding northeastward off the southwest of Kajitorino Hana and the Vessel B, manned with the Master B and 18 crew members, was proceeding southeastward in the same area. The two vessels collided with each other at around 04:40:42, December 31, 2009.

The port bow of the Vessel A was breached and port stern was dented. The bow of the Vessel B was cracked and dented and the starboard stern was dented. But no fatality or injury was caused on both vessels.

Summary (2nd accident): The Vessel A was proceeding southeastward after colliding with the Vessel B around the location of the 1st accident and the Vessel C, manned with the Master C and 3 crew members, was proceeding southwestward behind the port side of the Vessel B. The two vessels collided with each other at around 04:43.

The Vessel A sustained damage in the bow, and the Vessel C sustained the dent damage in her starboard mid-section. But no fatality or injury was caused on both vessels.



Events Leading to the Accident

Vessel A (chemical tanker)	Vessel B (cargo ship)	Vessel C (cargo ship)
Gross tonnage: 9,149tons L×B×D:133.00m×22.72m×12.10m Flag state: Republic of Malta Engine: Diesel engine Output: 4,891kW	Gross tonnage: 8,651tons L×B×D: 137.30m×21.00m×10.70m Flag state: Republic of Korea Engine: Diesel engine Output: 5,148kW	Gross tonnage: 499tons L×B×D: 75.50m×12.30m×6.87m Flag state: Japan Engine: Diesel engine Output: 735kW
Around 10:00, December 30	Around 17:30, December 30	Around 23:35, December 30
Vessel A departed the Ulsan Port, Republic of Korea, heading for the Kobe Section of Hanshin Port.	Vessel B departed the Kobe Section of Hanshin Port, heading for Gwangyang Port, Republic of Korea.	Vessel C departed Sakaide Port, Sakaide City, Kagawa Pref., heading for Kanmon Port.
December 31	December 31	
Vessel A sailed on a course of approximately 030° under automatic steering, on the right side of the line (center line) connecting the lighted buoys set up on the recommended route in the southern part of Aki Nada.	After setting out from the western entrance to the Kurushima Kaikyo Traffic Route, Vessel B sailed on a course of approximately 225° on the right side of the center line.	

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Around 04:03, December 31

Officer A passed to the southeast of the Aki Nada south passage No.2 light buoy and reached the waypoint to change course (*7), but he did not do so and remained on the same course.

After passing the No.2 light buoy, Officer A began to turn to starboard.

Around 04:11

Deck Officer A crossed the center line and sailed on the left side of the center line on a course of approximately 034°.

Around 04:25

When Officer A checked the radar, he mistakenly assumed that Vessel B was located on the port bow and proceeding southwestward along the center line, and that Vessel A could pass Vessel B on her port side. After this, Officer A did not keep a lookout for Vessel B, and sailed while maintaining the same course and speed.

Vessel B was actually located on the starboard bow of Vessel A.

Around 04:32

Officer A turned to starboard to a course of approximately 041°, and then sailed on a course of 038 - 042°.

Due to the course change, Vessel B was approaching Vessel A crossing ahead of Vessel A to her port side so as to involve the risk of collision with Vessel A. However, Officer A did not notice this situation.

About 30 seconds before a collision

Officer A saw the mast lights and both sidelights of Vessel B, which was at approximately 400m on the bow, and then steered to hard starboard.

Around 04:40:42

Vessel A and Vessel B collide

After the collision, Vessel A stopped her engine but continued to turn to starboard due to her forward residual momentum.

Around 04:31, December 31

Officer B detected Vessel A on the starboard bow using the radar and saw her port sidelight. He believed that Vessel B was in a crossing situation with Vessel A and changed her course approximately 2° to starboard.

At this time, it is probable that Vessel A was actually located on the port bow of Vessel B and was displaying her starboard sidelight to Vessel B. However, Officer B did not make a full appraisal of the situation between Vessel B and Vessel A, mistakenly assuming that Vessel B was the give-way vessel in a crossing situation, and then turned to starboard.

Since Officer B turned Vessel B to starboard, he assumed that Vessel A would be sailing to cross ahead of Vessel B to her port side. Then, Officer B sailed maintaining the same course and speed without keeping a lookout for Vessel A.

Since Vessel B was going to overtake Vessel C, which was sailing ahead of Vessel B's port side, on her starboard side, after this, Officer B was only paying attention to Vessel C's movement.

