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AN ANALYSIS OF THE RISK IN THE FRENCH SEA FISHING INDUSTRY. EXAMPLE OF THE DOCKSIDE ACCIDENT RISK

GILBERT LE BOUAR [1], CHRISTINE CHAUVIN [1]

ABSTRACT

In many maritime countries, the work of sea fishermen is one of the most hazardous of occupations. The number of accidents is much greater than in other occupations on land or at sea, and the accidents themselves are often more serious. When considering the risks and hazards of fishing, one initially thinks of major risks like collisions or vessels running aground, as well as the work related injuries which are mainly caused by the fishing equipment (otter boards, ropes) and by the motions of the vessel. These accidents and, in a more general sense, the dangers met by fishermen at sea have already been studied. But little research has been undertaken on the problem of accidents of fishermen while the vessel is in port; and in France, these accidents account for about 30 % of all registered injuries for the sea fishing industry.

[1] University of South Brittany, GESTIC (Study Group on Health, Work, Information and Cognition)
Ergonomy and Safety Laboratory on Maritime Activities (LESAM),
Research Centre, Rue de Saint-Maudé, 56321 Lorient-F Cedex.
Phone number : 0033 (0)297 874 521 ; fax number : 0033 (0)297 874 500
hristine.chauvin@univ-ubs.fr ; gilbert.le-bouar@univ-ubs.fr

The presented report takes a look at this category of accidents, on the basis of data on 5074 accidents registered between 1996 and 2005.

An examination of statistics therefore points to certain types of risks and dangerous situations, but it also leaves a number of questions pending. One of these is the number of "unknown" causes. Falls, in particular, are usually linked to an outside factor which is not listed on the form the sailors must fill out. To compensate for the limitations of the epidemiological analysis, on-site observation seemed to be the best way of understanding the risks of the activities of fishermen in the port.

Keywords: Occupational accidents; Fisher; Docked vessel; Injury

INTRODUCTION

The dangers met by fishermen at sea have already been studied (International Labor Office, 1999, Törner & Nordling, 2000, Matheson & al., 2005, Chauvin & Le bouar, 2007, Jaremin B & Kotulak E, 2004), but little research has been undertaken on the problem of accidents of fishermen in ports. Jensen, Stage & Noer (2005) notice just that "embarking and disembarking has been identified as a particularly hazardous activity in relation to fatal injuries".

This report takes a look at this category of accidents, on the basis of data on 5074 accidents recorded between 1996 and 2005. It includes a statistical analysis of this data, and an ergonomical analysis of on-the-job situations. Risks assessments need, in fact, to be made at two different levels : survey at company or plant level which may present risks, and in-depth investigations of individual jobs or workplace (Haslegrave & Corlett, 1995).

MATERIALS AND METHODS

Statistical analysis of accidents

The statistical analysis is based on data gathered from the forms fishermen fill in when declaring an injury. This form is not only used for dockside injuries, but for all accidents to workers in the sea fishing industry. The filling of this form is not mandatory. It accounts for 70% of the injuries occured in France during the period of the study.

This accident form (Chauvin &Lebouar, 2007) includes 18 questions relating to the injured person (age, type of work), the vessel (type and area of fishing, size), the circumstances of the accident (date and time, positioning of the vessel, weather conditions, activity of the injured person at the time of the accident, place of the accident), and the accident itself (type of accident, outside factors involved, consequences, injured body part, nature of the injury).

We will present the pertinent elements concerning the vessels on board which dockside accidents occur, determine the characteristics of the injuries and analyse them in terms of « risks » and « hazards ». A hazard is the innate of a product, an equipment, a phenomenon or a situation, liable to alter the integrity of persons, goods or an environment. A risk is calculated on a two-fold scale defining an unwished-for event : on one hand the probability that such an event will occur, on the other hand the seriousness of potential damage.

