Tools for Improving Safety Management in the Norwegian Fishing Fleet

Methods for Risk Control in Fishery

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Introduction

- A Norwegian research program (2002-2004) highlighted Health, Safety, and Environment (HSE) in the Norwegian fishing fleet

- Project title: ***"The Fishing Boat as a Future Workplace"***

- Multidisciplinary research:
  - SINTEF Fisheries and Aquaculture
    - Fishery Technology
  - SINTEF Health Research
    - Work Physiology
  - SINTEF Technology and Society
    - Safety and reliability
    - New Praxis

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- Existing methods for risk assessment
  - Short description
  - Evaluations of existing methods
- Features of a revised/new risk assessment method
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Background

- The fishery is still one of the most risk exposed occupations in Norway
- In the period 1998-2003, a total of 1890 injuries and 60 fatalities were reported
- High fatality rate among the smaller fishing vessels
- High injury rate among the medium sized and deep sea fishing vessels
- Lack of suitable methods and tools for risk management

Risk Status (based on NMD* data, 1998-2003)

A: All the registered personnel accidents in "Personnel Accident Database" (N: PUS)

Vessel group	Man-labour year (1998)	No. Accidents	Risk/1000 man-labour year
Inshore; Loa < 12,9 m	1841	171	15,48
Costal, 13 < Loa < 27,9 m	4428	527	19,84
Deep sea, Loa > 28 m	8046	1251	**25,91**
SUM accidents: 1998 – 2003	14315	1949	22,69

B: Fatalities

Vessel group	Man-labour year (1998)	No. Fatalities	Risk/1000 man-labour year
Inshore; Loa < 12,9 m	1841	33	**2,99**
Costal, 13 < Loa < 27,9 m	4428	17	0,64
Deep sea, Loa > 28 m	8046	11	0,23
SUM accidents: 1998 – 2003	14315	61	0,71

C: Injuries

Vessel group	Man-labour year (1998)	No. Injuries	Risk/1000 man-labour year
Inshore; Loa < 12,9 m	1841	138	12,49
Costal, 13 < Loa < 27,9 m	4428	510	19,20
Deep sea, Loa > 28 m	8046	1240	**25,69**
SUM accidents: 1998 – 2003	14315	1888	21,98

*NMD – Norwegian Maritime Directorate

Background, count.

- Important physical risk factors:
  - Severe weather conditions and climate in Norwegian sea waters
  - Challenging fishing operations on different vessels
  - Minor use of personal protection equipment and clothes
  - Improper workplace and equipment design onboard some vessels
- Important psychological risk factors:
  - Subjective risk perception differs from objective risk perception
  - “Relaxed” attitude to safety in general
  - Economical conditions and profitability targets are prioritised compared to HSE aspects

Examples of Working Conditions

Intake of Danish seine

Twisted rope

Purse seining for herring Sept. 2003 – On board a 62 meter long deep sea fishing vessel in the Vestfjord

Objectives

- **Contribute to a reduction of work accidents and health injuries in the Norwegian fishing fleet**

Important sub objectives:

- Carry out risk assessment of a selected group of fishing vessels:
  - Inshore fishing
  - Coastal fishing
  - Deep sea fishing (high sea)
- Provide action reports for the specific vessels involved in the study
- Derive action lists for groups of fishing vessels (generic)
- Test some common risk analysis methods
- Develop a method for risk assessment is based on a set of requirements

Study Approach

- Study occupational accidents
- Identify focus areas
- Prepare check lists and interview guidelines
- Collect information from fishing societies and vessel groups
- Carry out interviews
- Visit vessels and participate in fishery
- Conduct qualitative risk assessments
- Make summary reports of risk reducing measures
- Evaluate existing risk assessment methods
- Specify needs and requirements to a new method, and
- Develop the new method

Methods for Risk Assessment in Use

- Preliminary Hazard Analysis (PHA)*
- Danish Risk Assessment Scheme (DRS)**
- Safety Job Analysis (SJA)

