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Abstract

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Use of derrick scales for weighing live fish

by

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ABSTRACT

In Norway purse seine catches of saithe are usually sold to the factories alive. The fish is transported in boats specially constructed for the transport, i.e. well-boats. The saithe is weighed when transferred to these well-boats. The usual method of weighing has been to transfer the saithe by a dip net to a perforated container placed on a balance scales. Last year, however, a few well-boats started using a scales hanging from the derrick hook above the dip net, and the weight of each load could be read off immediately.

In this study the above methods of weighing saithe were compared, taking into account the accuracy of the methods, the mortality rate of the saithe, and time and effort involved in the process. Both systems of weighing were used on board a well-boat in which the well was divided into two separate compartments; and each load weighed was controlled after transport to land. No difference in accuracy could be detected between the two methods of weighing, but the use of derrick scales seems to give a slightly better survival rate and, furthermore, this method saves both time and effort.

INTRODUCTION

In order to provide the fishing industry with a continuous supply of quality fish for fillet production, live saithe is transported to the factories on well-boats. Here the fish is unloaded and kept alive in net pens until processed. As the well-boats represent the fish factories and the fishermen get paid according to live weight established on board, the weighing process consequently is of great importance.

Up to recently the only weighing system in use has been a perforated container on a balance scales. The container's maximum capacity is approximately 400 kg live fish. The fish is being weighed before release into the well. In order to keep the fish alive the weighing operation has to be quick and efficient.

Last year a new weighing method was introduced. It consists of a scales hanging from the derrick hook above the dip-net, where the weight of the fish in the net can be read off before release into the well of the boat.

The aim of this study was to compare these two weighing systems paying attention to accuracy, mortality and effort involved in the process.

MATERIAL AND METHODS

The weighing systems

The balance scales system is composed of an ordinary decimal balance whose total weighing capacity is 500 kg, the minimum unit of weight being one kg. However, as readings must be made very quickly due to the live saithe, the results are practically always rounded off to the nearest 5 kg.

The derrick scales used was a Salter crane scales, model 199 (Fig. 1), with a total weighing capacity of 1000 kilos, divided into units of 2 kg. The length, breadth and weight of the scales are respectively 90.5 cm, 58.1 cm and 49 kg. As the scales hangs from the derrick over the dip net, the weight load is best read from the wheelhouse, a distance of 2 to 3 meters, making accurate readings difficult. Consequently these results were rounded off to the nearest 5 kg.

In practical use, therefore the accuracy of readings was ± 2.5 kg for both weighing systems.

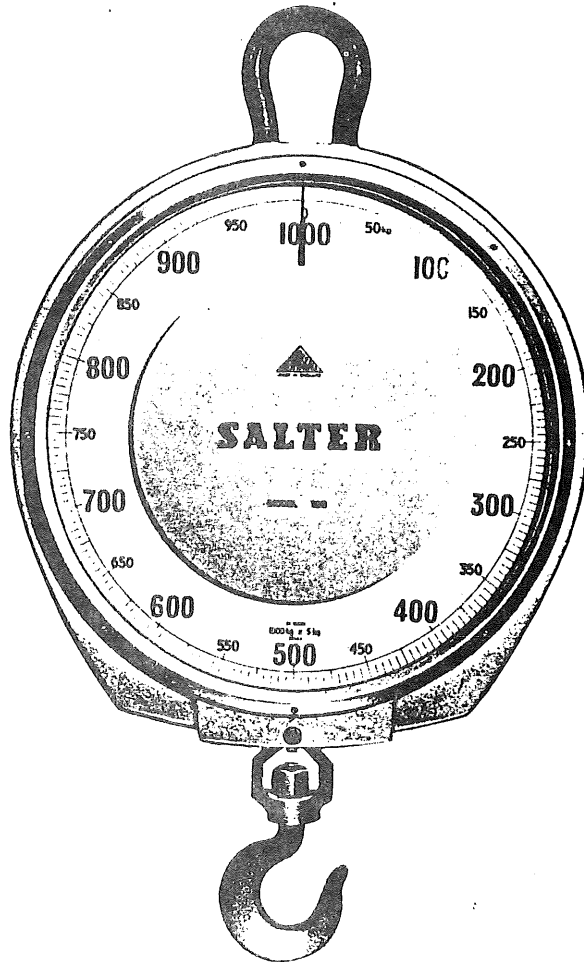


Fig. 1. Salter crane scales.

