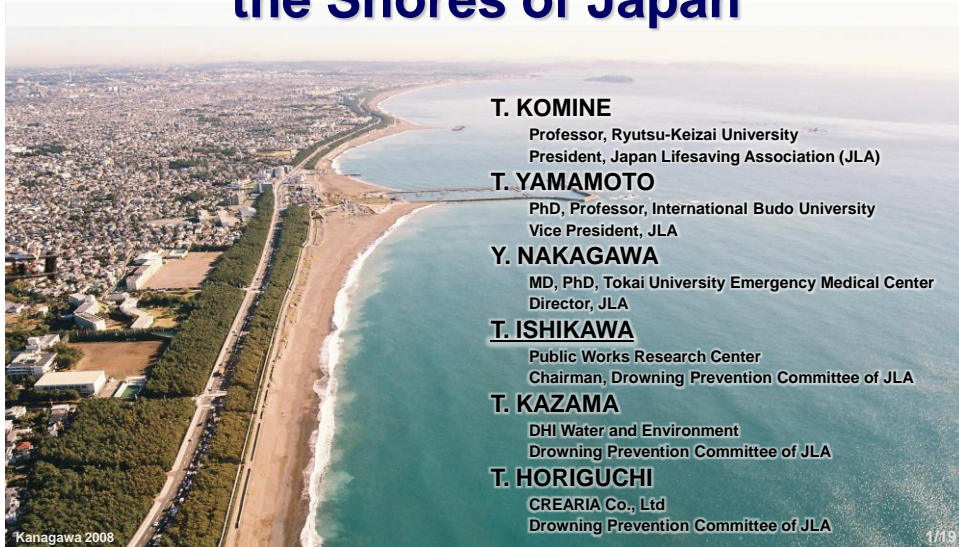




Outbreak Factors of Drowning on the Shores of Japan



Objectives

We analyze actual cases of drownings on the shores of Japan and investigate why these drownings have occurred.

Then, we propose outbreak factors and measures to prevent drownings.

Contents

1. Introduction
2. Lifesaver Rescue-reports
3. Drownings around Coastal Structures
4. Education and Emergency response organizations
5. Water safety regulations
6. Three Outbreak Factors & Measures
7. Conclusions



1. Introduction



Actual Cases of Drownings in Japan

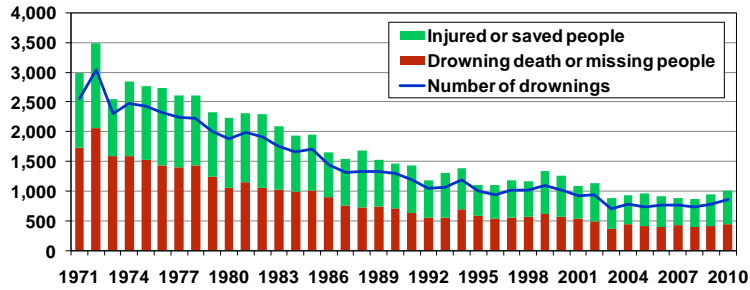
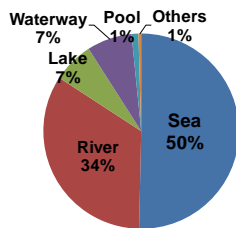


Fig. 1 Frequency of drownings based on the national data



Many drownings occur every year, and more than 400 lives are lost every year recently.
 In the sea, the number of drowning deaths or missing people accounts for 50%.

Preventive measures against water accidents are required.

Fig. 2 Distribution of drownings and missing people by location in 2010 based on the national data

1. Introduction



Actual Cases of Drownings in Japan

JLA operates on approximately 200 beaches.
 The regional life saving club makes patrol logs, first aid reports, rescue reports and the resuscitation reports at each beach from 1998.
 The detailed data regarding accidents on beaches are described.

