Dockside Grading Project - Canso Seafoods

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ABSTRACT

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In 1983 an extensive exaluation was conducted to determine the feasibility of a Dockside Grading Program for trawler-caught fish delivered to Canso Seafoods Ltd., in Canso Nova Scotia. Results showed that dockside grading at a large processing plant was not only feasible but economically justified. It was also shown that boxing at sea resulted in a higher percentage of Grade A fish being landed which, in turn, translated into higher returns. Other factors affecting quality were tow size, lag time (from capture to stowage in the hold), and onboard handling techniques.

Key words: Quality, Harvesting, Processing, Containerization, Grading

RESUME

Desantis, M.R., R. Hoge, P.C. Fahie, and David Lemon. 1984. Dockside Grading Project - Canso Seafoods. Can. Ind. Rep. Fish. Aquat. Sci. 148: iii + 10 p.

On a procédé en 1983 à une évaluation approfondie pour déterminer la faisabilité d'établir un programme de tri à quai pour le poisson livré par les chalutiers à Canso Seafoods Ltd., à Canso (Nouvelle–Ecosse). Les résultats révèlent que l'instauration du programme de tri à quai dans une grande installation de transformation du poisson est non seulement faisable, mais aussi justifié sur le plan économique. On a aussi constaté que la mise en caisse du poisson en mer produit un pourcentage plus élevé de poisson de première catégorie, donnant ainsi un rendement plus élevé. D'autres facteurs qui ont influé sur la qualité sont la taille du trait, le délai d'exécution des opérations (depuis la capture jusqu'à l'entreposage en cale) et les techniques de manutention à bord.

1. INTRODUCTION

The project described in the following report was carried out by H.B. Nickerson and Sons Ltd. at their subsidiary Canso Seafoods Ltd. in Canso, N.S. The town of Canso is located in Guysborough County in Eastern Nova Scotia, at the entrance to the Strait of Canso. The plant, a major employer in the region, is a two shift year round operation and employs over 675 people. It has a capacity of over 300,000 lb. of fish per day including ground fish (cod, haddock, pollock, etc.) flatfish (flounder, sole, greysole), scallops and pelagics (herring, mackerel, squid). The majority of fish processed at Canso Seafoods is supplied by offshore trawlers.

In December of 1982, H.B. Nickerson and Sons (H.B.N.) entered into a one year agreement with the Department of Fisheries and Oceans to carry out an evaluation of the potential for the dockside grading of trawler-caught fish. Before signing the agreement it became obvious that the project could not be restricted simply to dockside grading given the number of variables that play a role in any large offshore operation.

It was therefore decided by the firm and DFO to look at a number of factors, notably:

1) the effect of different handling methods utilized onboard;

2) the effect of different onboard stowage methods;

3) a comparison between the proposed DFO dockside grading system and the H.B.N. dockside grading system (which had been in operation for over a year prior to the commencement of this project);

4) a comparison between H.B.N. end of line inspections and the proposed DFO end of line grade standards, and the relationship between end of line evaluations and dockside grades; and

5) the effect of other variables that impact on quality, such as parasites.

2. METHODOLOGY

In order to obtain information relating to on board stowage and plant unloading methods, four stern trawlers of a specific design were chosen. These offshore trawlers (Hillsborough, Marjorie Colborne, Bedeque, and J.B. Nickerson) are unique in that they stow the first one-third of their catch in plastic offshore boxes. Each trawler has a holding capacity of 350,000 lb. (115,000 boxed, 235,000 penned). Boxing the first one-third of the trip's catch is done in an attempt to maintain the quality of the older fish so that all fish is of similar quality throughout the entire trip. This improvement in quality is achievable because the 70 and 90 litre boxes used result in less handling and reduced crushing of the fish as compared to penned stowage. For example, each 90 litre box holds approximately 125 lb. of fish, while each pen shelf may hold upwards of 3,000 lb.

Once the project location and chosen trawlers were confirmed, the easiest and most efficient method of data collection was determined for each point along the processing route. This required a number of meetings with plant and marine personnel to define all the project parameters.

It was decided that in order to collect proper and accurate data, an observer would be sent out aboard each trawler making a project trip. The observer would collect three samples of cod (cod was used for consistency). Each sample weighed approximately 10,000 lb. These samples had to be collected within 48 hours and caught in the same fishing area. This ensured that sample fish was roughly the same age and had similar characteristics. One of the samples was stowed in boxes while the other two were stowed in pens. Tow data for each sample was also recorded. Data included area fished, date caught, tow length, tow weight, tow depth, fish temperature, water temperature, air temperature, gutting and handling procedures, washing effectiveness, icing and the lag time from the moment the net of fish arrived on the deck until the last fish was iced in the hold. Each sample was well marked in the hold for easy identification and segregation. The observer also looked for and recommended improvements which would aid in handling and reducing fish damage aboard the trawler.