Around 04:36

Officer B overtook Vessel C. However, he did not notice that Vessel A was crossing ahead of Vessel B to her starboard side, and that she was approaching so as to involve a risk of collision.

About 30 seconds before a collision

Officer B steered to port, and engaged the engine to full astern.

Weather and sea conditions

Weather: Fair Wind direction: WNW
Wind force: 4 Visibility: Fair
Tide: Nearly low tide
Current of the Kurushima Kaikyo: during turning of tide from northward to southward

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December 31

*7 The direction of the standard course from the Aki Nada south passage No.1 light buoy to the No.2 light buoy is 029°, and the direction from the No.2 light buoy to the No.4 light buoy is 041°.

Officer C sailed along the right side of the center line, on a course of approximately 221°, under automatic steering.

Around 04:34

Officer C passed the Aki Nada south passage No.4 light buoy leaving a gap of approximately 0.1m to her port side.

Vessel C was about to pass Vessel A, which was on the starboard bow, on her starboard side.

Around 04:35

Although Officer C saw Vessel B overtaking Vessel C on her starboard side, he did not predict that there would be any risk of her approaching Vessel A.

Around 04:42

Officer C saw the 2 port sidelights and multiple white lights of Vessel A and Vessel B ahead to starboard, and wondered that those lights were approaching Vessel C while moving to port side.

Officer C did not notice that Vessel A and Vessel B had collided.

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Vessel A proceeded southeastward parallel to Vessel B, which was turning to port, and sailed toward the path ahead of Vessel C, which was sailing to the port aft of Vessel B.

Since the 2 port sidelights and multiple white lights were drawing near ahead to starboard, officer C steered to port approximately 20° in order to widen the distance to them, and then steered further to hard port. At this moment, officer C noticed that Vessel A and Vessel B had collided.

Although he was able to avoid a collision with Vessel B, he finally turned approximately 70° to port from his original course.

Around 04:43

Vessel A and Vessel C collide

Condition of lookout and vessel operation

1st accident

Vessel A > Due to a lack of sleep and accumulation of fatigue, Officer A's concentration was diminished and he was not paying attention to keeping a lookout ahead.

> When Officer A checked the radar, Vessel B was actually on the starboard bow of Vessel A, but Officer A mistakenly assumed that Vessel B was on the port bow proceeding southwestward, and that Vessel A could pass Vessel B on her port side. After this, Officer A was not keeping a lookout for Vessel B.

Vessel B > It is probable that Officer B detected Vessel A on the starboard bow by using radar, and turned to starboard believing that Vessel B was in a crossing situation with Vessel A, but in fact, Vessel A was located on the port bow of Vessel B at that time.

> Since Officer B turned Vessel B to starboard, he assumed that Vessel A would be sailing to cross ahead of Vessel B to her port side. Then, he was not keeping a lookout for Vessel A.

> Since Officer B was going to overtake Vessel C, which was sailing ahead of Vessel B's port side, on Vessel C's starboard side, Officer B was only paying attention to Vessel C's movement.

2nd accident

Vessel A > After colliding with Vessel B, Vessel A stopped her engine but continued to turn to starboard due to her residual momentum.

Vessel C > Officer C saw the 2 port sidelights and multiple white lights of both Vessel A and Vessel B and assumed that Vessel A and Vessel B had sailed in Vessel C's starboard bow direction; therefore, he wondered that those lights were approaching Vessel C while moving to port direction. Officer C did not notice Vessel A and Vessel B had collided with each other. Then, since those lights were drawing near ahead to starboard, he steered to port approximately 20° to widen the distance to them, and then steered further to hard port.

Probable Causes (1st): It is probable that the 1st accident occurred involving a collision of two vessels, Vessel A and vessel B, because both Vessel A and Vessel B were not keeping a lookout while Vessel A was proceeding northeastward on the left side of the center line of the Aki Nada south passage and Vessel B was proceeding southwestward on the right side of the center line of the Aki Nada south passage at night-time off the southwestern coast of Kajitorinohana.

It is somewhat likely that the reason why Vessel A was not keeping a lookout was that Officer A had mistakenly assumed that Vessel A could pass by Vessel B on her port side.

It is somewhat likely that the diminished concentration of Officer A and his lack of attention paid to keeping a lookout ahead, caused by a lack of sleep and accumulation of fatigue, may have contributed to the occurrence of this accident.

It is probable that the reason why Vessel B was not keeping a lookout was that when Officer B first saw Vessel A, he did not make a full appraisal of the situation of Vessel B with Vessel A and changed Vessel B's course 2° to starboard, assuming that Vessel A would be sailing to cross ahead of Vessel B to her port side.