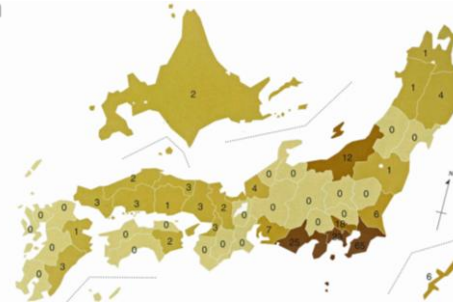


Fig. 3 Number of the beach where JLA operates

PATROL LOG (/day) **FA REPORT (/accident)** **RESCUE REPORT (/accident)** **RESUSCITATION REPORT (/accident)**

1. Introduction



Actual Cases of Drownings in Japan

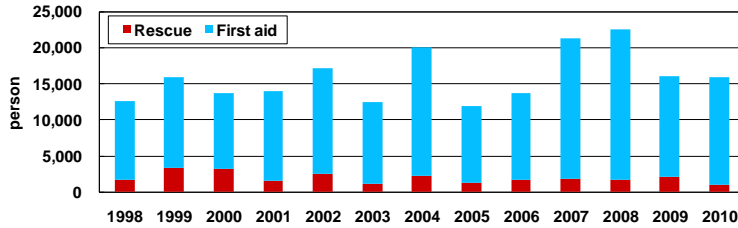


Fig. 4 Frequency of accidents based on lifesaver rescue-reports.

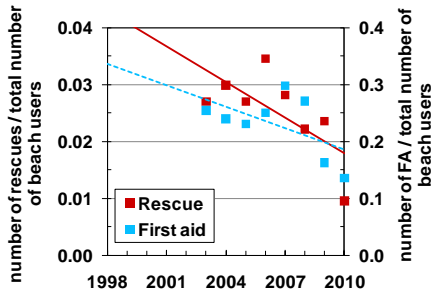


Fig. 5 Changes in a proportion of the number of the accidents for the total number of beach users

The number of accidents is definitely decreasing every year.

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1. Introduction



Actual Cases of Drownings in Japan

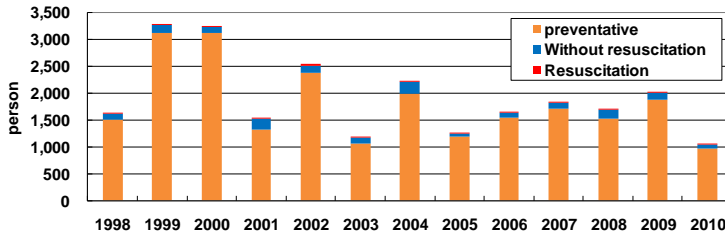


Fig. 6 Frequency of the different types of rescue.

"Preventative" is the rescue of potential drowners from high risk areas to safe areas.

"Without resuscitation" is the rescue of a conscious person.

"Resuscitation" is the rescue of an unconscious person.

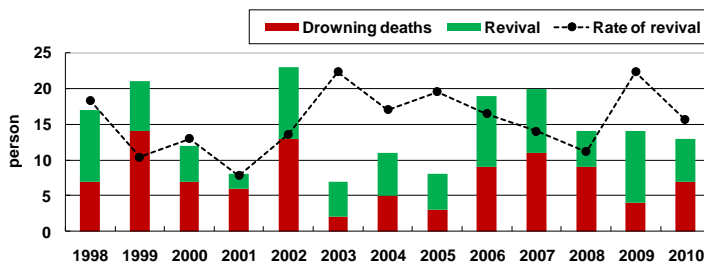


Fig. 7 Frequency of revival

The number of resuscitations is lower than 1% of the total number of rescues.

The rate of revival is approximately 50%.

Prevention measures against drownings are required.

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2. Analysis of Lifesaver Rescue-reports



Outbreak factors of drownings

Many drownings are caused by **currents**.

Drownings often occur under calm conditions.

It seems that **the user judges the condition of the sea from wave conditions that are confirmed visually**.

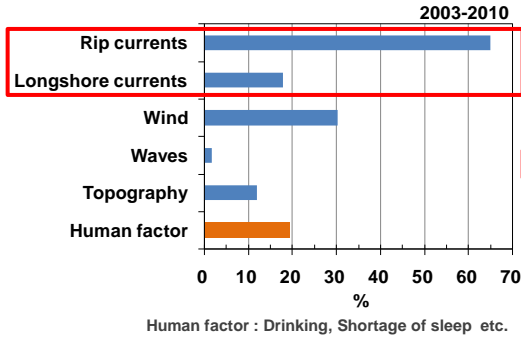


Fig. 8 Outbreak factors of drownings based on lifesaver rescue-reports.

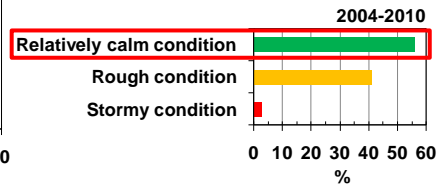


Fig.9 Condition of the sea at the time of the drownings based on lifesaver rescue-reports.