Once the vessel arrived in port, the boxed samples were unloaded by crane in the regular manner. One of the penned samples was to be air unloaded, while the other pen sample was unloaded by bucket. During the unloading and culling process, each sample was segregated from the regular fish. The samples were then well marked, iced and stowed, ready for processing. Information collected during this operation included date unloaded, unloading duration, amount unloaded, size grade and time spent in the holding room prior to cutting.

Just prior to each sample being unloaded, twenty fish were collected and graded for quality at dockside. (It is important to note that all H.B.N. trawlers are regularly dockside graded and the fish is

bought on that basis.) These fish were graded not only by the H.B.N. method, but also by the DFO method. This allowed for a direct comparison between the two systems. Once the fish were graded, two or three fillets from each sample were iced off and delivered to the plant's Quality Assurance Laboratory. Here the fillets were chemically analyzed for spoilage. The three tests conducted were Total Volatile Base (TVB), Free Fatty Acids (FFA) and pH. This information, combined with dockside grading information, gives a comprehensive picture of the quality of each sample prior to processing in the plant.

Once the three samples were unloaded and segregated, each was dumped into the hopper for cutting as soon as possible. Processed sample weights were recorded.

Each of the three samples (weighting 6,000 to 8,000 lb.) was sent down one cutting line and, when possible, one trimming and one packing line in order to maintain consistency. Information collected on the cutting line included number of cutters, pounds cut, time spent cutting, cutter defects, parasite count/fillet and skinning yields. Trimming information included pounds trimmed for each pack, number of trimmers, waste product and time spent trimming.

After packing and tallying, each pack produced from a particular sample was marked with the sample number (1, 2 or 3) and frozen along with other product. Once frozen, the sample packs were separated and mastered separately. Each master was then marked and put into the cold storage for later inspection if necessary.

Quality checks were conducted as usual on the trimming line and end of line, with each sample number being recorded on an inspection sheet. In addition to the regular H.B.N. end of line quality inspections, the product was also graded by the proposed DFO end of line grading standards. This allowed a direct comparison of both end of line grading systems, which could then be related directly to the dockside grades.

With this vast amount of information being collected, it was thought possible to identify any single element in the processing operation which might be responsible for creating a problem not normally evident. It would also allow the objectives of the project to be completed with a reasonable degree of accuracy.

3. RESULTS AND DISCUSSION

3.1 Effect of Stowage and Handling Practices on Dockside Grades

3.1.1 Penned versus Boxed Stowage

In order to determine the effect of stowage and handling practices at sea on dockside grades, fish from the same fishing area and approximately the same age were segregated and stowed in boxes and pens. Samples were drawn on board before offloading.

Results in Table 1 show that on the average for all trips boxed fish had 12% more Grade A fish and 6% less Grade B and C than penned fish. This is important because Grade A fish and, to a degree, Grade B fish are destined for fresh and other high quality packs.

Two of the factors that often lead to downgrading are deterioration in texture and bruising or discolouration of the fillet. When comparing only the texture scores for boxed and penned fish over the life of the project, it was found that approximately 12% more penned fish was downgraded as a result of texture losses than was the case with boxed fish (Table 1). Similarly, it was found that 5% more penned fish was downgraded as a result of bruising. Possibly, some bruising may occur during penned stowage if the main artery is not cut during hand-gutting processing. This hampers bleeding. However, in trips where substantial downgrading due to bruising occurred (Trips #6, #7, #8, #10) it is likely that additional factors were involved (Figure 3).

In three of the four cases where comparisons were possible, boxed fish yielded on average 25% more Grade A than penned fish at dockside. In one case the percentage of Grade A was the same for both methods, however in all four cases the boxed fish was two days older then the penned fish. Boxing leads to an increase in shelf life; however, it is also obvious that other elements play a definite role.

Table 1. Dockside Grading Comparisons Between Boxed and Penned Fish.