Probable Causes (2nd): It is probable that the 2nd accident occurred involving collision of Vessel A and vessel C, because Vessel A sailed toward the path ahead of Vessel C while Vessel A was proceeding southeastward turning to starboard due to her residual momentum after the collision with Vessel B and Vessel C was proceeding southwestward,.

In order to Prevent Recurrence

- > Vessels sailing along the recommended route should sail on the right side of the center line of the route.
- > Keep a proper lookout by sight and using radar and other available means.

The investigation report of this case is published on the Board's website (issued on January 27, 2012).

http://www.mlit.go.jp/jtsb/ship/rep-acci/2012/MA2012-1-3_2011tk0019.pdf

(This report is a translation of the Japanese original investigation report. The text in Japanese shall prevail in the interpretation of the report.)

Case 4

Collision between an inbound vessel and an outbound vessel whose courses intersected at Kurushima Kaikyo Traffic Route west entrance during southward current

Summary: Vessel A, manned with the Master A and 5 crew members, was proceeding northeastward off the northern coast of Kajitorino Hana at Kurushima Kaikyo Traffic Route west entrance, and Vessel B, manned with the Master B and 3 crew members, was proceeding southwestward in the same area. The two vessels collided with each other at around 00:10:30, June 16, 2010.

Vessel A sustained dents and other damage to her starboard bow, and the bow of the Vessel B was cracked and breached, but no fatalities or injuries were caused on both vessels.

Events Leading to the Accident

Vessel A (container ship)

Gross tonnage : 748tons
L×B×D : 91.35m×14.00m×4.50m
Hull material : Steel
Engine : Diesel engine
Output : 1,838kW

In order to navigate the Kurushima Kaikyo Traffic Route Naka Suido, Vessel A sailed toward the north side of the Kurushima Kaikyo Traffic Route west entrance, to the southwest of the Aki Nada south passage No.4 light buoy, with a heading of approximately 040° and at a speed of approximately 13.0 kn.

Around 00:00

Vessel A sailed with a heading of approximately 036° and at a speed of approximately 13.0 kn, and then continued sailing while repeatedly making turns to starboard.

Officer A first saw the radar images of Vessel C proceeding westward near the Kurushima Kaikyo Traffic Route west entrance, and Vessel B on the same course near her.

Since Vessel B had turned to port after setting out from the Kurushima Kaikyo Traffic Route west entrance, Deck Officer A believed that Vessel B was proceeding southwestward, and that Vessel A could pass by Vessel B on her starboard side.

Since Vessel C had turned to starboard after setting out from the Kurushima Kaikyo Traffic Route west entrance, Officer A focused his attention on the passage of Vessel C on the bow of Vessel A, and sailed while maintaining speed, not keeping a lookout for Vessel B using the radar.

No fog signals were sounded and communications with Vessel B by VHF radio were not being performed.

Officer A saw the mast lights of Vessel B on the starboard bow and immediately stopped the main engine.

Around 00:10:30

Collision

Vessel B (chemical tanker)

Gross tonnage : 198tonnage
L×B×D : 44.01m×8.00m×3.45m
Hull material : Steel
Engine : Diesel engine
Output : 625kW

Vessel B navigated the Kurushima Kaikyo Traffic Route Nishi Suido, and proceeded westward with the main engine at full ahead, toward the Kurushima Kaikyo Traffic Route west entrance.

When setting out from the Kurushima Kaikyo Traffic Route, Vessel B proceeded southwestward toward the area off the southern coast of Itsuki Shima.

Officer B saw the radar image of Vessel A near 2M on the port bow and identified that Vessel A was proceeding northeastward.

Officer B started to see the radar image of Vessel A at the starboard side of the heading marker on the radar display.

Officer B steered to starboard, intending to pass by Vessel A on Vessel B's port side while Vessel A was sailing in the opposite direction.

Officer B recognized that Vessel A had approached on the port bow, and after that even though Vessel A continued to approach from the port bow direction, Officer B continued to turn to starboard while maintaining speed.

No fog signals were sounded and communications with Vessel A by VHF radio were not being performed.

Officer B saw the mast lights of Vessel A on the port bow, and immediately engaged the main engine to full astern.



