JAPAN P&I CLUB
Coastal vessels No. 4 March 2018

P&I Loss Prevention Bulletin

The Japan Ship Owners' Mutual Protection & Indemnity Association Loss Prevention and Ship Inspection Department

Coastal vessels

Prevention of damage to harbour facilities and related cases

Contents

§1 Introduction

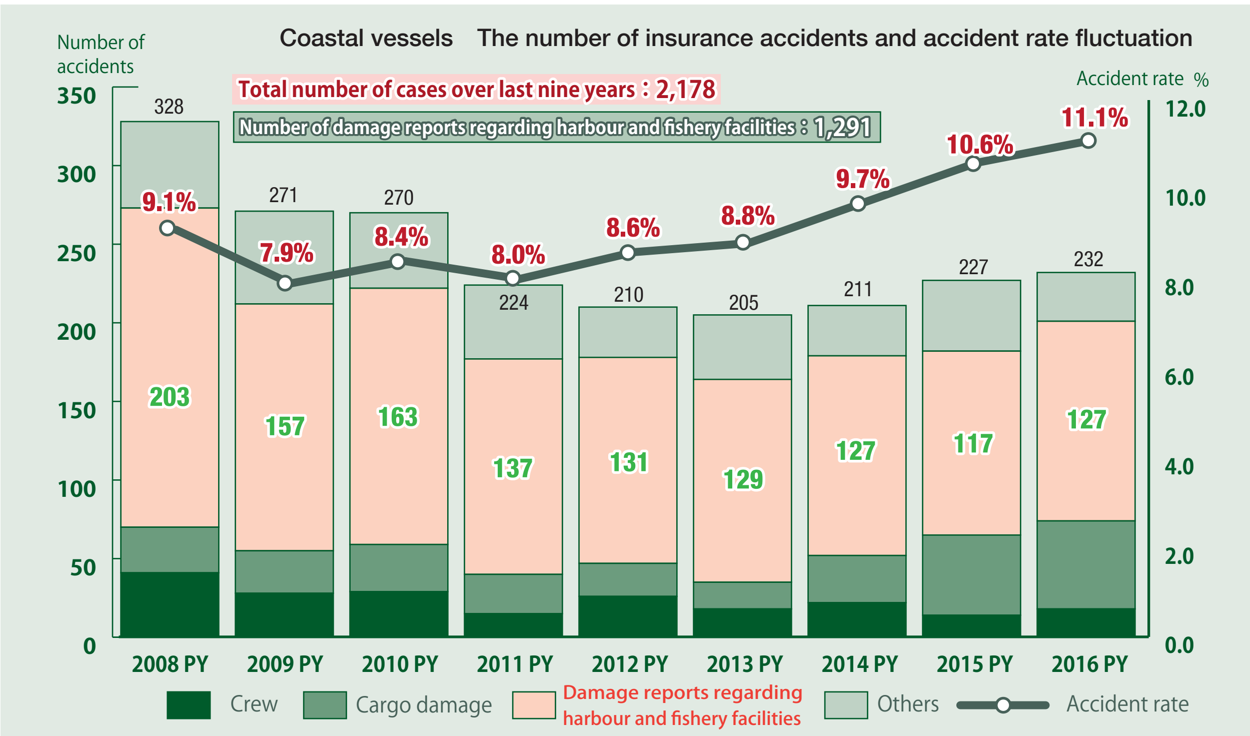
In November 2013, a Loss & Prevention Seminar under the theme of "Prevention of damage to harbour facilities" was held at the following five areas: Tokyo, Kobe, Imabari, Fukuoka and Saeki. Following these, Loss Prevention Bulletins Vol. 31 and 32 covering these themes were issued.

This time, the outline of the Loss & Prevention Seminar "Prevention of damage to harbour facilities caused by coastal vessels and related cases", which was held from September to December in 2017, will be included.

§2 P&I Insurance accident statistics: Claims in 2008PY to 2016PY Statistics

Note : Policy Year (PY) : the insurance period shall be one year from 20th February to the following 20th February

§ 2−1 Fluctuation of the number of accidents



Graph 1 Coastal vessels The number of insurance accidents and accident rate fluctuation

By accident type		2008PY	2009PY	2010PY	2011PY	2012PY	2013PY	2014PY	2015PY	2016PY	Total	%
Crew		41	28	29	15	26	18	22	14	18	211	10%
Cargo damage		29	27	30	25	21	17	30	51	56	286	13%
Damage reports regarding harbour and fishery facilities		203	157	163	137	131	129	127	117	127	1,291	59%
Others	Other people except crew	1	1	2	2	0	1	3	2	1	13	1%
	Collision	11	12	13	7	7	4	8	10	2	74	3%
	Oil spilt	14	22	10	12	11	9	8	9	9	104	5%
	Groundings, sinkings and fire	2	5	3	5	1	2	4	3	3	28	1%
	Others	27	19	20	21	13	25	9	21	16	171	8%
Other · Subtotal		55	59	48	47	32	41	32	45	31	390	18%
Total		328	271	270	224	210	205	211	227	232	2,178	100%
Number of entered vessels at the beginning of the policy year		3,609	3,428	3,225	2,799	2,436	2,319	2,176	2,134	2,098	24,224	
Accident rate (Number of accidents divided by Number of entered vessels)		9.1	7.9	8.4	8.0	8.6	8.8	9.7	10.6	11.1	9.0	

Table 2

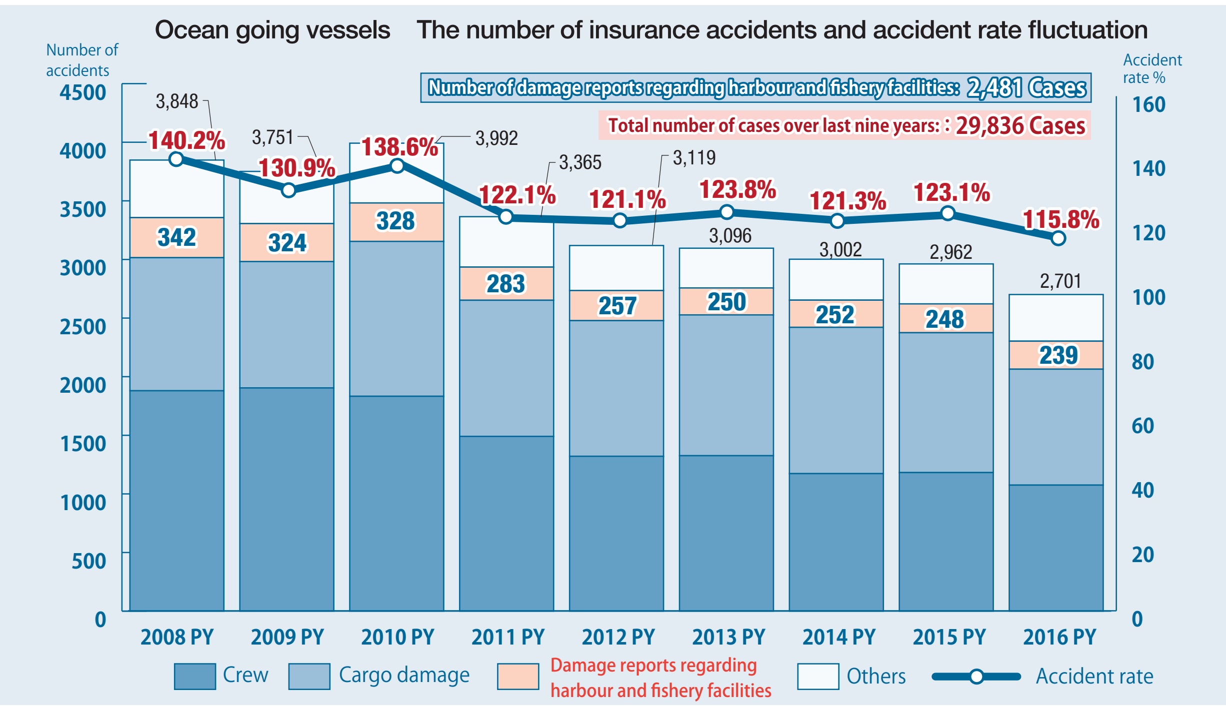
The total number of P&I insurance accidents concerning coastal vessels reported between 2008PY to 2016PY was 2,178. Of this figure, the number of damage accidents to harbour facilities and fishery facilities were 1,291, which occupied 59% of the total. Along with this, cargo damage accidents and crew injury / death related accidents account for approximately 80% of the total.

The number of accidents showed a tendency of decreasing at a peak of 328 cases in 2008PY, however, this number has slightly increased following 2014PY.

Although this trend shows a decrease in the number of accidents, it is influenced by a decrease in the number of entered ships. Thus, we compared this with an accident rate using a calculation that divides the number of accidents by the number of entered vessels at the beginning of the policy year.

Although the accident rate was 8% in 2011PY, it has increased very slightly since then.

In 2016PY, the accident rate was 11.1%, which, on close examination, tells us that 11 out of 100 ships caused some P&I accidents. We believe that urgent action should be taken to stop this increasing trend in order to decrease the call rate.



Graph 3 Ocean going vessels Number of accidents and accident rate fluctuation

By accident type		2008PY	2009PY	2010PY	2011PY	2012PY	2013PY	2014PY	2015PY	2016PY	Total	%
Crew		1,880	1,904	1,833	1,491	1,321	1,326	1,173	1,182	1,075	13,185	44%
Cargo damage		1,135	1,078	1,321	1,161	1,157	1,201	1,248	1,193	989	10,483	35%
Damage reports regarding harbour and fishery facilities		342	324	328	283	257	230	232	246	239	2,481	8%
Others	Other people except crew	93	95	99	106	73	76	67	67	74	750	3%
	Collision	72	60	64	45	32	32	42	32	42	421	1%
	Oil spill	55	34	34	47	35	40	26	30	34	335	1%
	Groundings, sinking and fire	18	9	12	19	7	11	10	11	11	108	1%
	Others	253	247	301	213	237	180	204	201	237	2,073	7%
Other · Subtotal		491	445	510	430	384	339	349	341	398	3,687	12%
Total		3,848	3,751	3,992	3,365	3,119	3,096	3,002	2,962	2,701	29,836	100%
Number of entered vessels at the beginning of the policy year		2,745	2,866	2,880	2,757	2,576	2,500	2,475	2,406	2,333	23,538	
Accident rate (Number of accidents divided by Number of entered vessels × 100%)		140.2	130.9	138.6	122.1	121.1	123.8	121.3	123.1	115.8	126.8	

Table 4 Ocean going vessels Number of accidents and accident rate fluctuation

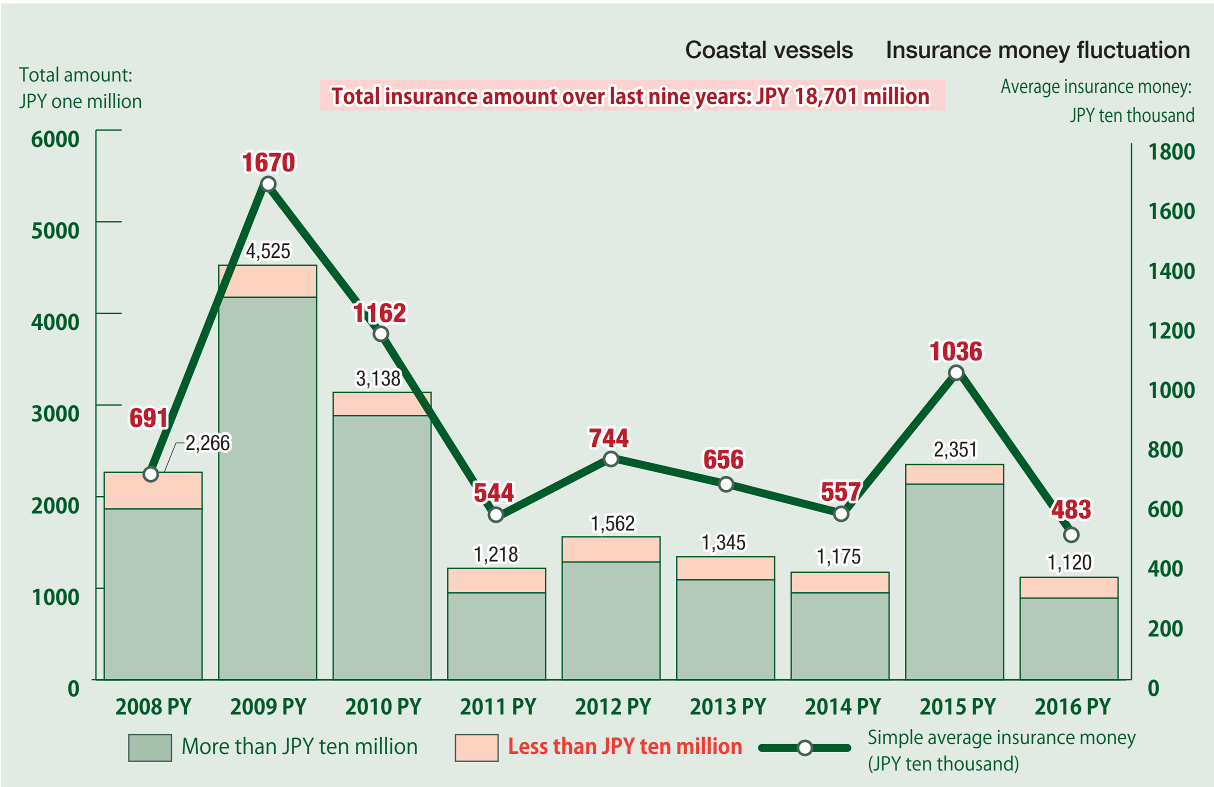
On the other hand, the total number of P&I accidents concerning ocean going vessels, which were reported between 2008PY to 2016PY, was 29,836. Of this figure, the number of damage accidents to harbour facilities and fishery facilities were 2,481, which occupied 8% of the total. The largest P&I accidents concerning ocean going vessels are crew injury / death related accidents, which occupy 44% of the total (13,185 cases). Cargo damage accidents came second place occupying 35% (10,483 cases) and in third place, damage accidents regarding harbour and fishery facilities occupying 8% of the total.

The differences between accident trends regarding coastal and ocean going vessels will vary depending on the contents of the insurance contract. The cost of medical treatment etc. for crew injury related accidents on board coastal vessels is covered by the seaman's insurance. If you contracted with P&I insurance which covers a seaman's accident compensation, you will be liable for any costs not covered by the seaman's insurance. Also, regarding coastal vessels, because shipowner as a business practice was not compensated for loss as a result of cargo damage accidents in the past, cargo related accidents concerning coastal vessels were not subject P&I insurance either. However, in recent years, cargo owners or cargo insurance companies that have been claiming for cargo accidents due to mistakes made by shipowners and crew have been increasing. In order to address this, there has been an increase in shipowners of coastal vessels also taking supplementary cargo related cover (Cargo Indemnity). In proportion to this, the number of cargo damage accidents for coastal vessels reported to P&I has shown a tendency to increase.

For coastal vessels also, we considered the accident rate using a calculation that divides the number of accidents of ocean going vessels by the number of entered vessels at the beginning of the policy year. Although there was a difference in the contents of insurance contract as described above, the accident rate was between 115.8% to 140.2%, which, on close examination, tells us that there were between 116 to 140 cases per 100 ships.

It is not appropriate to simply make a comparison, as there is a difference concerning insurance contracts. In addition, for ocean going vessels, crew injury / death related accidents occupy nearly half of the total number of accidents. However, comparing accident rates shows that the number of coastal vessel cases is only one tenth of that of ocean going vessels.

§ 2−2 Insurance money Fluctuation



Graph 5 Coastal vessels Insurance money fluctuation

Unit of insurance money: JPY one million

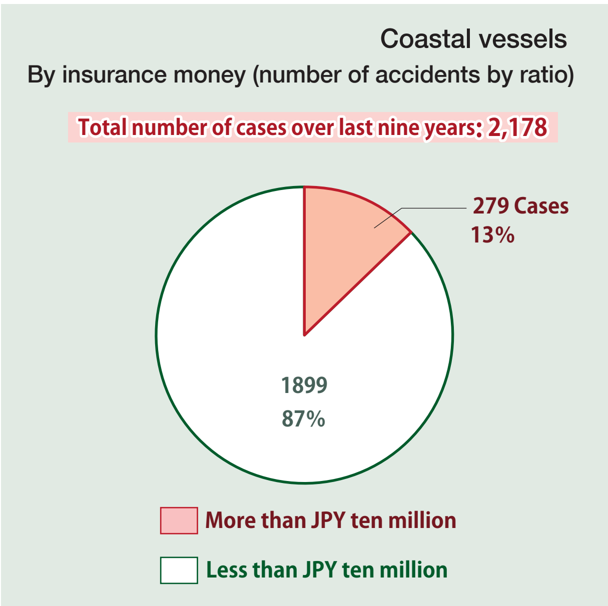
	2008PY		2009PY		2010PY		2011PY		2012PY		2013PY		2014PY		2015PY		2016PY		Total		%	
	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money
More than JPY one billion	0	0	1	2,605	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2,605	0%	14%
More than JPY 100 million but less than JPY one billion	5	784	3	623	5	1,573	2	244	5	758	2	532	1	101	2	1,276	2	468	27	6,359	1%	34%
More than JPY 50 million but less than JPY 100 million	2	118	2	138	9	662	4	265	2	148	3	243	3	236	4	316	0	0	29	2,127	1%	11%
More than JPY ten million but less than JPY 50 million	42	964	33	808	28	649	19	442	17	381	15	317	27	613	22	544	19	425	222	5,142	10%	27%
More than JPY five million but less than JPY ten million	20	145	19	133	8	54	15	108	16	106	11	75	11	80	8	56	13	91	121	849	6%	5%
More than JPY one million but less than JPY five million	80	191	65	167	60	144	49	108	54	131	59	139	50	114	54	122	48	103	519	1,218	24%	7%
Less than JPY one million	179	64	148	50	160	56	135	52	116	38	115	39	119	31	137	37	150	33	1,259	399	58%	2%
TOTAL	328	2,266	271	4,525	270	3,138	224	1,218	210	1,562	205	1,345	211	1,175	227	2,351	232	1,120	2,178	18,701	100%	100%

Table 6 Coastal vessels Insurance money fluctuation

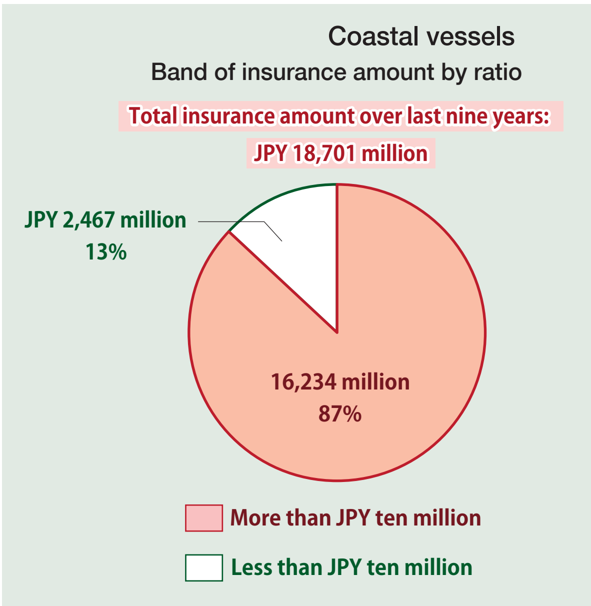
Regarding insurance money for coastal vessels, the insurance money has largely fluctuated every Policy Year. Compared to the number of accidents, it is conspicuous that there has been great change, recently. The total amount of insurance money over the last nine years is JPY 18,701 million. Although the largest amount was recorded in 2009PY (JPY 4,525 million), 2016PY came to only a quarter of the 2009PY (JPY 1,120 million).

The reason as to why there is a significant difference according to each individual Policy Year is because insurance money was greater for the PY when large P&I insurance accidents occurred, and, on the contrary, when there were no large P&I insurance accidents, the insurance money was small by comparison. Particularly, in 2009PY, only one accident occurred but the insurance amount was JPY 2,605 million, which was 57% of the total insurance money of the Policy Year (JPY 4,525 million). This came to 14% of the total insurance amount over the last nine years.
It is conspicuous that the ratio of insurance accident money comes to more than JPY ten million, which is significant, no matter which policy year it is.

The following two pie charts compare the total number of accidents and insurance money over the last nine years.

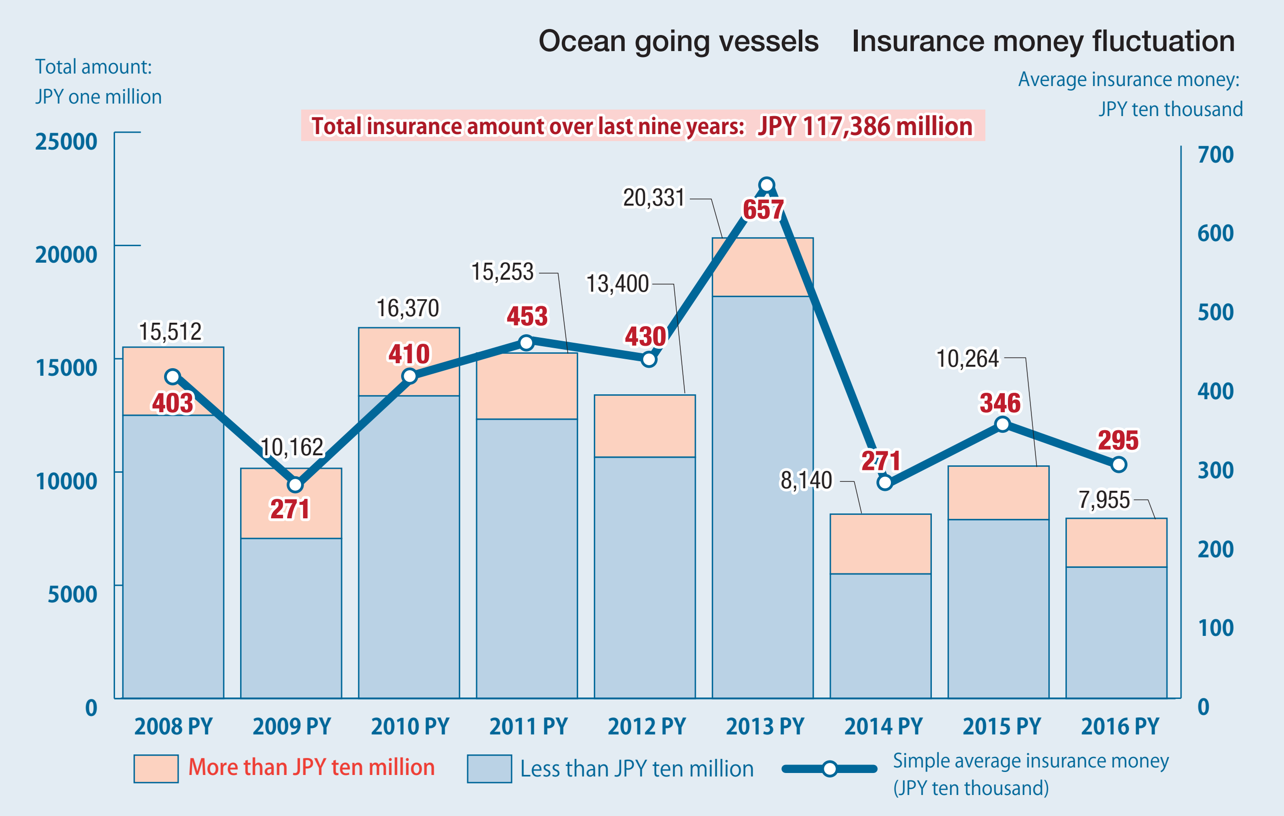


Graph 7
Coastal vessels By insurance money (number of accidents by ratio)



Graph 8
Coastal vessels Band of insurance amount by ratio

When it comes to the number of accidents, the insurance amount that was less than JPY ten million equated to 87% of the total. However, as for insurance money that was less than JPY ten million, it only equated to 13%.
Whereas, the number of accidents that came to more than JPY ten million were 13%, however, as for the insurance money, it accounts for 87%. Thus, we learn that large accidents greatly influence the total loss record.