Test procedure and material

Comparison of the two weighing systems took place on board the well-boat M/S "Magnus Kvamme" in June 1981. The well on the boat was divided lengthwise into two compartments, each having the capacity to hold 11 to 12 tons of live saithe.

The weight of live fish will always include some water. One of the aims of this study was to find how much water (expressed in percentage) was weighed with the fish on the derrick scales. The fish therefore had to be weighed once more after transport, either by balance scales on the boat or by other means on shore (Table 1).

Control weighing could also give information about the accuracy of the derrick system. Furthermore, information was collected from the firm of Kvalheim and Åsmundsvåg of Måløy in the control weighing of 5 other saithe loads, 105 tons in all, weighed on derrick scales and of 3 loads totaling 55 tons weighed on balance scales. All loads were transported by M/S "Magnus Kvamme".

Table 1. Time and place for loading and unloading live saithe on M/S "Magnus Kvamme", 4/5-12/5 1981.

Loaded		Weighing		Unloaded		Transported		Control
place	Date	Time	method	place	Date	Time	amount (kg)	weight (kg)
Fedje	4.5.	1500	Derrick/Balance	Storebø	4.5.	2350	ca 23 000	11 442
"	5.5.	1030	Derrick	Måløy	5.5.	2040	21 990	21 990
Krossøy	6.5.	1630	Derrick/Balance	Storebø	6.5.	2030	13 313	8 201
Hanøy	7.5.	0610	Derrick	Måløy	8.5.	0310	16 630	16 630
Innarøy	8.5.	1030	Derrick	Fedje	8.5.	1140	2 566	2 566
Fedje	12.5.	1130	Derrick/Balance	Storebø	12.5.	2120	20 750	20 750

As shown in Table 1 both systems were used on the same catches simultaneously 3 times. Each time the saithe from one catch was divided as evenly as possible between the two compartments in the well, each compartment having its own weighing system. The aim was to discover possible difference in the mortality rates.

In order to establish whether the new system of weighing by derrick scales saved time and effort, time studies involving both methods of weighing were carried out on 43 dip-net loads of live saithe. Also the length of time the saithe remained out of water was noted for both systems.

The size of the saithe transported varied from 0.3 to 0.6 kg. The fish were very lean and had empty stomachs.

RESULTS

Accuracy

The mean weight of the saithe, \pm standard variations, in each dip-net load was 361 ± 60 kg for the derrick scales and 228 ± 47 kg for the balance scales. The corresponding accuracy of readings expressed in percentage was calculated to 0.72 ± 0.16 and $1.17 \pm 0.43\%$ respectively. Consequently, the derrick scales should have a higher rate of precision and, theoretically, give less variation in the percentage of water weighed with the fish. On examining Tables 2 and 3, this does not seem to be the case, but the calculated mean water percentages are the same for both methods.

Table 2. Per cent water weighed with fish on balance scales calculated from gross weight on board and control weight at the fish factory.

Date	Firm	Gross weight kg	Control weight kg	Calculated water per cent
14.7.80	Kvalheim & Asmundsvåg	14 737	13 925	5.5
14.1.81	" "	21 009	19 760	5.9
1.4.81	" "	22 505	21 690	3.5
Mean water per cent for balance scales			\pm std =	5.0 ± 1.0

Table 3. Per cent water weighed on derrick scales calculated from gross weight on board and control weight at the fish factory.

Date	Firm	Gross weight (kg)	Control weight (kg)	Calculated water per cent
4.5.81	Dombstein Måløy	23 899	21 990	7.9
7.5.81	Kvalheim & Åsmundsvåg	17 360	16 630	4.2
20.5.81	" "	19 189	18 020	6.1
2.6.81	" "	22 103	21 239	3.5
16.6.81	" "	21 111	19 930	5.6
2.7.81	" "	21 686	23 133	2.3

Mean water per cent derrick scales \pm Std. = 5.0 \pm 1.7

When the saithe were control weighed on the balance scales after transport, readings proved slightly higher as compared with derrick scales results (Table 4). However, control weight gained in this way remained 0.5% heavier even when the balance scales system was used during loading. (See last line in Table 4).

