



Reducing the risk of falls overboard in the lobster fishery: Safety and ergonomic support



Francis Coulombe
Sylvie Montreuil
Jean-Guy Richard
Michel Tremblay

SCQFVS Annual Meeting – February 13, 2014

Presentation outline

- ▶ Context
- ▶ Research objectives
- ▶ Activities accomplished
- ▶ A few results
 - Work activities and the risk of falling overboard
- ▶ Conclusions
- ▶ Follow-up:
 - Development project: Trap haulers and racks for phase 1.5 (2013)
 - Valorisation activity (2014)
 - Preparation of design and trial bench criteria for phase 2.0 (2014–2016)
- ▶ General conclusion

Context

- ▶ Québec: 629 lobster fishing vessels (MAPAQ, 2011)
 - Magdalen Islands: 325 licences
 - Gaspé Peninsula: 170 licences
 - North Shore: 100 licences

- ▶ Catch: volume=3,984 t; value= \$41.6 M (DFO, 2012 p)
 - Magdalen Islands: 2,730 t; \$26.681 M
 - Gaspé Peninsula: 1,173 t; \$12.121 M
 - North Shore: 81 t; \$0.8 M

Context: Falls overboard

- ▶ Eastern United States from 2000 to 2009:
18 deaths in the lobster fishery, 11 of which due to falls overboard
- ▶ Causes: falls and slips, loss of balance and being pulled overboard by fishing gear
- ▶ There are few or no studies on the health and safety of commercial fish harvesters in Québec despite the fact that it is one of the highest-risk activities, according to international statistics.
- ▶ Events triggering this research program:
 - Deaths of 2 harvesters on lobster boats due to falls overboard (2010 and 2011).

Research objectives

- ▶ 1. Understand the fishing activities taking place aboard lobster boats and the risk factors associated with falls overboard.
- ▶ 2. Document collective and individual preventive measures that could be adapted to lobster boats.
- ▶ 3. Identify the most promising avenues for reducing risk.



Methodology for phase 1.0

- ▶ Review of the literature and networking by experts

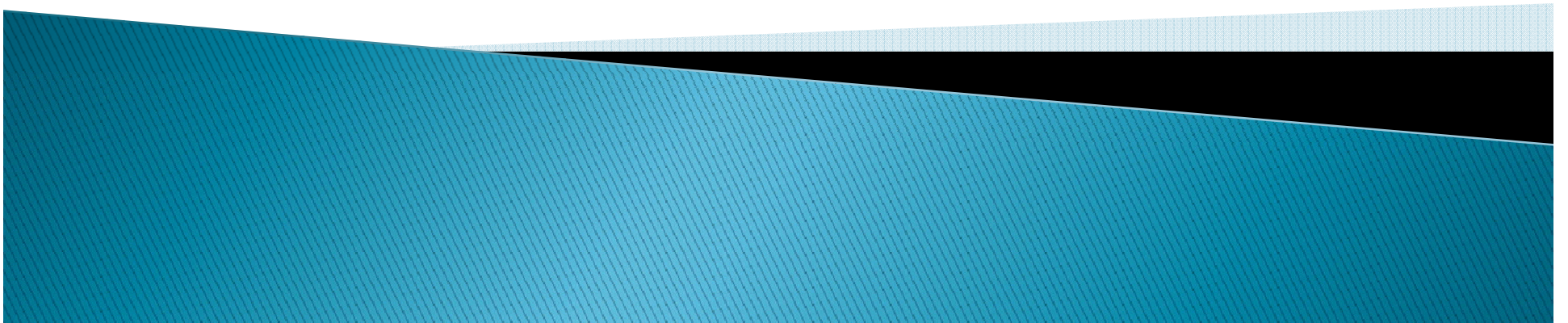
Based on the knowledge of harvesters

- ▶ Interviews and questionnaires on their perceptions of the risks (39 skippers and assistant fishers)
- ▶ Observation of fishing activities aboard 7 boats (3 fishing days each; 3 on the Gaspé Peninsula; 4 on the MI) (120 hours of video)
- ▶ Analysis of the fishing activities and the risks
- ▶ Validation with each of the participating crews (7 crews)

