For Prevention of Marine Accidents Causing Deaths or Injuries to Divers and Swimmers

(Yabiji, a well-know diving spot)

All ships must slow the speed when within 100 m of a diving boat!

Raise the A flag during diving!

A flag

March 2005

Naha Branch of Moji Regional Japan Marine Accident Inquiry Agency

CONTENTS

* The cover images of "Yabiji" offshore northerly from Miyako Island in Okinawa prefecture are used through the courtesy of Okinawa Marine Leisure Safety Bureau (OMSB) Foundation (Note).

(Note) Okinawa Marine Leisure Safety Bureau (OMSB) Foundation is, in order to prevent accidents associated with sports or recreations ("marine leisure") in sea areas and inland-water areas in Okinawa prefecture, development of the environment for marine leisure activities, providing guidance on safety measures for marine-leisure service providers and activities for raising awareness of safety first, etc. in the local people, a foundation for contributing to the safe and healthy promotion of marine leisure. The following website of the Foundation provides a list of good-practice service providers regarding safety measures.
Okinawa Marine Leisure Safety Bureau (OMSB) Foundation
Address: 1-2-2, Izumizaki, Naha City, Okinawa
Phone : 098-869-1173
URL: http://www32.ocn.ne.jp/-omsb/

Part 1: Introduction

Okinawa prefecture is surrounded by one of the world's most beautiful oceans and coral reefs, and according to Okinawa Marine Leisure Safety Bureau Foundation, as of December 2004, there are 518 scuba diving service providers, 265 pleasure-boats providing service providers, 59 swimming beaches and 5 marinas. Many tourists from inside and outside the prefecture are attracted to marine leisure such as diving and swimming throughout a year.

On the other hand, Regional Tribunals of Japan Marine Accident Inquiry Agency located all over Japan rendered 8,769 decisions in a period between 1994 and 2014, and 390 (4.4%) of these decisions are of marine accidents caused casualties ("marine casualties").
Among the marine casualties, the number of decisions on marine accidents in which a diver or swimmer was struck by a vessel is 45 in the whole country, i.e., about 10% of the marine casualties). The number may not be large, but many of these accidents are tragic accidents because people are struck by a vessel body or a propeller, resulting in deaths or severe injuries.

Among these 45 accidents in Japan, 8 cases of marine accidents in which a diver or swimmer was dead or injured occurred in the jurisdiction of Naha Branch of Moji Regional Japan Marine Accident Inquiry Agency, and 6 of which involved divers, and 2 of which involved swimmers, causing 3 deaths and 6 injured.
Considering that similar marine accidents are still occurring to this day, in order to prevent them from occurring again, we have analyzed 45 marine accidents in which a diver or swimmer was killed or injured, and formulated this leaflet entitled, "For Prevention of Marine Accidents Causing Death or Injuries to Divers and Swimmers".
We hope that this analysis contributes to the prevention of similar marine accidents from occurring again.

Enjoy safe marine leisure activities!

Part 2: Marine accidents causing casualties in divers or swimmers
1. Situations at the time of the accident

The number of accidents in which a person is struck by a vessel is about 5 per year.

In the 45 marine accidents in which a diver or swimmer was struck by a vessel, the casualties were divers in 22 cases, and were swimmers in 23 cases. In the former, 8 cases were during scuba diving, 6 cases were during diving for leisure and catching marine products such as abalones and turbos, 7 cases were during fishing by diving, and 1 case was during a work of removing a foreign object caught around a propeller (Figure 1).
Among these accidents, the number of marine accidents during marine leisure excluding during the fishing by diving and during the work removing a foreign object as 37, which accounted for 80%.
In addition, there were 48 casualties, including 11 deaths and 24 severe injuries such as fractured bones, and 13 minor injuries such as blows (Figure 2)

Figure 1 Conditions at the time of accident

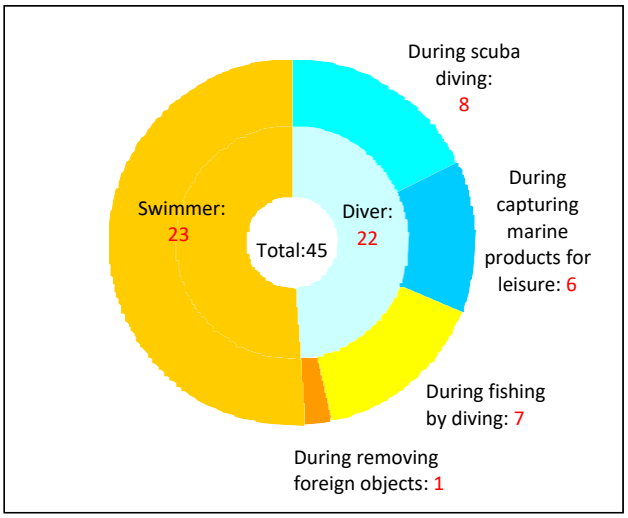
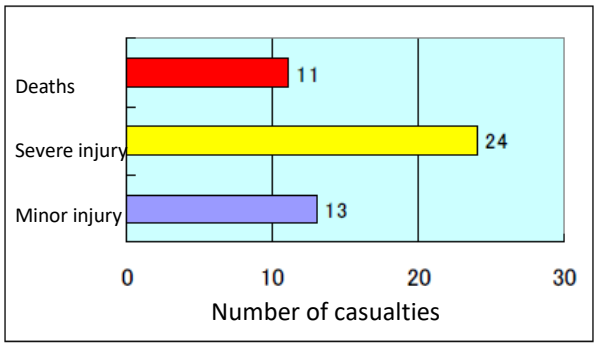


Figure 2 Number of casualties



When a person is struck by a vessel, it causes serous accident resulting in injury or death.

Use extra care!!

2. Number of accidents by vessel types and by casualties

(1) A diver struck by a vessel

According to the distribution of 22 accidents by vessel types, 6 cases were by fishing boats or leisure fishing boats, followed by 4 cases by passenger boats, and 2 cases each by coastal boats, transportation ships and motorboats (Figure 3).

There were 23 casualties, including 10 deaths, 11 severe injuries, 2 minor injuries. The deaths and severe injuries accounted for 90% (Figure 4).