Vessels and fishers

The ergonomical analysis rests on interviews and observations carried out in the Lorient fishing port, with fishermen working on netters fitted out for inshore fishing on one hand, and trawlers fitted out for coastal fishing on the other.

The crew of the trawlers we observed was made up of four fishers and one skipper-owner. These trawlers go out for a week, from Monday 3 :00 A.M. to Saturday 3 :00 A.M. Over the observation period, the trawlers came back to port every night around 2 :00 A.M. to unload the day's catch.

The netter crews which came under observation were made up of three people : two fishers and a skipper-owner.They go out for the day, from Monday to Saturday, going out to sea around 3 :00 A.M. and coming back to port in the afternoon, about 3 :00 P.M., to unload their catch.

Table 1. List of the vessels surveyed

Vessel name	Port	Number of fishermen	Size	Size typology	Construction	fishing gear	navigation typology
PHALENE III	Lorient/F	4	14	[12-16m[	1996	Trawler	coastal fishing
OURAL	Lorient/F	4	14,8	[12-16m[	1985	Trawler	coastal fishing
LE BREIZH	Lorient/F	5	16,53	[16-24m[	1987	Trawler	coastal fishing
SANTIMAX	Lorient/F	4	15	[12-16m[	1987	Trawler	coastal fishing
JORDJY	Lorient/F	5	14,6	[12-16m[	1978	Trawler	coastal fishing
LEA-MARIE	Lorient/F	4	16	[16-24m[	1980	Trawler	coastal fishing
ALICE-PAUL II	Lorient/F	4	13,1	[12-16m[	2002	Trawler	Inshore fishing
IKARIA	Lorient/F	3	9,12	L<12m	1986	Netter	Inshore fishing
LES6FRERES DE LUCIE	Lorient/F	3	11,98	L<12m	1988	Netter	Inshore fishing
LA GAVRAISE 2	Lorient/F	3	12	[12-16m[	1987	netter	Inshore fishing
GUEVELLEZED	Lorient/F	4	11,89	L<12m	1995	netter	Inshore fishing
BREIZH DA VIKEN	Lorient/F	2	11,99	L<12m	1972	Netter	Inshore fishing

Ergonomic observations involved 6 crews during the whole month of July 2005. The activity of the crews was filmed during the unloading, and also while crates were taken off the vessel. This analysis is designed to point out the risks incurred by the fishers (risks of falling, risks of back injuries), and to identify the hazards.

RESULTS

Statistical results

Circumstances of the accident

The French sea fishing industry is broken down into four categories:

- Ocean fishing : this involves all vessels over 1000 gross register ton, whatever the duration of fishing campaigns ; for smaller vessels, the campaign has to last over twenty days ;
- Offshore fishing, involving vessels which go out to sea for over 96 hours ;
- Coastal fishing, with vessels going out to sea for over 24 hours but less than for 96 hours ;
- Inshore fishing, with boats going out to sea for less than 24 hours.

In 2004, for mainland France only, we counted to 5556 vessels for 17,500 fishermen.

An examination of the type of navigation practiced by the vessels on which accidents have been reported shows an over-representation of coastal fishing (which employs 20% of seagoing fishers and registers 31,43 per cent of all accidents), while the inshore fishing was under-represented, since it employs 54% of seagoing workers and among them 44,10% of all accidents were reported.

Table 2 : Percentage of accidents according to the type of navigation

	% accidents	% workers
ocean fishing	4,90	6
offshore fishing	19,56	20
Coastal fishing	31,43	20
inshore fishing	44,10	54
total	100	100

The great majority of dockside accidents occurs on vessels less than 25 meters (75 ft) in length. The two categories of vessels most involved are: vessels less than 12 meters long (37%), and vessels 16 to 24 meters long (32,5%). A statistical analysis shows that vessels less than 12 meters in length on which these accidents occurred were, for the most part, netters fitted for inshore fishing. It shows that accidents occurring on vessels 16 to 25 meters long most often involve the vessels fitted for deep sea fishing and using otter boards. Coastal fishing vessels appear in both the « 12-16 meters » and the « 16-25 meters » categories.