Graph 9 Ocean going vessels Insurance money fluctuation

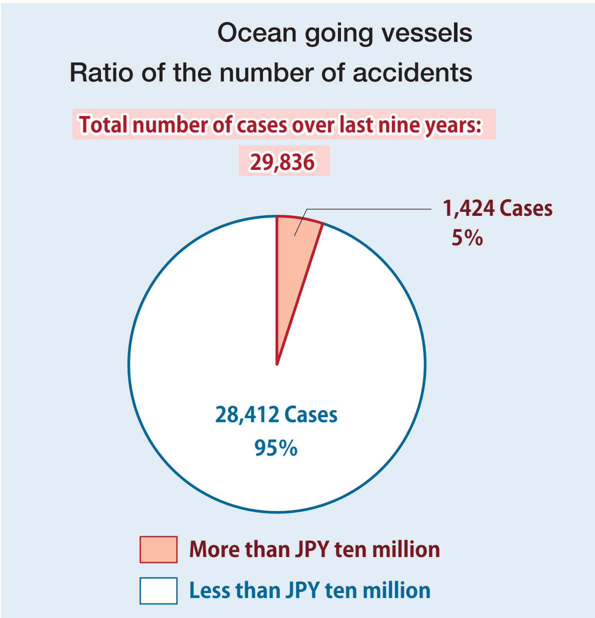
Unit of insurance money: JPY one million

	2008 PY		2009 PY		2010 PY		2011 PY		2012 PY		2013 PY		2014 PY		2015 PY		2016 PY		Total		%	
	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money
More than JPY one billion	3	5,108	1	1,096	4	6,401	2	2,413	1	4,366	3	11,695	0	0	1	2,282	1	1,108	16	34,468	0%	29%
More than JPY 100 million but less than JPY one billion	14	3,472	9	2,787	10	3,302	20	6,687	9	3,158	12	2,687	7	1,645	4	2,109	7	2,288	92	28,136	0%	24%
More than JPY 50 million but less than JPY 100 million	16	1,131	10	750	16	1,165	8	596	11	763	12	803	14	990	13	906	10	682	110	7,787	1%	7%
More than JPY ten million but less than JPY 50 million	147	2,791	134	2,433	136	2,494	134	2,633	131	2,366	139	2,564	152	2,865	144	2,599	89	1,721	1,206	22,468	4%	19%
More than JPY five million but less than JPY ten million	147	1,043	177	1,239	147	1,036	172	1,249	146	1,090	130	930	135	973	98	721	98	674	1,250	8,953	4%	8%
More than JPY one million but less than JPY five million	543	1,161	490	1,100	517	1,182	466	1,044	460	1,032	447	1,039	467	1,045	467	1,028	411	880	4,268	9,512	14%	8%
Less than JPY one million	2,978	805	2,930	757	3,162	791	2,563	631	2,361	625	2,353	613	2,227	622	2,235	619	2,085	601	22,894	6,062	77%	5%
Total	3,848	15,512	3,751	10,162	3,992	16,370	3,365	15,253	3,119	13,400	3,096	20,331	3,002	8,140	2,962	10,264	2,701	7,954	29,836	117,386	100%	100%

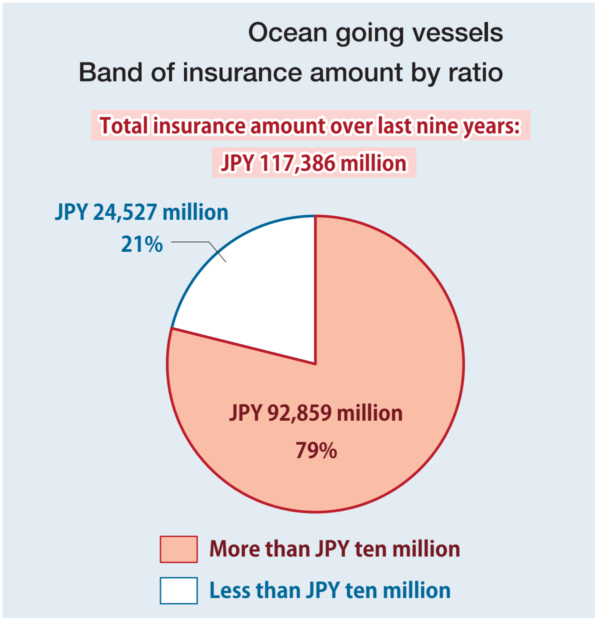
Table 10 Ocean going vessels Insurance money fluctuation

Although not as steep as coastal vessels, the insurance money for ocean going vessels also fluctuates every PY. The amount JPY 20,332 million in 2013PY is prominent. However, of these three cases the insurance money of more than JPY one billion in accidents among them was JPY 11,695 million, which occupied 57% of the total amount of insurance money in 2013 PY.

As shown in the following charts which compare the number of accidents over the last nine years and the total of insurance money, similar to coastal vessels, the number of accidents of more than JPY ten million came to 1,424 (5% of the total), however, as for the insurance money, it came to 79% of the total.



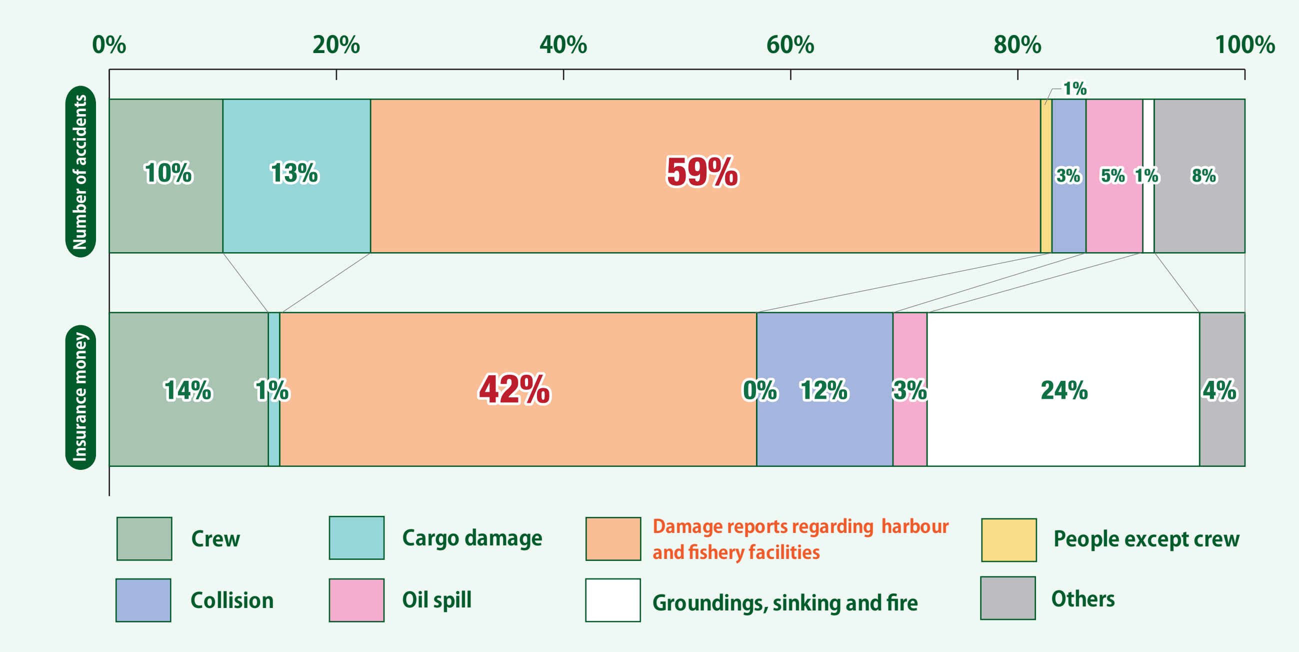
Graph 11
Ocean going vessels Ratio of the number of accidents



Graph 12
Ocean going vessels Band of insurance amount by ratio

§ 2－3　P&I Insurance accident statistics: Statistics of claims between 2008 PY and 2016 PY

We evaluated the insurance accident statistics which were described above, by comparing the number of accidents and insurance money by accident type and present them in the bar graph below.

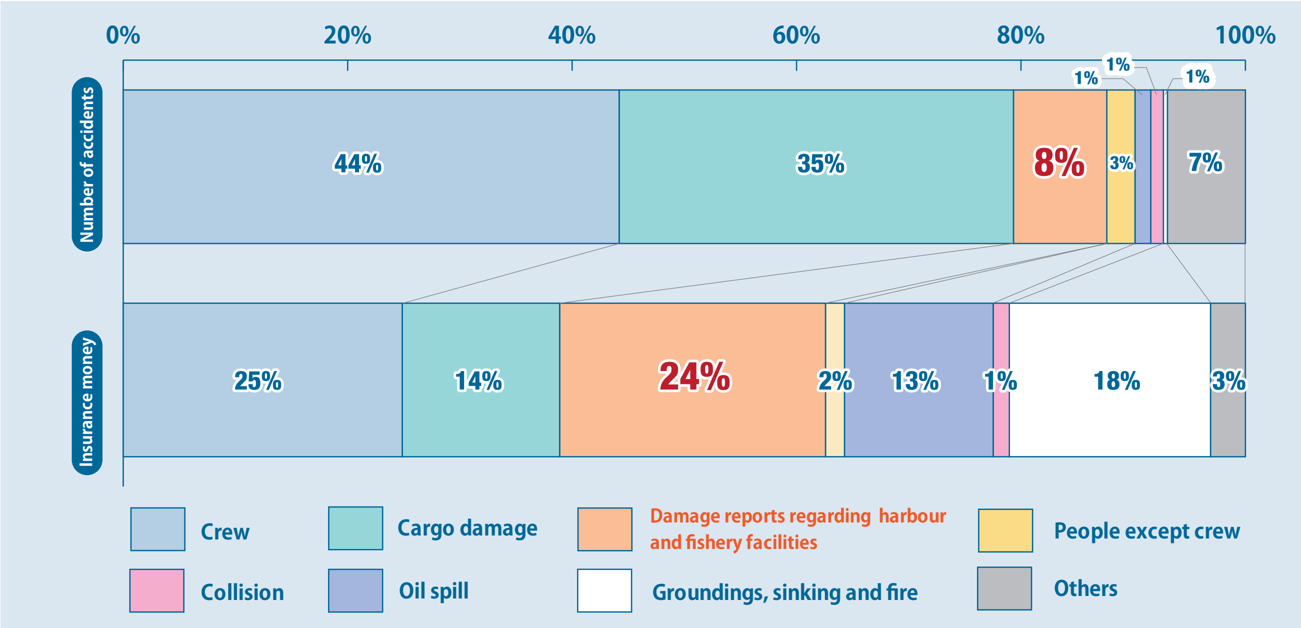


Graph 13　Coastal vessels　The number of accidents and insurance money evaluation

Accident classification	Number of accidents	Insurance (JPY one million)	Average insurance money per case (JPY)	Evaluation	
				Number of accidents	Insurance money
Crew	211	2,541	12,043,589	Medium	Large
Cargo damage	286	217	759,784	Fewer	Fewer
Damage reports regarding harbour and fishery facilities	**1,291**	**7,784**	**6,029,316**	**Greater**	**Large**
Other people except crew	13	70	5,403,762	Fewer	Medium
Collision	74	2,307	31,173,935	Fewer	Large
Oil spill	104	500	4,812,400	Medium	Medium
Groundings, sinking and fire	28	4,579	163,538,058	Fewer	Large
Others	171	702	4,103,671	Fewer	Small
Total	2,178	18,701	8,586,201		

Table 14　Coastal vessels　The number of accidents and insurance money evaluation

Regarding coastal vessels, loss records will be greatly improved if damage to harbour and fishery facilities can be prevented. Of course, it is important to reduce the number of large accidents such as collisions, groundings, sinkings and fire. Regarding crew accidents, the insurance money per case by simple average is significant. This is the reason as to why most take out supplementary insurance to cover "seamen's accident compensation" to cover in part compensation of death accidents and residual disability that were not covered by the seamen's insurance.



Graph 15　Ocean going vessels　The number of accidents and insurance money evaluation

Classification by accident	Number of accidents	Insurance (JPY one million)	Average insurance money per case (JPY)	Evaluation	
				Number of accidents	Insurance money
Crew	13,185	29,178	2,212,945	Greater	Fewer
Cargo damage	10,483	16,473	1,571,383	Greater	Fewer
Damage reports regarding harbour and fishery facilities	**2,481**	**27,805**	**11,207,095**	**Greater**	**Large**
Other people except crew	750	1,982	2,642,474	Fewer	Small
Collision	421	15,553	36,942,304	Fewer	Large
Oil spill	335	1,693	5,055,088	Fewer	Medium
Groundings, sinking and fire	108	21,049	194,896,468	Fewer	Large
Others	2,073	3,654	1,762,564	Fewer	Small
Total	29,836	117,386	3,934,372		

Table 16　Ocean going vessels　The number of accidents and insurance money evaluation

Because the insurance and supplementary content for ocean going vessels is different from those of coastal vessels, we compared the number of accidents and the insurance money in a bar graph, similar to those of coastal vessels, and evaluated it as follows.

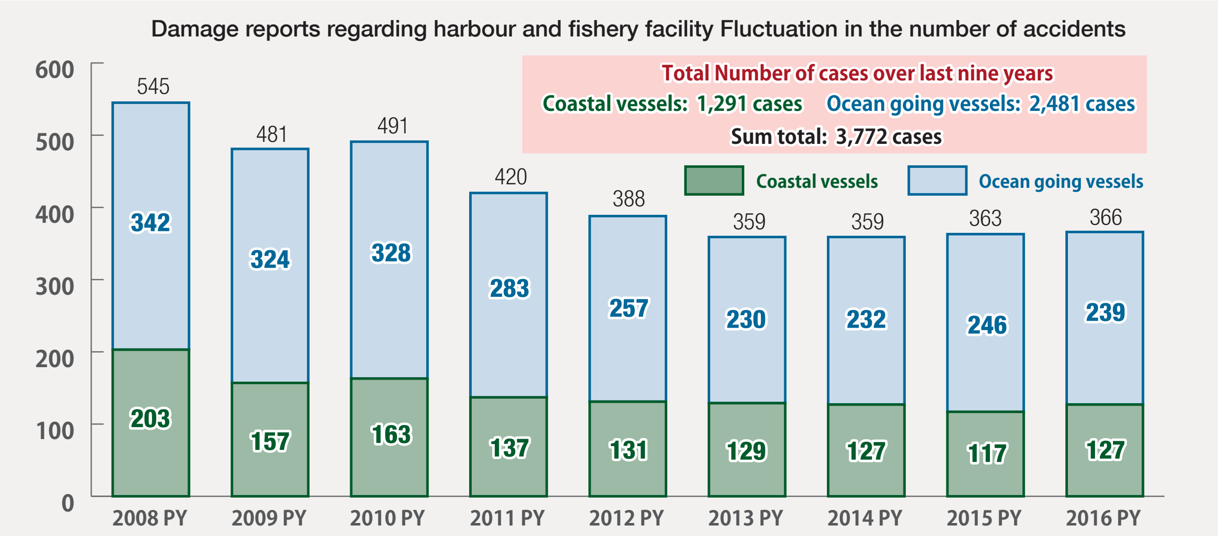
- **It is a necessary to reduce them, because the number of crew accidents is significant. However, the simple average of insurance money for one case is approximately one sixth of that of a coastal vessel.**
- **The simple average insurance money per damaged accident regarding harbour and fishery facilities is large only after huge accidents such as collision, groundings, sinkings and fire. It is necessary to reduce this.**

Naturally, the goal is for an accident never to occur, however, it is becoming evident that loss records will be greatly improved if the number of accidents regarding harbour and fishery facilities are reduced for both coastal and ocean going vessels.

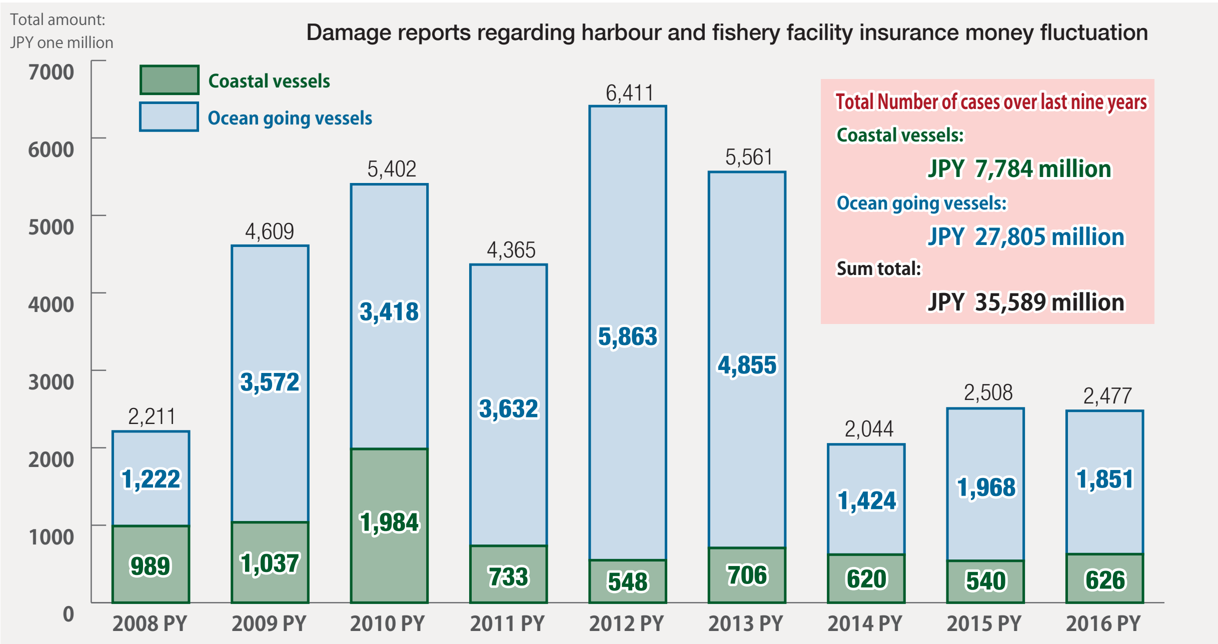
§3 Damage statistics regarding harbour and fishery facilities

§ 3−1 Trends concerning damage to harbour and fishery facilities caused by coastal and ocean going vessels

Trends concerning all accidents in our Club were referred to in the previous chapter. Here, damage sustained by harbour and fishery facilities will be analysed.



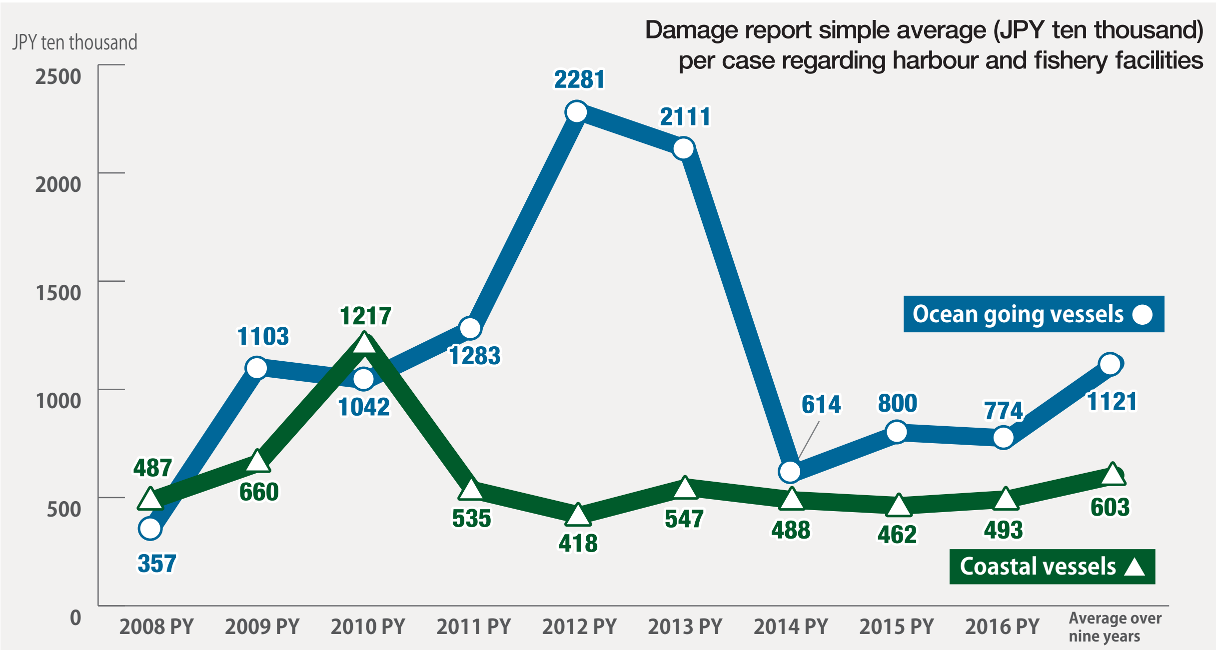
Graph 17 Damage reports regarding harbour and fishery facility Fluctuation in the number of accidents



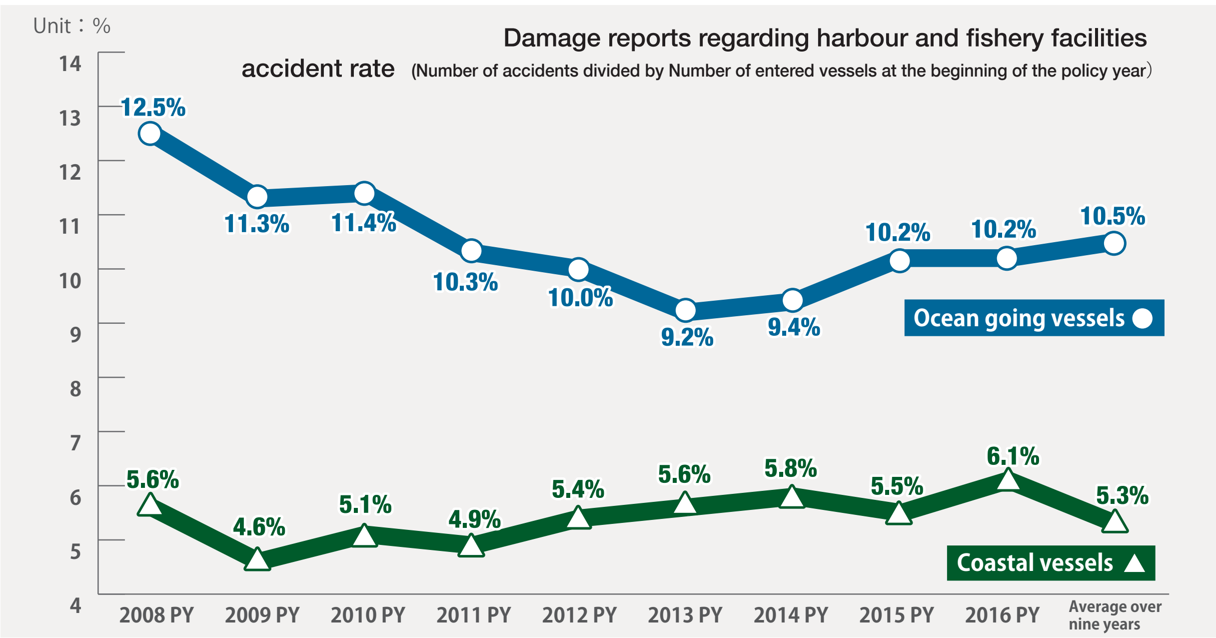
Graph 18 Damage reports regarding harbour and fishery facility insurance money fluctuation

The total number of accidents over nine years concerning coastal and ocean going vessels was 3,772 cases: the number of accidents for ocean going vessels accounts for 2,481 cases, which is approximately double that of coastal vessels. In addition, the total number of accidents for both coastal and ocean going vessels came to approximately 360 cases. This figure has remained constant since 2013PY.