Breakdown of activities for the work situation analysis

Types of activity	Work situations
Season opening	Loading the traps
	Travelling from the wharf to the fishing grounds
	Deploying the traps in the water
Regular fishing	Raising the traps
	Returning the traps to the water
	Moving the traps at the fishing grounds
	Related tasks

A few results



Results from the risk perception questionnaires

Work situations	Risk perception: Scale of 1 to 10
SEASON OPENING – Deploying traps in water	4.8
REGULAR FISHING – Returning traps to water	3.1
REGULAR FISHING – Moving traps at fishing grounds	3.0
SEASON OPENING – Travelling from wharf to fishing grounds	2.6
SEASON OPENING – Loading traps	1.7
REGULAR FISHING – Hauling traps	1.6

Note: The three situations deemed to feature the highest risk all involve management of lines/ropes.

Results for the 39 questionnaires dealing with past incidents involving falls overboard or close calls

Type of fishing	Working situation	Circumstances/Causes	Number	
Season opening	Loading traps + Boarding and leaving the boat	Pushed by a vehicle (on the wharf)	1	
		Fell while boarding or leaving the boat	4	
	Travelling from wharf to fishing grounds	While moving forward or astern	1	
		Slipped-lost balance	2	
	Deploying traps in water	Lost balance	3	
		Lines/ropes (traps on deck)	2	13
Regular fishing	Hauling traps	While grabbing buoy	5	
		While untangling one line from the other	1	
	Returning traps to water	Lines/ropes (traps on deck)	2	
		Lines/ropes (traps on table)	7	
		Caused by the measuring tool	1	
		Unknown	1	
	Moving traps between fishing grounds	Lines/ropes (traps on deck)	4	21
Other	Unknown situations	Lost balance	2	9
		Lines/ropes (on deck or on table, not specified)	7	
	Other situations	Lost balance	5*	
		Caused by a pail (while washing deck)	1	
		Hit by hauler pulley	1	7
Total			50	50

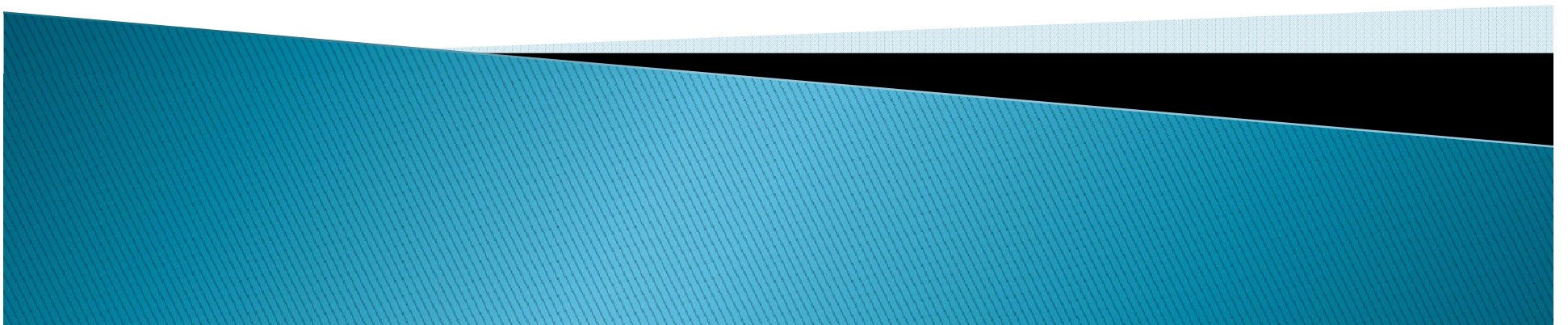
Overview by cause of fall

Circumstances/Causes	Number	
Loss of balance	12	
Lines/ropes (traps on deck)	9	23
Lines/ropes (traps on rack)	7	
Lines/ropes (on deck or on rack = not specified)	7	
While catching a buoy	5	
Fall while boarding or getting off the boat	4	
Caused by (other than lines/ropes: pail - gauge)	2	
Moving to the fore or the stern of the boat	1	
Untangling two lines	1	
Pushed by a vehicle (on the wharf)	1	
Unknown	1	
Total	50	
Lines and ropes involved in 46% of all cases (23/50)		