Damage to Vessel A

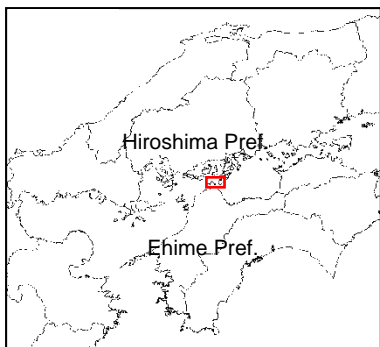
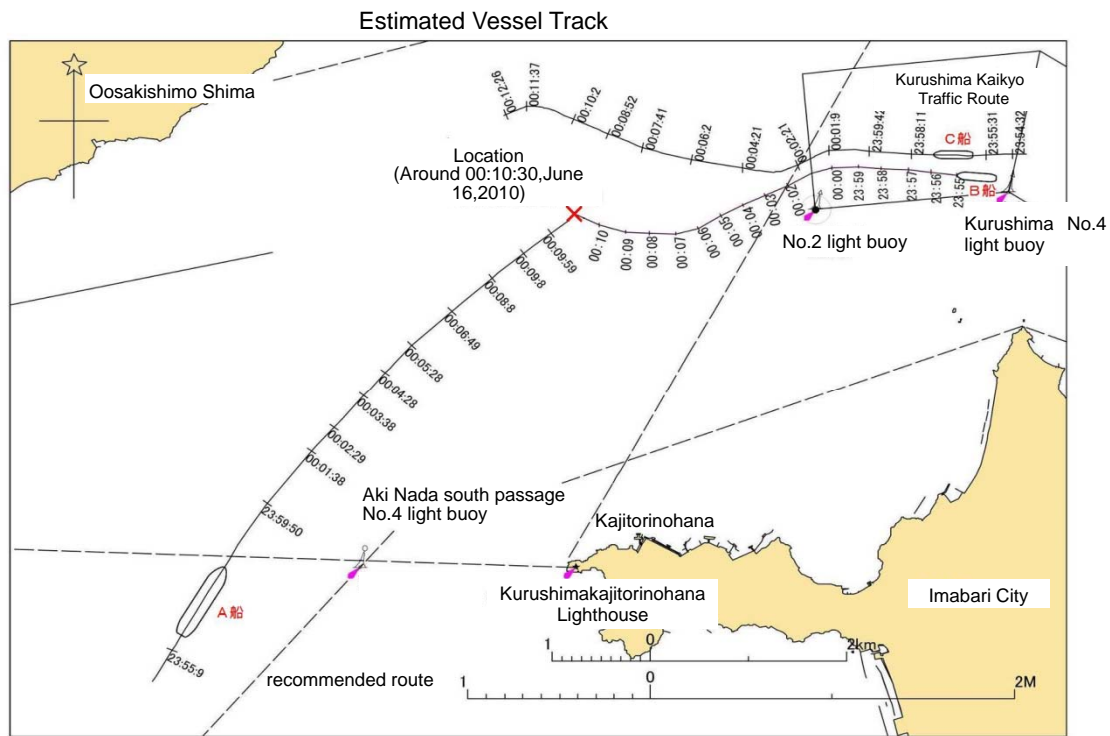
Weather and sea conditions

Weather: Dense fog Winds direction: WSW
Wind force: 1
Visibility: about 0.2 - 0.5M Tide: the time of high tide
Current near the accident location: northeastward current about 2.2kn

Kurushima Kaikyo Traffic Route: southward current



Damage to Vessel B



Reports to the master and VHF communications between both vessels under restricted-visibility conditions

- The Safety Management Manual of Company A specifies that the Master should take appropriate measures such as reducing speed if visibility was restricted during underway.

Moreover, Master A had instructed the bridge crew on watch to provide him with a report when the visibility worsened to 1M and to operate the engine or whistle without hesitation.

Since Officer A had heard from Master A that the fog had begun to lift, he believed that it would clear in a short time. Then, he sailed maintaining the speed without reporting to Master A.

It is somewhat likely that if Master A had received a report, he would have been able to take measures such as reducing to a safe speed.

- In the Special Operation Procedures of the Safety Management Manual for Company B, procedures were specified for cases of encountering restricted-visibility conditions.

When visibility was restricted, Officer B did not take any measures such as reporting to Master B, sounding fog signals, standing by the engine, or reducing speed.

It is somewhat likely that if Officer B had followed the procedures under restricted-visibility conditions, instructions from Master B could have been received and measures such as reducing speed could have been taken.

- Vessel A and Vessel B did not confirm each other's intention, etc. using VHF radio.