On the other hand, insurance money greatly fluctuates depending on the scale of the accident. Further, accidents that occurred on ocean going vessels accounted for approximately 3.6 times that of accidents that occurred on coastal vessels. 67 cases regarding large accidents of more than JPY 50 million occurred between 2009 PY to 2013 PY (coastal vessels: 22 cases and ocean going vessels: 45 cases, average 13.4 cases per year). Meanwhile, the number of large accidents after 2014 PY increased up to 20 cases (coastal vessels: 5 cases and ocean going vessels: 15 cases, average 6.7 cases per year). This is also shown in the simple average insurance amount per case.



Graph 19 Damage report simple average (JPY ten thousand) per case regarding harbour and fishery facilities

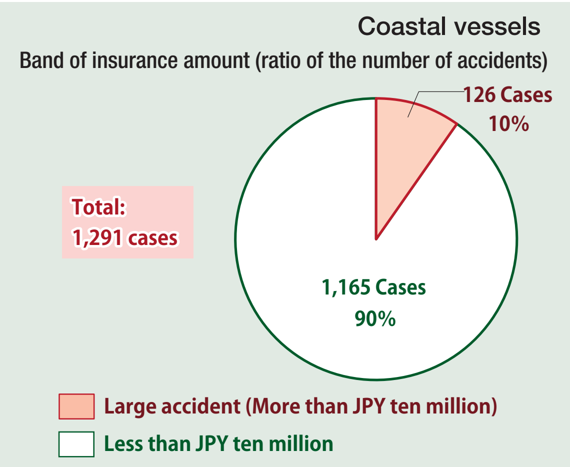


Graph 20 Damage reports regarding harbour and fishery facilities
accident rate (Number of accidents divided by Number of entered vessels at the beginning of the policy year)

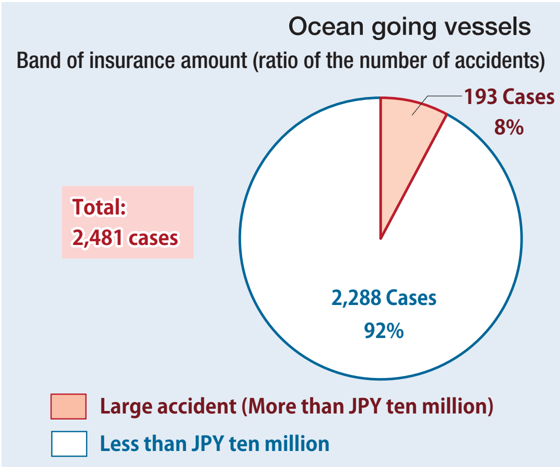
Unit of insurance money: JPY one million

Amount band (insurance)	Ocean going vessels				Coastal vessels				Total			
	Number of accidents		Insurance money		Number of accidents		Insurance money		Number of accidents		Insurance money	
	Number of accidents	%	Insurance money	%	Number of accidents	%	Insurance money	%	Number of accidents	%	Insurance money	%
More than JPY one billion	5	0.2%	11,739	42.2%	0	0.0%	0	0.0%	5	0.1%	11,739	32.9%
More than JPY 100 million but less than JPY one billion	27	1.1%	9,022	32.4%	13	1.0%	2,882	37.0%	40	1.1%	11,905	33.5%
More than JPY 50 million but less than JPY 100 million	28	1.1%	1,992	7.2%	17	1.3%	1,275	16.4%	45	1.2%	3,267	9.2%
More than JPY ten million but less than JPY 50 million	133	5.4%	2,727	9.8%	96	7.4%	1,961	25.2%	229	6.1%	4,688	13.2%
Large accident (More than JPY ten million) subtotal	193	7.8%	25,481	91.6%	126	9.8%	6,118	78.6%	319	8.5%	31,598	88.8%
More than JPY five million but less than JPY ten million	121	4.8%	851	3.1%	82	6.4%	580	7.4%	203	5.4%	1,431	4.0%
More than JPY one million but less than JPY five million	431	17.4%	1,005	3.6%	354	27.4%	825	10.6%	785	20.8%	1,830	5.1%
Less than JPY one million	1,736	70.0%	468	1.7%	729	56.5%	261	3.4%	2,465	65.3%	730	2.1%
Less than JPY ten million subtotal	2,288	92.2%	2,324	8.4%	1,165	90.2%	1,666	21.4%	3,453	91.5%	3,990	11.2%
Total	2,481	100.0%	27,805	100.0%	1,291	100.0%	7,784	100.0%	3,772	100.0%	35,589	100.0%

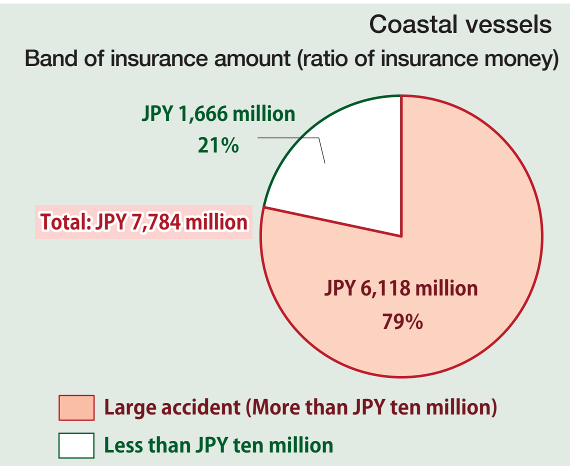
Table 21 Coastal vessels Harbour and fishery facilities by insurance amount Number of accidents and ratio



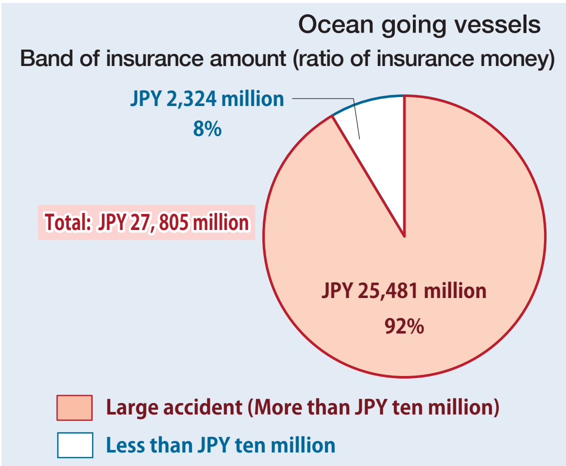
Graph 22



Graph 23



Graph 24



Graph 25

In addition, large accident claims accounted for more than JPY 10 million: 10% for coastal vessels and 8% for ocean going vessels, however, when it comes to insurance money, it is 79% for coastal vessels and 92% for ocean going vessels respectively, which means that large accidents make for worse loss records.

Meanwhile, looking at the accident rate which was divided by the number of accidents by the number of entered vessels at the beginning of the policy year, it is possible to see that ocean going vessels is approximately double that of coastal vessels.
Also, compared to the year when accident rates were at their lowest (coastal vessels: 2009PY(4.6%) and ocean going vessels: 2013PY (9.2%)), it is notable that the accident rates for both coastal and ocean going vessels have been increasing slightly since then.

Looking closely at the total number of accidents and insurance money over the past nine years by band of insurance amount, the sum total number of accidents for coastal and ocean vessels was 319 cases, which occupied 8.5% of the total. The insurance money was JPY 31,598 million (88.8% in total). Also, the number of accidents that came to more than JPY one million were 45 cases, which occupied only 1.2% of the total, however, as for insurance money, it accounts for JPY 23,644 million, which is 66.5% of the total.

Cases that claimed more than JPY 500 million will be introduced in the following.
In addition to damaging the quay, accidents involving damage to the on shore cargo work facilities and leakage of oil will significantly increase the magnitude of the accident.

Cases that claimed more than JPY 500 million

Ocean-going container vessel 1

In April 2009, at the time of ship departure from a quay of Port Said in Egypt, when turning round with the assistance of two tug boats, she closed to the quay on her port side stern due to drifting caused by wind pressure. As she made contact with a gantry crane which was consequently damaged, the repair fee and loss of time insurance for the gantry crane was claimed for. This was caused by the pilot's miss-maneuvering.

Ocean-going container vessel 2

In December, 2009, at the time of departure on ballast condition from Osaka Nanko, she was flown under during strong wind in the sea route after having left the wharf while using two tug boats, and came into contact with a breakwater causing damage to it. Also, a broken hole was made in the shell plating of the hull and approximately 0.8KL of fuel oil was spilt. Because spilt oil appeared inside the tetrapod, it took two years to remove it. The cause was the pilot's miss-maneuvering.

Coastal tanker 3

In October 2010, during a berthing operation using two tug boats at the petroleum station in Okinawa, ship posture control was lost and she made contact with the mooring dolphin on her port side stern. A broken hole was made in the fuel tank and approximately 46KL of fuel oil was spilt. A huge expense was incurred on the dolphin's repair cost, fuel oil washing operation and fishery compensation. The cause was down to the Master's miss-maneuvering.

Ocean-going container vessel 4

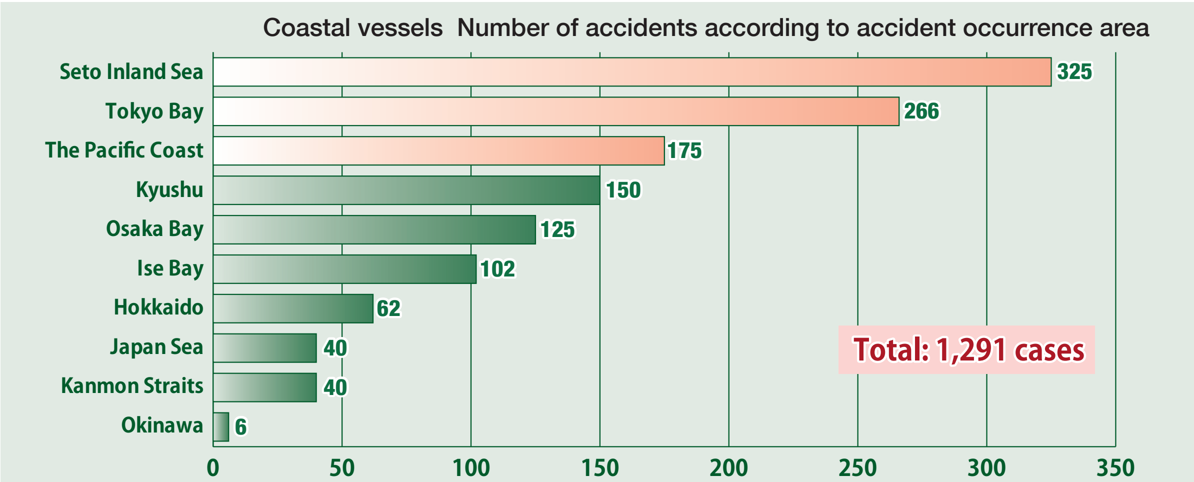
In January, 2010, during the berthing operation at Tokyo Oi Container Terminal using one tug boat, it made contact with a gantry crane due to excessive speed. Crane repair and inactivity incurred a huge cost. This was caused by the pilot's miss-maneuvering.

Most damage to harbour facilities is caused by miss-maneuvering by the ship commander such as the Master or pilot. Particularly, the risk increases in the event of sudden weather change at the time of leaving the wharf and during berthing operation. It will be difficult to ensure that the number of damaged accidents be zero, however, through BTM, it will be possible to reduce the amount of damage caused to harbour facilities. For example, after a pilot comes on board at both the time of entering and departing port, to not rely solely on his maneuvering, but to have a briefing regarding the ship maneuvering procedure with the Master and exchange necessary information with each other. Further, when it comes to coastal vessels where the pilot is not required to board, it should be seen to it that sole maneuvering is not carried out by the Master, but that his intentions of ship maneuvering are shared with the other crew on the bridge, fore/after stations and the Chief engineer.

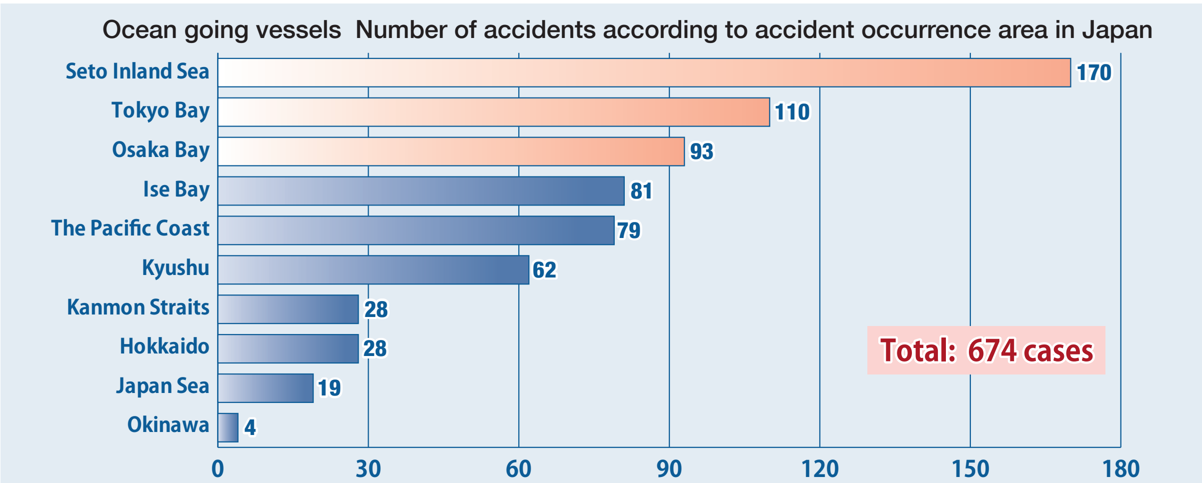
In addition, ship bottom contact accidents have occurred frequently because of a lack of investigation concerning harbour facilities in advance. Needless to say, it is important to regularly check harbour facilities in advance, even if the vessel has been navigating the line frequently.

§ 3−2　Statistics on the number of accidents by accident occurrence area in Japan

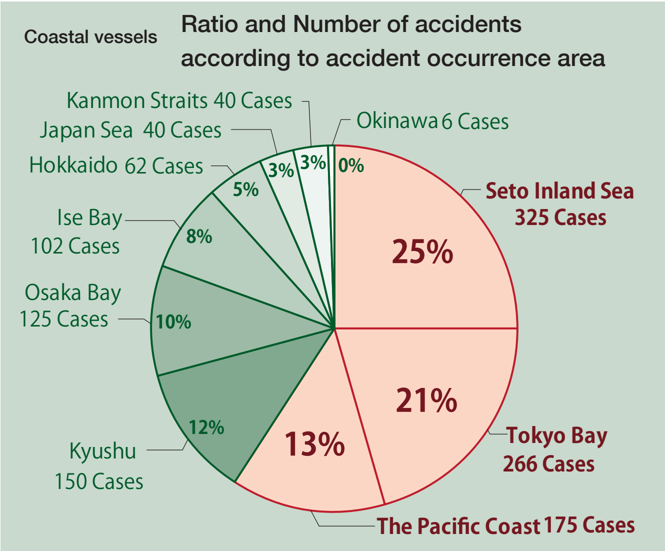
Accidents regarding harbour and fishery facilities in Japan were compiled by accident occurrence area.



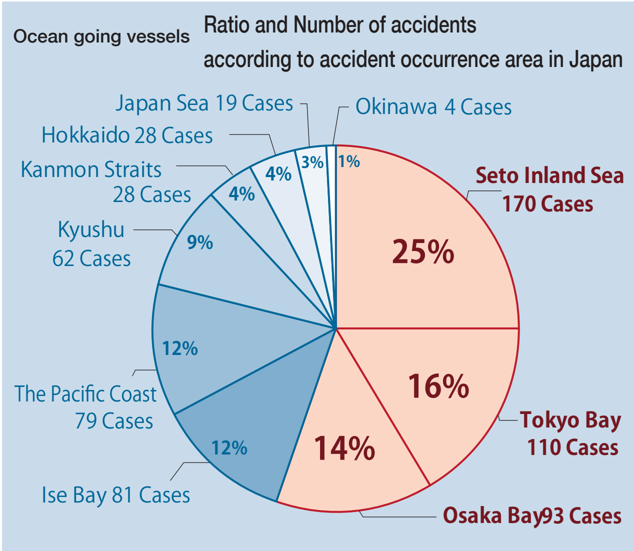
Graph 26　Coastal vessels　(number of accidents according to accident occurrence area)



Graph 27　Ocean going vessels　(number of accidents according to accident occurrence area in Japan)



Graph 28

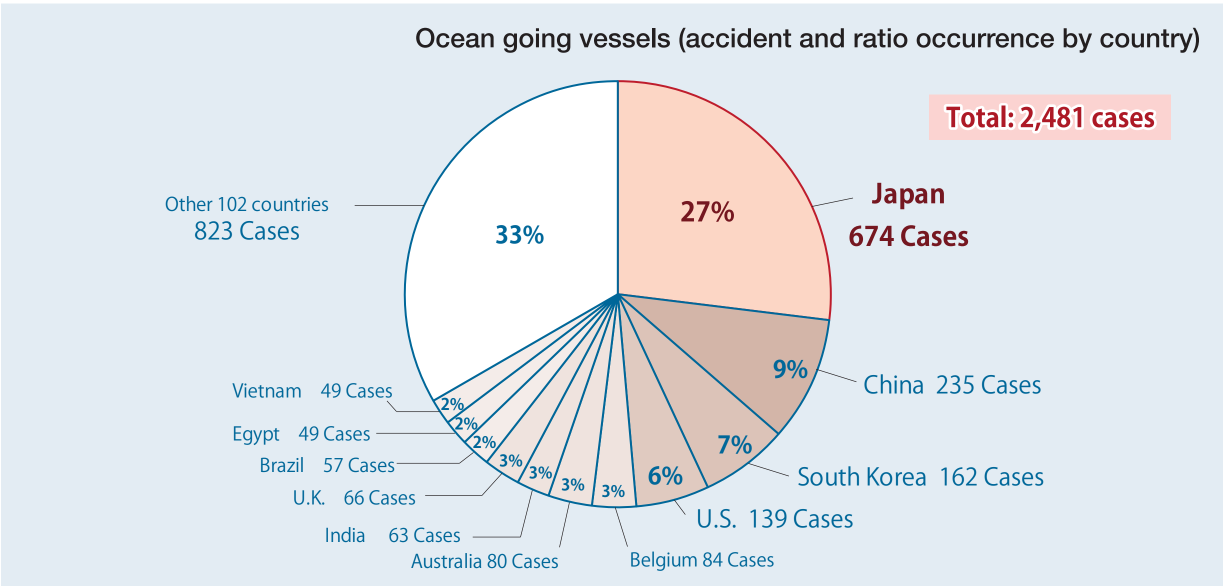


Graph 29

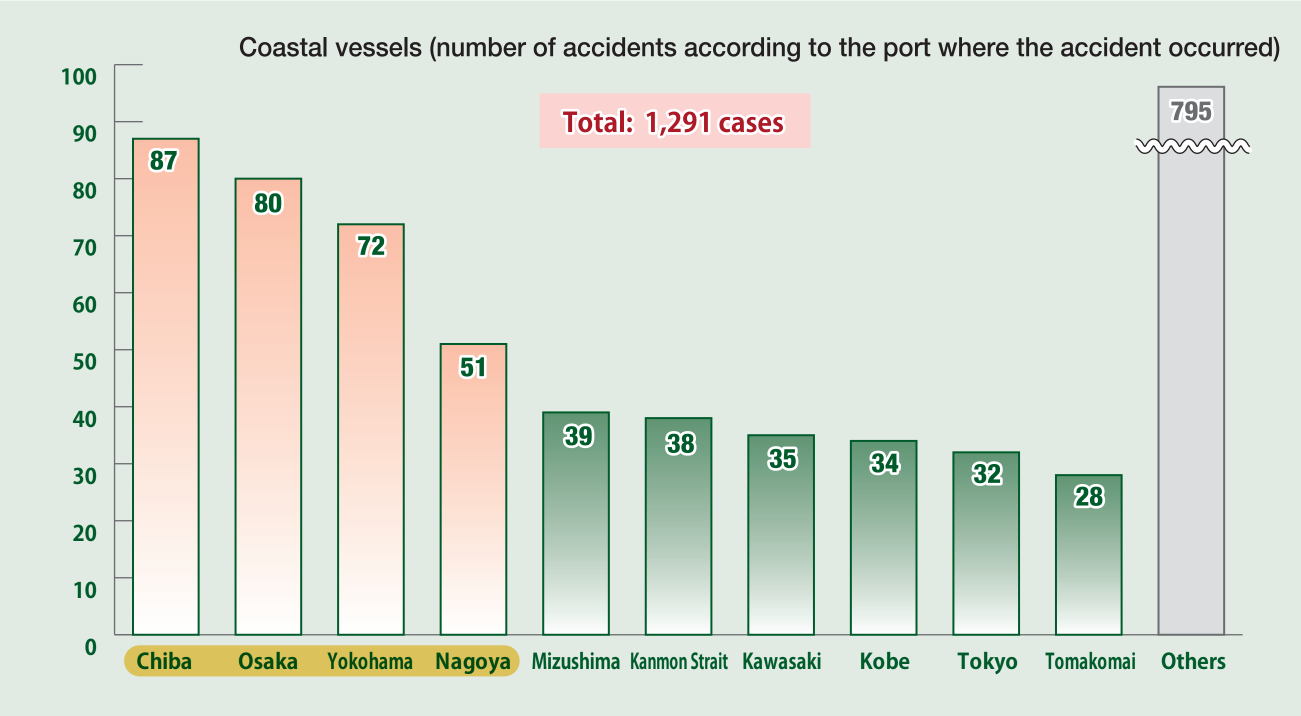
For a more accurate analysis, it was necessary to compare the number of entered and departed ports of our Club's members' ships by area over the past nine years, using the number of entered and departed ports by region, and comparing this with the accident occurrence rate as a denominator. However, unfortunately, because data of such numbers of entered and departed ports was not available, we only compared this with the number of accidents.

