Work-time studies aboard Belgian fishing vessels

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At the Third FAO Fishing Boats Meeting, held in Gothenburg last year, an interesting and unusual contribution to the discussions was made by the Director of the Belgian Fisheries Research Station, Ostend, Mr. P. Hovart. His research station has been engaged in a study aimed at the more efficient use of crews in Belgian fishing craft, particularly when the net is shot and hauled and when the catch is handled.

This article, explaining the reasons for this work and the methods used, is based on the introduction to the report on the Belgian investigations.

Work-time studies aboard Belgian fishing vessels

by P. HOVART and G. CLEEREN, Proefstation voor Zeevisserij (the Belgian Fisheries Research Station), Ostend

AN outstanding feature of the fishing industry today is the rapid pace of technical development. In recent years, we have observed the pace at which new types of vessel (such as stern trawlers and factory ships) have been going into service; fishing gear and its operation is changing; we have seen new concepts in deck arrangement, new trends in the processing of fish on board and in the designing of fish holds.

The main purpose of all this development has been to increase catching facilities and to curtail production risks. A supporting aim is to simplify and reduce the heavy work on board fishing vessels; in view of the fact that the industry is faced with crew problems, it is logical that more efforts should be made to achieve a saving of labour.

A deficiency

Until recently, these efforts were based on qualitative observations; at the very most, an overall time-determination was made of the work cycle. No figures were compiled on overall labour efficiency and per crew member, nor was the degree of employment of the crew assessed. In the technical 'revolution' of fisheries, this may undeniably be said to be a deficiency.

To remedy this deficiency, it is essential to conduct work-time studies on board fishing vessels.

Some time ago, the working group 'Techniek in de Zeevisserij' appointed by the Committee on Applied Scientific Research in the Fishing Industry embarked on such studies.

Two reports have already been published, namely 'Een vergelijkende studie van het zijtrawlen en het hektrawlen voor een ijslandvaarder' (A Comparative study of labour on side and stern trawlers) and 'De rationalisatie van de visverwerking aan boord van een zijtrawler' (Rationalization of fish processing on board of a side trawler).[1] These publications related to work-time studies of the handling of fishing gear and the processing of fish respectively. At present, studies are being conducted in connection with shrimp vessels, likewise on gear and catch, but in this case the comparisons are between a side trawler, an ordinary beam trawler and a stern trawler.

The aim of this paper is to outline the principles and the methods applied in these work-time studies.

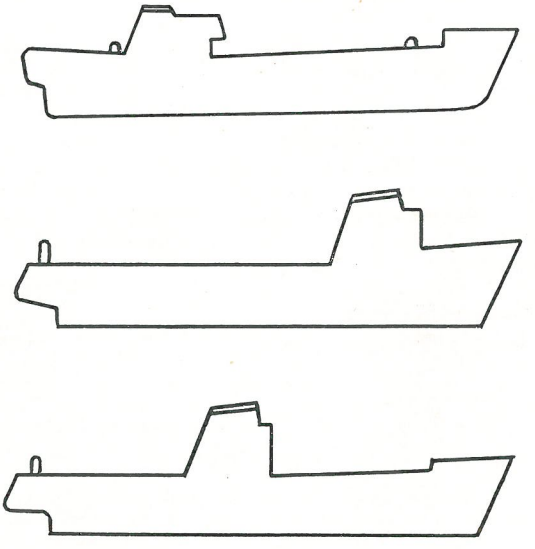
The object of the work-time studies in general — and on board fishing vessels in particular — is the efficient employment of manpower by improvement of working methods and investigation of the factors affecting rationalization. In concrete terms, the aim is to secure more rational handling of the gear and the catch, and, accordingly, efforts are being directed towards better deck arrangement.

Before starting on the work-time studies, it is necessary to determine three factors — the type of vessels and existing deck arrangement, the gear used and the size of the crew.

Type of vessel and deck arrangement. The method of handling the catch and the gear is conditioned by the

Figure 1

Position of the bridge on fishing vessels



deck arrangement — in other words, the available working space.