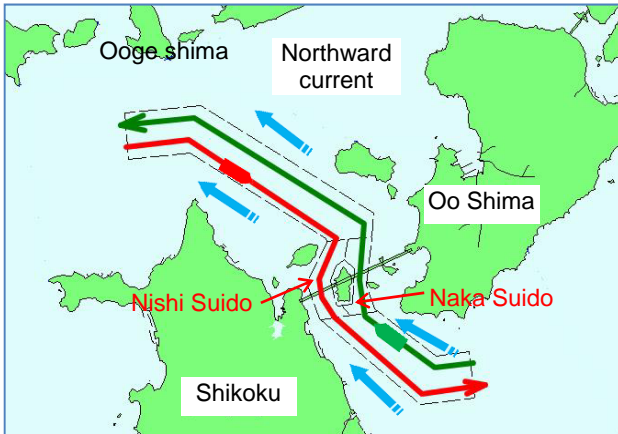
It is somewhat likely that with confirmation, the vessels could have known the other's course, etc. and ensured safe navigation.

Navigation rules for the Kurushima Kaikyo Traffic Route

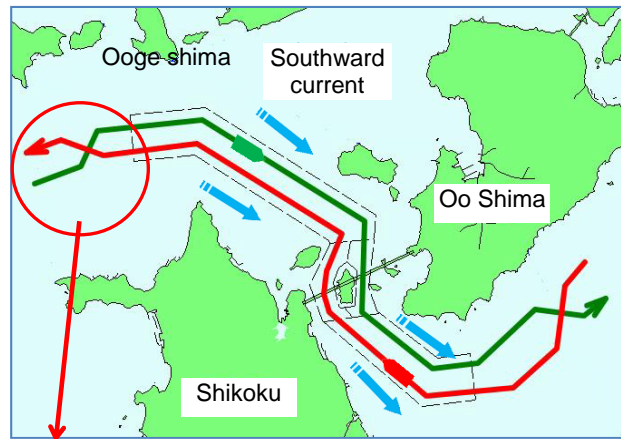
“Sail Naka Suido along with the tidal current, sail Nishi Suido against the tidal current” rule

In the case of following current (when the tidal current is the same as a vessel's direction of navigation), a vessel should sail the Naka Suido; on the other hand, in the case of reverse current (when the tidal current is reverse to a vessel's direction of navigation), a vessel should sail the Nishi Suido (Article 20 of the Maritime Traffic Safety Act).

Keep-to-the-right rule



Keep-to-the-left rule



Tidal current and navigation at the accident location

When the tidal current of the Kurushima Kaikyo Traffic Route is **flowing southward**, vessels navigating that route must follow a **“Keep-to-the-left rule”**, which differs from the “Keep-to-the-right rule”, the general rule for marine traffic. In that case, vessels should pay more attention because they need to change to the “Keep-to-the-left rule” and the **courses of vessels sailing in opposite directions intersect each other near the west entrance of the route**.

Vessel A and Vessel B were sailing in areas with conditions of restricted visibility. In such areas there is a need to keep a proper lookout by radar, using radar plotting and other systematic observation methods for other vessels detected on radar sailing in the opposite direction, while also making careful judgments on their approach, following the navigation rules for vessels in restricted-visibility conditions provided in Article 19 of the Act on Preventing Collision at Sea, and taking action to avoid situations such as those with the risk of collision during periods when there is ample time to do so. It is also desired to consider confirming the intention of other vessels by VHF radio as valuable for making judgments on the approach of those vessels.

Probable Causes : It is probable that in visibility restricted by fog at night, when the tidal stream was flowing southward through the Kurushima Kaikyo Traffic Route, Vessel A was sailing northeastward in waters off to the north of Kajitorinohana on the north side of the center line of Aki Nada(*8) toward the north side of the western entrance to the Kurushima Kaikyo Traffic Route and Vessel B was sailing southwestward toward waters located to the south of Itsuki Shima; when they detected each other ahead by radar, Officer A of Vessel A, who assumed that he would pass Vessel B on his starboard side, maintained his speed, without monitoring her movement by radar thereafter; on the other hand, Officer B of Vessel B came to observe Vessel A which had been initially detected on his port bow on the starboard side of the heading marker on the radar scope; considering it necessary to pass Vessel A on his portside, he turned his vessel to starboard; although the distance to Vessel A continuously closed on his port bow, he continued turning to starboard while maintaining his speed; as a result, the two vessels collided with each other.