It should only be natural to imagine that a large number of accidents occur at Tokyo Bay, Ise Bay and Osaka Bay where main ports are concentrated, and Inland sea where both coastal and ocean going vessels frequent. Coastal and ocean going vessels account for about 70% of accidents in these top four areas. However, both coastal and ocean going vessels that continue to use these major ports, continue to experience accidents at Pacific Ocean coastal ports, also. (Coastal vessels occupy third place and ocean going vessels occupy fifth place)

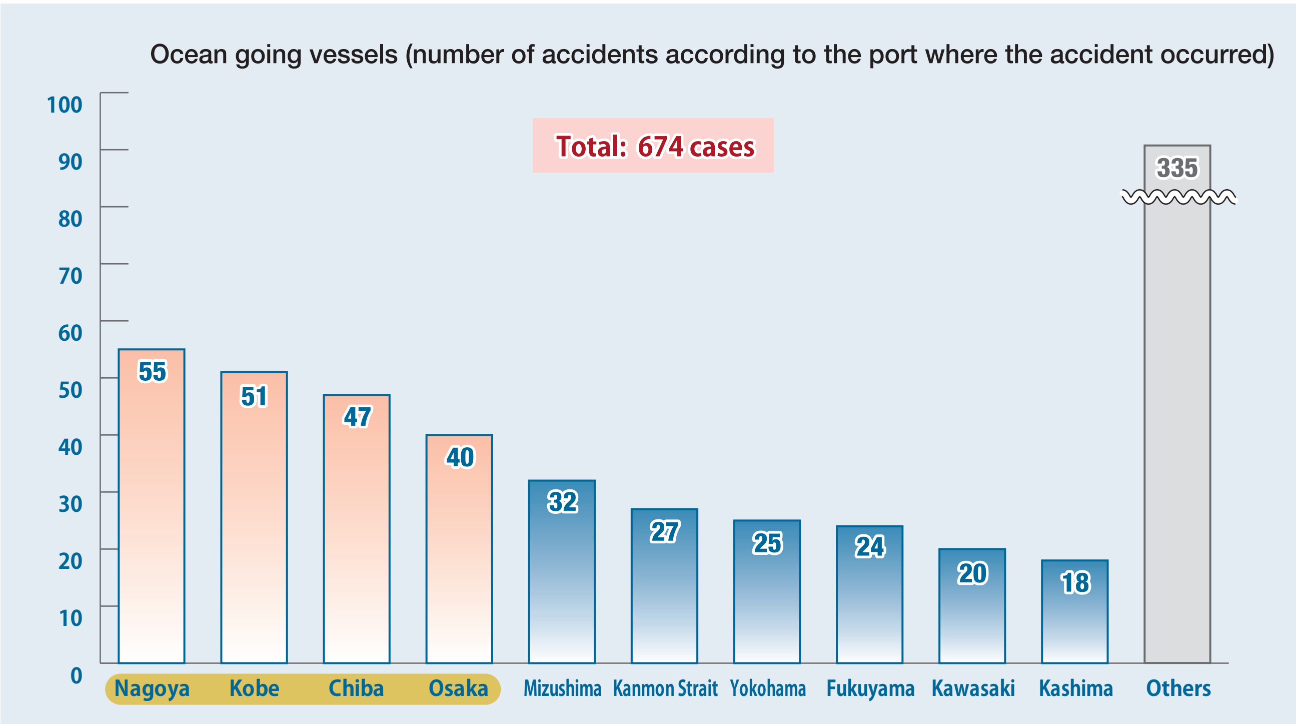
As a matter of fact, the number of accidents by country for ocean going vessels is shown in the pie chart below. The number of accidents that occurred in Japan occupied 27% of the total number of accidents.



Graph 30 Ocean going vessels (accident and ratio occurrence by country)



Graph 31 Coastal vessels (number of accidents according to the port where the accident occurred)



Graph 32 Ocean going vessels (number of accidents according to the port where the accident occurred)

Moreover, we summarised the number of accidents by port.
A large number of accidents occurred at main ports for both types of vessels. One of the causes among the main ports of Nagoya, Osaka and Kobe and Chiba appears to be down to their similar quay structure.

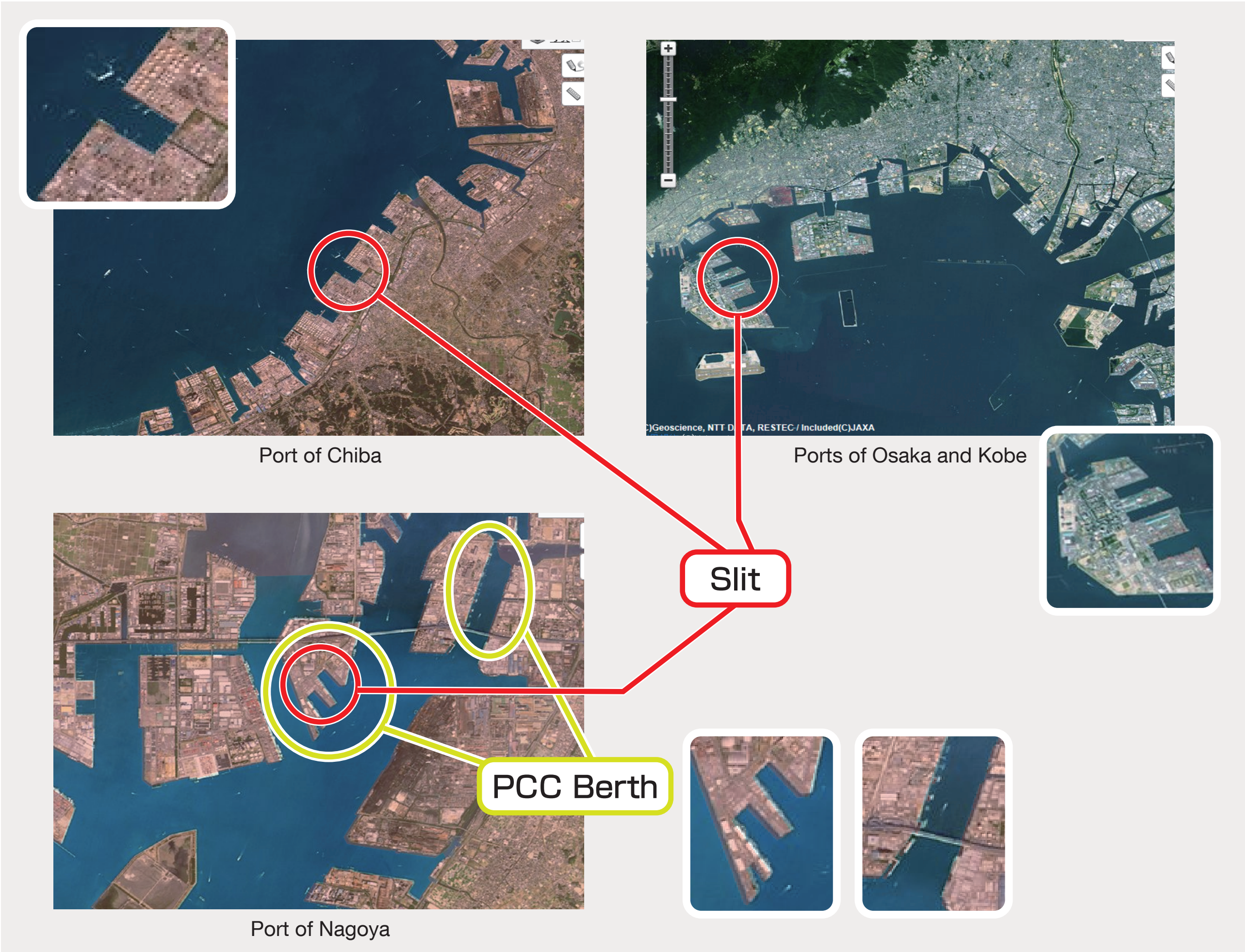


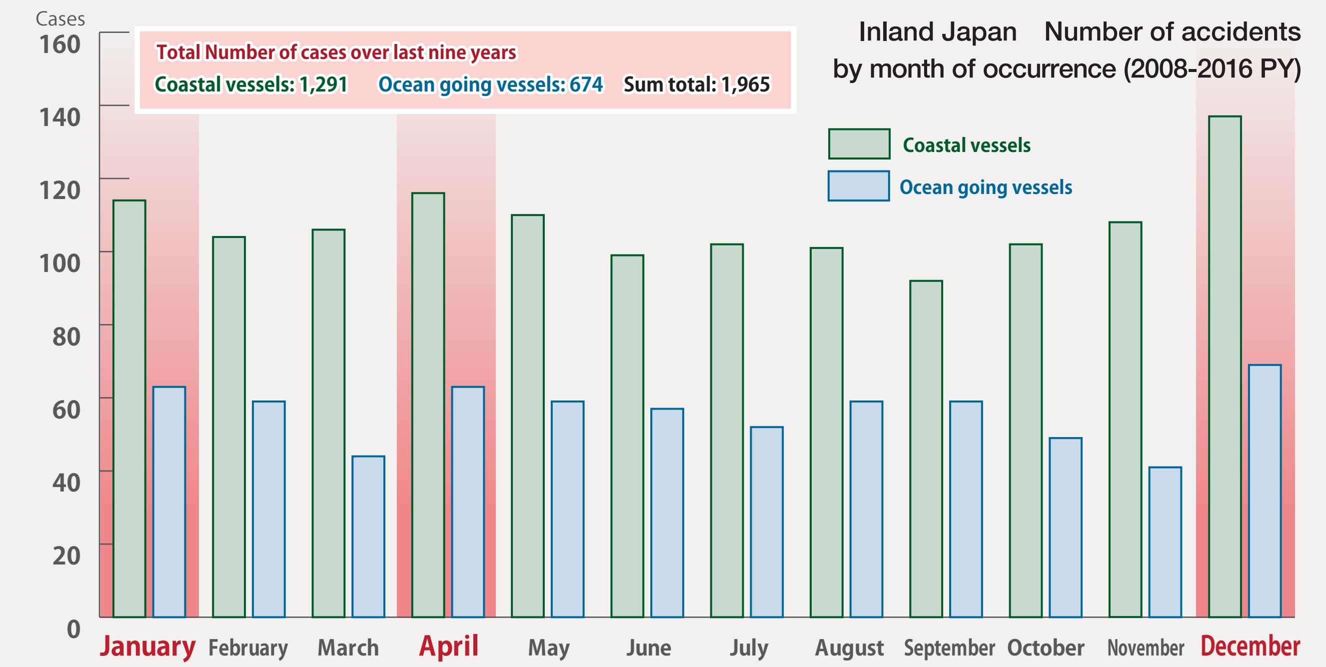
Fig. 33　Picture of Slits

Regarding the way that these ports are configured, there are a large number of slit type quays where larger vessels are also to dock, which presumably could be causing the accidents. At the port of Nagoya, there are a large number of Pure Car Carriers (PCC) entering the port and the accident rate for this type of ship, which will be mentioned below, is high. Moreover, the frequency of docking on this slit type quay adds to increase the risk of accidents occurring.

§ 3−3　Statistics on the number of accidents by accident occurrence month in Japan

There is the tendency that the number of accidents at the end of the year, beginning of the new year and at the beginning of the Japanese fiscal year (April) is larger for coastal and ocean going vessels, compared with other months throughout a year. Regarding ocean going vessels, there were no trends like this in other countries but Japan. Thus, this is characteristic of harbour and fishery facility accidents in Japan.

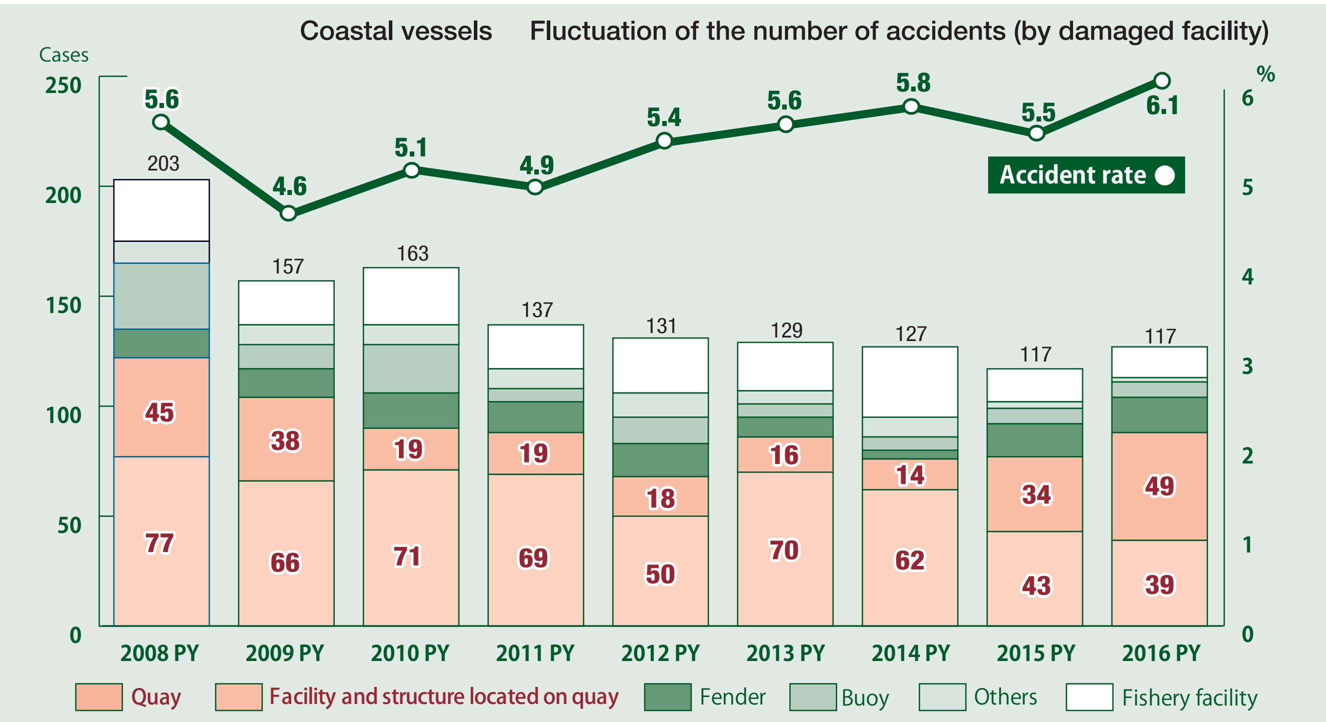
So as to eliminate such accidents, it will be necessary to remind vessels of these time periods.



	January	February	March	April	May	June	July	August	September	October	November	December
Coastal vessels	114	104	106	116	110	99	102	101	92	102	108	137
Ocean going vessels	63	59	44	63	59	57	52	59	59	49	41	69

Graph 34 Inland Japan Number of accidents by month of occurrence (2008-2016 PY)

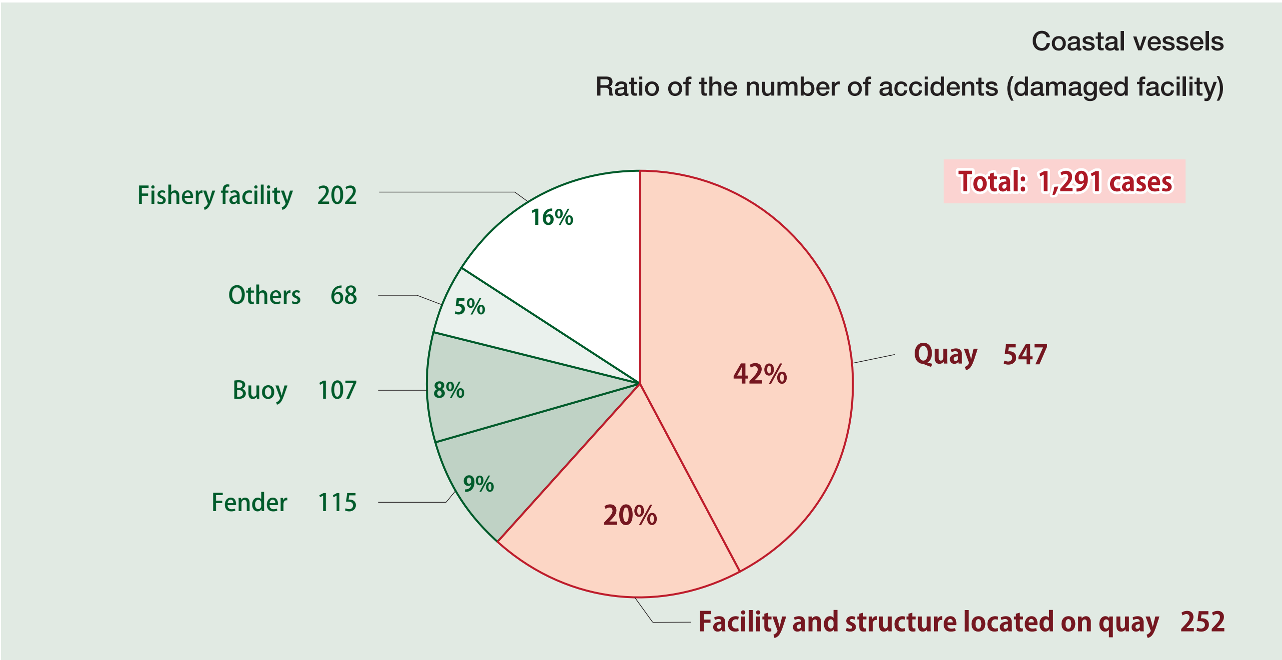
§ 3−4 Statistics on the number of accidents by damaged facility



Graph 35 Coastal vessels Harbour and fishery facilities Fluctuation of the number of accidents (by damaged facility)

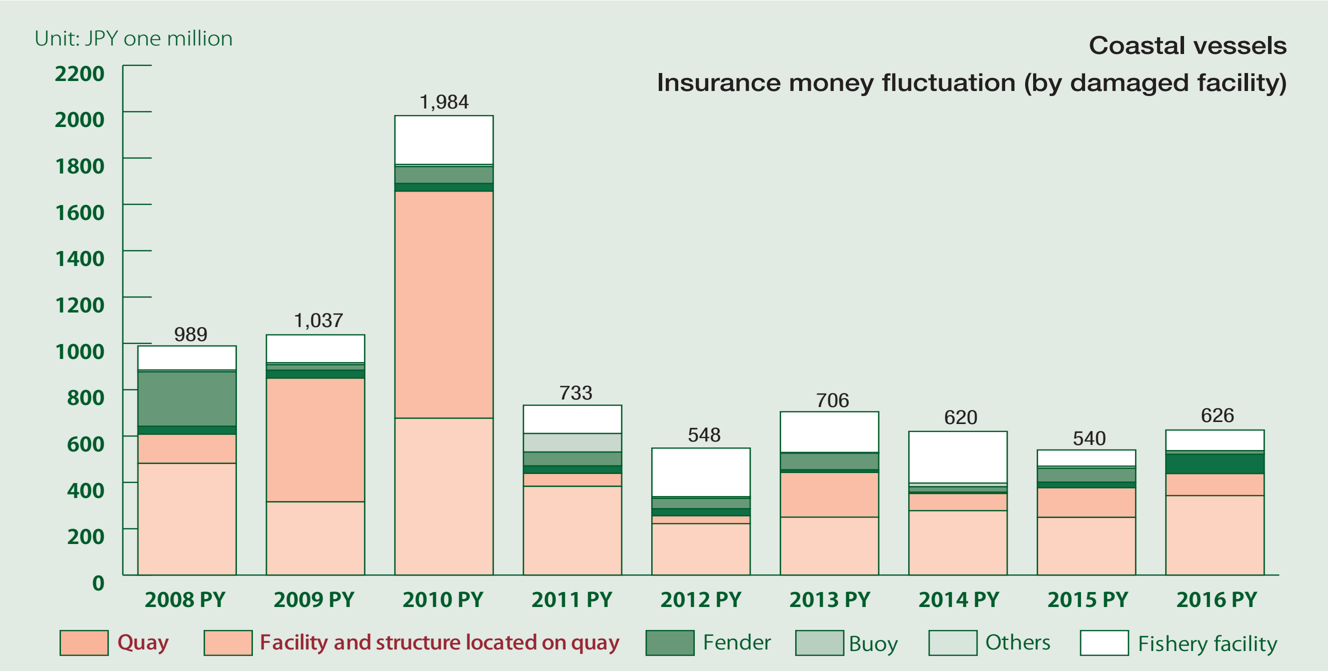
	2008 PY	2009 PY	2010 PY	2011 PY	2012 PY	2013 PY	2014 PY	2015 PY	2016 PY	Total	%
Quay	77	66	71	69	50	70	62	43	39	547	42%
Facility and structure located on quay	45	38	19	19	18	16	14	34	49	252	20%
Fender	13	13	16	14	15	9	4	15	16	115	9%
Buoy	30	11	22	6	12	6	6	7	7	107	8%
Others	10	9	9	9	11	6	9	3	2	68	5%
Fishery facility	28	20	26	20	25	22	32	15	14	202	16%
Total	203	157	163	137	131	129	127	117	127	1,291	100%
Number of entered vessels at the beginning of the policy year	3,609	3,428	3,225	2,799	2,436	2,319	2,176	2,134	2,091	24,217	
Accident rate (Number of accidents divided by Number of entered vessels ×100%)	5.6	4.6	5.1	4.9	5.4	5.6	5.8	5.5	6.1	5.3	

Table 36　Coastal vessels　Fluctuation of the number of accidents (by damaged facility)



Graph 37 Coastal vessels　Ratio of the number of accidents (damaged facility)

Examining the number of accidents of coastal vessels by damaged facility, the sum total of quay damage accidents (42%) and structure damage accidents including quay facilities (20%) occupy more than half of the total number of accidents.

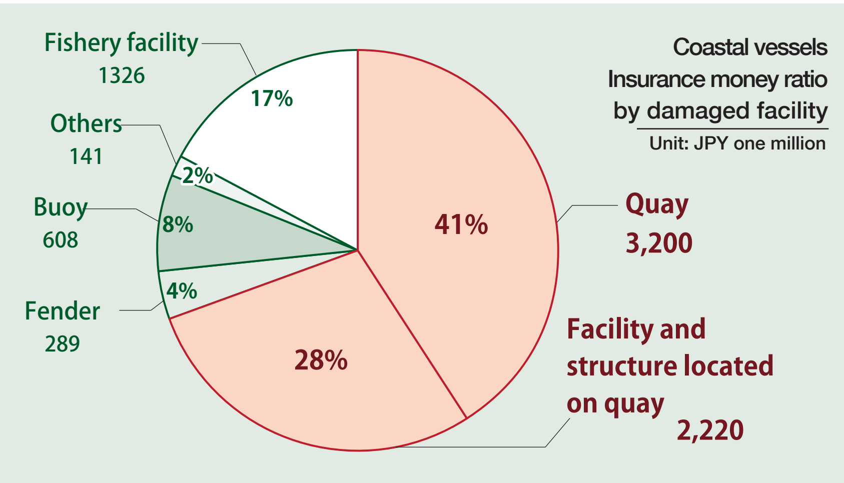


Graph 38　Coastal vessels　Insurance money fluctuation (by damaged facility)

Unit of insurance money: JPY one million

	2008 PY	2009 PY	2010 PY	2011 PY	2012 PY	2013 PY	2014 PY	2015 PY	2016 PY	Total	%
Quay	482	316	677	383	222	250	278	249	343	3,200	41%
Facility and structure located on quay	126	534	980	56	34	193	74	128	95	2,220	28%
Fender	34	34	33	32	30	11	6	24	83	289	4%
Buoy	235	24	73	60	45	72	23	60	16	608	8%
Others	8	8	9	80	7	3	16	9	0	141	2%
Fishery facility	104	121	211	122	210	176	223	70	89	1,326	17%
Total	989	1,037	1,984	733	548	706	620	540	626	7,784	100%
Accident rate	13%	13%	26%	9%	7%	9%	8%	7%	8%	100%	

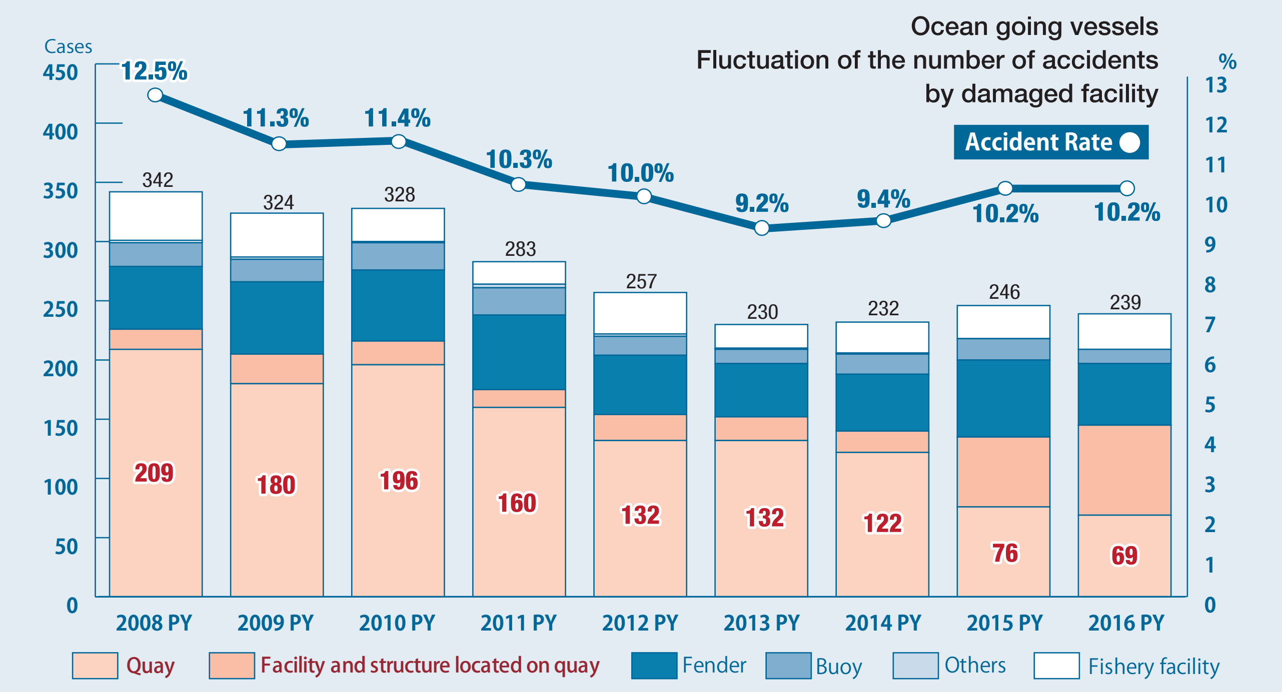
Table 39　Coastal vessels　Insurance money fluctuation (by damaged facility)



Graph 40　Coastal vessels　Insurance money ratio (by damaged facility)

On the other hand, regarding insurance money, 2010 PY is prominent compared to other insurance years due to one large accident (929 million yen: 47% of 2010 PY overall) that occurred.