Stowage Method	Average DFO Dockside Grades (%)				Downgrading Due to	
	A	B	C	R	Texture	Bruises
Boxed	42	52	6	0	41%	29%
Penned	30	58	11	1	53%	34%

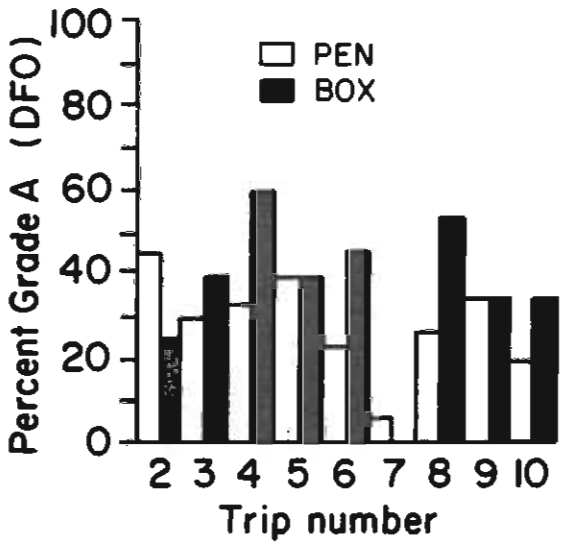

Figure 1. Percentage of Dockside Grade A Fish In Penned and Boxed Stowage

3.1.2 Tow Weights

Figure 2 shows that as tow weights increase, the quantity of Grade A landed decreases. When tow weights exceeded 20,000 lb., dockside grades were substantially reduced, regardless of the stowage method utilized. Downgrading was the result of discolouration and poor texture. Figure 4 indicates that in order to maintain 50% Grade A at dockside, tow weights should be less than 12,000 pounds.

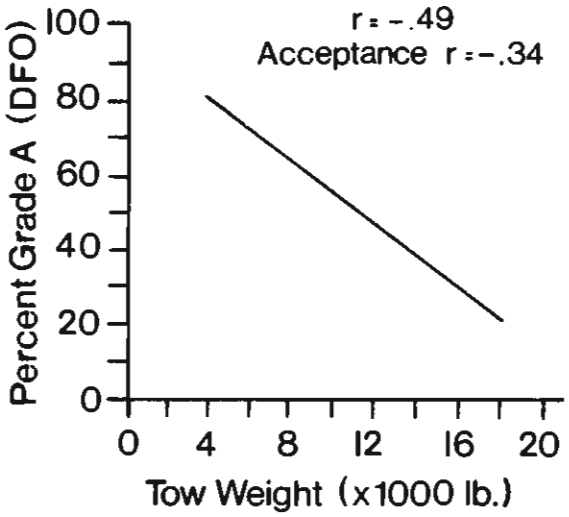

Figure 2. Percentage of Grade A Fish Per Tow Weight

Figure 3 shows that as the lag time between fish removed from the trawl and being iced off increases, the quantity of Grade A landed decreases. In those trips where there were excessively long lag times, fish of markedly lower grades were landed; chiefly due to discolouration and poor texture.

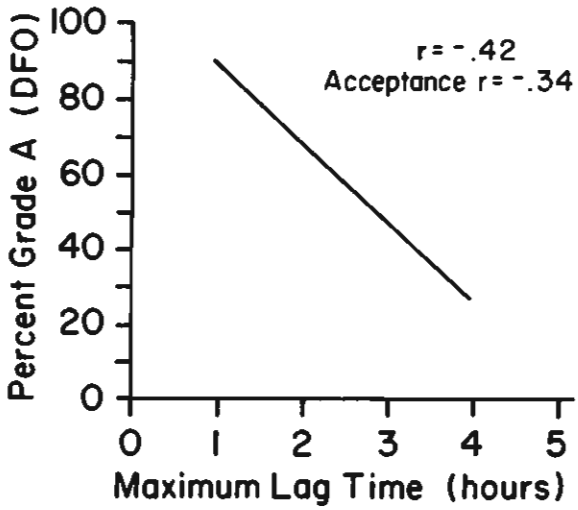

Figure 3. Percentage of Grade A Fish Per Lag Time

It must be pointed out that Figures 2 and 3 are statistical representations of observed trends. There is no doubt that the two factors, tow weights and lag times, are interrelated. Obviously the more fish brought on board, the longer it will take to get it below.

3.2 H.B.N. Dockside Grading versus DFO Dockside Grading

The H.B.N. dockside grading system is based on three grades: premium, standard and reject, whereas the DFO dockside grading system is based on four grades: A, B, C and reject (R). The two systems are actually very similar in that the criteria for grading is essentially the same. Both evaluate representative samples of fish (eyes, gill colour, gill odour, external appearance and external texture) and fillets taken from those fish (colour, odour, texture, bruising and discolouration). The final grade of each sample is based on the lowest grade obtained in each element of the evaluation. Since the project termination, the proposed DFO grading system has been somewhat altered. Major differences in the two systems used rest in four areas:

1) sampling;

2) measuring and scoring bruises;

3) measuring and scoring texture; and

4) final lot grade.