Figure 3 Number of accidents by vessel types

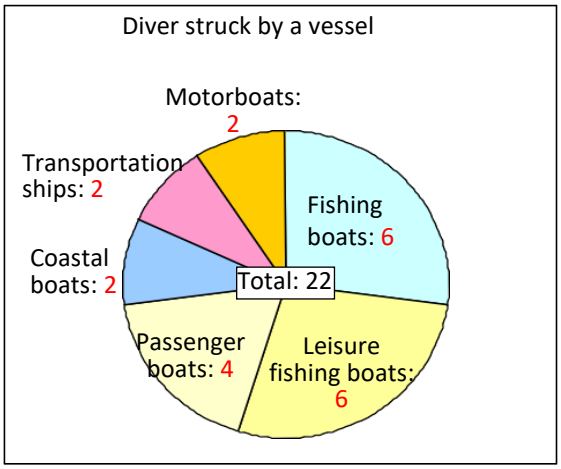
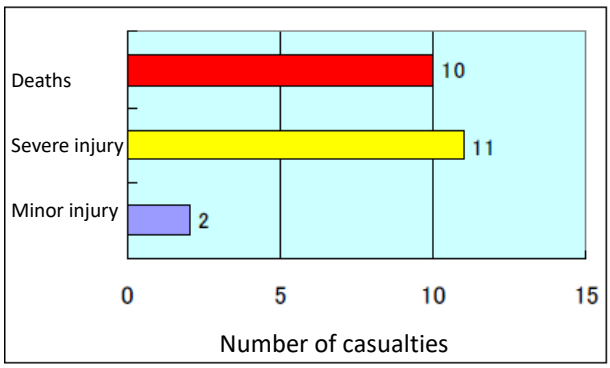


Figure 4 Number of casualties of divers



(2) A swimmer struck by a vessel

According to the distribution of 23 accidents by vessel types, 13 cases were by personal watercrafts, 7 cases were motorboats, 2 cases were leisure fishing boats, and 1 fishing boat (Figure 5).

Among 8 accidents occurred in this jurisdiction, 3 cases were by leisure fishing boats, 2 cases were by passenger boats, and 1 case each by a fishing boat, a personal watercraft and a transportation ship.

There were 25 casualties, 1 death, 13 severe injuries, and 11 minor injuries. The deaths and severe injuries accounted for 60% (Figure 6).

Figure 5 Number of accidents by vessel types

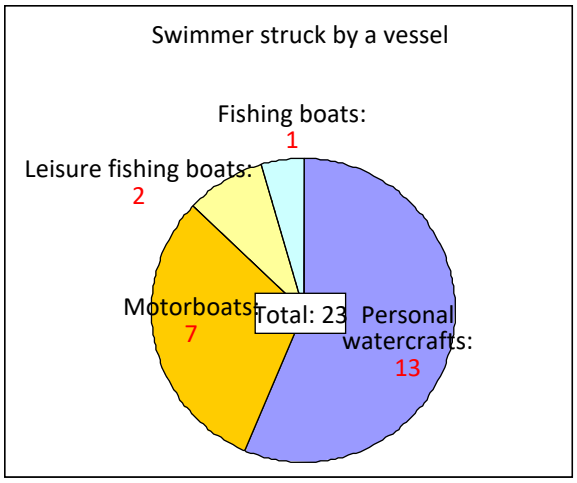
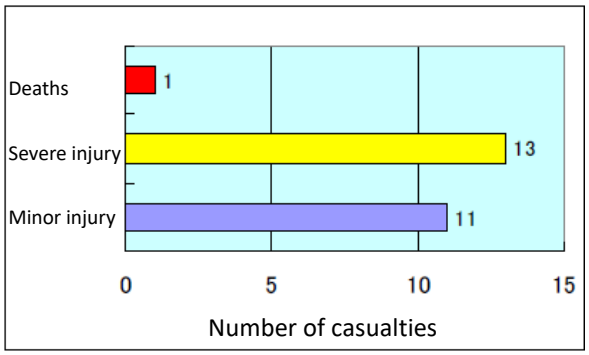


Figure 6 Number of casualties of swimmers



Part 3: Analysis on the marine accidents of a diver or swimmer struck by a vessel

In this jurisdiction, scuba diving is popular, and thus there are many service providers related to this activity. In addition, there are many swimming beaches, with mild weather enabling swimming for a longer period of time than other locations. The results of the analysis on marine accidents between a diver during scuba diving or a swimmer struck by a vessel are as follows.

1. Marine accidents of a diver struck by a vessel during scuba diving

There are 8 cases of accidents in which a diver was struck by a vessel during scuba diving, all of which occurred at the diving site, resulted in 5 deaths, 3 severe injuries and 1 minor injury.