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2. Analysis of Lifesaver Rescue-reports



Outbreak factors of drownings

Most drownings occur under conditions with waves less than 1m in height.

They most often happen within 100m from the shore between a depth of 1m to 3m.

Drownings most often occur in the breaker zone.

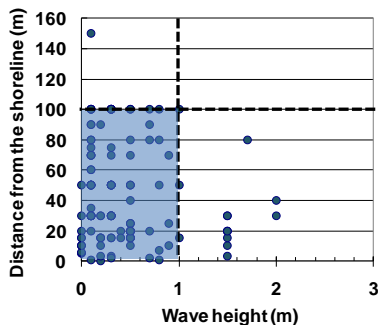


Fig. 10 Relations of the wave (breaker) height and the distance from the shore at the time of the rescue.

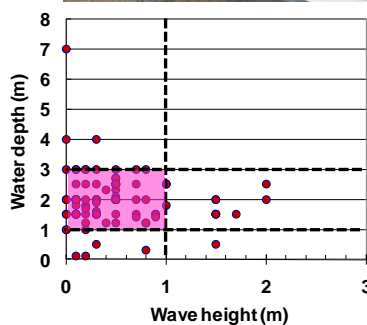


Fig. 11 Relations of the wave (breaker) height and the water depth at the time of the rescue.

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3. Drowning Accidents around Coastal Structures



Outbreak factors of drownings

The main factor of drownings. It depends on currents including the rip currents when swimming under seemingly calm conditions.

There are many coastal structures such as ports, fishing ports, jetties, detached breakwaters and artificial headlands etc. in Japan. Then rip currents occur around coastal structures.



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3. Drowning Accidents around Coastal Structures

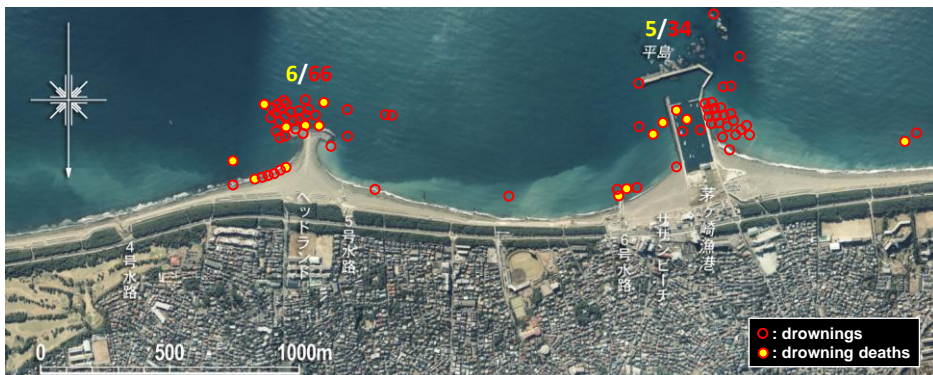


Outbreak factors of drownings

The main factor of drownings. It depends on currents including the rip currents when swimming under seemingly calm conditions.

There are many coastal structures such as ports, fishing ports, jetties, detached breakwaters and artificial headlands etc. in Japan. Then rip currents occur around coastal structures.

Drownings occurred around the artificial headland and the fishing port almost every year.



based on data of the fire departments and coast guards

Fig. 12 Spot of drowning accidents on Chigasaki Beach in Japan between 1992 and 2004

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3. Drowning Accidents around Coastal Structures



Outbreak factors of drownings

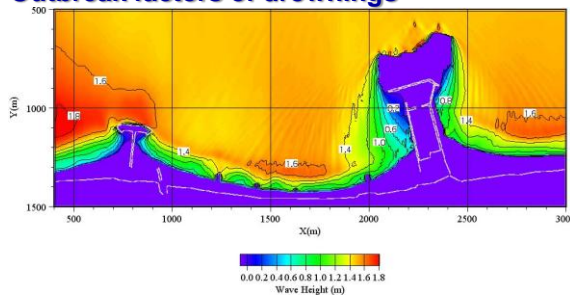


Fig. 13 A calculation result of the distribution of the wave height

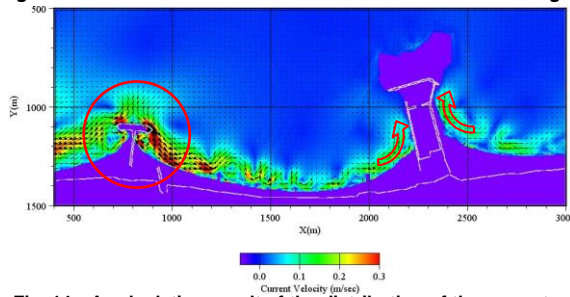


Fig. 14 A calculation result of the distribution of the currents.