Also, regarding damaged facilities, insurance money regarding quay damage, quay facilities and structure damage occupy 70% of the total.

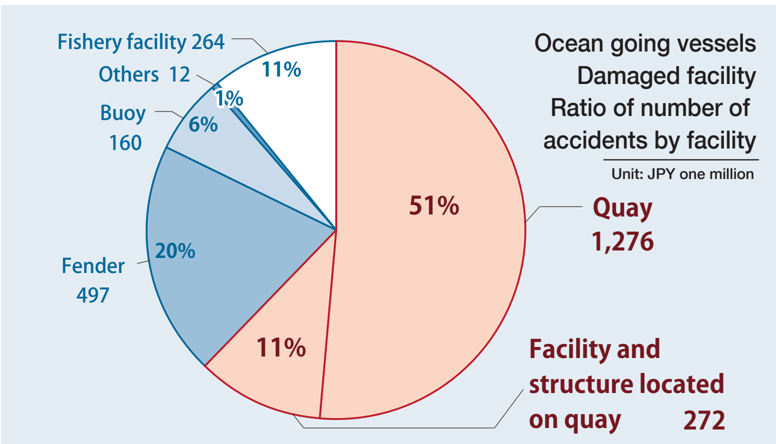


Graph 41 Ocean going vessels Fluctuation of the number of accidents (by damaged facility)

Unit of insurance money: JPY one million

	2008 PY	2009 PY	2010 PY	2011 PY	2012 PY	2013 PY	2014 PY	2015 PY	2016 PY	Total	%
Quay	209	180	196	160	132	132	122	76	69	1,276	51%
Facility and structure located on quay	17	25	20	15	22	20	18	59	76	272	11%
Fender	53	61	60	63	50	45	48	65	52	497	20%
Buoy	20	19	23	23	16	12	17	18	12	160	6%
Others	2	2	1	3	2	1	1	0	0	12	1%
Fishery facility	41	37	28	19	35	20	26	28	30	264	11%
Total	342	324	328	283	257	230	232	246	239	2,481	100%
Number of entered vessels at the beginning of the policy year	2,745	2,866	2,880	2,757	2,576	2,500	2,475	2,406	2,333	23,538	
Accident rate (Number of accidents divided by number of entered vessels ×100%)	12.5	11.3	11.4	10.3	10.0	9.2	9.4	10.2	10.2	10.5	

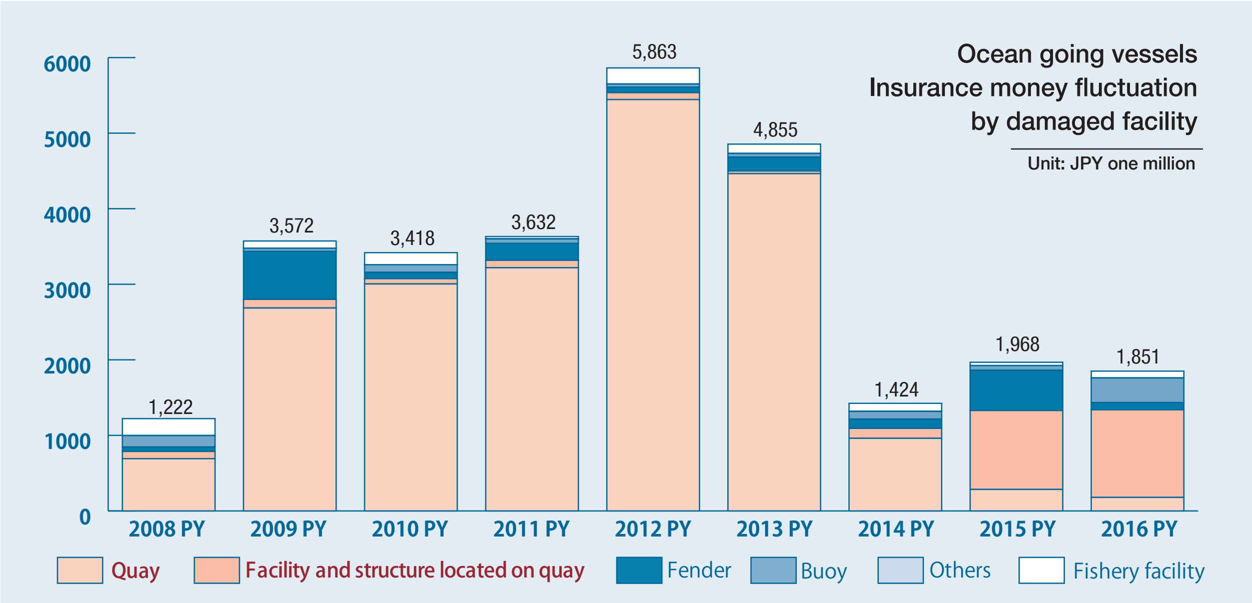
Table 42 Ocean going vessels Fluctuation of the number of accidents (by damaged facility)



Graph 43 Ocean going vessels Damage facility Ratio of number of accidents (by facility)

Similar to coastal vessels, regarding the number of accidents by damaged facility in ocean going vessels including accidents that occurred outside of Japan also, the sum total of quay damaged accidents (51%) and structure damage accidents including quay facilities (11%) occupy more than half of the total number of accidents. However, fender damage accidents account for a large percentage (20%) which is different to that of coastal vessels.

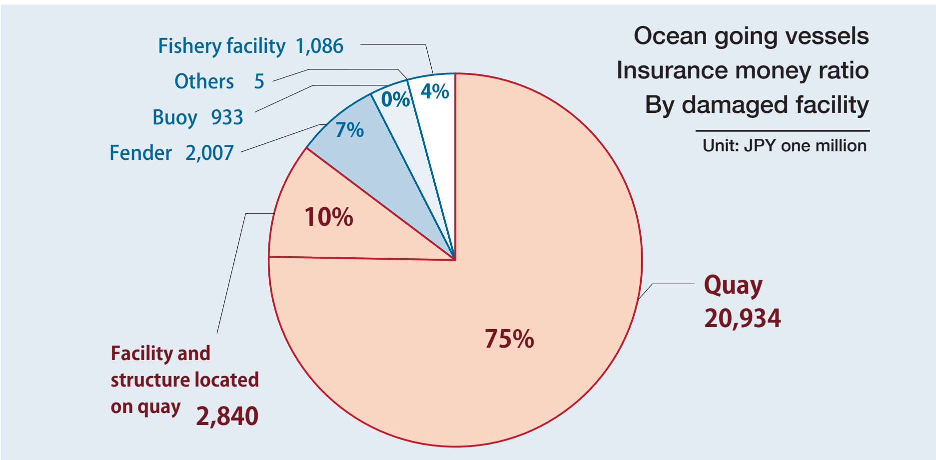
Regarding fender damage accidents, it includes fender accidents which occur as a result of wear and tear. It is not fair to include all of these causes with vessel miss-maneuvering. Especially, if the aged fender is damaged at a public quay, then renewal by repair may be all that is needed. This kind of work is troublesome.



Graph 44 Ocean going vessels Insurance money fluctuation (by damaged facility)

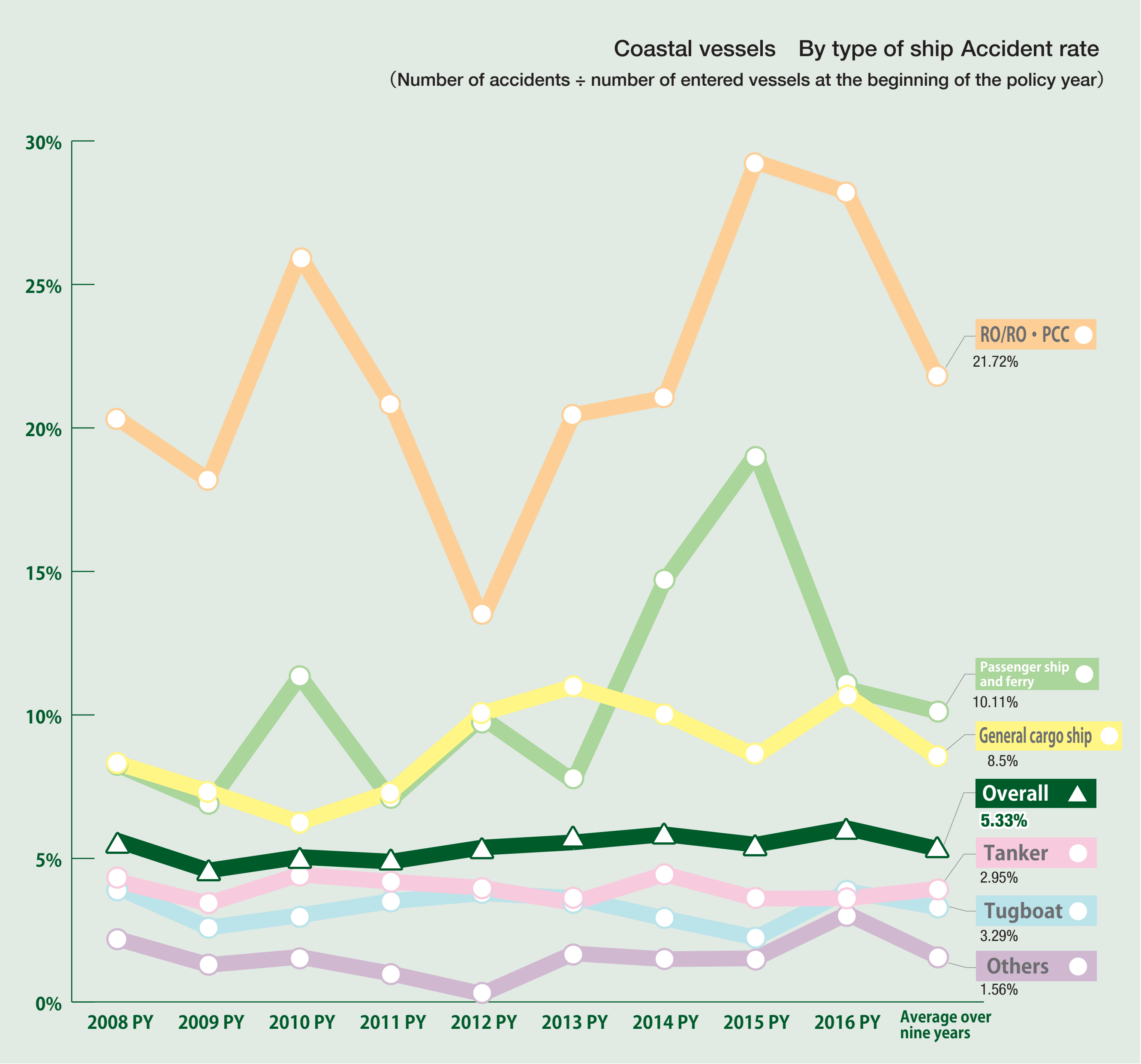
	2008 PY	2009 PY	2010 PY	2011 PY	2012 PY	2013 PY	2014 PY	2015 PY	2016 PY	Total	%
Quay	692	2,686	3,004	3,219	5,444	4,464	961	285	179	20,934	75%
Facility and structure located on quay	95	114	70	98	92	35	132	1,045	1,160	2,840	10%
Fender	59	633	83	223	73	184	123	533	95	2,007	7%
Buoy	151	44	102	59	40	47	101	62	326	933	3%
Others	1	0	0	3	1	1	0	0	0	5	1%
Fishery facility	224	95	159	29	213	124	107	44	91	1,086	4%
Total	1,222	3,572	3,418	3,632	5,863	4,855	1,424	1,968	1,851	27,805	100%
%	4%	13%	12%	13%	21%	17%	5%	7%	7%	100%	

Table 45 Ocean going vessel Insurance money fluctuation (by damaged facility)



Graph 46 Graph 46 Ocean going vessels Insurance money ratio (by damaged facility)

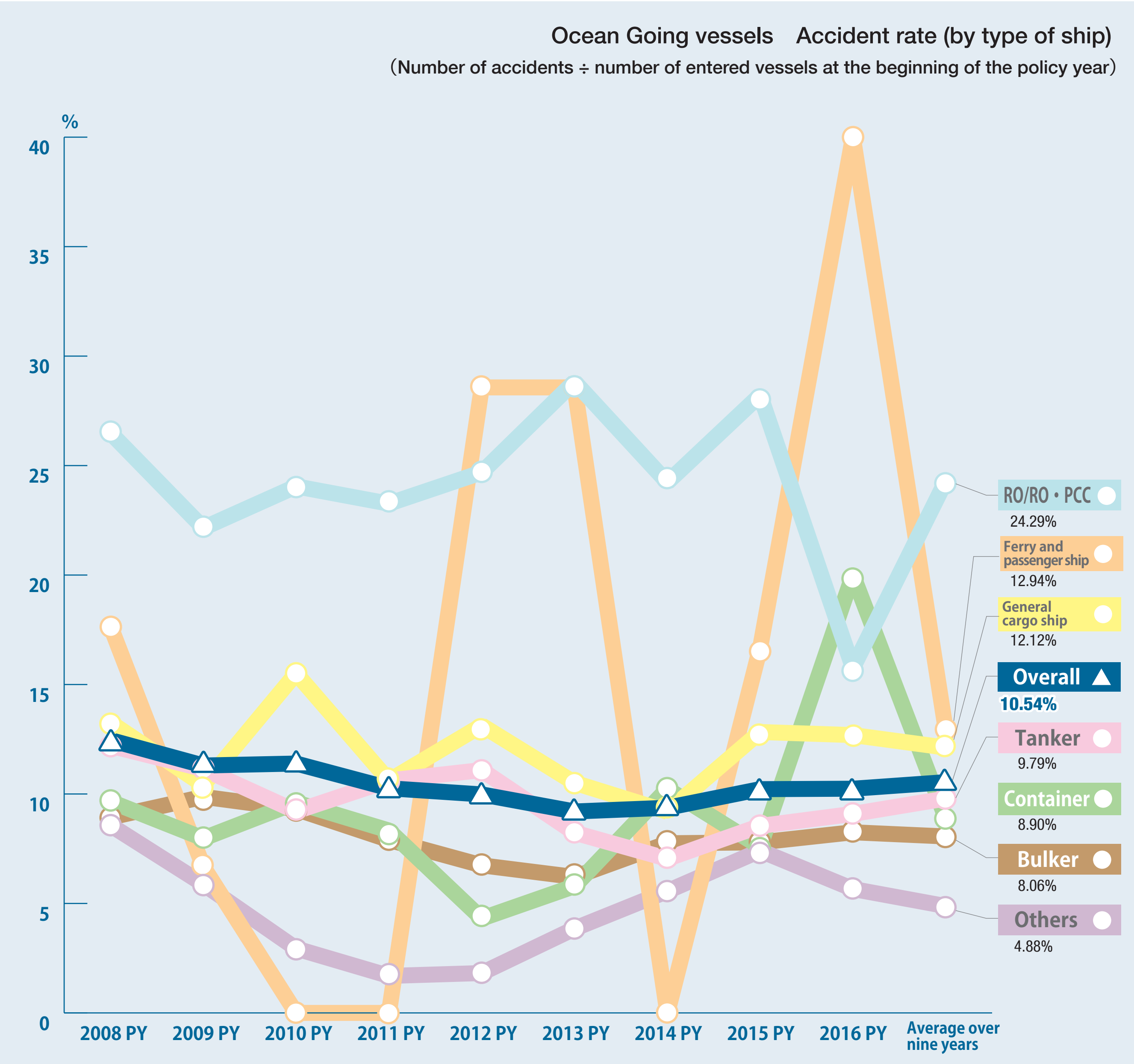
§ 3−5　Statistics on the number of accidents by ship type



Graph 47　Coastal vessels　By type of ship
accident rate (Number of accidents ÷ number of entered vessels at the beginning of the policy year)

Looking closely at the accidents regarding harbour and fishery facilities of coastal vessels by ship type along with accident rate, the following characteristics are found.

- The accident rate for all ship types over the last nine years is 5.33% and, as for simple average, one out of twenty vessels caused an accident.
- However, ship types above this average value are Ro-Ro ships, passenger ships and general cargo ships. In particular, the accident rate of Ro-Ro ships is four times that of the mean value.



Graph 48　Ocean going vessels　By type of ship
accident rate (Number of accidents ÷ number of entered vessels at the beginning of the policy year)

On the other hand, the total accident rate for ocean going vessels is 10.54% over an average of nine years. The ship types above this average value are, similar to those of coastal vessels, Ro-Ro ships and PCCs, which are prominent at 2.3 times (24.29%) that of the mean value.

There is a trend that general cargo ships, ferries and passenger ships are higher than the average value, however, the difference is not so dramatic when compared to coastal vessels.

= Reason as to why accident rates for PCCs and Ro-Ro ships are higher than other ship types =

The wind pressure area of PCCs and Ro-Ro ships is larger than other ships of the same length (length of hull), which require maneuvering with caution. Above all, they tend to be affected by the wind at the time of leaving the wharf and docking.

Also, the ship's hull construction is, as shown in Fig. 49, the Parallel Body (PB: the part contacting to quay) and it is short. And, if the mooring lines at fore and aft station were not rolled up evenly, the fore and aft parts may run aground on the quay (Over Hang) if the PB part loses balance during docking at this point. Consequently, it can cause damage to the edge of the quay, mooring bit, car stopper etc. According to the ship's hull construction shown below in Fig. 49-2, we can see that Over Hung (R) is approximately 1 m 38 cm. This was caused by shifting towards the quay by only one degree.

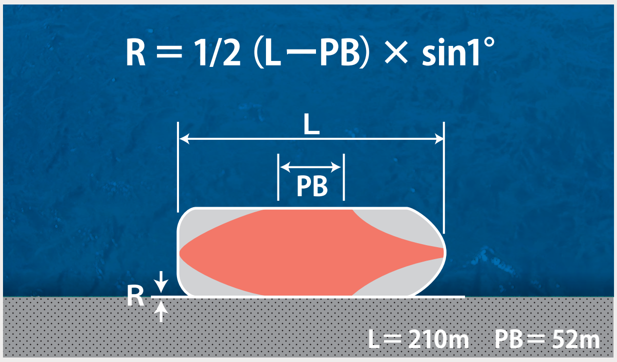


Fig. 49-1

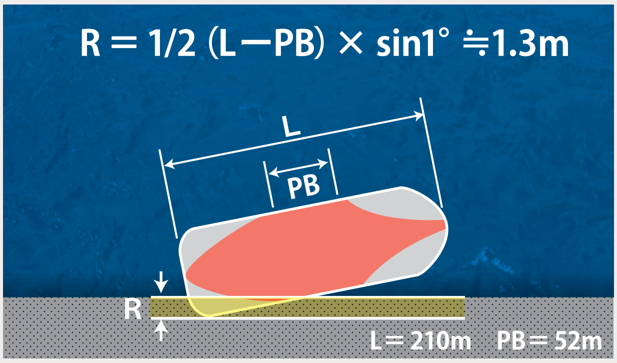


Fig. 49-2

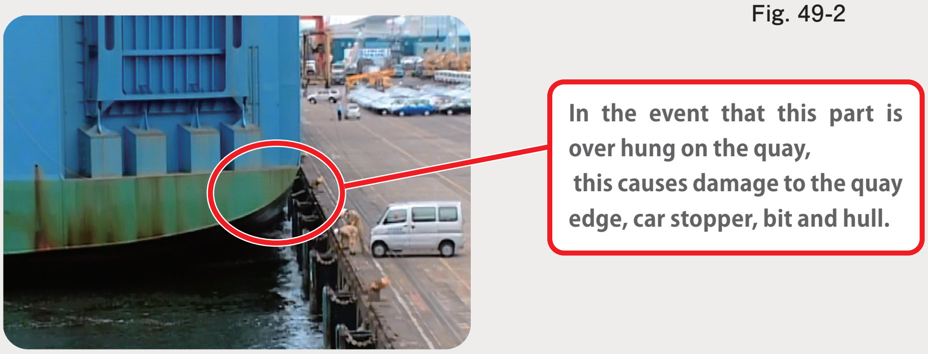


Fig. 49-3

In the event that this part is over hung on the quay, this causes damage to the quay edge, car stopper, bit and hull.