(1) Case examples and analysis

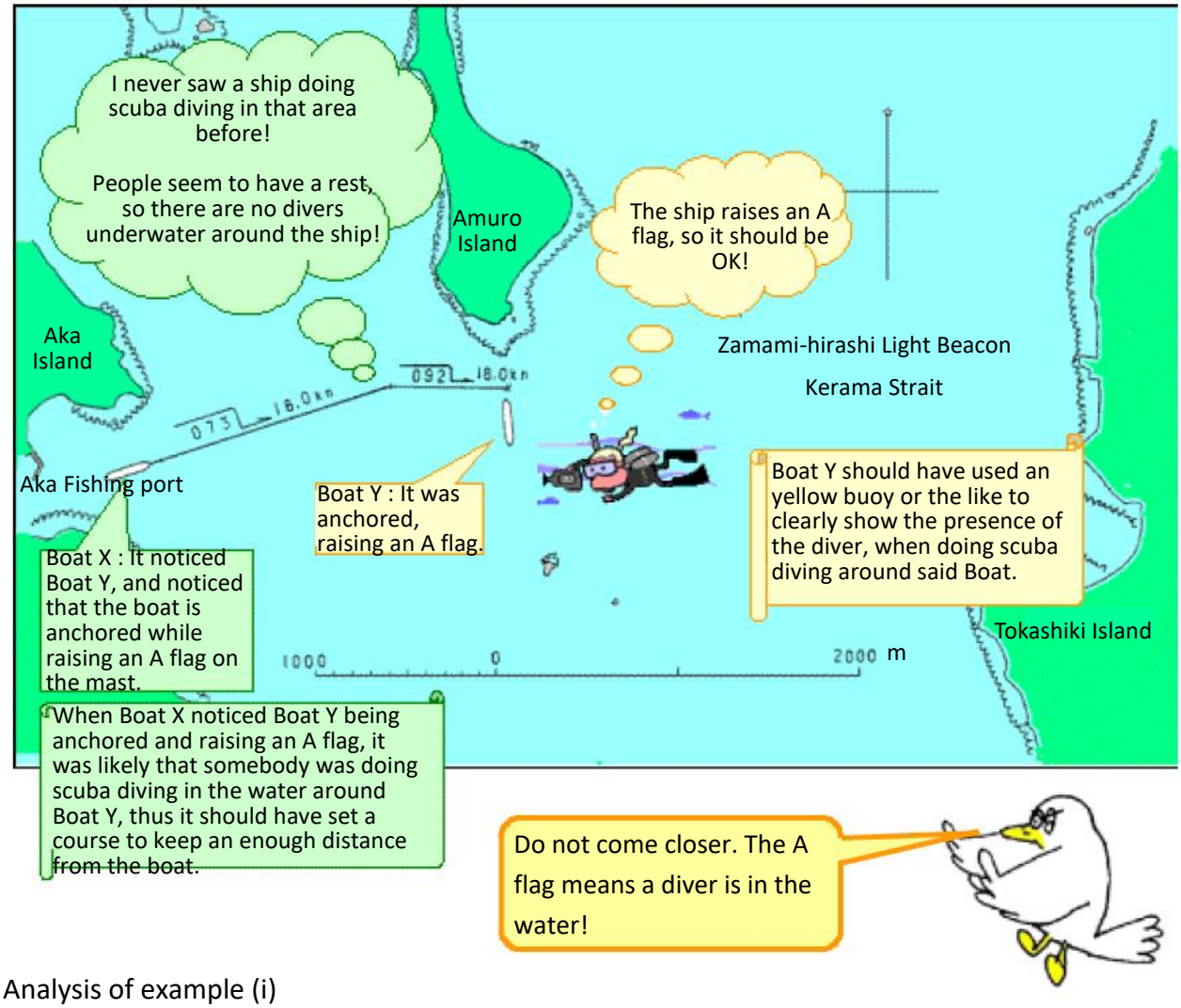
(i) An example in which a diver investigating the diving point was struck by a leisure fishing boat while sailing

Leisure fishing boat X (1.1 t, diesel engine, 49 KW)　　leisure fishing boat Y (4.9 t) Accident site: Southerly from Amuro Island in Kerama Islands, Okinawa prefecture Weather, etc.: Weather: clear, north wind, wind scale 4 Casualties: The diver on the Y side received a blow to the head	
Accident Summary	Boat X got underway from Aka fishing port in Kerama Islands, and, when sailing easterly to the diving site, the captain noticed Boat Y which was anchored while raising A flag (Note). However, since the captain does not usually see a ship in this water area, he kept on sailing assuming that no diver was present in the water around Boat Y although he saw many people onboard. Then, the diver (Boat Y captain) surfacing after the investigation of the diving point was struck by Boat X.
Causes	When the captain of Boat X recognized Boat Y anchoring and raising the A flag, he did not direct the course to keep an enough distance from the water surrounding Boat Y. The diver did not take a measure to clearly identify its presence, such as using an easily identifiable yellow-colored buoy.
Background factors	The captain of Boat X ：He knew that a leisure fishing boat raising an A flag should have a diver in the water around it, but he assumed that divers were resting because there were many people onboard. The captain of Boat Y ：He left the operation to a diving guide.

(Note) A flag (an international maritime signal flag): It represents that divers are working underwater, and requires any vessels sailing nearby to keep an enough distance at a very low speed.

A flag

Reference Figure of Example (i)



Analysis of example (i)

When the captain of Boat X noticed a ship being anchored while raising an A flag, he assumed that all people are onboard, simply because he saw many people there, which is a hasty conclusion.

Since he does not know how many people were on Boat Y, he needs to anticipate a possible danger, such as "there may be diver left in the water around the ship".

If Boat X sailed keeping a distance about 100 m from Boat Y, the accident could have prevented. It would not take much time to do so, but Boat X chose to sail between Boat Y and the island.

The captain of Boat Y was diving for pre-diving assessment, while having a qualified diving guide control the ship, and he had an easily-viewable yellow-colored buoy, but did not use it when they were diving.