This arrangement may vary from vessel of vessel. For instance, the bridge may be more forward, more aft or amidships. On a side trawler, the bridge is more aft, while on stern trawlers it is more amidships or more forward of the vessel (Figure 1).

The size of the working deck is also influenced by the position of the winch, which may be operated from the deck or from the bridge.

Also of importance for handling of the gear is the number of drums on the winch and the method of operation; in practice, there are two, four of six drum-winches, which are operated either mechanically or hydraulically.

In addition, the working deck is determined and circumscribed by the hatches (number and position) and the equipment required for processing the catch (e.g. fish washing machine, shrimp sieve, shrimp-boiler, etc.).

Gear. Various types of gear are employed in the fishing industry. Side and stern trawlers, for example, use bottom and pelagic nets with doors, while beam trawlers have two nets which are fixed to beams.

Determining factors in gear handling are the number of nets, the size of the nets and the additional netting equipment (legs, bobbins, danleno's, beams, booms, etc.).

Crew. The size of the crew and the division of work depends on the size of the vessel and the type of fishing in which it is engaged. In inshore fisheries, the crew strength is three to four a vessel, while in distant water fisheries it is 10 to 18. The tasks include those of skipper, mate, chief engineer, deckhand, ordinary seaman and cabin boy.

Principles.

The work-time study is in two parts, one being concerned with method investigation and the other with time measurement. The first part comprises 'the critical and systematic determination, analysis and examination of existing and planned working methods, aimed at improving them so as to arrive ultimately at a more efficient and simpler working method'.[3]

The time measurement consists in 'the application of certain techniques with the object of determining the work content of a particular task by time measurement'.[3]

Figure 2

Outline of work-time studies

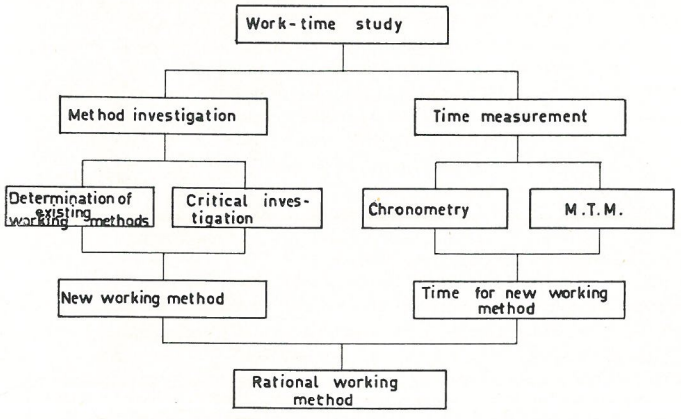
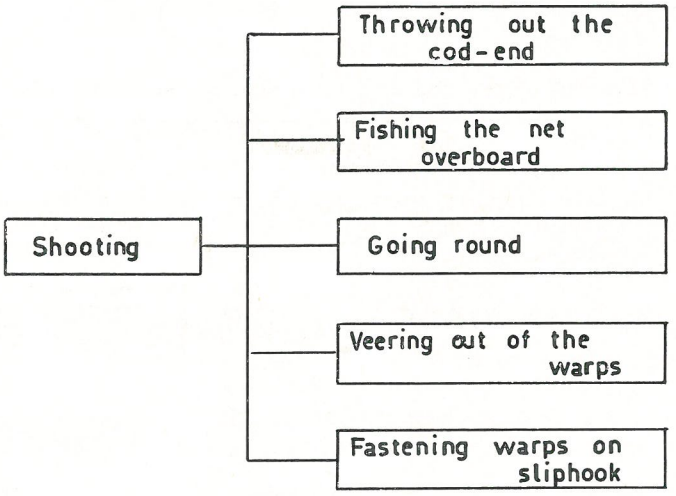


Figure 3

Shooting of the gear



The method study is more of a qualitative nature, whereas the work measurement emphasizes quantitative data. There is, however, a close link between these two factors, as seen in Figure 2.

Method study. The original situation, with all necessary details, in the handling of the gear and the catch is determined by means of a graphic work-analysis.

The shooting of the gear on board a shrimp vessel, for example, is provided by Figure 3.