§ 3–6 Statistics on the number of accidents by size of ship (G/T)

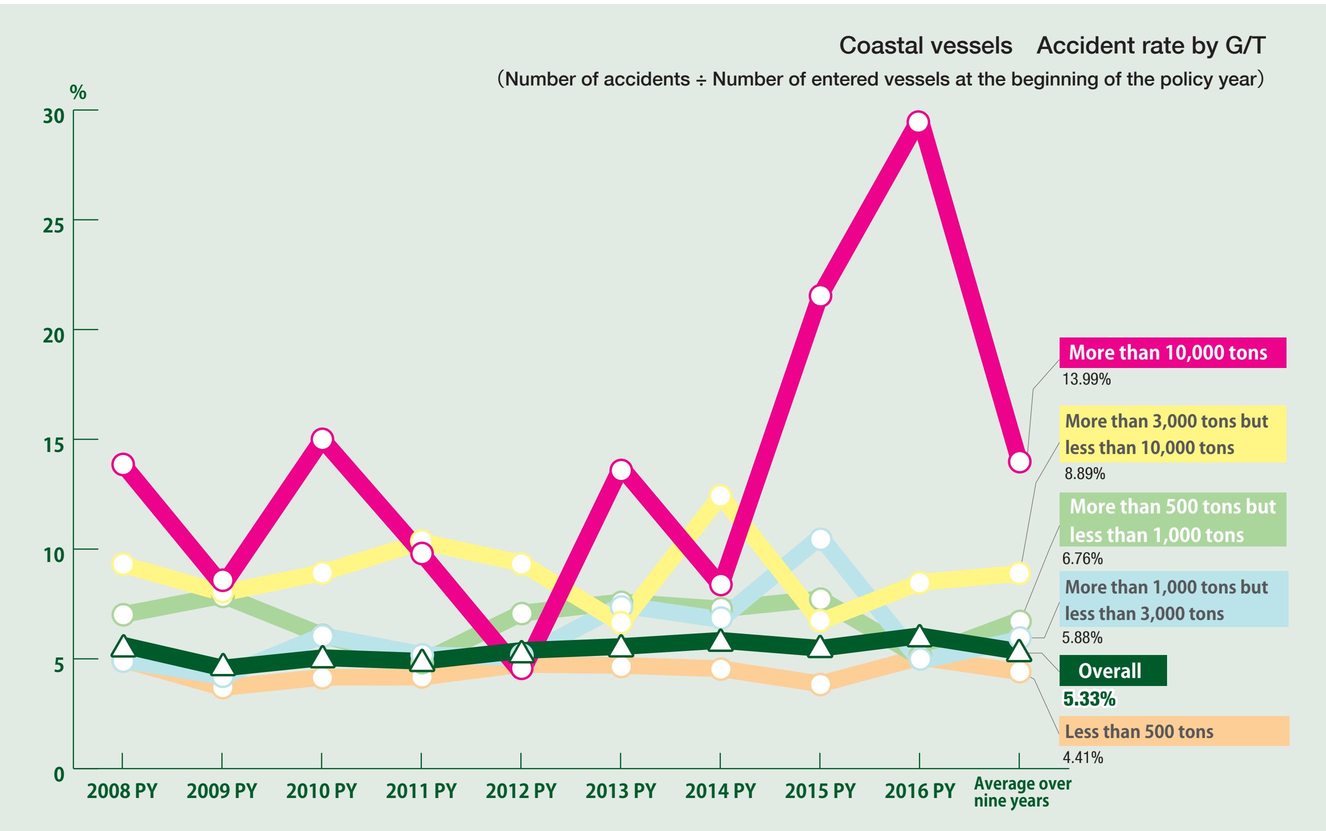
Accidents regarding harbour and fishery facilities of coastal vessels were compared according to the insurance amount.

Because most entered coastal vessels are mainly less than 1,000 G/T, this size of ship occupies the largest number of accidents. Ideally, we should have carried out a more detailed evaluation, by comparing the accident rate that indicates as to how many times each vessel entered and departed the port and how many damaged accidents were caused on each occasion. Also, it is unfortunate that only the comparison of number of accidents and insurance money were mainly discussed in this section, and that there was a lack of data regarding numbers of those entering / leaving ports, similar to "§3-2 Statistics on the number of accidents by accident occurrence area in Japan"

Unit of insurance money : JPY one million

Amount band (insurance)	More than 10,000 tons		More than 3,000 tons but less than 10,000 tons		More than 1,000 tons but less than 3,000 tons		More than 500 tons but less than 1,000 tons		Less than 500 tons		Total	
	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money
More than JPY 100 million but less than JPY one billion	1	929	1	101	1	154	2	409	8	1,288	13	2,882
More than JPY 50 million but less than JPY 100 million	1	94	0	0	3	251	3	211	10	719	17	1,275
More than JPY ten million but less than JPY 50 million	6	100	10	219	7	162	17	383	56	1,097	96	1,961
More than JPY ten million	8	1,123	11	320	11	568	22	1,003	74	3,104	126	6,118
% of total amount	1%	14%	1%	4%	1%	7%	2%	13%	6%	40%	10%	79%
More than JPY five million but less than JPY ten million	4	28	13	102	7	46	8	59	50	344	82	580
More than JPY one million but less than JPY five million	16	45	48	108	35	85	53	128	202	459	354	825
Less than JPY one million	40	14	101	34	62	24	90	33	436	156	729	261
Less than JPY ten million	60	87	162	245	104	156	151	220	688	959	1,165	1,666
Ratio of total amount	3%	0%	8%	0%	5%	0%	7%	0%	34%	2%	56%	3%
Total	68	1,211	173	565	115	723	173	1,223	762	4,062	1,291	7,784
Ratio of total amount	6%	16%	13%	7%	9%	9%	13%	16%	59%	52%	100%	100%

Table 50 Coastal vessels By band of insurance amount and G/T Number of accidents and insurance money



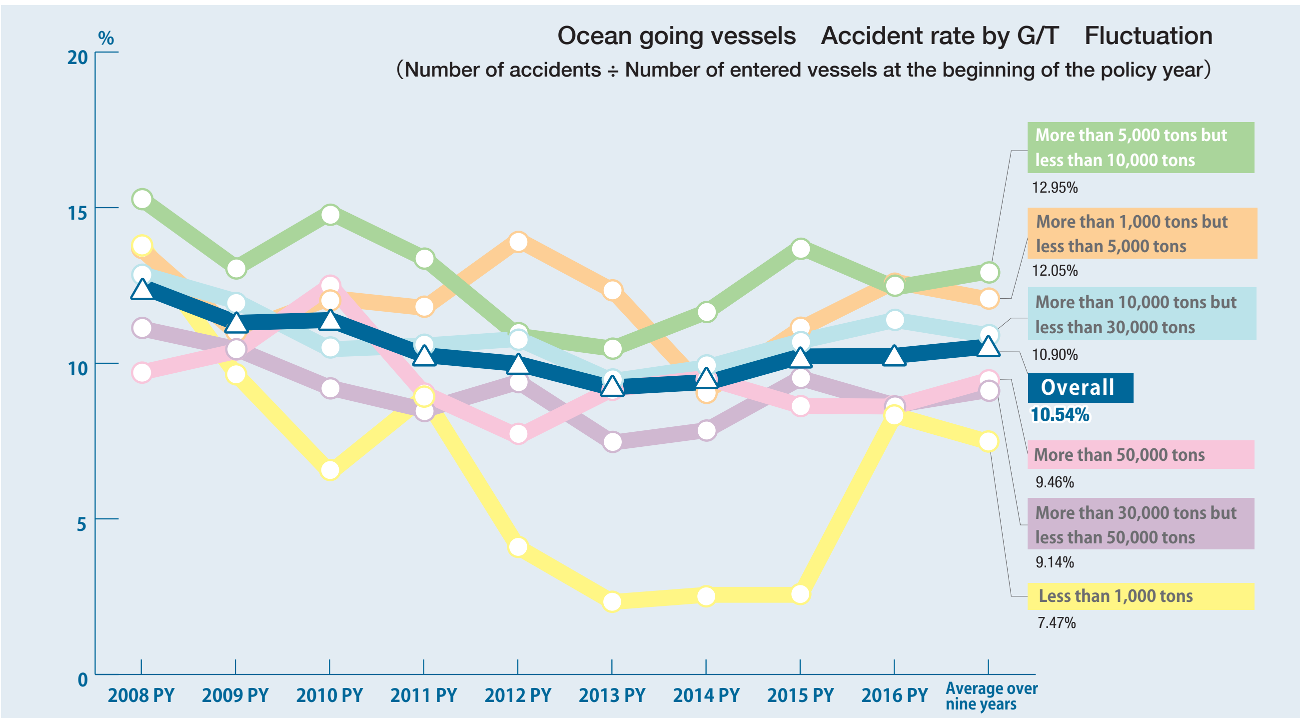
Graph 51 Coastal vessels Accident rate by G/T

When comparing this with accident rate and the number of entered vessels denominator at the beginning of the policy year, coastal vessels of more than 10,000 G/T greatly fluctuated every Policy Year. And, we can understand that there is a tendency for the accident rate to be higher than for ships less than 10,000 G/T over a nine year average.

Unit of insurance money : JPY one million

Amount band (insurance)	More than 50,000 tons		More than 30,000 tons but less than 50,000 tons		More than 10,000 tons but less than 30,000 tons		More than 5,000 tons but less than 10,000 tons		More than 1,000 tons but less than 5,000 tons		Less than 1,000 tons		TOTAL	
	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money	Number of accidents	Insurance money
More than JPY one billion	3	9,435	1	1,096	1	1,207							5	11,739
More than JPY 100 million but less than JPY one billion	6	1,648	5	2,356	8	3,197	6	1,430	2	392			27	9,022
More than JPY 50 million but less than JPY 100 million	4	317	3	190	9	653	8	566	4	267			28	1,992
More than JPY ten million but less than JPY 50 million	21	511	20	398	37	682	27	589	27	536	1	11	133	2,727
More than JPY ten million	34	11,911	29	4,040	55	5,738	41	2,585	33	1,196	1	11	193	25,481
% of total amount	1%	43%	1%	15%	2%	21%	2%	9%	1%	4%	0%	0%	8%	92%
More than JPY five million but less than JPY ten million	17	128	23	164	29	208	23	161	25	167	4	24	121	851
More than JPY one million but less than JPY five million	73	168	77	179	110	264	84	193	74	170	13	30	431	1,005
Less than JPY one million	365	85	364	95	495	136	303	88	189	57	20	7	1,736	468
Less than JPY ten million	455	382	464	439	634	607	410	442	288	394	37	61	2,288	2,324
% of total amount	18%	1%	19%	2%	26%	2%	17%	2%	12%	1%	1%	0%	92%	8%
Total	489	12,293	493	4,478	689	6,346	451	3,027	321	1,590	38	72	2,481	27,805
% of total amount	20%	44%	20%	16%	28%	23%	18%	11%	13%	6%	1%	0%	100%	100%

Table 52 Ocean going vessels Number of accidents and insurance money (by band of insurance amount and G/T)



Graph 53 Graph 53 Ocean going vessels Accident rate by G/T Fluctuation
(Number of accidents ÷ Number of entered vessels at the beginning of the policy year)

Meanwhile, on examining ocean going vessels, it was revealed that large accidents of more than JPY 10 million of insurance money were concentrated on vessels of more than 10,000 G/T. Statistically, even if it makes contact with a quay at the same speed, a large ship will sustain huge damage.

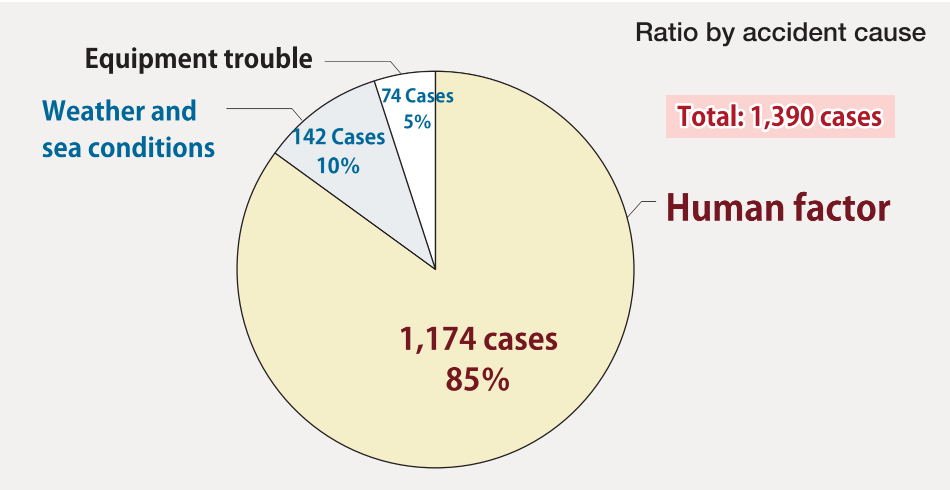
On the other hand, regarding the accident rate of vessels that are more than 1,000 G/T but less than 10,000 G/T it is greater because these vessels are larger than other large vessels. Though there is this kind of tendency, details into the causes remain unknown.

§4 Accidents regarding harbour and fishery facilities Causes

§ 4−1 Statistics on accident causes

Accident Cause Classification	Cause	Ocean going vessels	Coastal vessels	Sum total	%
Equipment trouble	Mooring winch trouble	11	5	**16**	1.2%
	Onshore equipment trouble	16		**16**	1.2%
	Other ship's equipment trouble	8	6	**14**	1.0%
	Equipment trouble during cargo handling	12	1	**13**	0.9%
	Main engine and generator trouble	9	3	**12**	0.9%
	Hatch cover trouble	1		**1**	0.1%
	Other equipment trouble	2		**2**	0.1%
	Equipment trouble subtotal	**59**	**15**	**74**	**5.3%**
Human factor	Miss-maneuvering by ship	394	459	**853**	61.4%
	Miss-maneuvering by pilot	106	1	**107**	7.7%
	Other human-induced mistakes	38	53	**91**	6.5%
	Insufficient lookout	12	26	**38**	2.7%
	Miss-maneuvering of tug boat	29		**29**	2.1%
	Miss-maneuvering by other ships	25		**25**	1.8%
	Mistake by workers on shore	29		**29**	2.1%
	Falling asleep		1	**1**	0.1%
	Lack of knowledge and information	1		**1**	0.1%
	Human factor subtotal	**634**	**540**	**1,174**	**84.5%**
Weather and sea conditions	**Weather and sea conditions**	**98**	**44**	**142**	**10.2%**
Sum total		**791**	**599**	**1,390**	**100.0%**

Table 54 Statistics on accident causes



Graph 55 Ratio by accident cause

We analysed 1,390 cases where the causes of the accidents could be investigated. Consequently, human factor causes (human error) came to 84% (1,174 cases) of the total number of cases. In the figure, miss-maneuvering by crew on board (including Master) and the pilot occupies 69.1%.
Also, on analysing the accident report, 10% (142 cases) of the total number of accidents were caused by unforeseen squall and tidal streams. These are mainly caused by a lack of weather chart checking and weather information, and a lack of thorough investigation concerning tidal stream information.

Because we are experienced crew and pilots, it is possible for us to be prepared if we are privy to such information, and can predict squalls with weather lore. Thus it follows that these accidents caused by weather and sea conditions can also be regarded as human error.

Moreover, although equipment trouble (e.g. main engine stoppage and black out, etc.) induced accidents, these devices are also maintained by humans. Thus, causes of damage to harbour and fishery facilities can be said to be 100% down to human error.

Causes of damage to harbour and fishery facilities can be said

Human factor **(Human error)** **100%**

§ 4−2 Human Error Concept

Please refer to the details which were introduced in our Loss Prevention Bulletin Vol.35 “Thinking Safety”

Twelve human characteristics

1. Human beings sometimes make mistakes
2. Human beings are sometimes careless
3. Human beings sometimes forget
4. Human beings sometimes do not notice
5. Human beings have moments of inattention
6. Human beings are sometimes only able to see or think about one thing at a time
7. Human beings are sometimes in a hurry
8. Human beings sometimes become emotional
9. Human beings sometimes make assumptions
10. Human beings are sometimes lazy
11. Human beings sometimes panic
12. Human beings sometimes transgress when no one is looking

Table 56 Twelve human characteristics

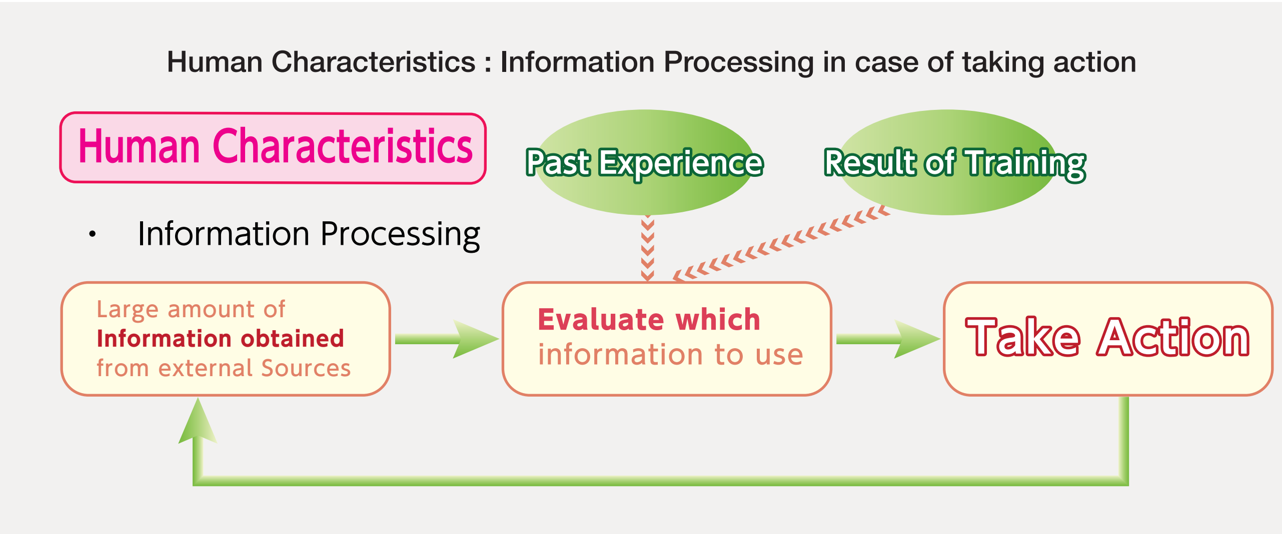
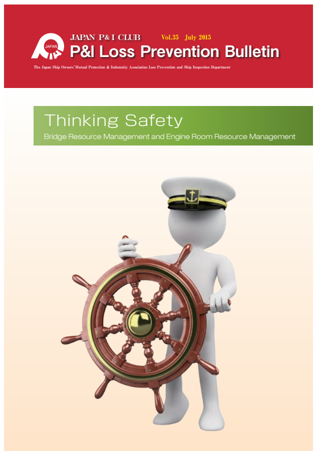


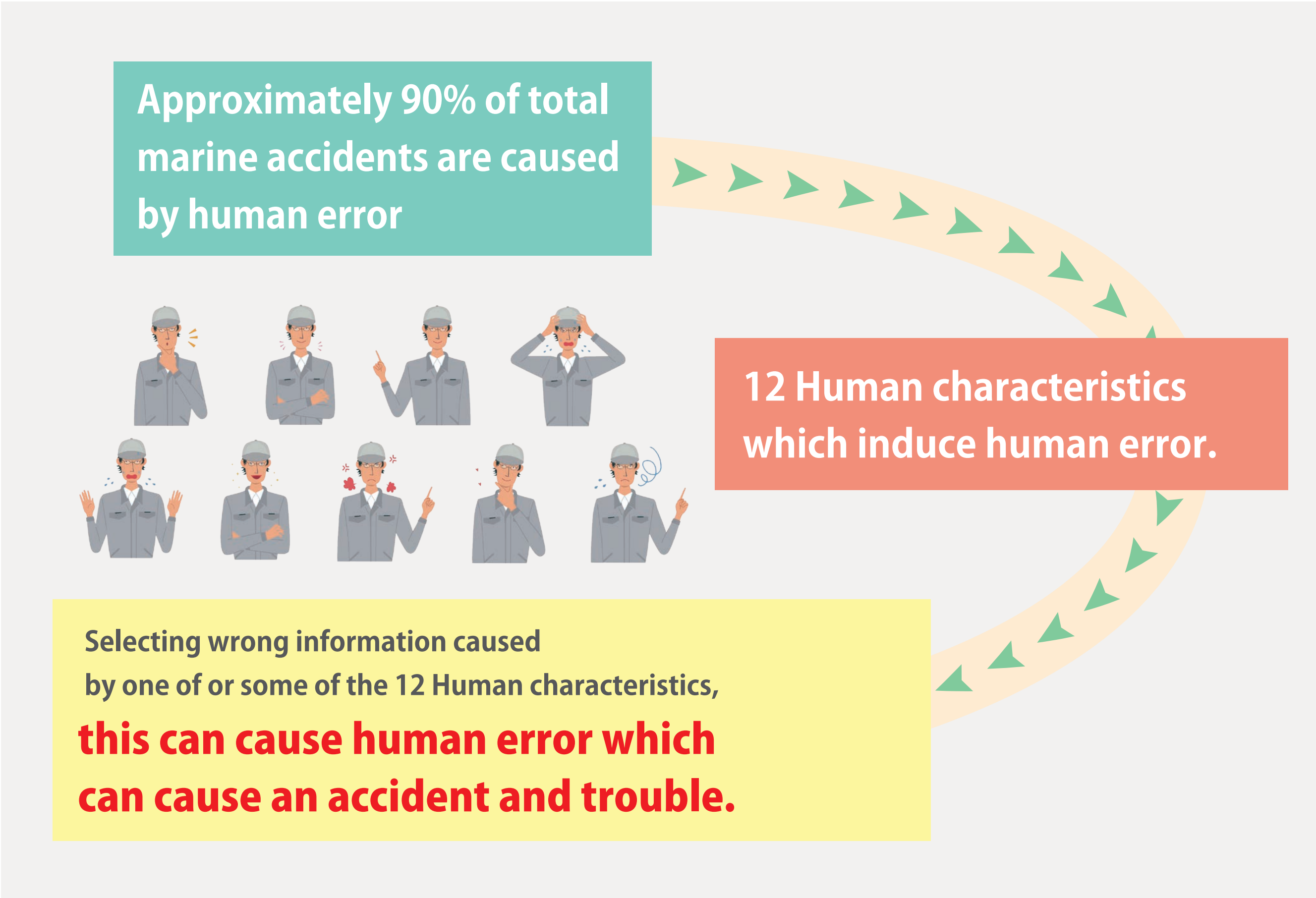
Table 57 Human Characteristics : Information Processing in case of taking action

Table 56 shows the 12 Human characteristics which may cause human errors. Everyone has these characteristics. Table 57 shows how people behave when they act.
In other words, human beings process a large amount of information using the five senses and take action depending on what information they believe should be used. In addition, because taking new action requires additional new information, the cycle repeats.
When considering how to use the information, you look back at the outcome of past experience and training. For example, in the event of attempting to walk on a rough road, we are careful so as not to fall over. Why are we cautious? One reason is that this comes from our common experience of feeling pain when we fell over and grazed our knees when we were children. And, our memory of pain is stored somewhere in the brain. Even when we have become adults, we recall that information of the rough road experience from memory automatically and a message is transmitted telling us to “please be careful”.

It is said that the brain automatically lets us deal with almost 80% of the human behaviours unconsciously. However, if there is an error in the memory source, the wrong signal will be transmitted. That is, unconscious errors are triggered, which leads to accidents.
Also, regarding the remaining 20%, we think for a moment before taking action, or think about it deeply prior to taking action. However, the fundamental is also the same in this case, and errors that cause accidents are induced by wrong judgement, if there were mistakes in past experience and memory. This root cause is shown in the 12 Human characteristics indicated in Table 56.
Therefore, most accidents can be prevented by calmly recognizing the Human characteristics that everyone has and measures can be taken to prevent the causes of the errors.



§ 4−3 BTM (Bridge Team Management)/ETM (Engine Room Team Management)



There are various causes for marine accidents, however, in the event of a collision accident, for example, it is said that approximately 80 to 90% of all accidents are caused by a mistake made by a person, in other words, "human error" (as mentioned above) such as "Insufficient Look-out". In addition, even though the vessel collided into a harbour and fishery facilities, not another vessel, such an accident regarding harbour and fishery facilities is also classified as an accident. The cause can be treated the same as other collision accidents, namely, that it was down to "human error". Most of these accidents were not caused by only one error, rather, the error was part of chain of other errors.

On the premise that "human beings are error-prone", BTM and ETM were established with the purpose of "achieving safe navigation" in order to further prevent human error chains and to bolster team ability at the bridge and in the engine room.

In other words, the utmost purpose of BTM and ETM is to eliminate "one-man error" through mutual support in order to maintain safe operation of the ship together with the all members and resources in the bridge and engine room. And, it aims "to achieve safe navigation" by improving team ability in the bridge and engine room as always.

This is shown in Table 58. The person at the centre (Liveware: person responsible for the accident) is surrounded by the following four resources.