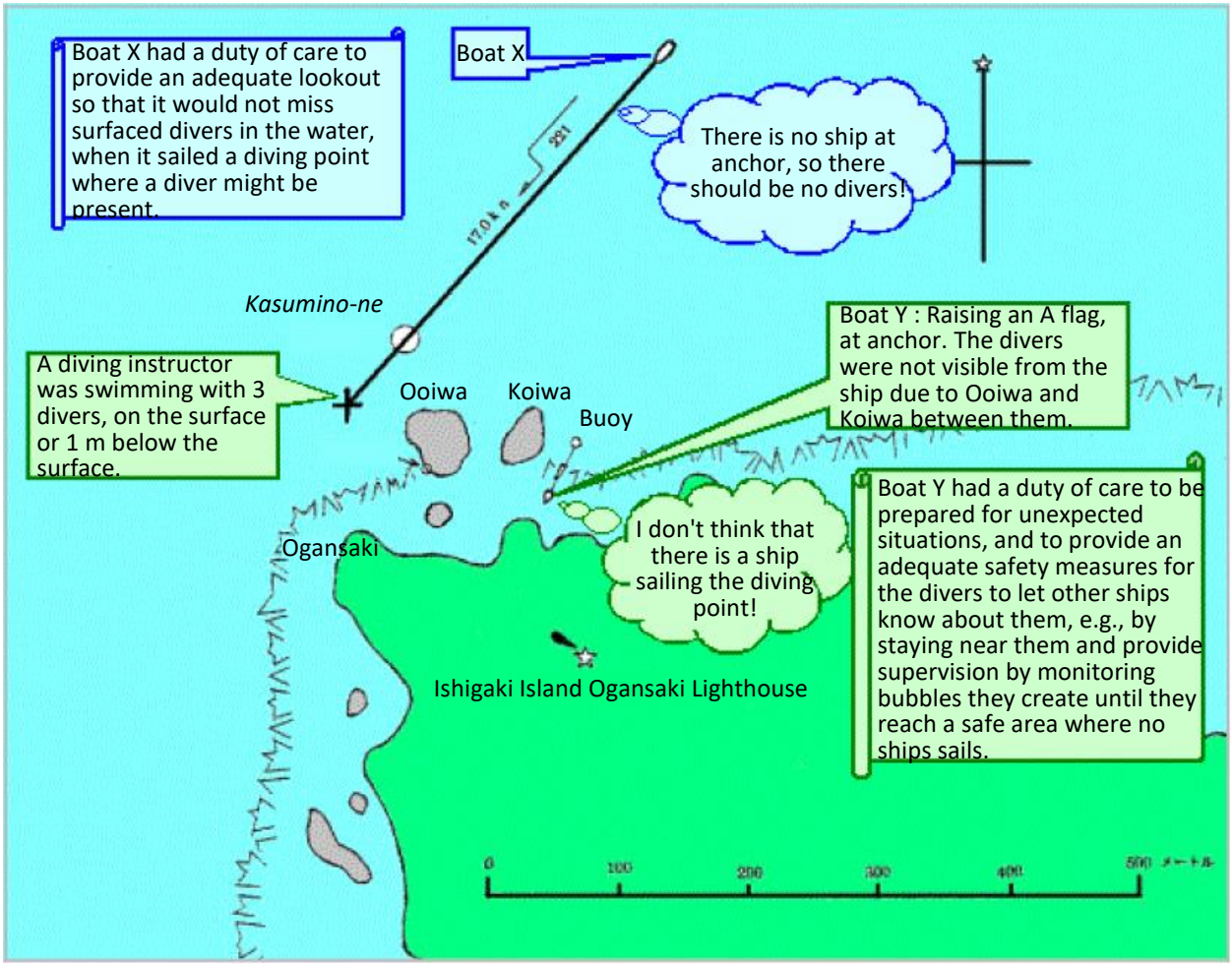
In addition, prior to having the guide control the ship, if the captain gave precautions to the guide, for example, the guide should send an alert signal if another ship approaches, the accident should have been avoided.

(ii) An example that divers during boat diving were struck by a transportation ship returning to the port

Transportation ship Boat X (10.63 m, diesel engine, 80KW), Transportation ship Boat Y (11.94 m, diesel engine, 169KW) Accident site: *Kasumino-ne* offshore northerly from Ogansaki, Ishigaki Island, Okinawa prefecture Weather, etc.: Weather: clear, south wind, wind scale 1 Casualties: 1 diver of Boat Y dead due to fractured skull, and 1 diver was injured with fractures to the right shoulder blade.	
Accident Summary	When Boat X engaged in transport of scuba diving guests was passing by the diving point called "*Kasumino-ne*" offshore from Ogansaki, Ishigaki Island on the way returning to the port, the captain of Boat X noticed at a distance Boat Y raising an A flag, but did not find any ships at the diving point. Then, assuming that there was no diver around the point and sailed into the point without keeping a distance, and struck two divers doing boat diving in the surrounding area.
Causes	Boat X did not have adequate lookout while sailing, and did not avoid the surfaced divers. When Boat Y was doing boat diving, it did not provide adequate safety measures for the divers.
Background factors	Boat X : At a place 160 m away from *Kasumino-ne*, it noticed a service shuttle boat for scuba diving guests, but no boat was anchored at *Kasumino-ne*. Thus, the captain assumed that no divers were present near the point. It did not have an adequate lookout for the water in a forward direction, and did not notice that there were surfaced divers present in the water. Boat Y : It chose to anchor at a place where the diving guests who do the boat diving were not visible because of a rock between the ship and the divers. When letting divers do boat diving, it should have been prepared for unexpected situations, and, in order to let other ships know that there are divers near the ship, it should have stayed in the water where diving is carried out to supervise the divers by following the movements of bubbles they create until they reach a safe area where no ships sails.
Guidance of Yaeyama diving Association	・ When sailing *Kasumino-ne*, a ship must keep an enough distance from it. ・ For boat diving, assign a lookout on the boat or a diver on the surface as the supervisor. ・ When approaching a ship raising an A flag, slow the speed when within 100 m of the ship.

Slow the speed when within 100 m of a diving boat

Reference Figure of Example (ii)



Analysis of example (ii)

The captains of both Boat X and Boat Y were members of Yaeyama Diving Assiciation, but both of them did not followed instructions of the Association, which led to this accident.

If Boat X followed the instructions, it would have sailed while keeping an enough distance from *Kasumino-ne*, but when it approached *Kasumino-ne*, the captain of Boat X assumed that there was no diver in the area because there was no boat at anchor raising an A flag there, and sailed forward in absence of adequate lookout in the forward direction. Had there be an adequate forward lookout, Boat X could have found the surfaced divers in the water ahead of it and could have taken an evasive maneuver.

As to Boat Y, as well, had it stayed in the water area of diving such that it would be prepared for an unexpected situations involving the divers who were doing boat diving, it could have been able to notify other ships that there were divers near the area, but assuming that no ship sails near the diving point where divers might be present, but it chose to anchor at a place away from *Kasumino-ne* where the divers were not visible, and thus was not be prepared for unexpected situations.

(iii) An example that a leisure fishing boat started the engine without knowing that a diver entered the water and struck the diver

Leisure fishing boat A (6 t, diesel engine, 308 KW) Accident site: Hibikinada Shirashima Island Weather, etc.: Weather, clear, west wind, wind scale 3 Casualties: Killed instantly due to cerebral contusion	
Accident Summary	When letting 6 diving guests the 3rd round of diving trial at the diving point, a diver who did not join the 2nd round of diving trial was ready for the entry and entered the water without giving any signals to others. Then, the captain who did not know the situation started the engine with geared backward to move the ship, whereby a propeller struck the diver.
Causes	During the standby period in a drifting state before initiating diving, when the captain geared backward in order to move closer to the rock below the lowest water surface, he did not adequately check the diving guest.
Background factors	The boat: The captain geared backward without counting the number of the diving guests onboard to see whether there were anyone who had already entered the water. The captain believed that all of the diving guests were preparing for the diving on the board. The diver: He entered the water without checking with the captain.