When comparing TVB values with DFO dockside Grade A's (box), a fairly significant trend was noted. As the percent Grade A decreased, TVB levels increased. On the other hand, the H.B.N. grading system did not correlate with TVB values.

DFO end of line grades (percent premium, choice and standard) corresponded very closely with DFO dockside grades, while there was no correlation with H.B.N. dockside grades. Although the percentages for the DFO dockside and end of line grades are very close, the fact that dockside grading does not include defects (bones, parasites, etc.) while end of line grading does (47% downgraded for defects) demonstrates that dockside grades do not correspond as closely as is indicated. This is discussed further in Section 3.7.

In evaluating a number of factors, including TVB values and pack distribution, it seems evident that the H.B.N. dockside grading system is too lenient and DFO dockside grading system is too strict for grading offshore trawler fish.

Overall, dockside grading has been shown to improve quality. If a four grade system, like the DFO system should be adopted, it must be modified for trawler fish in the following manner:

1) Due to the large volumes of fish landed by offshore trawlers (150,000-500,000 lb. per trip), a quick efficient method of sampling this fish is required. At the time of the project's inception, the proposed DFO method was found to be grossly impractical for offshore trawlers because samples totalling 40 fish per 5000 lb. were required. That corresponds to a total of 160 lb./half pen or 3.2% of the total catch. Through the H.B.N. dockside grading system, it has been determined that 10 fish (40 lb.) per 5000 lb. (half pen) or 0.8% of the catch is a reasonable and efficient method of sampling an offshore trawler without seriously compromising representative sampling.

2) Since a neutral fillet odour is one of the criteria for a premium and choice fillet at the end of line, then neutral fillet odour should be the criteria for Grade A and Grade B at the dockside. The DFO grading system used in this study automatically downgraded a fillet to Grade B if a neutral odour was present.

3) Although it does contribute to downgrading at the end of line, bruising does not seem to be a major problem in final packs. Therefore, it is evident that the DFO 2 cm linear restriction on bruising for Grade A at dockside is too strict. Since the end of line grading criteria measure bruising in terms of area, bruising should be measured by area at the dockside. The recommendation for these measurements is as follows:

a) up to 5 cm^2 = Grade A
b) over 5 cm^2 to 10 cm^2 = Grade B
c) over 10 cm^2 and up to 50% of the fillet = Grade C
d) over 50% of the fillet = Reject

4) After each pen or half pen is unloaded, the fish should be segregated in the holding area and identified by age and grade. If more than one pen is being unloaded at once, then they should be pens of the same age and the grades obtained for that fish should be well marked. This allows the processing supervisors to know with a reasonable degree of accuracy the quality of fish with which they will be working thus fish can be directed into appropriate final packs.

One of the most critical aspects of adopting a four grade system over the present three grades is pricing. In order to land a better quality fish, there must be a sufficient price incentive. The price structure should be set up such that one would receive a slightly higher price for Grade A than is presently being paid for premium under the three grade H.B.N. system. In order to further encourage the landing of Grade A fish, the price paid for Grade B should be slightly lower than is now paid for premium. In order to discourage the landing of Grade C fish, the price should be substantially lower than is now paid for Grade B.

Due to the tremendous cost of parasite removal (Section 3.6), downgrading as a result of parasite infestation should be included as part of dockside grading. Obviously fishermen and processors are restricted as to what they can do to prevent this problem, however, both should share equally in the costs associated with it.

3.3 Economic Feasibility of Dockside Grading

Since dockside grading began at H.B. Nickerson & Sons Limited almost two years ago, a major question has been: "Is dockside grading economically viable?" As part of the project, a comparison was

made of the percentage of premium fish landed and the price paid to fishermen between the pre-dockside grading-buying structure and the H.B.N. dockside grading structure. Landings and species mix at Canso for 1983 were used as a basis for analysis. To arrive at the percentage of premium fish landed while using dockside grading, the actual Jan.-Aug. 1983 Canso dockside grades were used. To determine the percentage of premium fish landed using the pre-dockside grading price structure, actual Jan.-Aug. 1980 Canso buying percentages were used. The premium and standard prices paid to the fishermen for this comparison were the actual 1983 prices. The weighted averages of these prices were 15.39¢/lb. for premium, 11.69¢/lb. for standard (gutted weight). The results of the analysis showed that buying practices based on dockside grading did not result in higher costs to the firm when purchasing fish. In fact under the H.B.N. grading system the plant actually realized a net cost saving of approximately 0.2¢/lb. landed.