(*8 The line connecting the all light buoys set up on the recommended route in the southern part of Aki Nada. In general, vessels sailing along the recommended route sail on the right side.)

In order to Prevent Recurrence

Both Company A and Company B should take following measures:

- Instruct their crewmen more specifically on the points that should be followed when visibility is restricted (reporting to the master, etc.).
- Instruct their crewmen to confirm the intention, etc. of the other vessel using VHF radio when they find a vessel sailing in the opposite direction under restricted-visibility conditions because when the tidal current of the Kurushima Kaikyo Traffic Route is flowing southward, there may be conditions where the courses of vessels entering the Kurushima Kaikyo Traffic Route and vessels leaving it intersect northeastward in waters off to the north of Kajitorinohana.

The investigation report of this case is published on the Board's website (issued on March 29, 2013).

http://www.mlit.go.jp/jtsb/ship/rep-acci/2013/MA2013-3-52_2010hs0095.pdf

(This report is a translation of the Japanese original investigation report. The text in Japanese shall prevail in the interpretation of the report.)

4. Summary (Conclusion)

Based on our investigation reports on fatal and collision accidents the four serious accident investigation cases mentioned in this digest, we summarized as follows how these accidents occurred, and what the lessons which will help prevent recurrence are.

Status of collision accidents in the target areas

◆By the type of vessel

The accidents are classified by the type of vessel as follows: 39 cargo ships (36.4%), 28 fishing vessels (26.2%), and 12 tankers (11.2%). For cargo ships and tankers, comparing the number of vessels involved in collision accidents in the target areas with those occurring in general areas shows that the frequency of accidents occurring in the target areas is approximately 2 times higher.

◆Breakdown of the fatalities and injured

Out of the 50 cases, there were 18 fatalities and injuries occurring in 10 cases. All of them involved small vessels less than 5 tons: 4 fishing vessels, 3 recreational fishing vessels, and 3 pleasure boats, with 3 fatalities (1 fishing visitor, 2 fishing vessel skippers), 1 serious injury, and 14 light injuries.

◆Categories of Causes

When the causes are broken down by accidents, the number of accidents caused by human factors is 40 (80.0%), and the number of human/environmental factors is 8 (16.0%). All of them involve "human factors or a combination of multiple factors involving human factors". Moreover, when human factors are broken down by vessels, "judgment errors" are characterized by a fact that 32 out of the 33 vessels (36.3%) made "wrong assumptions".

Lessons from the accident investigation cases

- Keep a proper lookout, effectively using radar and other available means and not relying solely on visual observation.
- When performing work other than maneuver of a vessel, only after accurately understand the situation of surrounding vessels and safety has been confirmed, complete that work quickly so that it does not interfere with a proper lookout.
- In a crossing situation, continue to keep a proper lookout in order to judge the risk of collision properly.
- Vessels sailing along the recommended route should sail on the right side of the center line of the route.
- If the other vessel does not take action to avoid a collision, immediately give a warning signal.
- If one's own vessel shall become the stand-on vessel, take such action as will best aid to avoid collision.
- If one's own vessel shall become the give-way vessel, take early and substantial action in order to keep sufficient distance from the other vessel.

For sailing near the western entrance to the Kurushima Kaikyo Traffic Route

- management company should:
 - Instruct their crewmen more specifically on the points that should be followed when visibility is restricted (reporting to the master, etc.).
 - Instruct their crewmen to confirm the intention, etc. of the other vessel using VHF radio when they find a vessel sailing in the opposite direction under restricted-visibility conditions because when the tidal current of the Kurushima Kaikyo Traffic Route is flowing southward, there may be conditions where the courses of vessels entering the Kurushima Kaikyo Traffic Route and vessels leaving it intersect northeastward in waters off to the north of Kajitorinohana.

A word from Director for Analysis, Recommendation and Opinion

We believe that in the marine areas that are congested with many vessels using the same waters, the high traffic volume calls for a greater level of watchfulness than usual when maneuvering a vessel.

However, nearly 40% of target vessels ran into a risky condition as a result of operation based on optimistic assumption, with thoughts such as "I assume there aren't any other vessels around" or "I assume the other vessel will make way".

We hope that the content introduced in this document can be seen as lessons to learn from, leading to operation in preparation for all possibilities, with considerations such as "I think perhaps there might be other vessels around" or "I think perhaps the other vessel might not make way" shall be practiced.

We welcome your comments on "JTSB Digests" and inquiries for visiting lectures

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