Risks and hazards –
Activity of the injured worker at the time of accident and the type of accident

The activities generating the greatest number of accidents are: the loading and unloading operations (23,93%), vessel maintenance (21,09%), processing and handling of the catch (15,18%), handling of the fishing equipment (12%), as well as the « other » category (16,14%) covering events not mentioned in the accident registry form.

To better understand the circumstances of these accidents, it is important to mention that 77% of dockside accidents are officially listed as having occurred aboard the vessel.

Falls (falls from a height or at ground level, falls overboard) represent a major risk (30,25% of accidents). The next category involves excessive efforts or awkward movements (20,81%). There are other risks, such as being « struck, pinned, carried along by equipment » (12,36% of injuries) or « Cut, pricked by… » (12,06% of injuries), "blows against a fixed obstacle" (7,90%) and the risks listed as « others» (11,63%).

A chi_square test between the variables [Activity of the injured worker at the time of accident] and [the type of accident] shows that a high interdependancy factor exists between :

The risk of « falls » and the « loading and unloading » phases.

The risk of being « cut, pricked » while « handling the fishing equipment ».

A large number of accidents remain unspecified regarding the risk (type « other ») run by the « other » occupation of the sailor at the time of the accident.

Risks and hazards – outside factor involved and the type of injury

The causes of injuries are not well known, since 47,83% of injuries involve an unspecified outside factor. The best-represented category is that of « baskets, crates and containers », involved in 11,41% of injuries.

A chi_square test between the variables [outside factor involved] and [the type of injury] shows that falls involve, for the most part, an outside element other than those listed on the form.

The risk of being « struck, pinned, carried along by an element » is not linked to any specific activity. It is correlated with two dangerous elements of the fisherman's environment : the otter boards and the hoisting gears.

The risk of being « cut or pricked» shows a high correlation factor with « knives and hand tools » and, to a lesser extent, with « fish and shellfish » on one hand and an « other » outside

Awkward movements and excessive efforts show a correlation with the handling of the catch, and with hazardous elements such as baskets, crates and containers.

An examination of statistics therefore points to certain types of risks and dangerous situations, but it also leaves a number of questions pending. One of these is the number of “unknown” causes. Falls, in particular, are usually linked to an outside factor which is not listed on the form the fishers must fill out. A reason of this could be explained by the fact that falls are often due to a combination of risk factors and there is, therefore, difficult to refer to only one identified factor (6). To compensate for the limitations of the epidemiological analysis, on-site observation seemed to be the best way of understanding the constraints of the activities performed on the dock.

Results of ergonomical analysis

Fishermen are aware of the dangers of their profession, but for the most part, they identify these risks with their fishing activity at sea, and tend to minimize the risks of injury while the vessel is docked.

The fishers whom we interviewed all perceived that the loading and unloading of a vessel presented a risk. Specifically, in their eyes, the risk of falling into the sea between the quay and the vessel. They often have to step over a one-meter gap; at low tide, the vessel can lie 5 to 6 meters below the quay. The port’s installations (ladders built into the dock) are not always handy. The loading and unloading are often performed in fairly acrobatic conditions. The risk increases when the fisher is alone: if he falls into the water, the risk of hypothermia or drowning is great .

Analysis of the fisher’s activity aboard 12 vessels while unloading the catch (July 2005)

The unloading procedure was fairly similar for every vessel observed. When the vessel does not have its own hoisting equipment, the skipper tries to dock close enough to one of the port’s crane to be able to use it. When the vessel docks, one or two fishers go ashore. The vessel is moored and the unloading of the catch begins.

It can happen that the vessel coming back to port does not find a docking place allowing it to make use of a crane. In that event, all unloading operations are performed by hand.