Take in 2006 : Kanagawa Pref.

It is relatively calm around the head land and the fishing port. however strong currents occur on these area. The swimmer can not accurately assess the dangers.

This characteristic factors into drowning accidents in Japan.

Calculation conditions

Calculation method	Parabolic equation model (Isobe, 1987)
Wave conditions Energy-mean wave significant wave	Energy-mean waves ($H_{1/10}=0.83$ m and $T=6.35$ s) and wave direction: S13° E
Water level	Mean sea level

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4. Education and Emergency response organizations



Outbreak factors of drownings : Hearing investigations

Waves
H=1m, T=5-6s
S10E-S15W

Wind
U>10m/s
S10E-S15W

Condition of waves and currents
Under rough conditions

- Low tide, flow is from river mouth to sea.
- Wave height is about 1m.
- Wave period is 5-6s.
- Wind speed is over 10m/s onshore.
- Water depth in river mouth is 1.5-1.6m.

Education
The education about water safety in elementary and junior high schools was insufficient.

Drowning accidents on the Shonan Coast in Japan

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4. Education and Emergency response organizations



Outbreak factors of drownings

The young group (between 5 and 25) has more drowning accidents.

It seems that there is a lack of the basic knowledge of ocean safety in this age group.

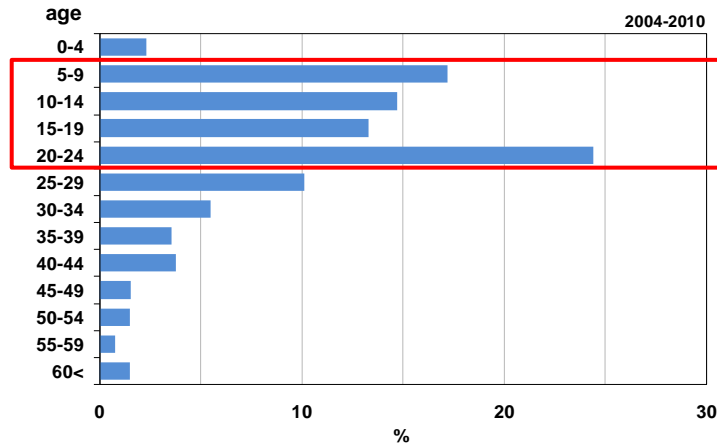


Fig. 15 Number of the rescue according to the age based on lifesaver rescue-reports

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4. Education and Emergency response organizations



Outbreak factors of drownings : Hearing investigations

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Drowning (Location marked with a red flag)

Pick up (Location marked with a red arrow, 2km East)

Education
The education about water safety in elementary and junior high schools was insufficient.

Emergency response organizations
Communications between the public emergency response organizations such as Coast Guards, Fire Departments and Police Departments, and lifesavers was lacking.

Drowning accidents on the Shonan Coast in Japan

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4. Education and Emergency response organizations



Outbreak factors of drownings

Japan's emergency response organizations are concerned with coastal safety management.

However, they lack co-ordination and communication between each other, and have no clear system of responsibility.

In addition, there is no publically funded lifesaving system in Japan. Virtually, every lifesaver is employed on a volunteer basis.



Fig. 16 Organizations concerned with drowning accidents on the shores

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5. Water safety regulations



Outbreak factors of drownings

Water safety regulations are undeveloped.

Only 13/49 prefectures has any regulations. Concern for water safety is Low.