Of equal importance is improvement in landed quality and the resulting premium pack production. If the objective of dockside grading is to land a better quality fish, then one must assume that the improved quality will carry through into final pack production and, therefore, a higher percentage of premium packs will be produced.

Using the same years as in the previous analysis and looking at the final pack production for cod, it was found that in 1980 approximately 28% of production would be considered to be of premium grade. In 1983 while dockside grading was in force, 41% of production was premium. Admittedly other factors can come into play in determining product mix, but the trend to higher valued packs over the relatively long project period is obvious.

3.4 The Effects of Stowage and Unloading Methods on Production and Quality

To determine the effect of stowage and unloading methods on production and quality, three unloading methods used were analyzed: unloading boxed fish by crane, bucket unloading of penned fish and air unloading of penned fish.

Because of a number of problems encountered in sampling, very little data was collected on bucket unloading. Therefore, the focus here will be on crane unloaded boxed fish and air unloaded penned fish.

3.4.1 Trimming Costs

It can be seen in Figure 4 that in three of the four trips where comparisons were possible between the two unloading methods, there were lower trimming costs with boxed fish; the difference ranging from 2¢ to 5¢/fillet lb. The exception to this trend is Trip 6 which showed air unloaded fish as having a lower trimming cost than boxed fish. Due to handling practices aboard the vessel, specifically a large tow for the penned sample, the quality of that sample was much lower than the boxed sample at the dockside. When the poor quality soft fish was air unloaded and kept in the shed for over nine hours, the quality deteriorated even further. As a result, the soft fish produced a lower packed up yield. However, due to the softness, fewer trimming decisions were needed on cuts for pack selection; thus the product was processed more quickly than the boxed fish sample. A higher percentage of block from the penned sample is evidence of this softness.

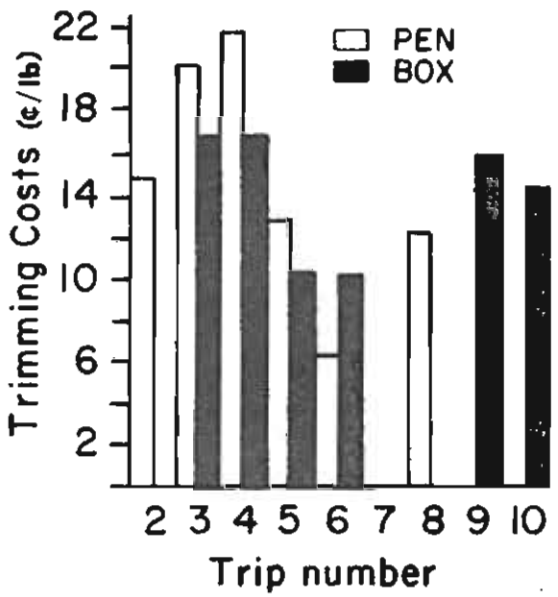

Figure 4. Trimming Costs of Crane Unloaded Boxed Fish and Air Unloaded Penned Fish

3.4.2 Packed Up Yield

As seen in Figure 5, five of the six trips were comparisons between the two unloading methods where possible clearly demonstrates that crane unloaded boxed fish has a higher packed up yield than air unloaded penned fish. In fact, in all five trips the packed up yield for boxed fish is consistently 1.5-2% higher than penned fish. Trip 8 is the only sample not following this trend and it showed packed

up yields for both as being equal. This is understandable because the fish in both samples was only one and two days old when processed, with very little time spent in the holding room. Therefore, the quality of each should have been exceptional.

Although the final packed up yields and trimming costs are heavily in favour of crane unloaded boxed fish, the results were also affected by handling practices at sea. It is important to note that where large tows and extended lag time affected stowage and dockside grades, these effects also carried through to the processing operation.