* As currently used by small and medium sized companies

** Developed by the council of working environment within fishery in Denmark

Preliminary Hazard Analysis

Preliminary Hazard Analysis						
Vessel:			**Conducted by:**		**Date:**	
Workplace:			**Operation:**			
Nr.	**Event (how)**	**Cause (why)**	**Consequence (injury/loss)**	**Risk analysis**		**Actions:**
				Frequency (1-4)	**Consequence (1-4)**	
1						
2						
3						
4						

Risk Matrix

Class	Frequency
1.	At least once per 100 year
2.	At least once per 10 year
3.	At least once every year
4.	At least once per month

Class	Consequence
1.	Insignificant injury
2.	Less significant injury (absence 1-7 days)
3.	Significant injury (absence > 7 days)
4.	Fatal injury

Frequency	Consequence			
	1	2	3	4
4	Small	Medium	High	High
3	Small	Medium	High	High
2	Small	Small	Medium	High
1	Small	Small	Small	High

Danish Risk Assessment Scheme

Surrevod / Flyshooting

Arbejdsoppgaver

1. Tilrigning af fartøj	Minimal risiko	Nogen risiko	Særlig risiko
a. Ombordtagning af proviant	☐	☐	☐
b. Ombordtagning af vand og brændstof	☐	☐	☐
c. Ombordtagning af is	☐	☐	☐
d. Ombordtagning af kasser	☐	☐	☐
e. Reparation af redskaber på land	☐	☐	☐
f. Kørsel med truck	☐	☐	☐
g. Ombordtagning/stuving af redskaber	☐	☐	☐
h. Andet_____	☐	☐	☐

2. Udsætning af redskaber	Minimal risiko	Nogen risiko	Særlig risiko
a. Udsætning af ankergrej/bøje	☐	☐	☐
b. Udsejling af 1.arm tov	☐	☐	☐
c. Klargøring/oplægning af vod	☐	☐	☐
d.	☐	☐	☐

Qualitative Risk Assessment

Skriftlig Risikovurdering	
Fiskerimetode:	Skibsnavn:
Arbejdsopgave:	Havnekendings nr.:
	Kaldesignal:
Risiko	
Forebyggelse	
Dato: _____	Underskrift: _____

Evaluation of the PHA and DRS Methods

- +DRS seems more easy to adapt by its user guide
- +DRS is less work intensive through the prelist of work activities
- -For both methods it may be a problem to formulate risk-reducing measures
- +DRS encourage risk awareness and suits in training of new personnel
- -Risk concept not explicitly defined by DRS, whereas
- +PHA defines risk as (Frequency x Consequence)
- -DRS has no means for prioritising risk reducing measures
- +The PHA ranks risk-reducing tasks according to a given score
- -PHA gives no guidance in formulating hazardous events and related consequences which is challenging for non-trained personnel

Features Regarding the New Risk Assessment Method

- Vessel specific templates taking into account the relevant fishing methods onboard the specific type of vessel
- Emphasise on an user friendly approach, no training or prequalification the users should be necessary
- Contribute to easier prioritising between the safety measures
- Provide important knowledge to ship designers and designers of safety equipment and protective clothing

Motivating Factors for its Implementation

- Make safety information known among involved parties
- Make easy communication of method and results
- Provide an easy user interface, incl. procedures
- Apply rewards and sanctions if reasonable (economical)
- Clarify external factors (authority requirements, etc.)
- Describe responsibility and roles
- Facilitate discussions/sessions (where should such take place, how to set aside time?)

The New Method – a Scheme

No.	Activity	Event	Causes	Frequency				Consequence				Risk
	Preperation and refuel in port			*Once per 100 year* 1	*Once per 10 year* 2	*Once per year* 3	*Once per mnd.* 4	*Insignificant injury* 1	*Less significant injury (absence 1-7 days)* 2	*Significant injury (absence > 7 days)* 3	*Fatal injury* 4	**Frequency + Conseq-uence SUM:**
1	Prep. of vessel and equipment in port			☐	☐	☐	☐	☐	☐	☐	☐	
2	Re-fuel of foil and spare parts			☐	☐	☐	☐	☐	☐	☐	☐	
3	Purchase supplies and consumer products			☐	☐	☐	☐	☐	☐	☐	☐	
4	Annet:			☐	☐	☐	☐	☐	☐	☐	☐	

Action list for events with SUM Risk ≥5 (Ref. to activity in scheme above.