Red : Sea and Pool
Blue: Only Sea
Green : Only Pool

- Regulation Example
- Rescue equipment (12)
 - Lifesavers (12)
 - Lifesaving station (11)
 - Lifesavers qualification (8)
 - Reporting (5)

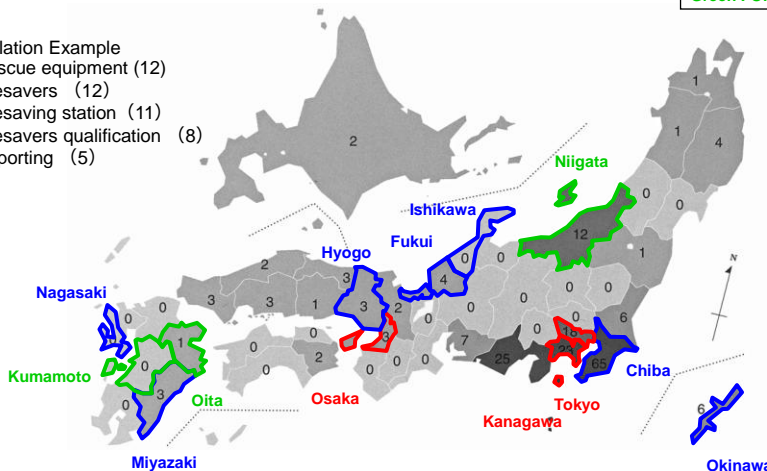


Fig. 17 Distribution of each prefectural regulations regarding drowning prevention (investigation in 2008)

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6. Three Outbreak Factors & Preventive Measures

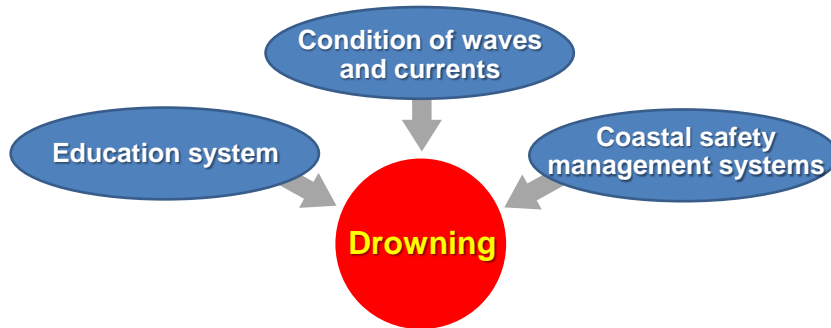


Fig. 18 Outbreak factors of the drowning accident

Condition of waves and currents: Rip currents and currents around coastal structures.

Education system: A lack of sufficient water safety education in elementary and junior high schools.

Coastal safety management systems : Between Japan's emergency response organizations, the responsibility of coastal public safety is indefinite. Water safety regulations are undeveloped.



We propose multiple measures to prevent or reduce drownings affected by these factors.

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6. Three Outbreak Factors & Preventive Measures



Multiple measures to prevent or reduce drowning accidents

Condition of waves and currents

- Because drownings often occur in apparent calm conditions.
- We must publicize the hidden dangers of rip currents and other dangerous factors to beach users and swimmers.
- The examination in a design of the coastal structures for safety of the user is necessary.
- However, it is a problem that coastal protection and shore use are sometimes incompatible (trade-off).



A signboard of the attention awakening

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6. Three Outbreak Factors & Preventive Measures



Multiple measures to prevent or reduce drowning accidents

Education system

- Improvement of coastal safety education programs for schools and communities.
- Establish basic ocean policies which point out the need for education.



School education



Junior lifesaving program



Community education

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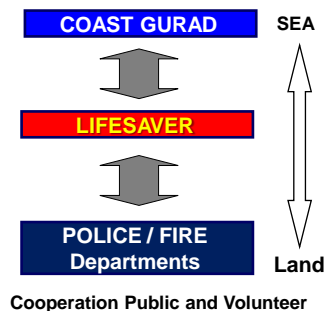
6. Three Outbreak Factors & Preventive Measures



Multiple measures to prevent or reduce drowning accidents

Coastal safety management systems

- The coastal safety system needs improvement.
- Build up communication between public emergency response organizations and lifesavers and sharing information about emergency situations.
- Create a permanent lifesaving system, and define lifesaver's position and responsibility.
- Construction of water safety regulations, such as rescue equipment and conditions for swimming.



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7. Conclusions



- The causes of drownings on the shores of Japan can be classified into three outbreak factors.
- The first factor is “Conditions of waves and currents” such as rip currents around coastal structures.
- The second factor is “Education system”, especially insufficient safety education provided in elementary and junior high schools about the ocean.
- The third factor is “Coastal safety management systems” that between Japan's emergency response organizations, the responsibility of coastal public safety is indefinite.
- Moreover, we propose multiple measures to prevent or reduce drownings affected by these factors.