Table 4. Difference gained between loading weight on derrick scales and control weight on balance scales.

Date	Place	Loaded amount derrick scales (kg)	Unloaded amount balance scales (kg)	Difference in %
4.5.81	Storebø	11 794	11 845	-0.4
6.5.81	"	8 561	8 490	+0.8
8.5.81	Fedje	2 593	2 656	-2.4
12.5.81	Storebø	10 329	10 588	-2.5
		Loaded amount balance scales		
12.5.81	Storebø	10 850	10 899	-0.5

Survival of the saithe

During most transports, the mortality of the saithe was negligible. Only once, on the trip from Fedje to Storebø 4.5., approximately 100 kg saithe died, i.e. 0.9% of those in the compartment weighed with the balance scales. No mortality occurred among the saithe in the other compartment weighed by derrick scales.

The saithe has to be taken out of the water for weighing. The average time out of water was 12 to 15 seconds with derrick scales use. With the balance scales the time was 15 to 20 secs.

Time and effort

The preparation and replacement before and after use of the balance scales required the work of 2 men for approximately 10 minutes. In contrast, the use of the derrick scales required no such effort. Furthermore, the loading went faster when using the new system. According to weight and time studies carried out on 43 dip-net loads, the mean/average time \pm standard deviation for loading M/S "Magnus Kvamme" (22 tons live saithe) was 48 $\frac{3}{4}$ minutes \pm 12 $\frac{2}{3}$ minutes using the balance system, and 38 $\frac{1}{4}$ minutes \pm 10 $\frac{1}{2}$ minutes using the derrick scales system.

It was anticipated that the derrick scales would swing and be damaged by blows. It seemed, however, that the weight of the dip-net acted as a stabilizer on the scales, reducing the danger considerably.

CONCLUSION

The accuracy of each system expressed in percentage of total weight is determined by the load in each dip-net. As a larger dip-net is used in the derrick system, theoretically, this system should give more accurate results. An accuracy percentage of 1.17 \pm 0.43% for the balance scales and 0.72 \pm 0.16% for the derrick scales shows that neither system is very precise.

Furthermore, control weighing ashore gives a water per cent variation of 2.3 to 7.9 % (Table 3) and 3.5 to 5.9% (Table 2), respectively, for the new and old systems. This may in fact indicate that the derrick scales weighs less accurately. But as available data were limited to only 3 control weighings by the old system, then the water per cent variation is probably too small for the balance system.

When the same amount of live saithe was weighed by both systems, the derrick scales seemed to register lower weights (Table 4). The difference may be due to the low precision of both systems.

There is disagreement on how much water is weighed with the fish on well-boats, and different areas have accepted different water percentages. For Hordaland the water percentage is fixed at 3% of gross weight on well-boats, for Sogn and Fjordane it is 4% and northern Norway 2%. The results of this study are most likely maximum values, as the saithe were penned a few hours before control weighing started, and during this interval a loss of saithe from the net-penns can easily take place. Experience shows that near fish factories seagulls can be very active predators in net-penns containing live saithe.

With regard to accuracy and water percentage it seems safe to conclude from the available data that there are no significant differences between the two systems of weighing.

The well-boat M/S "Ole Knut" has now used the new weighing system for a year and the captain asserts that this was the only well-boat without mortalities during the summer of last year. He believes this to be due to the use of derrick scales for weighing. This study indicates that the derrick system subjects the saithe to a less rough treatment. The fish is no longer dropped one meter into a dry container, and their time out of water is shortened. The only occurrence of mortality noted during transport happened to saithe weighed by the old

system. The conclusion must be that the new system gives the saithe a better survival rate.

The new system of weighing is labour-saving since the preparation and replacement of the container and balance scales, plus movement of often heavy weights is no longer necessary. Furthermore, as the derrick scales has a weighing capacity of 1000 kg, the size of the dip-net used can be increased which means saving on loading time. If the size of the dip-net can be enlarged, it should eventually be done by increasing its diameter and not its depth. The latter will raise pressure on the saithe at the bottom of the dip-net, and may lead to increased mortality.