**Results for the questionnaires on the respondents' perceptions
regarding the impact of certain factors on the risk of falling:
Scale of 1 to 10**

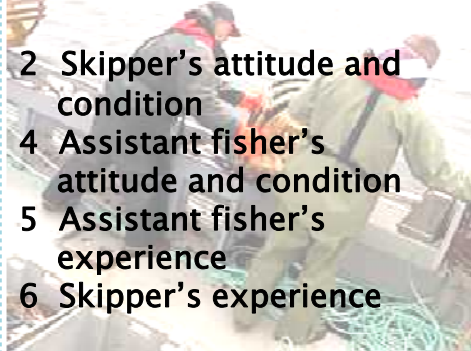
Rank	Factor	Score
1	Weather conditions	6.5
2	Skipper's attitude	6.4
3	Line/rope management	6.2
4	Assistant fisher's attitude	5.9
5	Assistant fisher's experience	5.6
6	Skipper's experience	5.6
7	Deck condition – Grip	5.3
8	Work methods	5.1
9	Gunwale height	5.0
10	Lobster boat's stability at sea	4.9
11	Deck condition: Congestion	4.6
12	Layout of boat	3.9
13	Hauler condition	3.0
14	Layout of wharf	2.9
15	Gunwale width	2.7
16	Equipment available	2.7
17	Access to head	2.0
18	Position of hauler	1.8
19	Traps	1.7

Factors, by category

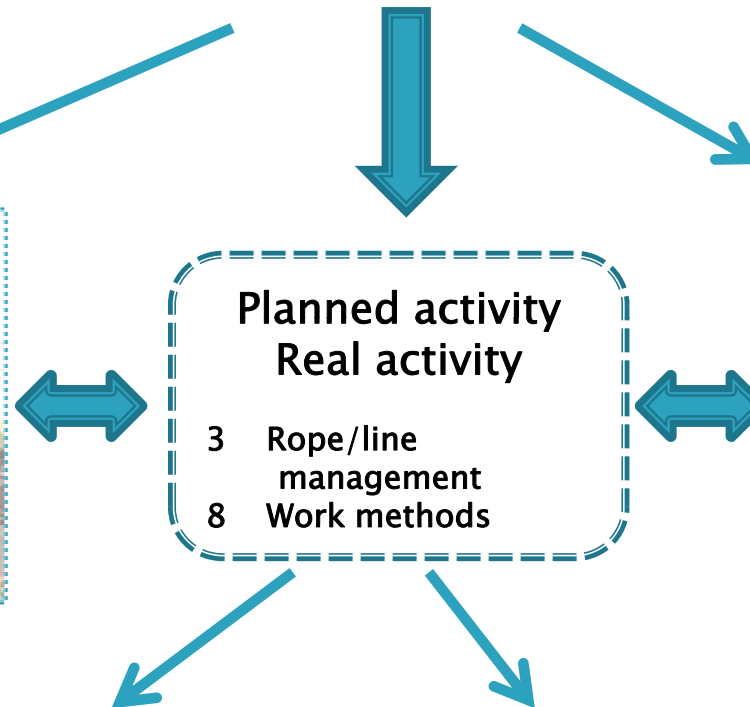





Workers



- 2 Skipper's attitude and condition
- 4 Assistant fisher's attitude and condition
- 5 Assistant fisher's experience
- 6 Skipper's experience



Boats and equipment



- 7 Deck condition: Grip
- 9 Gunwale height
- 10 Stability at sea
- 11 Deck condition: Congestion
- 12 Boat layout
- 13 Condition of hauler
- 14 Wharf layout
- 15 Gunwale width
- 16 Equipment available
- 17 Access to head
- 18 Location /position of hauler
- 19 Traps