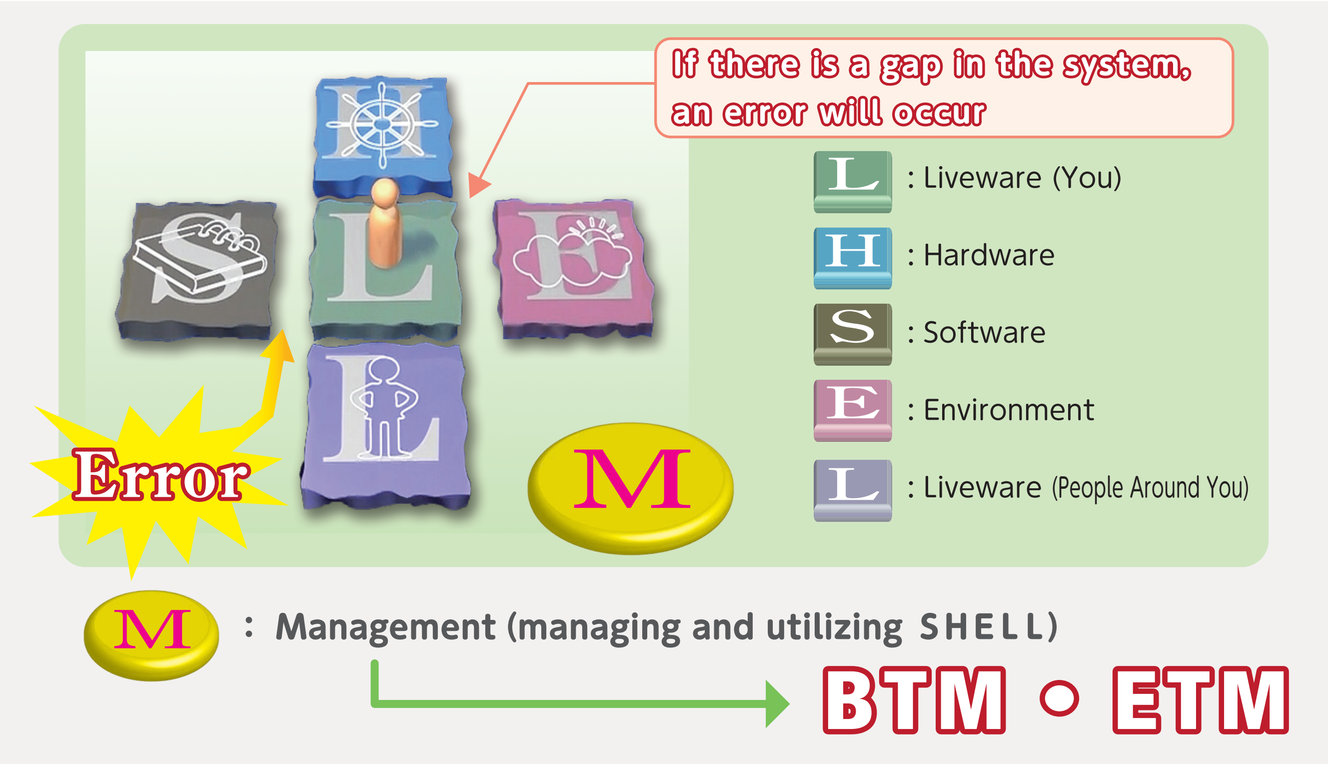


Fig. 58　M-SHELL Model

Fig. 59　Four resources.

L (you), the person at the centre of model, is required to always communicate with these resources and to manage them (management). Each initial in the model collectively form the acronym M-SHELL.

People around us communicate with each other via speaking and listening. They also communicate via other voiceless means such as books: Maritime Collisions Prevention Act (COLREGs) and the safety management manual.

Also, although the hardware (equipment) does not utter any words, it provides us with a variety of information. Automatic Radar Plotting Aids (ARPA) display the Closest Point of Approach (CPA) of other vessels or Time to the Closest Point of Approach (TCPA). The action of confirming this information can be said to be communicating with ARPA. Or, crew in the engine department, including the chief engineer, in the engine room confirm using their five senses to check the sound, for vibration, temperature and pressure generated by the main engine to assess as to whether or not fuel is burning at a normal state. This is also a form of communication: communication with equipment.

Moreover, Environment means external information. It can be regarded a communication when one is speaking and listening via VHF or reading a weather chart.

In addition, because each resource including the position of oneself (L) is constantly changeable, it can be represented as a fluctuating square. If cooperation between oneself (L) and each resource is not adequate, a gap between the resources is created, human error enters and safety is compromised. Then a chain of errors causes an accident.

On the other hand, if communication and cooperation is satisfactory, there will be no gap to cause error because each resource is connected. Thus, it can be said that safety has been established.

For instance, let's suppose that the Master gave a wrong steering order to the Helmsman. At that moment, if the duty officer confirms the possible mistake with the Master and the Master admits and corrects the steering order, the error "careless mistake" (wrong steering order) will no longer pose a problem there and then.

Unfortunately, if the duty officer who even felt question did not confirm this, the Helmsman, who specialises in navigating, would steer following the wrong steering order. The Master noticed this after the vessel had started turning round, but it was too late. That is, a gap into which an error could enter was generated.

§5 Case study

Through the following three cases, preventive measures will be postulated.

§ 5−1 Case ① Quay contact

Case ① Quay contact

Date and time of occurrence :

On an unspecified day of March 2011, approximately 07:53 Japan time (JST))

Accident site :

At an unspecified port in Tokyo Bay

Vessel particulars :

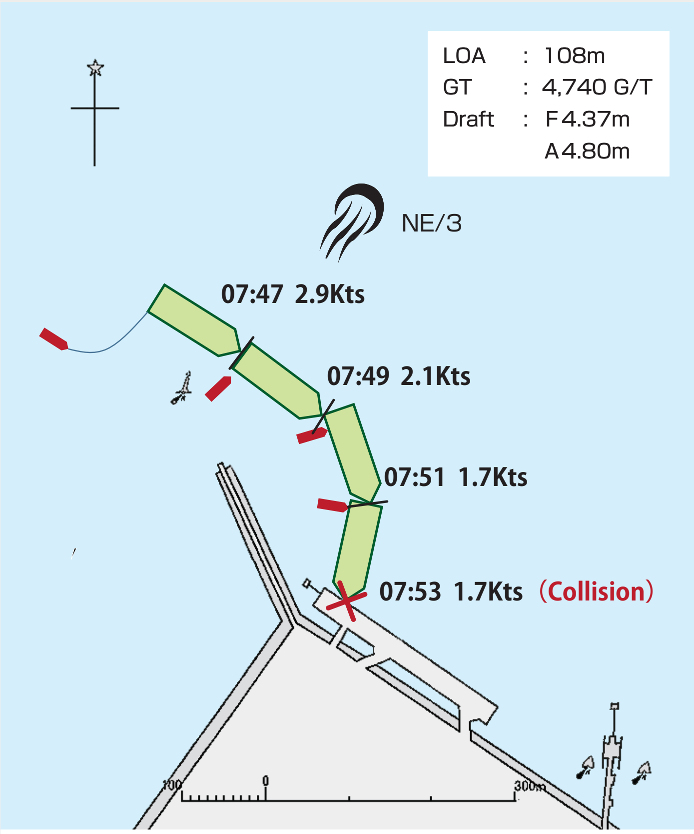
4,440GT, Loa 108 m General cargo ship
Fore draft 4.37 m Aft draft 4.80 m Loaded
Steel product with half-loaded

Weather and sea conditions :

Fine, NE wind, wind force 3, No influence from tidal current, and good visibility

Crew members :

Korean Master, chief engineer and other crew were Indonesian (16 members on board in total)



South Korean Master and Indonesian crew

Fig. 60

§ 5−1−1　Chain of events leading up to the accident

Time	Movement	Who
06:55	Pilot embarks. Presents Pilot Card. Confirms ship's particulars and draft. Pilot remarks that there is only one tug boat on port side alongside. There was no explanation regarding ship manoeuvring instructions. On questioning the pilot following the accident, the pilot explained "We planned a manoeuvre to turn round in front of the berth and then set parallel condition with the berth as close as possible. "	Master and pilot
07:47	Speed 2.9 kts. D.Slow ah'd、 Leeway 3°Leeward direction. The straight-line distance from the bow to quay is 320ｍeters (3L which is approximately three times that of hull length (L).	Pilot
07:49	Speed 2.1 kts. Stop Eng.. While allowing the tug boat to push on her starboard quarter, Start right turn. Linear distance is at 220 meters (approximately 2L) from bow to quay	Pilot
07:51	Speed 1.7 kts. Stop Eng.. Continues starboard turning round. Linear distance is at 120 meters (approximately 1L) from bow to quay	Pilot
07:52	Because the Master felt anxious Half Ast.Eng..is ordered.	Master
07:53	Keeps Speed at 1.7 kts. collision into quay	Master and pilot

Table 61　Chain of events leading up to the accident

Table 61 shows the chain of events leading up to the accident. The pilot let the tug boat report the distance from the bow to the quay, but did not explain this to the captain. On the other hand, the chief officer who was allocated at the bow had a duty to report the distance between the bow and the quay to the Master, but the Master did not relay this to the pilot, and he continued to entrust navigation entirely to the pilot.

The Master, now feeling anxious, ordered astern with engine only one minute before the accident was to occur and the vessel, unable to take corrective action, collided into the quay at 1.7 kts.

§ 5−1−2　Judgement and cause analysis by Marine Accident Tribunal

Judgement and cause analysis by Marine Accident Tribunal is as follows.

Main text of judgement:	Operation suspension as pilot for a month
Cause:	The pilot did not sufficiently confirm the approaching state between the bow and quay and delayed in carrying out speed reduction arrangement. In addition, he did not adequately confirm the speed, despite the fact that it was easy for the tug boat to push stronger into the half-loaded vessel which led to the situation of increasing Head way. Also, he over relied on the approaching condition reported by the tug boat.

§ 5−1−3 Analysis according to Human characteristics and Preventive Measures

= Analysis =

Accident causes were analysed along with §4-2 Human Error Concept and §4-3 BTM (Bridge Team Management)/ ETM (Engine Room Team Management).
Firstly, we dealt with the direct and indirect causes separately.

Direct cause

Miss-maneuvering by the pilot caused the following trouble. This is the same as the Marine Accident Tribunal cause analysis.

- **Insufficiently confirmed approaching condition between the bow and quay.**
- **Did not reduce speed at a distance of 1L (approximately 100 meters) from the approaching quay.**

Indirect cause

The cause was not only triggered by the pilot but by the Master also.

= Pilot =

- **Did not explain berthing plan to the Master**
- **Used only the distance reported by the tug boat (Immediately before the collision, although the distance from the tug boat was 60 meters, the chief officer reported it as being 35 meters.)**

= The Master =

- **Although the chief officer (Indonesian) who was allocated at the bow had a duty to report the distance between the bow and the quay to the Master, the Master did not relay this to the pilot.**
- **He continued to entrust navigation entirely to the pilot.**

In addition, we examined the "root cause" lurking behind the "direct cause" and "indirect cause" mentioned above against the "Human characteristics" shown in Table 56 on page 29. We conclude that the error chain was broken as a result of human error, when Human characteristics are applied. (Each number is applicable to that of Human characteristics shown in Table 56)

= Root cause =

⑩ Human beings are sometimes lazy (Master and Pilot)

After the pilot got on board, the Master continued to entrust navigation entirely to the pilot. Also, regardless of the fact that the chief officer, who was allocated at the bow had a duty to report the distance between the bow and the quay, the Master did not relay this to the pilot. Immediately before the collision, the tug boat reported the distance at 60 meters to the pilot, however, at the same time, the chief officer reported it as 35 meters. At this point in time, had they noticed that there was a conflict between the two reports, and had the Master and the pilot communicated with one another, they could have reconfirmed the correct distance to the quay.

⑤ Human beings have moments of inattention (Master and pilot)

Finally, the Master ordered Astern engine, however, time did not permit this. On confirming Head way against the log and GPS and deducing that the speed was excessive, the Master should have advised the pilot of this at that time.

⑨ Human beings sometimes make assumptions (Master)

The Master assumed that the pilot would not miss-maneuver.

Summarizing these time sequences, chiefly, the root cause can be attributed to insufficient communication between the crew on board (officer at the watch of the 3rd officer) and the pilot. We can deduce that BTM including the pilot was not functional. In addition, the 3rd officer arranged at the bridge was expected to report the hull speed and the information relayed by the chief officer, who was allocated at the bow, to both the Master and the pilot, but was negligent in doing this. Collapse of BTM caused this accident.

Lack of communication between crew on board (including Master) and pilot

BTM is not functioning.

Generally, the tug boat and the pilot were communicating in the local language (Japanese in this case) using transceivers. In particular, because the Master and pilot stand alongside at the final stage of berthing maneuvering, it is not possible to confirm visually the tug boat's movement. Also, without an understanding of the local language, it may be difficult to grasp what is going on between the pilot and the tug boat. Then, in the event that something unpredictable occurs during the operation process that is different to what the Master intended, one of the human characteristics ⑪ Human beings sometimes panic may be triggered and this can induce human error.

Another reason may be that there is not enough time for the pilot to keep interpreting the tugboat's instructions to the Master. Therefore, as a precaution, it may be wise that the chief or 2nd officers, who are allocated at the bow, briefly report when the tug boat changes movement. (A brief description such as "Started pushing (pulling) in the direction of XX o'clock" is perfectly acceptable.)

= Preventive measures =

As described above, BTM collapse including the pilot can be considered a root cause. For this reason, both the Master and the pilot should have fully recognised the importance of BTM, but again: ② Human beings are sometimes careless, ③ Human beings sometimes forget and ⑩ Human beings are sometimes lazy apply.

There should have been no problem with the ship maneuvering skills of the pilot and the Master. However, in light of the Human characteristics mentioned above that can be the root cause, forgetfulness may suggest that re-training of BTM in order to remember be one of the effective preventive measures taken.

Photograph 62 BTM training

Photograph 63 Ship handling and manoeuvring simulator

§ 5−2 Case ② Oyster raft accident that sustained damage

Case ② Oyster raft accident that sustained damage

Date and time of occurrence:

On an unspecified day of December 2015, approximately 18:37 Japan time (JST)

Accident site:

Near Miyajima Seto, Eastern sea area of Itsukushima, Inland sea

Vessel particulars:

2,988GT
L × B × D = 118.03m × 16.60m × 11.99m
Pure Car Carrier (PCC) Fore draft 3.54m Aft draft 3.85m Loaded with 447 cars

Port of departure:

Departed Uno Port, Okayama prefecture. Cleared out Kurushima Strait at approximately 15:00.

Port of destination:

Ujina Port, Hiroshima prefecture

Crew members:

A Japanese Master age 63, a 3rd marine officer (navigation) and crew were Japanese (10 members on board in total)

Weather and sea conditions:

The weather was cloudy, WNW wind, wind force 5 and the tide was at the middle stage of ebb
At that time, gales and high wave advisory were continuously being announced for Hatsukaichi city and Edajima in Hiroshima.

= Arrangement in place when the accident occurred =

Bridge:

Master operated the ship, Chief Engineer operated the engine and the 3rd Officer steered

Stern:

The Chief Officer, Boatswain and Able Seaman (3 in total) were preparing for entering port.

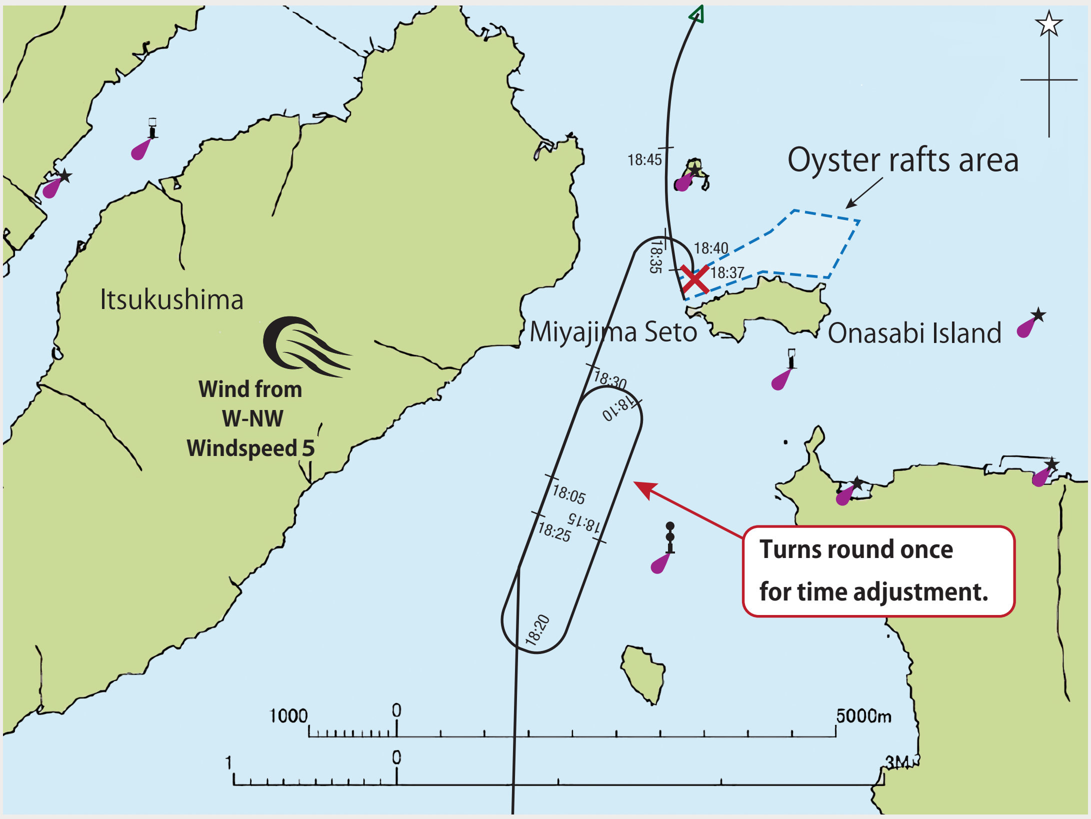

Oyster rafts area
Itsukushima
Wind from
W-NW
Windspeed 5
Miyajima Seto
Onasabi Island
Turns round once
for time adjustment.
18:45
18:40
18:37
18:35
18:30
18:10
18:05
18:15
18:25
18:20
1000
0
5000m
1
0
3M

Fig. 64

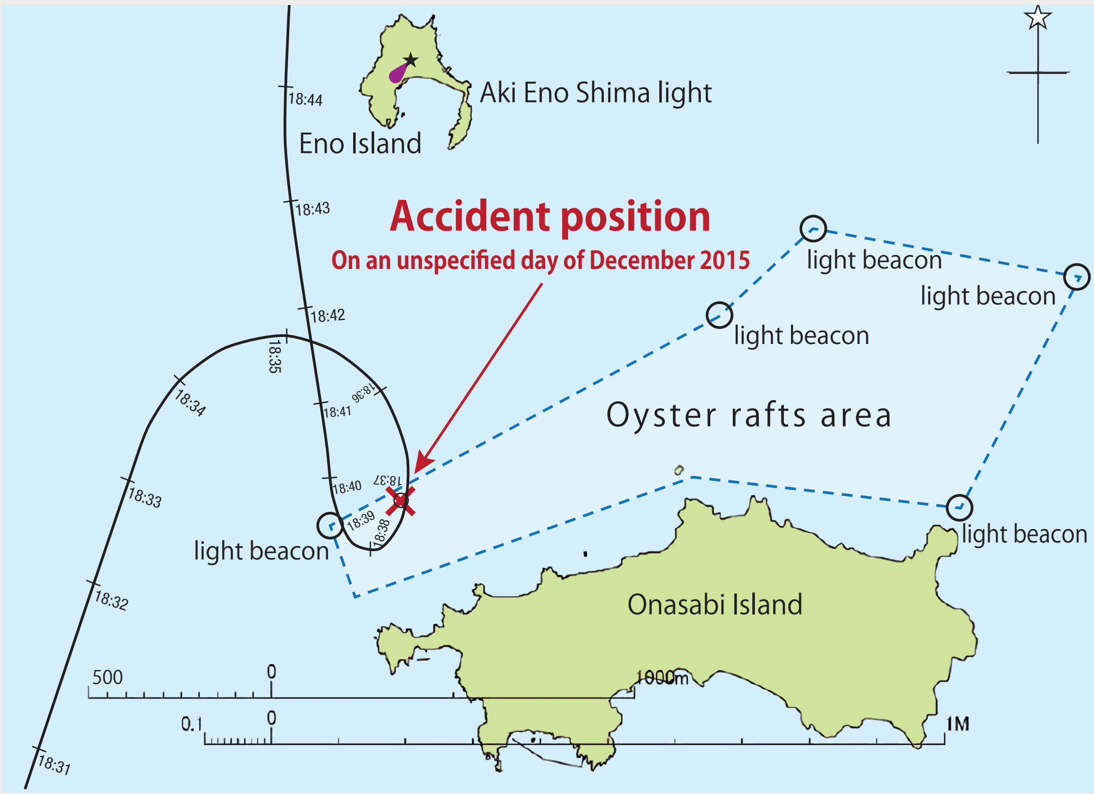

Aki Eno Shima light
Eno Island
Accident position
On an unspecified day of December 2015
light beacon
light beacon
light beacon
Oyster rafts area
light beacon
light beacon
Onasabi Island
18:44
18:43
18:42
18:41
18:40
18:39
18:38
18:37
18:36
18:35
18:34
18:33
18:32
18:31
500
0
1000m
0.1
0
1M

Fig. 65

§ 5−2−1 Chain of events leading up to the accident

Time	Movement	Who
10:40 (Approx.)	Received contact that cargo handling work of the previous vessel at the port of Hiroshima Ujina berth was approximately 2 hours delayed.	Master
15:00 (Approx.)	Cleared out of Kurushima Strait. Predicted arrival at outside port of Hiroshima to be approximately just under 3 hours from that point. Because she was to arrive at the outside port at approximately 18:00, it was decided that 30 to 40 minutes time adjustment was required.	Master
18:00 ～ 18:30	At the Miyajima Seto South Side Area, adjusted by approximately 30 minutes by turning round once.	Master
18:33	Judged that further adjustment time was needed, intended to turn round at North Asami Island Northwest Seas, and ordered that course be altered to starboard 10 degrees after confirming the state of the surrounding environment via radar (4 nautical mile range).	Master
Just after 18:33	Boatswain completed preparation for entering port at the foreward station, returned to the bridge and started lookout. Immediately after, he noticed the marked light of an oyster raft and reported it to the Master.	Boatswain
18:37	He felt a shock to the hull and realized that the vessel had collided with the oyster raft.	Master
18:40 (Approx.)	Ordered the Chief engineer to check the condition of the hull by sounding etc. After that, because no flooding was detected, she continued to navigate as before.	Master
21:55	After completion of cargo handling, he contacted the Japan Coast Guard.	Master

Table 66 Chain of events leading up to the accident

The chain of events that led up to the accident are summarized in Table 66. They received a telephone call from the local agent requesting for time adjustment at around 10:40, because the cargo handling work of the previous vessel at the port of Hirosima Ujina berth was delayed. Following this, they cleared out of Kurushima Strait at around at 15:00, and it was decided that 30 to 40 minutes time adjustment was required. Then, at Miyajima Seto South Side Area at approximately 18:00, time was adjusted by approximately 30 minutes by turning round once.
However, it was still decided that further adjustment time was needed. When turning round at North Asami Island Northwest Seas, the accident, which was a collision with an oyster raft, occurred.

The Master explained the following when questioned by the Japan Transport Safety Board.