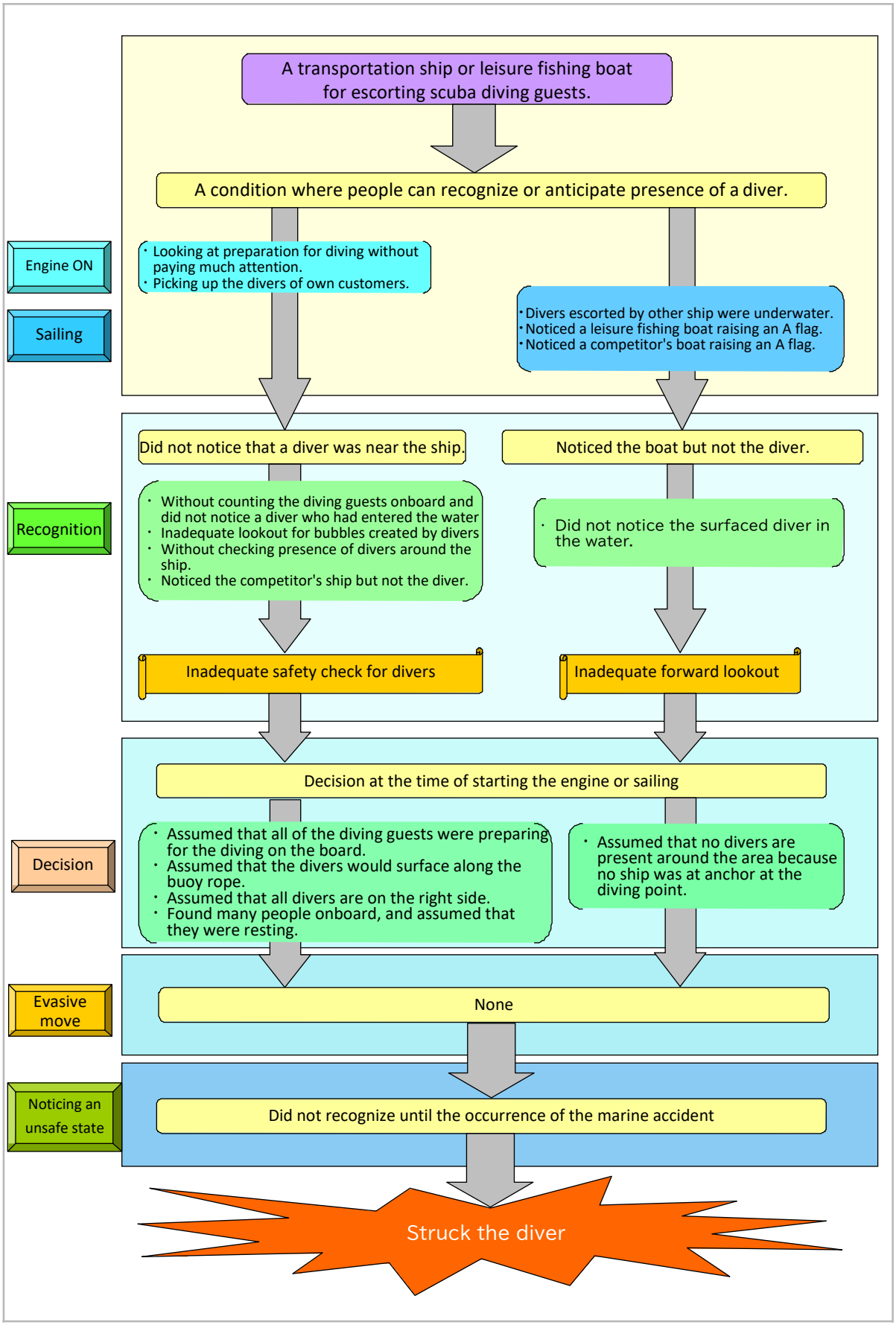
Prior to moving the ship, make sure that all divers are onboard.

(iv) An example that a leisure fishing boat struck a diver guided by a boat operated by a business competitor

Leisure fishing boat B (1 t, diesel engine, horsepower under the Fishing Boat Act: 40) Accident site: Otojiro easterly from Kamome Island offshore south-westerly from Kadowakizaki, Shizuoka prefecture Weather, etc.: Weather, clear, east wind, wind scale 1 Casualties: Multiple fractured ribs to take 2 months to heal completely	
Accident Summary	At the diving point, when the boat gets underway for return trip to the port, picking up its diving guests, it struck a diving guest of a competitor's boat.
Causes	The captain did not have an adequate lookout for bubbles created by diver in the water of the forward direction, and did not avoid the surfacing diver. When the diving instructor was surfacing accompanied by a diver, he did not adequately check safety of the surface above, and surfaced without waiting for the leisure fishing boat to pass.
Background factors	The boat: The captain thought that the diver would surface along the buoy rope, so that he tried not to approach the buoy, and started sailing, while setting the course between the buoy and the land. The diving instructor: Since behavior of the accompanying diver looked abnormal, and thus he tried to surface no along the buoy. When surfacing, leisure fishing boats generally sail offshore side of the buoy, and thus he assumed that it would be safe if they surface between the buoy and the coast.

Pay attention to bubbles created by divers.

(2) Mechanism of causing marine accidents with casualties in divers during scuba diving or swimmers



(3) Summary

Take a roundabout route or sail slowly near a diving boat!

- When sailing a diving point where another ship is present, take a roundabout route or sail at a low speed while carefully checking conditions below the surface.
- The operator of the ship must pay attention to another vessel approaching so that the lives of all divers can be protected. If such another ship continues to approach, whistle an alert signal to notify the approaching vessel.

Start the engine after checking safety for divers around the ship!

- At a diving point, many ships are often present at the same time. Pay attention to divers of other ships as well as those of the own boat, and do not move forward unless you have checked that no diver is present at the forward direction. Do not act based on an assumption of "it should be OK".
- When moving a ship, thoroughly check that no diver is present around the ship, including places which are not visible from on board.
- When picking up divers, the propeller should be stopped.