Prevention strategies suggested in risk perception questionnaires

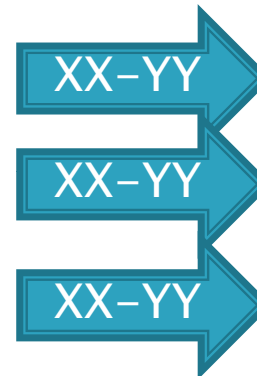
PREVENTION STRATEGY	NUMBER OF TIMES MENTIONED
Improve adherence of deck	16
Optimise cohesion between crew members	16
Improve placement and handling of lines/ropes	13
Improve table/rack or gunwale	11
Adapt pace of work (hauling and deploying lines/ropes)	11
Install safety devices around the boat	9
Lay out work areas adequately	7
Avoid piling traps too high; tie them down	6
When moving lines/ropes during regular fishing activities, use the trap support when deploying them at all times.	4
Other: cleats to hold lines/ropes, sobriety, etc...	8

Results

A few illustrations



The way the traps are loaded onto the boat at the wharf has a major impact on safety when the traps are deployed in the water.



Work situations	Risk perception: Scale of 1 to 10
SEASON OPENING – Deploying traps in water	4.8
REGULAR FISHING – Returning traps to water	3.1
REGULAR FISHING – Moving traps at fishing grounds	3.0
SEASON OPENING – Travelling from wharf to fishing grounds	2.6
SEASON OPENING – Loading traps	1.7
REGULAR FISHING – Hauling traps	1.6



Moving from the front to the back of the boat



Deploying the first row of traps (Poly1)–clip 3



- Importance of having adequate work space
- Importance of having a trap load whose volume (height X width X number) → stability



Management of lines/ropes during initial trap deployment





It's always
dangerous.



Hauling the traps



XX-YY

XX-YY

XX-YY



GOPRO245, t- 1:21



GOPRO960 t=0:42



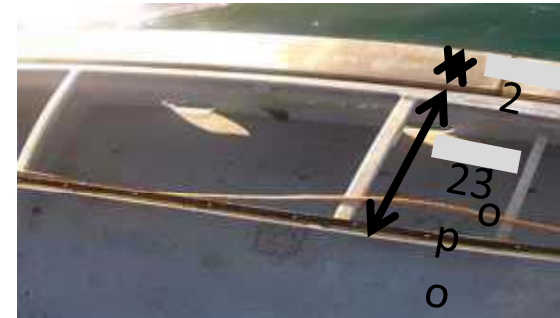
GOPRO915, t=0:56
Posture départ
Initial posture

Management of lines/ropes



Management of lines/ropes

- ▶ On the table



- ▶ In a bin



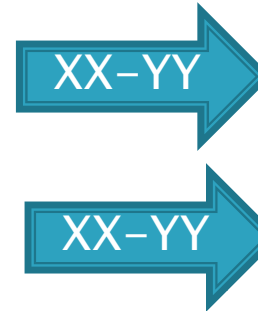
- ▶ On the deck



Deploying lines



Moving traps between the fishing grounds



First area of intervention identified

- ▶ Actions involving the workers: awareness-raising, training, transfer of knowledge pertaining to experience and prudence = valorisation of the research results
 - Risk analysis and identification of potential ways to prevent falls overboard by crewmembers on Québec lobster boats: Phase 1 (2011–018). The research report was presented to IRSST (Montreuil *et al.*, yet to be published)
 - 2014: Valorisation activities with fish harvesters, fisheries schools and other stakeholders TC, CSST, DFO = identification of the principal knowledge to promote

Second area of intervention identified

- ▶ Actions involving the layout of the hauler station and the trap table/rack
 - Improve the safety and ergonomics of the hauler station and the trap table/rack. Preparatory step: Analysis of the current situation and establishment of experimental conditions. Phase 1.5 (2013-0032)
 - 2014–2016: Criteria to ensure the safe layout of the hauling station and the trap rack on lobster boats: developed with the lobster harvesters' participation, validation on test benches in 2015 and implementation strategies