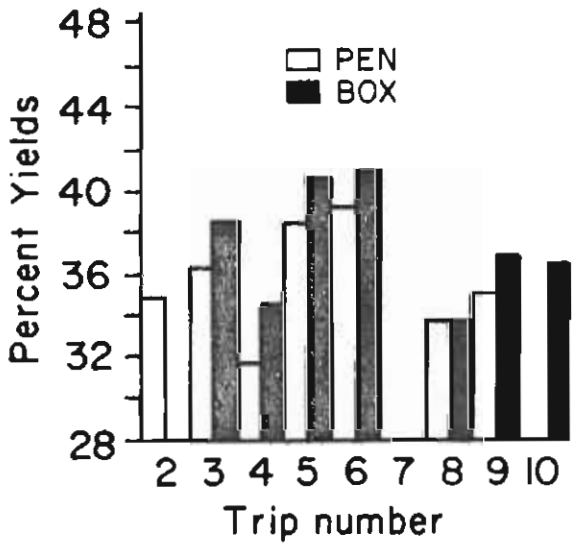

Figure 5. Percentage Packed Up Yield of Crane Unloaded Boxed Fish and Air Unloaded Penned Fish

3.4.3 Other Factors

Another factor which may have an effect on the production costs and yields is the time the fish spends in the holding room after being unloaded but prior to being processed.

Although there is no correlation between time in the shed and packed up yield, there are isolated cases where quality was affected. As stated earlier, Trip 8 demonstrates that one or two day old air unloaded fish that is processed quickly retained quality. Trip 5 shows the opposite trend. The quality of four day old penned fish and six day old box fish were equal when graded at the dockside (box Grade A = 46.5%, pen Grade A = 47%). However, when the penned fish was kept in the holding shed for over twenty hours while the boxed fish was held for approximately seven hours, the quality of air unloaded fish had deteriorated. This deterioration resulted in trimming costs 2.5¢/fillet lb. higher and a packed up yield of 1.6% lower than the boxed fish. This demonstrates that keeping fish in the holding area for an extended period of time is detrimental to quality.

3.5 Economic Feasibility of Improved Handling Methods

The data clearly shows that crane unloading boxed fish results in lower trimming costs (2-5¢/fillet lb.) and a higher packed up yield (1.5-2%). Given the added 2¢/raw material lb. price paid to the fishermen for boxing, even with the decreased labour cost and increased packed up yield, is boxing more profitable than penned stowed air unloaded fish? To answer that question, the contribution per round pound of each unloading method was determined.

Incorporating a realistic pack selection, along with trimming costs and packed up yield differences between stowage and unloading methods, the results demonstrated that boxed fish had a contribution to the plant 2.6¢/round pound higher than penned air unloaded fish. This monetary difference clearly shows the superiority of boxed fish over air unloaded penned fish.

Although it is easy to see the advantage of boxed fish over air unloaded penned fish, the question now arises as to a comparison of boxed fish to bucket unloaded penned fish. Such a study is presently being conducted.

3.6 The Effect of Parasite Infestation

In order to determine the effect of parasite infestation on production, the following aspects were analyzed:

- effect of parasites on trimming cost,
- effect of parasites on packed up yield,
- effect of parasites on product mix.

3.6.1 Trimming Costs

Figure 6 clearly demonstrates that as the level of parasite infestation increases, trimming costs increase. This is expected since parasite removal requires added work and time on the part of the trimmers. The graph also shows that for every 10 parasites/20 lb. of untrimmed fillets, trimming cost increases by 1.25¢/fillet lb.

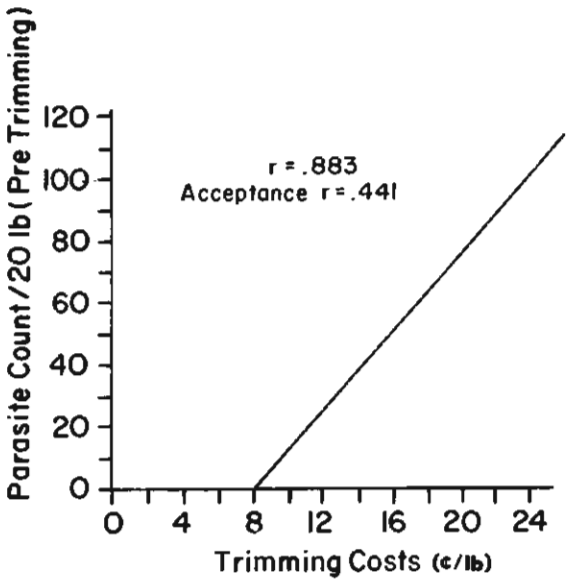

Figure 6. Trimming Costs vs. Parasite Count

3.6.2 Packed Up Yield

Figure 7 demonstrates that as the parasite level increases the packed up yield decreases. This yield loss is due to the increase in waste as more parasites are removed from the fillets. The graph also demonstrates that for every 10 parasites/20 lb. of untrimmed fillets, packed up yield decreased by 0.8%.