Start diving or surfacing at a signal, after safety has been confirmed!

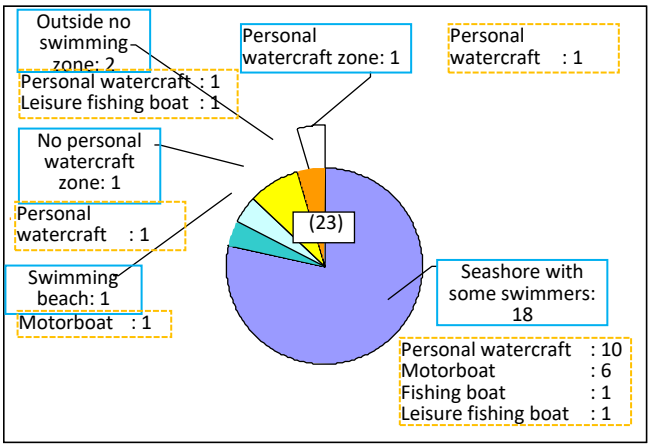
- If the structure of the ship does not allow the operator to visually confirm divers entering the water, it is necessary to have a person for lookout to check signals each other precisely, or the operator him/herself is required to check visually.
- Instruct divers to enter the water after receiving a signal to do so.
- The operator or the lookout should pay attention to bubbles created by divers.
- When the instructor is underwater, make sure safety near the surface, and then send a signal to the divers to surface.

2. Marine accidents of a swimmer struck by a vessel in a swimming beach, etc.

There are 23 cases of accidents in which a swimmer was struck by a vessel throughout Japan, and details of the accident sites are as summarized in Figure 7.

Do not ride dangerously!!

Figure 7. Accident sites by vessel types, where marine accidents between a swimmer and a vessel occurred



20 of these 23 accidents occurred in a no swimming zone or no personal watercraft zone such as a swimming beach, *2 of them occurred outside a no swimming zone, and the remaining 1 accident occurred in a situation where a swimmer entered a designated personal watercraft zone.

In the accident occurred in a personal watercraft zone, the operator of the personal watercraft knew that some surfers often entered the zone, seeking high surfs. Thus, in 21 out of 23 cases, the operators rode a motorboat or personal watercraft in a water area where they could anticipate presence of a swimmer.