- Because the Master predicted arrival to be at approximately 15:00, which was earlier than ETA, he kept maneuvering believing that the time could be adjusted following confirmation of the ship's position and the previous vessel's situation at around 16:00 or 17:00.
- Although the Master knew an oyster raft was located at the North Asami Island Northwest offing, he did not know the exact location as this was not his usual navigating area. He assumed that it might be located on the east side of the North Asami Island Northwest offing.
- Moreover, because his visibility was restricted by wind and waves, he experienced difficulty in confirming the marked lights close to the sea level.
- Only after the accident, he thought that he should have looked more carefully at the radar screen or electronic chart that displayed the oyster raft.

§ 5−2−2 Analysis by Japan Transport Safety Board and Marine Accident Tribunal and Preventive Measures

Analysis of the accident and preventive measures by Japan Transport Safety Board are as follows.

(1) Analysis

Following the announcement of the gale warning and high wave caution, the situation was such that it was difficult to visually confirm the marked lights near the sea surface. During the passage/navigation to the north-northeast of North Asami Island Northwest offing, the Master started right turn in order to adjust the time. Because look-out was not appropriately arranged utilizing the radar, he operated the right turn without noticing the oyster raft that was situated at the North Asami Island Northwest offing, which caused a collision with the oyster raft during turning round.

(2) Preventive measures

- Keep appropriate look-out by utilizing radar etc.
- In the event of operating away from of a standard charted course, check the condition of the channel beforehand using a Nutical chart etc.

In addition, the judgement and cause analysis by Marine Accident Tribunal was as follows.

Main text of judgement:	One month suspension of seamen's competency certificate as operating Master
Cause:	● Insufficient hydrographic survey Neglected to conduct a hydrographic survey, such as using navigational passage information and electronic chart data to check location information of the oyster raft. ● The Master didn't think that there would be an oyster raft in the area of sea some distance away from Asami Island.

§ 5−2−3 Analysis according to Human characteristics and Preventive Measures

= Analysis of root cause =

Similar to Case ①, accident causes were analysed along with the Human characteristics. We conclude that the error chain was broken as a result of human error, when Human characteristics are applied. (Each number is applicable to that of Human characteristics shown in Table 56)

Because the Master was experienced and actually had been on board the same vessel on several occasions, it is naturally believed that maneuvering the vessel would not have been a problem for him and that he was sufficiently aware of the hull motion characteristics. We shall examine as to why such an experienced Master caused an accident, along with the "root cause" lurking behind the course of events.

⑩ Human beings are sometimes lazy

At approximately 10:40, the local agent requested that the ETA time be adjusted, while he was steering the ship through a narrow channel leading towards Kurushima. From this we can understand that it was not reasonable to start adjusting time at that moment judging by the surroundings and it was too early to adjust the timing, if attempted.

However, even at that time, regarding the sea area he was navigating towards, if the circumstances, weather, sunset time (the sunset time of December in the Hiroshima region is around 17: 00 - 17: 10) and the twilight (stars of the first and second magnitude can be seen and a horizon can be identified, approximately 1 hour before sunrise and 1 hour after sunset) were taken into consideration, time adjustment would need to have been completed at approximately 18:00 at the latest, if this was to be carried out by turning round.
However, in fact, assuming that time adjustment could be carried out at around 16:00 to 17:00 in ample time, the Master did not examine the status of the sea area he was navigating towards or method by which he would adjust time (including reducing speed and changing course).

⑨ Human beings sometimes make assumptions

He believed that the oyster raft was located at the east side of North Asami Island Northwest offing. It can be said that there was insufficient investigation regarding route conditions in advance.

⑤ Human beings have moments of inattention

Moreover, because his visibility was restricted by wind and waves, he experienced difficulty in confirming the marked lights close to the sea level. Despite this, he did not set up an additional look-out.

③ Human beings sometimes forget

Regarding the Pure Car Carrier (PCC), he understood that the pressure fluctuation of the wind was significant. However, as a consequence of time adjustment by turning round in a narrow water area, the vessel also flowed significantly. It can be considered that the Master forgot about hull motion characteristics.

Also, in spite of maneuvering in a narrow channel, the bridge arrangement constituted a 3rd Officer as helmsman and the Chief Engineer as engine operator, with only the Master actually Look-out steering. Considering the importance of BTM, the personnel arrangement was not appropriate, which may mean that he forgot about the BTM concept.

On analysing this case we understand that human errors, derived from the above mentioned four Human characteristics, were the cause and may have led to the accident occurring as a result. If one of the errors can be eliminated, an accident can be prevented.

It seems that the accident occurred as a result, because the chains of potential human error related to these kinds of human characteristics could not be eliminated.

= Preventive measures =

The Marine Accident Tribunal reprimanded the Master with a one month suspension of his seamen's competency certificate and the file was closed. We appreciate that the Marine Accident Tribunal judged this case fairly under the revised Act under Marine Accident Inquiry, however, even though the Master who caused the accident deeply regretted it, this is not enough if an accident is to be prevented in the future: punishment is by no means conclusive. As a preventive measure it will be more effective to analyse how to eliminate the human error, found in Human characteristics, that was the root cause.

Regarding the following main Human characteristics that are at the heart of the error causes, preventive measures are to be examined.

⑩ Human beings are sometimes lazy

The original problem emanated as a result of carelessness concerning turning round to adjust time, without sufficiently examining route conditions, such as narrow sea area etc.

In the event of time adjustment, a reduction in speed and temporary anchoring are mainly required. It is recommended that work instructions be created in accordance with the safety management manual, which state that, in the event of time adjustment by turning round, it is to proceed into a sea area where more than four to five times of the tactical diameter can be assured, and moreover, where marine traffic is not congested.

③ Human beings sometimes forget

Regarding the Pure Car Carrier (PCC/PCTC), he forgot that the pressure fluctuation of the wind was significant. In addition, he had undergone BTM training and understood the importance of it in theory, however he either could not recollect or could not carry it out in practice, which is what caused the accident.
Thus, in order help them remember, if they forget, as a preventative measure, it would be effective to have in place a re-training system requiring that training be retaken if a certain period of time has passed since the last BTM training.

§ 5−3 Case ③ Fair way buoy damage

Case ③ Fair way buoy damage

Date and time of occurrence:

On an unspecified day of December 2015, approximately 21:27 Japan time (JST)

Accident site:

Port of Muroran No.2 light beacon

Vessel particulars:

499 GT L × B × D = 75.52m × 12.00m × 7.20m
Cargo ship Fore draft 3.65m Aft draft 4.75m Loaded Steel product (1,599kt)

Port of departure:

Port of Muroran, Berth 1-9

Port of destination:

Hanshin Port Osaka-ku

Crew members:

A Master aged 58 and 4 other members on board

Weather and sea conditions:

The weather was sunny, NNW wind, wind force 2, the tide was low wave and Good visibility. There were neither marine navigational warnings or high waves.

Arrangement in place when the accident occurred

After leaving the wharf, the Bridge Watch personnel constituted the Master only. One radar had a range of 1.5 nautical miles and the other a range of 3 nautical miles. However, at the time of passing the No.3 light beacon, the radars were switched off, and he increased speed while setting the engine to full speed ahead.

Traffic condition in fairway

Before entering the sea route, she passed a vessel inbound. After, there were no other vessels concerned.

Damage condition

- **No2. light beacon:**

Dent with a crack at the floating part and bending damage to protective fence.

- **Vessel particulars:**

Bending loss on her port side bow and no flooding.

Photograph 67　Damaged state of No.2 light beacon

Label of No.2 light beacon: visible distance four nautical miles, red flash once every three seconds. Light height was 8.2 meters

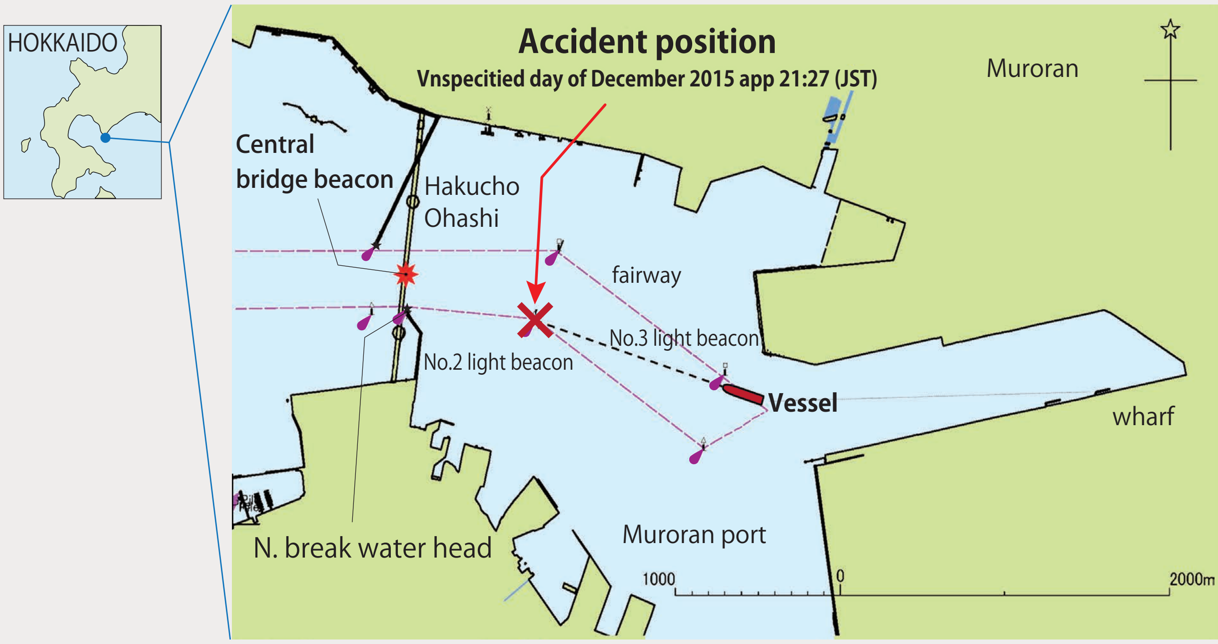


Fig. 68

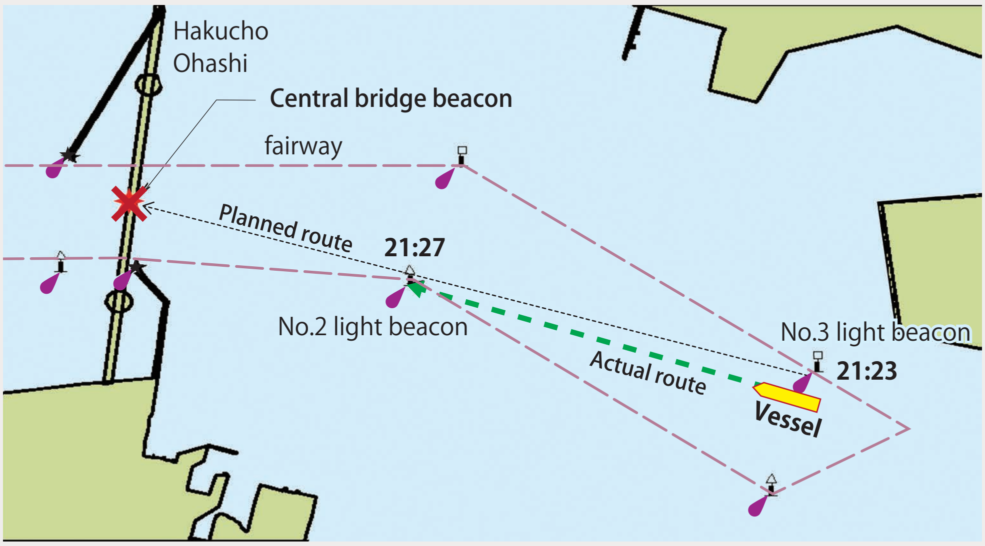


Fig. 69

§ 5−3−1 Chain of events leading up to the accident

Time	Movement	Who
21:13 (Approx.)	Departed from port of Muroran Harbour. Dismissed Departure S/B mid-channel and Master started steering by himself. Hand Steering.	Master
21:18 (Approx.)	Because he recognised that there was a ship in port at the west end of the Fairway, he steered to starboard because of passing port to port. He saw the No.3 light beacon on the starboard side, and altered course in order to pass.	Master
21:20 (Approx.)	Headed bow to Muroran port Hakucho Ohashi central bridge beam light at 90 meters south of No. 3 light beacon. Set engine to full speed ahead.	Master
21:20 ～ 21:26	Judged that there was enough time to reach Hakucho Ohashi. Moved to the engine operation console on the starboard side and adjusted Eng. R.P.M. Mainly watched the M/E R.P.M indicator and from time to time confirmed visual estimated distance to Hakucho Ohashi. When he noticed the red light of the No.2 light beacon before his very eyes, it was too late to take action.	Master
21:27 (Approx.)	Collision into No.2 light beacon. Contacted Japan Coast Guard.	Master

Table 70 Chain of events leading up to the accident

Table 70 shows the chain of events leading up to the accident.
At approximately 21:13, she departed the Port of Muroran harbour, and started navigating to Hanshin Port Osaka-ku. Dismissed Departure S/B mid-channel with the Master being the only person at the bridge, where he commenced his duties. (Hand steering)
Because he recognised that there was a ship (West end of Fairway) prior to entering the port at approximately 21:18, he steered to starboard because of passing port to port. He saw the No.3 light beacon on the starboard side, and altered course in order to pass. At the same time, he set engine to full speed ahead.
At Approximately 21:20, he headed the bow towards the beam light of Hakucho Ohashi central bridge and at approximately 21:23:30, he changed to automatic steering at the time of passing No. 3 light beacon which was on the starboard side. At that time, because the main engine rpm did not increase, but rather fluctuated up and down, the Master started engine adjustment. While mainly watching the main engine, he noticed the red light of the No.2 light beacon before his very eyes. Unable to act otherwise, the vessel made contact with the light beacon. Promptly, they contacted the Japan Coast Guard.

§ 5−3−2 Analysis by Japan Transport Safety Board and Marine Accident Tribunal and Preventive Measures

Analysis of the accident and preventive measures by Japan Transport Safety Board are as follows.

= Analysis =

◆ **Insufficient confirmation regarding ship's position**

Although a GPS chart plotter was available, the nautical chart that he was using at Muraran port was too old an edition and did not indicate the fairway side line and light beacon on the east side of Hakucho Ohashi (inside of port).
Also, one of the causes of this accident was down to the fact that he switched off the two radars. The radars at setting ranges 1.5 nautical miles and 3 nautical miles were used after leaving the wharf until around the time of passing the vessel inbound. Because there was no record of the ship's position on the nautical chart, it is presumed that the ship's position fixing was not originally conducted.

◆ **There was a problem in setting the course.**

After passing 90 meters south of No.3 light beacon, intending to take a short-cut, he headed bow to the beam light of the central bridge. Analysing the AIS record at the time of when the accident occurred, it was confirmed that there was no pressure fluctuation in tidal stream or wind.

◆ **Human beings sometimes make assumptions**

Because she was passing the edge of the starboard route, he assumed that she could pass to the north of the No.2 light beacon.

◆ **Insufficient Look-out**

He was preoccupied with adjusting the main engine rpm, and neglected to monitor what was happening ahead of the vessel. Also, he checked only the beam light of the central bridge which was located at 65 meters above the sea surface without paying attention to the sea surface.

◆ **Inappropriate feedback to abnormal situation**

He believed that he could adjust the main engine rpm by himself and did not ask for help from the chief engineer.

= Preventive measures =

While solely watchkeeping at the bridge, concentration on maneuvering is a requirement. In the event that it is necessary to adjust the remote control device, including the engine, take measures that allow the staff members of the engine department to come up to the bridge.

In addition, judgement by Marine Accident Tribunal was as follows.

Main text of judgement:	Official reprimand of the Master
Cause:	Duty of care was insufficient regarding the carrying out of sufficient look-out of the surroundings in order to not miss the light of No.2 light beacon located at the south of the sea route during night time. He was preoccupied with adjusting the main engine rpm, and neglected the duty of sufficient look-out.

§ 5−3−3 Analysis according to Human characteristics and Preventive Measures

= Analysis =

Accident causes were analysed along with the Human characteristics in the same way. The following four of Human characteristics are applicable and we again conclude that the error chain was broken as a result of human error. (Each number is applicable to that of Human characteristics shown in Table 56)

⑫ Human beings sometimes transgress when no one is looking

It would appear that the next two are violations.

- Did not possess the most updated nautical chart. (It is supposed that both vessel and company had this problem.)
- Navigated the Fairway diagonally by short cut.

Article 12 of Act on Port Regulations (Act No. 174 of July 15, 1948) is as follows.

> When vessels other than Miscellaneous Vessels enter into or leave from or go through the Specified Port, they **shall use the Fairway provided in the Ordinance of the Ministry of Land, Infrastructure, Transport and Tourism** hereinafter simply (referred to as "Fairway" until Article 37 ; provided, however, that this shall not apply) to the cases in which they intend to keep away from a marine accident or other compelling reasons exist.

Here, "the Fairway provided" means to navigate alongside the sea route, and diagonal navigation can be regarded as being in conflict with Port Regulations Law.

⑤ Human beings have moments of inattention

- Both radars were switched off.
- Did not confirm the ship's position on the noutical chart.

⑨ Human beings sometimes make assumptions

- Because she was passing the edge of the starboard route, he assumed that she could pass to the north of the No.2 light beacon.
- Believed that he could adjust the main engine rpm by himself and did not ask for help from the Chief Engineer.

⑥ Human beings are sometimes only able to see or think about one thing at a time

- He was preoccupied with adjusting the main engine rpm, and neglected to monitor what was happening ahead of the vessel.
- Only checked the beam light of the central bridge and did not monitor the sea surface.

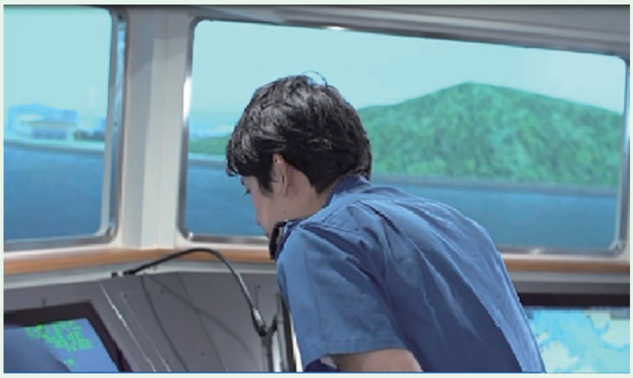
= Preventive measures =

It appears that the main root cause comes from over-confidence due to being accustomed with the work.
The Master was experienced just as the Master in Case ② was, he had entered the Muroran Harbour on many occasions. After the accident, the Master regretted and reflected adequately, however re-training will still be necessary.

The company determined the following are to be preventive measures and informed all vessels.

- Accident summary
- After dismissed Departure S/B, all crew arranged at the bow are to go up to the bridge. They are also to maintain watchkeeping arrangement on the bridge until outside of harbour and system to assist the Master.
- Navigation speed that is slower than slow ahead engine is recommended in the harbour.

Photograph 71 (Image)



Photograph 72 (Image)

The guideline determined by this company can be amply evaluated, because of its specific watchkeeping arrangement and operating guideline. However, it is necessary to get more involved in order to regulate it.

When trouble occurs, it is also necessary not to cope with it independently and to clarify priority order of work.
This time, the first priority is naturally to concentrate on maneuvering and look-out during ship operating in the harbour. It is necessary to take action by asking for help from the chief engineer immediately, if the main engine rpm does not increase.

The collapse of one person BTM was the main cause and a gap between each resource manifested. Furthermore, human error added to the equation.

§6 Conclusion

The statistics of the accidents regarding harbour and fishery facilities and examples of three related cases that were reported to our Club were introduced.
As shown in Graph 13 on page 8, in coastal vessels, the ratio of the total number of the accidents regarding harbour and fishery facilities is approximately 60% (the number of accidents) and approximately 40% (insurance money) of the total respectively. In addition, it is presumed that almost 90% of the total marine accidents are caused by human errors, however, it is no exaggeration to say that collision accidents, groundings, and damage to harbour and fishery facilities are all 100% caused by human error.

All experienced Master, chief engineer and crew are on board. They are expected to obtain the technical skills and knowledge and to be more than familiar with the law including the Maritime Collisions Prevention Act (COLREGs).

However, even these professional technicians induce human error caused by a behavioural characteristic that anyone may have, and it is these chains of errors that cause accidents.

Therefore, we can say that not causing human error leads to a the elimination of accidents. BTM and ETM are effective means.

On the premise that “human beings are error-prone”, BTM and ETM were established with the purpose of “achieving safe navigation” in order to further prevent human error chains, and to bolster team ability at the bridge and in the engine room, in order not to cause an accident following one person’s direct human error.

In the event of coastal vessels, because there are a large number of operating ships with a single watchkeeping arrangement, some crew might think BTM is not available. However, even during single watchkeeping, BTM can be performed by imagining there is another L (yourself) who tries to find an answer to your own question.

For example, in the event that you recognize another vessel that does not change relative bearing while monitoring the radar display, you may check the Navigation Act along with the Maritime Collisions Prevention Act (COLREGs). If the other vessel is a give-way vessel, you may think or even utter “Strange! This vessel does not seem to be changing relative bearing.” This what your other self will tell you.

In the end, it is important to eliminate errors by supporting each other so that an accident is not caused by a single person’s error by establishing communication with the surrounding resources including the other L (yourself), shown in the “M-SHELL Model” of Fig. 58 on page 32.

References

- A collection of determinations by Marine Accident Tribunal
- Report by Japan Transport Safety Board of Ministry of Land, Infrastructure, Transport and Tourism
- ”Bridge Team Management -A Practical Guide” by Captain A.J.Swift
- “Practical Navigator”, by Japan Marine Science Inc.
- Japan Captains’ Association, DVD “For Effective Practice of the BRM - Are you sure about your BRM?-”

CD-ROM

Ship maneuvering related English version of Loss Prevention Bulletin and technical reference
Please make a good use of the enclosed CD-ROM file which contains the following documents.

- P&I Loss Prevention Bulletin Coaster Vessel Vol.4.pdf (Japanese only)
- P&I Loss Prevention Bulletin Coaster Vessel Vol.4 Technical Reference. pdf (Japanese only)
- P&I Loss Prevention Bulletin Coaster Vessel Vol.4.pdf (English only)
- P&I Loss Prevention Bulletin Coaster Vessel Vol.4 Technical Reference. pdf (English only)

The author

Capt. Takuzo Okada
Master Mariner
General Manager
Loss Prevention and Ship Inspection Dept.
The Japan Ship Owners' Mutual Protection & Indemnity Association

JAPAN P&I CLUB
日本船主責任相互保険組合

Website http://www.piclub.or.jp

- **Principal Office（Tokyo）** 2-15-14, Nihonbashi-Ningyocho Chuoh-ku, Tokyo 103-0013, Japan
  Tel：03-3662-7229 Fax：03-3662-7107
- **Kobe Branch** 6th Floor Shosen-Mitsui Bldg. 5, Kaigandori Chuoh-ku, Kobe, Hyogo 650-0024, Japan
  Tel：078-321-6886 Fax：078-332-6519
- **Fukuoka Branch** 6th Floor Meiji-Dori Business Center 1-1, Shimokawabata-machi, Hakata-ku, Fukuoka 812-0027, Japan
  Tel：092-272-1215 Fax：092-281-3317
- **Imabari Branch** 2-2-1, Kitahorai-cho, Imabari, Ehime 794-0028, Japan
  Tel：0898-33-1117 Fax：0898-33-1251
- **Singapore Branch** 80 Robinson Road #14-01 SINGAPORE 068898
  Tel：65-6224-6451 Fax：65-6224-1476
- **Japan P&I Club (UK) Services Ltd** 38 Lombard Street, London EC3V 9BS U.K.
  Tel：44-20-7929-3633 Fax：44-20-7929-7557

Translated by: YUZEN Translation LLC