Again, the figures shown in this section are statistical representations of trends.

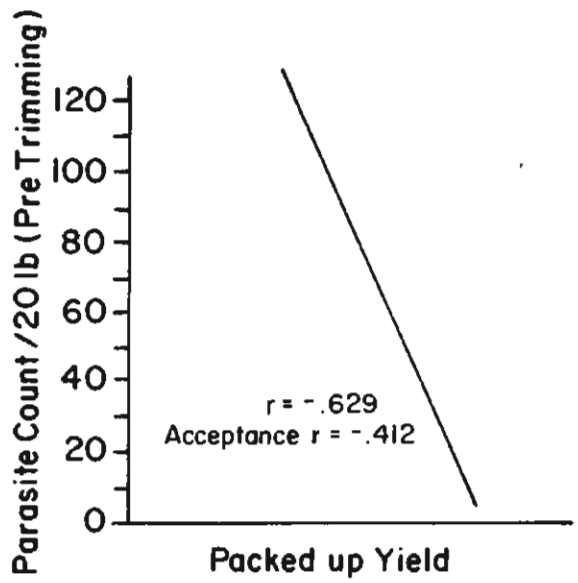

Figure 7. Packed Up Yield vs. Parasite Count

3.6.3 Product Mix

Figure 8 shows that as parasite infestation goes up, so does the amount of block produced. A number of factors come into play here. First, the fillets must often be reduced to small pieces or stripped during trimming, causing more of the fish to be suitable only for block. Secondly, when parasite levels are sufficiently high, the production staff may decide not to trim for premium or standard fillet packs in order to avoid the problem of re-working fillets which are off spec (which usually renders the product suitable only for blocks), or having the product detained. An example of such a re-work occurred with product from Trip 10 (boxed fish) which had a parasite level of 47/20 lb., yet only 14% of total production was blocks. However the boned 5's produced (72%) were off spec for parasites and were later re-worked into block.

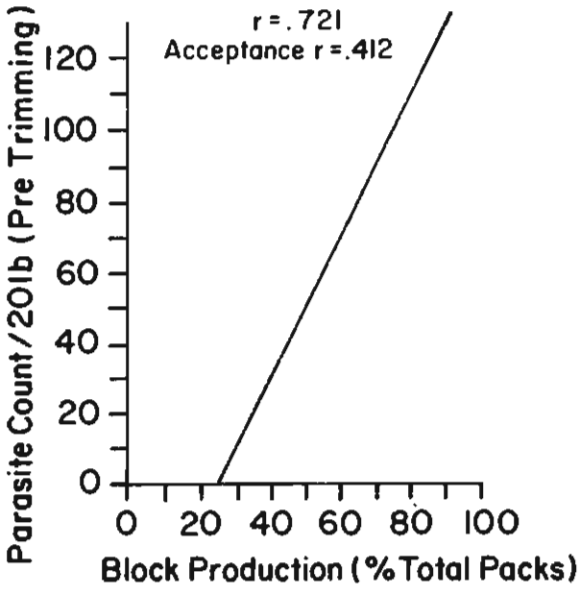

Figure 8. Block Production vs. Parasite Count

When levels were quite high, the decision to pack only blocks and tails was the most common response, usually made before trimming began. In rare cases the decision came after the end of line checks had determined the fillet packs to be off spec. Trip 3 illustrates a situation in which infestation levels (67/20 lb. before trimming) were the deciding factor in pack selection. The air unloaded samples were the first to be processed and problems with parasites and texture led production personnel to change from packing shatterpack to blocks and tails. This continued in spite of the fact that the boxed fish consisted of fillets having better texture than air unloaded fillets, along with fewer parasites.

Therefore, more shatterpack would have been packed if the boxed fish had been processed first. Trips 3, 4, 5, 6, 9 and 10 were all adversely affected to some degree by the parasite levels causing lower-grade pack selections, off spec products, or both.

3.6.4 Financial Considerations

Using the figures found in Section 3.5 and the trimming costs, packed up yields and block production figures shown in the figures, the difference between parasite-free fillets and fillets infested with 10 parasites/20 lb. is 2.3¢/fillet lb. Therefore, based on 1,000,000 lb. landed, the cost to the plant is $23,000. This cost skyrockets as parasite infestation levels increase, especially in a plant processing large volumes.