Nr.	**Event** (in short)	**Single cause**	**Preventive action**

Characteristics of the New Method

- The method accommodates real fishing operations
- Provides a scheme for each ***main phase*** of the fishing operation
- Lists activities connected to phases
- Identifies events and causes
- Classifies frequencies into (1-4)
- Classifies the worst possible consequence into (1-4)

- The event risk is calculated as the SUM of frequency and consequence.
  - Values between (2-4) indicate a **Small risk**, a value of (5) indicates a **Medium risk**, and values between (6-8) indicate a **High risk**.
- To each ***main phase*** a action list is prepared for the medium- and high-risk events
  - For each single cause risk reduction measures are identified.

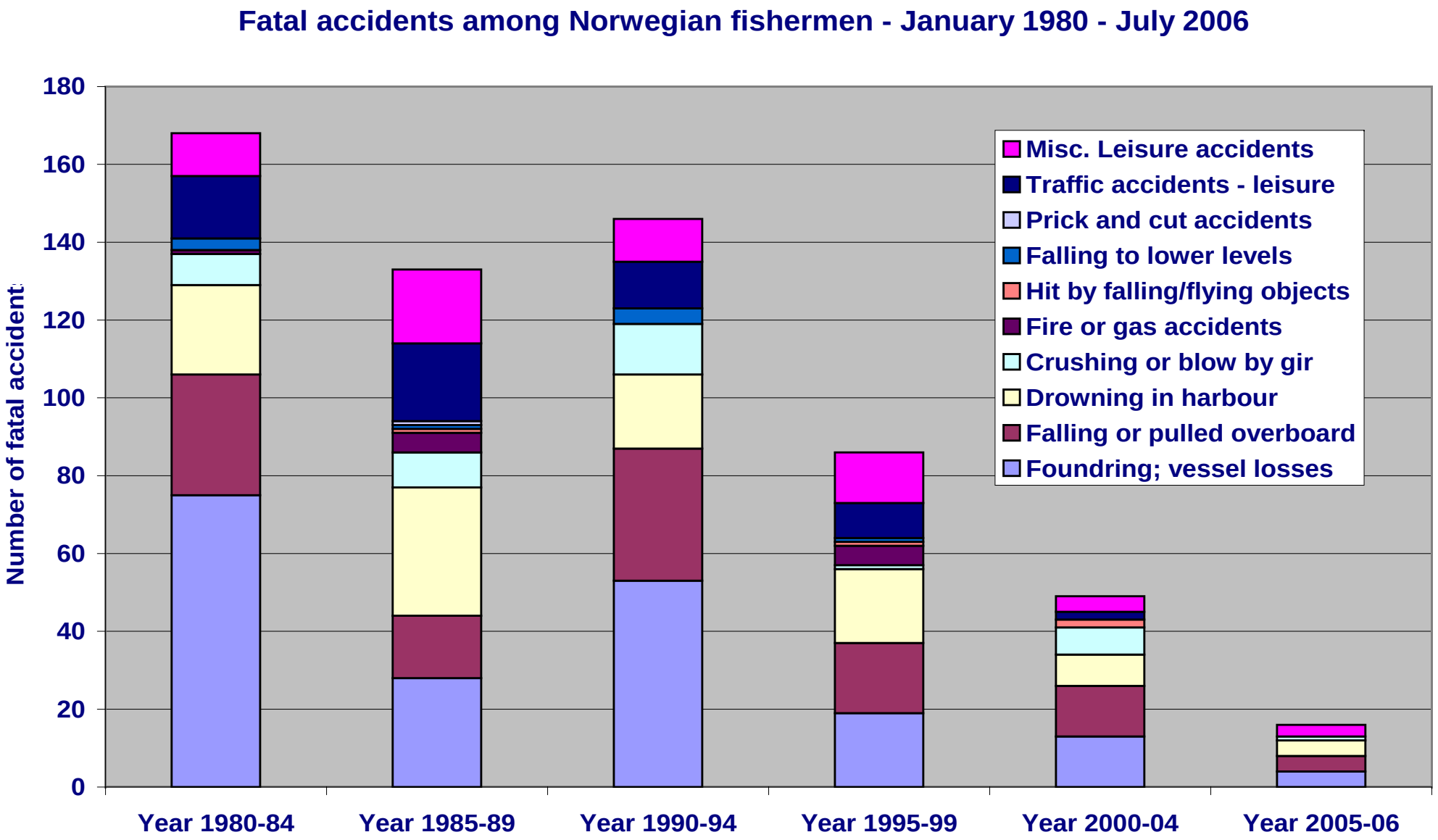
Risk Matrix

Frequency	Consequence			
	1	2	3	4
4	5	6	7	8
3	4	5	6	7
2	3	4	5	6
1	2	3	4	5

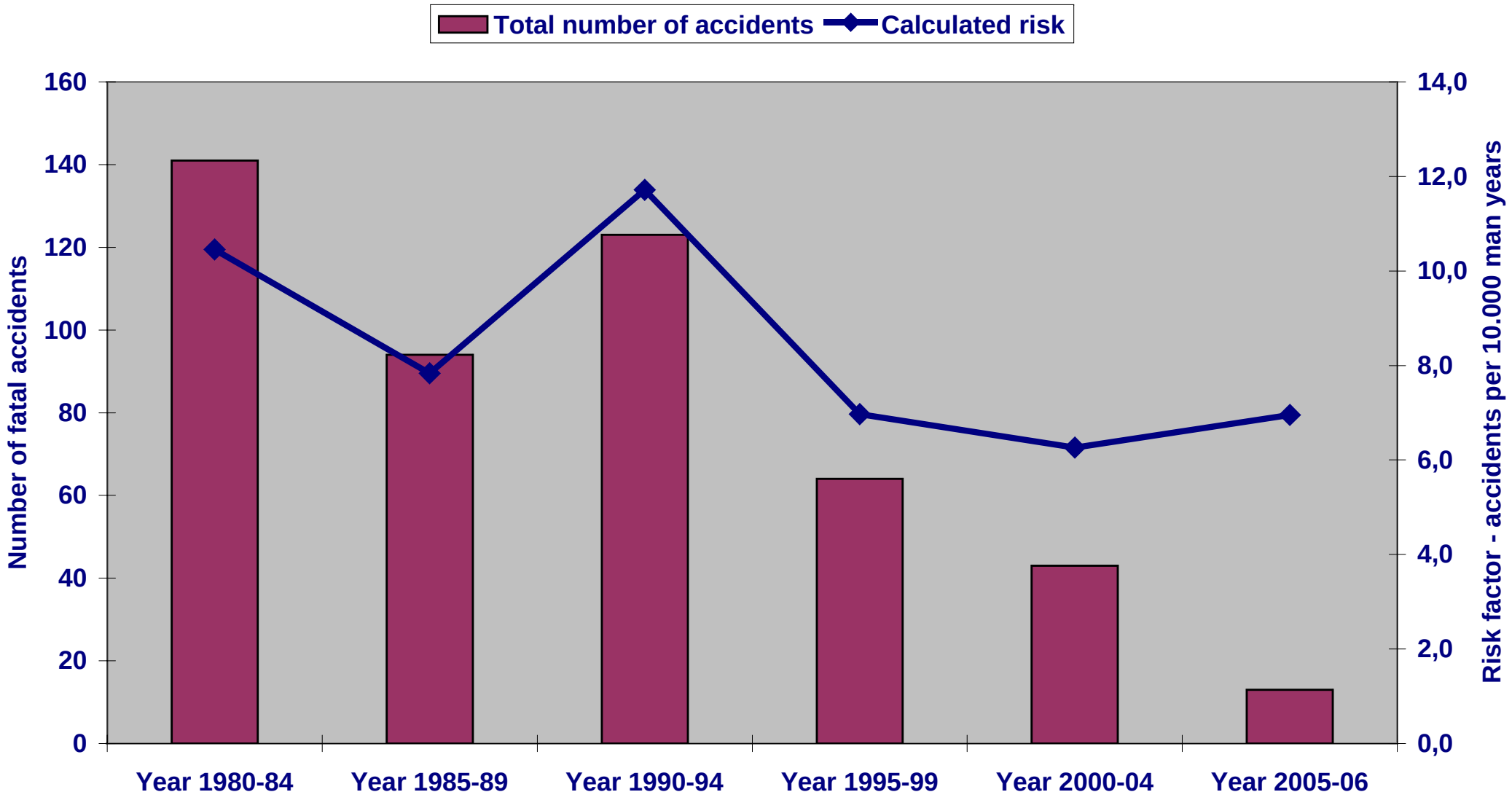
Safety Education and Training

- Safety training for all Norwegian fishermen
  - Training courses started in 1982 and became mandatory in 1987
  - Basic course of 40 hours (one week)
  - Repetition course of 20 hours every 5 - 8 years (started in 1996)
- Main parts of the safety course:
  - Survival from accidents at sea
  - Fire fighting
  - First aid
  - Protection and environment
  - Laws and regulations
- Around 35.000 people (mostly fishermen) have completed the safety course until June 2006

Fatal Accidents during the last 25 years (SINTEF-data)



Fatal accidents in the Norwegian fishing fleet