Over the observation period (July 2005), the unloading process for the trawlers lasted 15 to 30 minutes, according to the volume of the catch. For the netters the duration of the unloading process was generally shorter, from 10 to 16 minutes.

At that season of year, the vessels mainly look for prawns but they also bring in fish.

To show the importance of the port's equipment on the fisher's workload while unloading the catch, let us compare the unloading process with and without the help of a hoisting crane.

Unloading with the port's hoisting crane

During the unloading process, on trawlers the fishers are positioned as follows (Figure 1) :

- one crane-operating man (1) on the dock,
- one man (2) on the vessel's deck, where he can see both the hold and the crane operator ;
- one man (3) on tween deck, then down in the hold,
- one man (4) on the dock to handle the crates.

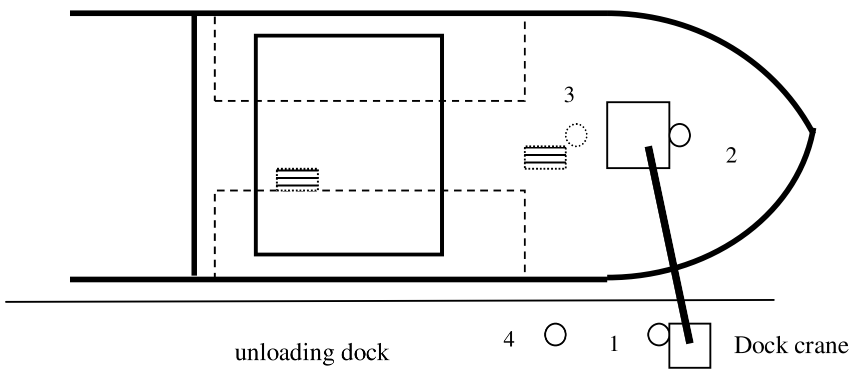

Figure 1 : position of the crew during the unloading process

Concerning the netters, the main difference with the trawlers is that the 3-man crew does not allow for a man on deck to serve as middleman between the crane operator and the fisher preparing the piles of crates between decks. This creates a risk because no one is there to steady the swinging of the piles of crates fastened to the slings during the transfer from the vessel to the dock, particularly as the crates go through the hatch to the deck. This same risk recurs while loading the piles of empty crates for the next day's fishing. The prawns are unloaded first. This operation requires that the man stationed here should slide the crates stacked between decks (piles of 10 crates). He cannot place the pile directly into position under the hatch because it is set just above the hold hatch, which is capped by a coaming. He therefore has to re-stack the pile of 10 crates on the hold hatch, by hand, lifting one or two crates simultaneously. Each crate weighs 10 kilos.

The fisher on the vessel's deck catches the crates' hanging sling and sets them above the hatch giving access to the front storage area of the vessel, between decks. The man between decks catches hold of the slings and fastens them to the prepared pile of 10 prawn crates. The pile of crates is lifted out of the vessel by the crane, and deposited on the quay; the fisher on the deck guides the pile as it emerges from the hatch. This does not require any great physical effort, the primary usefulness of this workstation is to relay communication between the crane operator and the fisher down between decks.

Once the pile of crates is set down on the quay, a fisher unfastens the slings and the unloading process continues. The man on the quay lifts the crates one by one to place them on a loading pallet. Once filled, the pallet will be carried off by a motor-driven or electrical vehicle, either to a dockside selling counter or to a refrigerated storage room.

Once all the prawns are unloaded, the man stationed between decks goes down into the hold, and the unloading process continues in the same way for the fish crates.

When the entire catch has been unloaded, the fishers use the crane to load the empty crates for the next fishing campaign.

The workload falls essentially on the man preparing the piles of crates between decks and in the hold, and on one of the fishers on the dock. They handle 10 kilo crates, grasping them at floor level and lifting them to shoulder height, or higher for the crates to be set on top of the pile.

Unloading without a port's hoisting crane

Without the assistance of a crane, operations follow the same cycle with some alterations.