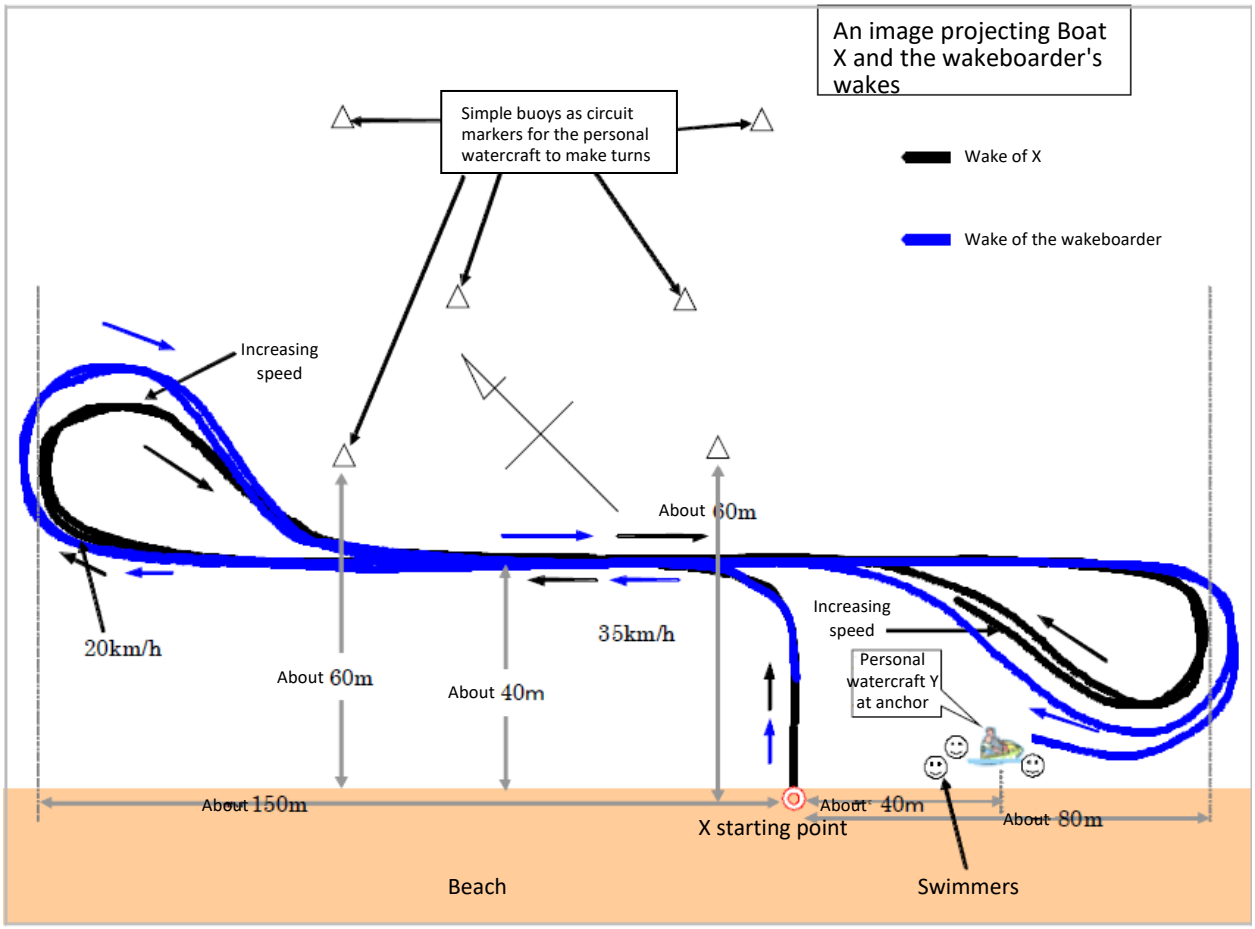
(1) Case examples and analysis

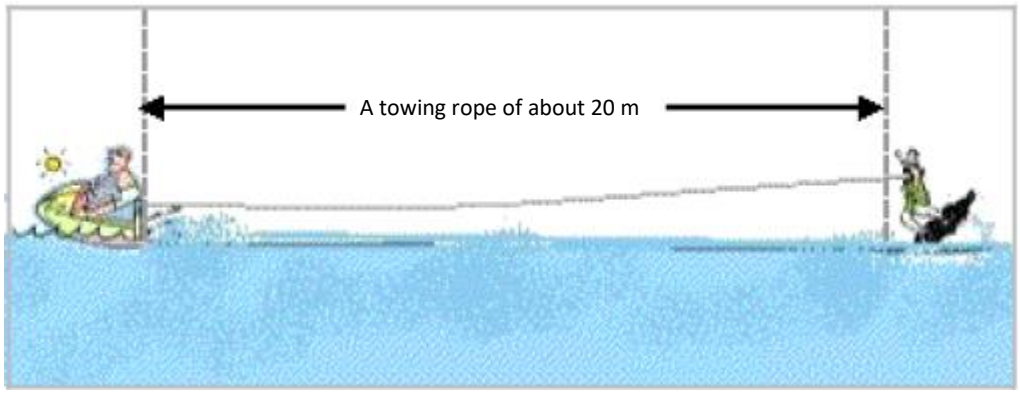
(i) An example where a personal watercraft towing a wakeboarder struck a swimmer

Personal watercraft X (3.12 m, electric ignition engine, 107 KW) Accident site: Offshore from the east coast of Yagaji Island, Okinawa prefecture Weather, etc.: Weather, clear, southwest wind, wind scale 2 Casualties: A swimmer received a blow to the head	
Accident Summary	When turning the watercraft towing a wakeboarder and the wakeboarder was pulled outwardly by the centrifugal force created by the turning motion, the captain found that the towed wakeboarder was boarding in such a manner that extremely approaches to personal watercraft Y being at anchor and swimmers in the surrounding area, and tried to make correction by increasing the speed, and also the wakeboarder found Y very close in the forward, and quickly released the towing rope, but thrown into the anterior of Y, and hit a swimmer onboard Y.
Causes	The captain did not take adequate safety measures for swimmers, and the wakeboarder was pulled outwardly by the centrifugal force created by the turning motion, thereby approaching extremely close to the swimmer. The captain did not tow in a water away from swimmers. The wakeboarder did not ask the captain to tow in a water away from swimmers.

Background factors	The captain : He was familiar with the method of controlling the personal watercraft as well as the wakeboarder's boarding conditions when the bike turned, and felt that a distance between the water area where the personal watercraft turns and the water area where the swimmers were present was narrow, but the wakeboarder being towed can easily slide to move sideways about the sailing direction and thus the wakeboarder would not approach too close to the swimmer. The wakeboarder : When boarding, he was too occupied with the movements of the towing personal watercraft to lookout the surroundings in the forward direction.

Reference Figure of Example (i)





Towing figure

Analysis of example (i)

The captain not only lacked recognition that, since the water where the circuit was placed was too close to swimmers, it was dangerous to make a circuit while towing a wakeboarder, but also had an incorrect recognition that the towed wakeboarder would not approach too close to a swimmer because he could easily avoid the swimmer by sliding sideways.

In reality, the wakeboarder was too occupied with the movements of the towing personal watercraft to lookout the surroundings in the forward direction. Thus, the wakeboarder, too, should have asked the operator to tow the board in a water away from swimmers.

(ii) An example that a ship started the engine with no knowledge of a swimmer present in the surrounding area, and struck the swimmer

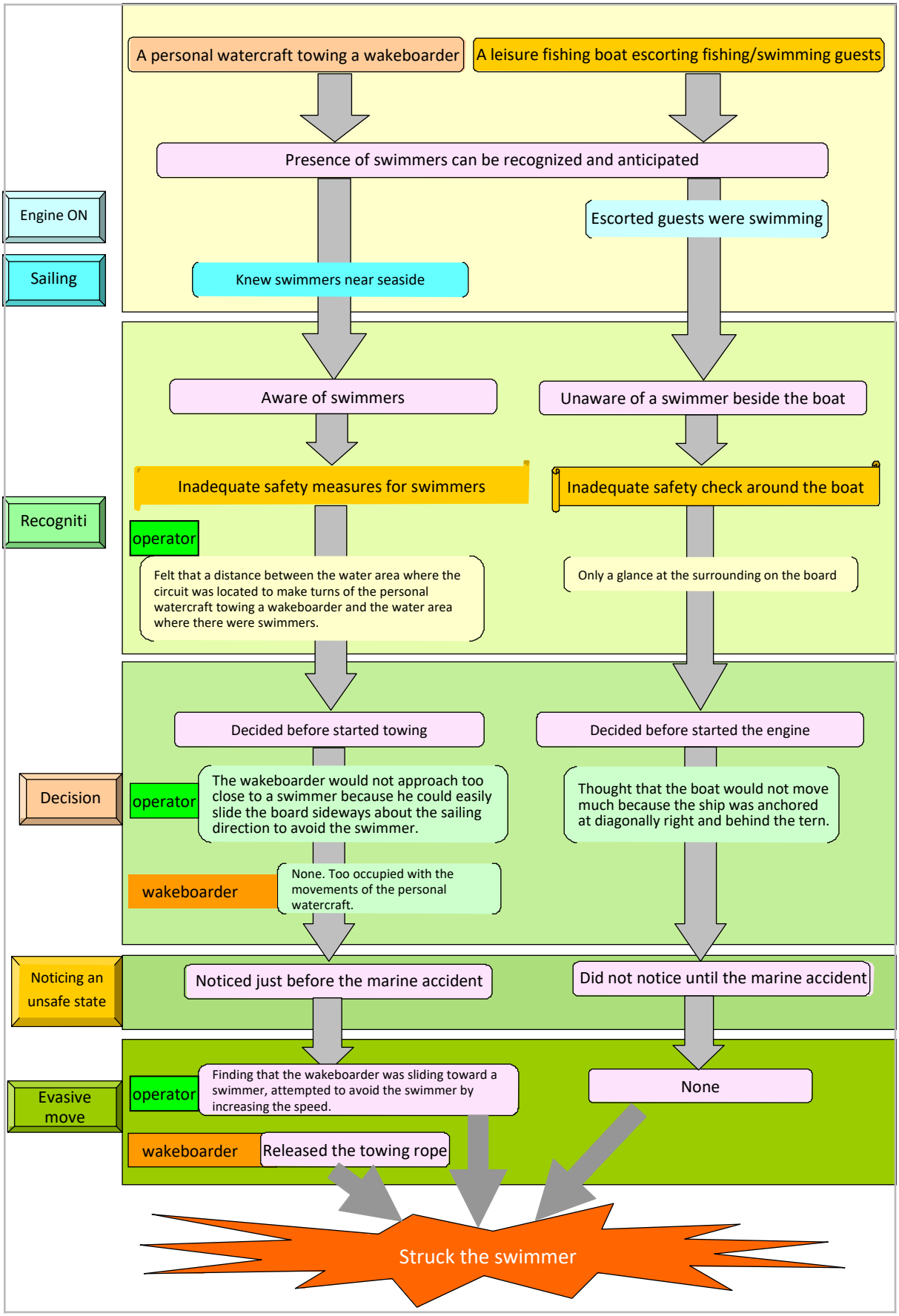
Leisure fishing boat (7.92 m, diesel engine, 36KW) Accident site: Sakiyama Bay, west coast of Iriomote island, Okinawa prefecture Weather, etc.: Weather: clear, southeast wind, wind scale 1 Casualties: Lacerated wounds which take 3 weeks to heal completely	
Accident Summary	9 guests were onboard, and the boat was at anchor for fishing and swimming activities for them, but decided to move another location. Although a half-clutch state was enough to rotate the propeller, but the captain thought that the boat would not make much move because it was anchored at the stern side. The captain only gave a glance at the surrounding water on the board, started the main engine without adequately check safety of the water around the boat, and caused the accident where a swimmer swimming in the water close to the port side of the boat was struck by the propeller.
Causes	When starting the main engine in a half-clutch state while being anchored at diagonally behind the port of the boat, the captain did not adequately check safety of the water surrounding the boat.
Background factors	The main engine could be rotated without pressing the free throttle button, due to the long period of use, and the clutch was able to be in a half-clutch state. The propeller was rotating, the captain considered that since the boat was anchored at the stern side, starting the main engine in a half-clutch state would not move the ship too much.