Total Distribution of the Fatal Accident Types (January 1980 - July 2006)

- Main fatal accident types among fishermen (a *total of 598 accidents*):
  - **Foundering;** lives lost when loss of vessels like water filling, capsizing, grounding, collisions etc.: 32%
  - ***Accidents at leisure time;*** *like drowning or traffic accidents: 20 %*
  - **Overboard accident;** falling or pulled over board on the fishing ground and drowning: 19 %
  - **Harbour accident;** fishermen falling in the water and drowning when the vessel is in the harbour: 18 %
  - **Crushing or blow by gear;** fisherman is fixed in the rope or net and goes into the hydraulic winch or drum and can be killed: 7%
  - **Fire, gas and explosions;** No fatal accidents for the last years: 2 %
  - **Other fishing accidents;** like falling on deck or to a lower level: 2%
  - **Hit by falling or flying objects**; mostly onboard bigger vessels with heavy fishing gear like trawlers: 1%

Remarks to the Safety Training and Organization of HSE

- Foundering: Loss of small vessels with one or to men onboard. **No control of *the safety standard* on board this smaller vessels (Length, Loa < 35 feet)**
- Vessel operation: **No offers or demands for skippers on smaller vessels (Loa <15 meters) to take courses *in operation and stability***
- Overboard and harbour accidents: **Lack of *vital safety equipment and no safety control* on board smaller vessels**
  - Despite of the safety courses, the fishermen **"don't care" to invest in proper safety equipment** like safety ladders, safety lines, clothing with buoyancy, etc.
  - There is a **low rate of protective work organisation** onboard the vessels in the Deep Sea Fishing fleet
- *Motivation and safety attitude* related tasks are given only minor focus in the safety training (ref. the high number of leisure accidents)

Conclusions

- Safety management:
  - Systematic HSE work should be a cooperation between research communities, authorities and the fisheries themselves:
  - Organisation of HSE and follow-up should always be a leadership responsibility
  - Safety management systems should be applied on larger units
  - Risk assessment should be implemented as part of the safety management system
  - Safety handbooks should be prepared for all the fishing vessels
  - The authorities should take into account risk assessments in their regulations and in the way of follow- up (carrying out inspections, etc.)

Conclusions, count.

- Risk assessment methods:
  - User guidelines for risk assessment methods should be focused
  - Risk assessment methods should fit real phases of work; Effects:
    - Improved efficiency of analysis
    - Reduced time spent on analysis
- Communication of the HSE message:
  - Arranging informal sessions and ***motivation*** courses onshore
  - Using visualisation tools, as video and animations to improve the general understanding and final ***learning effect***
- Safety education and training should be continuously updated catching those accidents with the highest risk