Obviously, the workload is much increased, since each fisher must handle each crate, often in very strained postures : crate at arms' length, overhead. We know these postures to be extremely uncomfortable, and in one of the cases observed, the fishers had to handle 53 crates of prawns and 35 crates of fish, almost a ton in 25 minutes.

The workload is also increased by the fact that, after unloading the entire catch, the fishers must load manually the empty crates to be used for the next fishing cycle.

We were able to observe that the passing of the crates hand to hand called for particularly dangerous positions, with fishers working with one knee on the quay and one foot on a quay protection tire.

We note however that in both cases, the fishers all remain at a given post. During the unloading of the catch, there are few comings and goings between the vessel and the dock.

The man positioned on the quay did not come back on board during this phase of activity.

Maintenance operations and taking on supplies

After the catch is unloaded, the fishers perform routine maintenance operations: washing out the cold storage hold, washing the vessel, unloading old equipment, greasing the equipment, repairing any damages noticed while fishing. To these systematic end-of-campaign operations are added preventive maintenance operations: laying out the otter boards (on an average, once or twice a year) and nets on the dock, changing the engine oil and a general overhaul of the vessel every two weeks.

These operations involve numerous comings and goings between the vessel and the dock. Ladders are not always close enough to use, and the crew members are often carrying heavy loads: barrels, old pieces of rigging, chains.

Maintenance operations also imply activities in the engine room, where space is more restricted. The engineers are forced to assume very uncomfortable positions to carry out their work. The air is polluted by the exhaust gases during engine trials; it can also be very noisy. Hot pipes also constitute a danger.

DISCUSSION AND CONCLUSIONS

The great majority of dockside accidents of fishermen occur on vessels less than 25 meters. On board larger vessels, dockside accidents are less numerous because they do not come so often to port to unload the catch, and above all because the unloading work is often taken over by dockers.

Accident analysis based on accident reports highlights the hazards related to dockside work of fishers i.e.risks of falls, excessive physical effort, awkward movements, and, to a lesser extent, risks of getting "struck, stuck, dragged along by a gear" and risks of getting cut; even though this survey does not focus on understanding the operating step-lists and identifying the hazards and hazardous situations accurately.

On the other hand, the work analysis renders the statistical analysis more exhaustive and accurate. More specifically, it shows that the fall risks are closely related to the unloading operations. This risk is linked to dockside equipment elements i.e. ladders or other ways of access to the vessel or the dockside.

This analysis leads to the formulation of various proposals aiming at upgrading the existing safety standards for fishermen. Firstly, it puts forward the poor equipment of some docksides, regarding both the handling gear and the ways of access. Secondly, it underlines ship-design failings : taking the unloading operations of the crates into account, this should lead the ship-designers to locate the hold-hatches in such a way as to reduce, or even remove, manual handling operations. It should also lead to developing a new version of the accident report form by categorising the unloading operations whether they are related to the catch, the gear or the crew members and including the ladders in the dockside equipment elements.

More generally, this survey raises two issues :

- the issue of the risk assessment methods used in a field where vessels and crew activities show a wide variety of features. Implementing a risk-assessment method requires adequate knowledge of the tasks carried out. On-board tasks carried out by fishermen have regularly been focussed on and studied in France and abroad. But paradoxically, dockside operations which can easily be observed and analysed, have been given little attention so far.
- The issue of designing occupational feedback tools, such as the accident report form. In the commercial sea-fishing field, different data acquisition tools have been drawn up. They ordinarily (8) classify the following data: data on the casualty, the vessel, the operating conditions (size of the crew, weather conditions), description of the accident site, description of the on-going working process at the time of the accident, description of the accident, its causes and consequences. These data-bases leave a certain number of questions pending. They do not provide any information on the "influencing factors" (10) such as the working hours (5). Giving a general overview only, these data-bases should lead to complementary analyses, using different methods, such as cause-trees and occupational analyses.

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