Analysis of example (ii)

The captain did not notice the swimmer in the water beside the middle section of the port side of the boat, because he only gave a glance at the surrounding water on the board when the main engine was started, and did not adequately check safety of the water around the boat including the views which were not visible from the captain.

When starting the main engine, the captain must know the positions of all swimmers he escorted, and since there may be a case where swimmers escorted by another ship may be present, it is essential to adequately check safety of the water around the boat.

(2) Mechanism of causing marine accidents with casualties in swimmers in swimming beach, etc.



(3) Examples of other types of dangerous ride

In many marine accidents in which a swimmer was truck by a vessel, the vessel did not have an adequate lookout for the sailing direction, and sailed based on an assumption that there was no swimmer in the forward direction, which resulted in striking a swimmer. However, there were also the following types of dangerous ride:

(i) When picking up swimmers, the motorboat's propeller was rotating;

(ii) When trying to surprise a swimmer with splashes created by a rapid turn, the operator rapidly sailed the personal watercraft close to the swimmer, but was too late to gear reverse and struck the swimmer;

(iii) Expecting that the boat can dodge the swimmer along his/her left side without changing the course, the operator move closer to the swimmer and stopped the engine, and waves at the water's edge pulled the boat to have it struck the swimmer; and

(iv) When an operator had an unqualified person ride on the personal watercraft alone, the watercraft became uncontrollable due to the effects of waves, resulting in striking a swimmer.

(4) Summary

Do not ride dangerously!

- Small vessel operators are prohibited to ride dangerously near swimmers, etc., such as sailing at a high speed, making a rapid turn or zigzag turns.
- Such actions as moving towards a person and making a rapid turn to splash over the person are examples of dangerous ride.

Do not ride without qualification!

- Small vessel operators must not carelessly have unqualified persons ride a vessel alone.
  Especially, it is illegal to ride a personal watercraft without a license.

Part 4: Proposals

1. In order to avoid accidents of a diver struck by a vessel during scuba diving

Have a thorough discussion between the ship operator and the diver on the diving plan, signals and signs, etc.!

(1) Precautions for the vessel

(i) When a vessel has a person undertake scuba diving, raise an A flag of an international maritime signal flag, which shows that there is a diver in the water below, to the top of the mast.

(ii) When you find a boat raising an A flag of an international maritime signal flag near a diving point, slow the speed when within 100 m of the boat.

(iii) For boat diving, in case of unpredictable situations, assign a lookout on the boat or a diver on the surface as the supervisor, so that bubbles created by a diver can be monitored.

(iv) When starting the engine at a diving point, pay close attention to the places which are not viewable on the board, as well, check availability and number of the divers, and then move the boat.

(v) Before having a diver enter the water, instruct the diver to follow signals to act.

(2) Precautions for the diver

(i) Diving instructors must use extra caution to safety of divers

(ii) Instructors undertaking diving must first check safety near the surface, and then give a signal for surfacing to the diver.

(iii) All divers must follow instructions of the diving instructor.

2. In order to avoid accidents of a swimmer struck by a vessel

Do not ride dangerously or without qualification!

(i) Small vessel operators must not ride the boat at a speed that is considered to have a risk of collision or other hazards, to approach a swimmer.

(ii) Small vessel operators must not ride a boat near a swimmer, by making a rapid turn or zig-zag turns

(iii) The manager of a no swimming zone must not allow small vessels to sail within a no swimming zone

(iv) Service providers who provide small vessels such as personal watercrafts must alert the operator of a small vessel about safe operation when providing the small vessel to the operator.

Clerk Division, Naha Branch of Moji Regional Japan Marine Accident Inquiry Agency
2-11-1, MInatomachi, Naha City 900-0001 Okinawa
Phone: 098-868-9334
FAX: 098-862-8156
Email :naha-k63pj@qst.mlit.go.jp
Japan MAIA website URL: http://www.mlit.go.jp/maia/index.htm