Phase 1.5

**Survey and detailed analysis of the
work done at the hauling station
and trap rack**

Some typical results

Vessel variability: Gaspé Peninsula

Flats



Vessel variability: Magdalen Islands

Multi-purpose

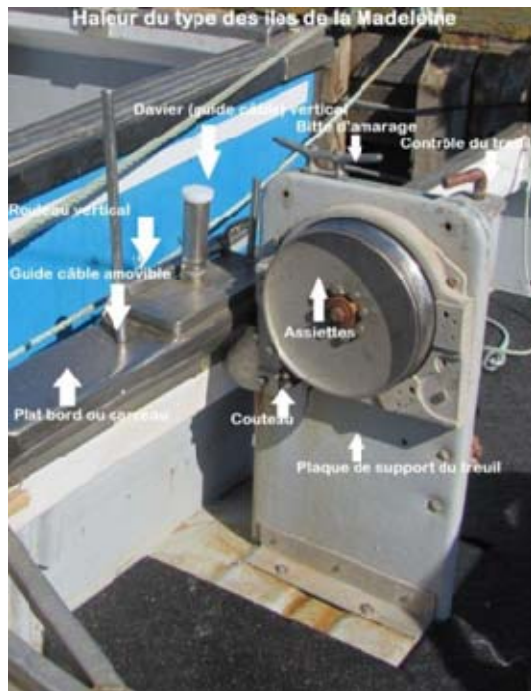


Conventional

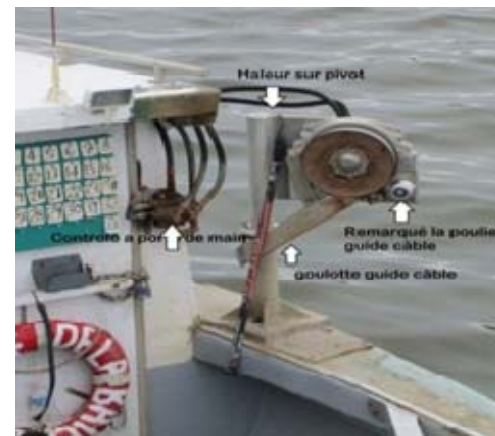


Hauler station layouts

Magdalen Islands



Gaspé Peninsula



Layouts in trap rack area

Gunwale



Gunwale with trap rack



Table



Phase 2.0: Design criteria and test benches: The project's underlying principles

- ▶ Three types of expertise:
 - Lobster harvesters and prevention organisations;
 - MERINOV= fishing techniques and design;
 - Université Laval=risk analysis, prevention and the ergonomic aspects of the design.
- ▶ Participative approach: Co-design and validation activities (needs, design parameters, feasibility, constraints, impacts, etc.)
- ▶ Sharing of experiential knowledge and innovation already implemented
- ▶ Trial benches installed on 3 lobster boats that are representative of fleet variability
 - Modifications comply with design criteria leading to safe and ergonomic work stations
 - Assessment of impacts on the degree of risk
 - Evaluation of the potential for general use on other boats

CALENDRIER 2014-2016

Période de pêche

Lots	Description des travaux/Mois	Sept.	Oct.	Nov.	Déc.	Jan.	Fév.	Mars	Avril	Mai	Juin	Juil.	Août	Sept.	Oct.	Nov.	Déc.	Jan.	Fév.	Mars	Avril	Mai	Juin
1	Comité éthique																						
2	Comité de suivi																						
3	Comité d'experts																						
4	Recrutement, ententes et analyse																						
5 a	Paramètres de conception : analyse comparative																						
5 b	Paramètres de conception : formulation et faisabilité																						
5 c	Étude d'impact sur les autres systèmes																						
5 d	Paramètres de conception : validation																						
6	Conception des modifications (bancs d'essai)																						
7	Planification des essais et fabrication																						
8	Méthodologie pour documenter les essais																						
9	Réalisation des essais																						
10	Analyse des résultats																						
11	Validation auprès du comité d'experts																						
12	Exploration des stratégies de valorisation																						
13	Préparation du document synthèse pour la valorisation																						
14	Rédaction du rapport																						
15	Réponse aux évaluateurs et corrections																						



RÉUNIONS