On the basis of the work-analysis diagram, a critical examination of the existing working methods and working conditions is carried out. A number of questions are posed (what, where, when, who and why) and from the answers to these questions an attempt is made to devise and crystallize new functions and working methods which enable working conditions to be improved.

Time measurement. The time measurement is performed concurrently with the method investigation. Time measurement may be effected by chronometry and by MTM analysis (Method Time Measurement). The latter technique is used in the fishing industry for stabilized operations (such as winch handling), and the former for all others.

In the chronometric method, the time is recorded by means of a chronometer with a scale divided into centiminutes (hundredths of a minute — cmn). For the study on board fishing vessels, what is known as a 'three-stop-watch board' is used.

An important factor in the time-recording process is the tempo of working. By tempo is meant the evaluation of the work-time which corresponds to the ordinary performance of an average worker who, in the accomplishment of his task, without any risk of overstraining himself, produces an effort that he can sustain throughout the working day. Tempo is a certain reference which is adopted, but this reference is necessary in order to be able to compare the times for the various workers. After being converted, the time obtained may be called the normal time. It should be added that, in determining the

time, it is also necessary to take into account such aspects as fatigue and interruptions of work.

An example of the times obtained by chronometry for the hauling of a cod end on a shrimp stern trawler is given in Table 1.

Table 1

Hauling of the cod end on a shrimp stern-trawler.

Operations	Time in cmn
1. Hauling the net	150.4
2. Rinsing the net and the cod end	114.7
3. Hauling the cork line	126.4
4. Hauling the cod end	188.0
Total	579.5 cmn

The starting-point adopted in MTM analysis is the activity of a specific person, that is, a standard worker.

All the data concerning the work process and working conditions are collected and the various movements are analysed and classified.

Analysis consists in determining the nature of the movements performed by the left and the right hand and also the distance traversed by both hands. The movement of the body during performance of the work is also noted. All these operations are then converted to basic movements (reach, move, grasp, turn, release, disengage, etc.).

Classification consists in determining the class of movement (for example, reaching for something in a specific plate).

Once the pattern of movement has been fixed, a basic or 'standard' time (in cmn) is adopted for each operation in accordance with the MTM method.

Other items to be taken into account for determination of the times are frequency and a fatigue factor (15 per cent.).

An example of time-recording by the MTM method is provided by Table 2.

The time is determined for each item in the work cycle. The total time occupied by the work process is then obtained simply by adding up these individual times.

In fishing, there are operations which are performed only once during the entire work cycle and others which recur several times. Putting the doors or booms out and taking them in, for instance, are operations which only take place once a voyage. Hauling and shooting the net, on the other hand, have to be done several times, and thus the time taken by the entire work process is proportionate to the number of hauls. If the latter is n, the total time for handling the gear is equal to: (time for putting out doors or booms) + n (time for hauling and shooting) + (time for taking in doors or booms).

Apart from the number of hauls, there is another factor which affects the work time in handling the catch, namely the catch per haul may differ widely in quantity, size and kind of fish. For the results to be comparable, these three factors must be considered as constant; in both the analysis of the traditional working methods and the introduction of new working techniques, the same quantity, size and kind of fish must be adopted.

Time measurement is carried out in both the original situation (reference basis) and the new job function. In this way, it is possible to appraise the new working methods as compared with the reference basis, determine the gain or loss of time and show the degree of employment of the crew.

If the study yields a gain in time and if the degree of employment can be improved, the working method can be stabilized and introduced. This results in a more rational deck arrangement or even in the designing of new types of vessel, for which not only observations, but also statistical data are available as a basis.

Table 2.

Operation of winch-brake.

Left Hand		Time in cmn	Right hand	
Operations	Symbol		Symbol	Operations
Reaching to wheel	R 45 A	0,72	R 45 A	Reaching to wheel
Grasping wheel	G 1 A	0,12	G 1 A	Grasping wheel
Disengaging brake	D 3 E	1,37	D 3 E	Disengaging brake
Moving wheel	M 10 B	0,46	M 10 B	Moving wheel
Releasing wheel	RL 1	0,12	RL 1	Releasing wheel
		2,79		

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