From this analysis it is clear that parasite infestation is extremely costly. Therefore, some measure must be introduced to allow downgrading at the dockside when the parasite levels rise above a plant's acceptable economic limit.

3.6.5 Area and Seasonality

All the samples taken at sea during the project were caught in areas 4VS and 4W. Figure 9 demonstrates the variation in parasite infestation levels. In these samples, the months of March and April, and to a lesser extent August, presented serious parasite problems.

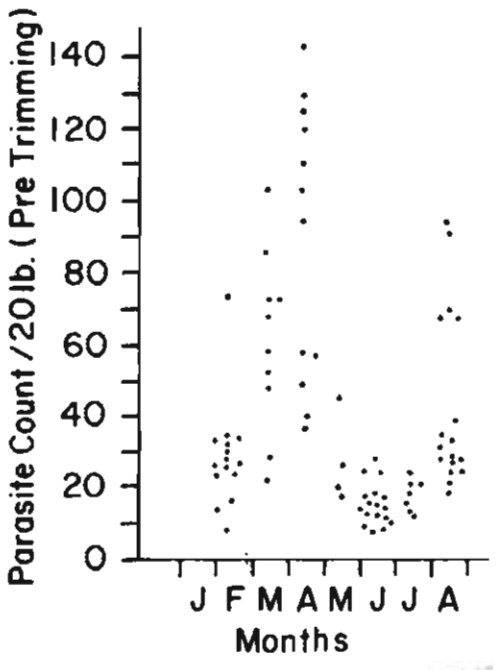

Figure 9. Parasite Counts of Fish Caught in 4W and 4Vs

The parasite problem is an extremely difficult one and present data indicates that if anything, it is getting worse. Certainly a great deal more effort is required, and to this end DFO has begun extensive work in this area.

3.7 DFO End of Line Grading Versus H.B.N. Quality Grading

The H.B. Nickerson end of line quality grading system and DFO end of line grading system use similar methods for determining defects. The major differences lie in the scoring of these defects and the resulting final grade. The H.B.N. system is based on product specifications, either the product is on spec or it is not. For each particular pack, a maximum number of defects is assigned and defect levels cannot exceed this number.

The DFO system is based on four grades (premium, choice, standard and reject). A score is assigned to each defect and a maximum total defect score is the limit for each grade. There are no limiting factors on individual defects other than parasites and bones found in blocks.

Figure 10 demonstrates that as the percent of premium H.B.N. packs increase, so does the DFO percent premium grade. This, along with an observed close correspondence between the two grading systems throughout the project, suggests that it would be relatively simple to adapt from the H.B.N. to DFO end of line grading system.

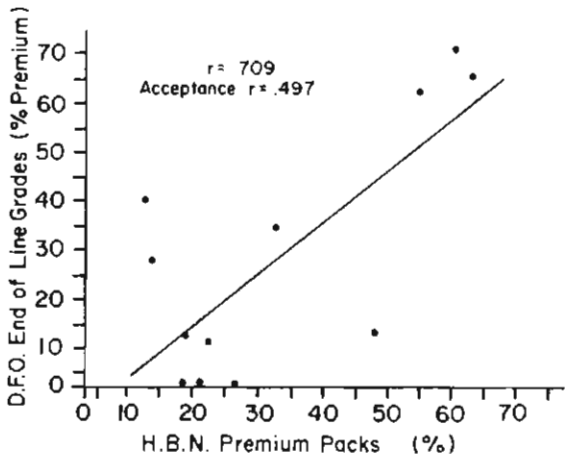

Figure 10. H.B.N. Percentage Premium Packs vs. Percentage of DFO End of Line Grades (Premium)

As to which end of line system best corresponds to dockside grades, data collected seem to indicate that for boxed and penned samples, DFO end of line grades as well as H.B.N. final pack distribution correspond very closely to DFO dockside grades.

As mentioned in Section 3.2, although this result is very encouraging, it is misleading because the major reasons for downgrading end of line packs were defects, mainly parasites and bones. Since the dockside grading system used does not consider defects, it is reasonable to assume that the H.B.N. and DFO final pack grades do not correspond as closely as thought to DFO dockside grades.

This is reasonable in view of the fact that so many variables come into play between the dockside and end of line. Production pressures, defects, unloading methods, cutting and trimming operations all lead to subsequent grading loss at each stage in the process. Separate studies should be carried out in which variables can be controlled and grading loss at key points in the processing can be measured. All factors affecting the loss at each point can also be evaluated.

Therefore, as both systems presently stand, neither H.B.N. or DFO end of line grading systems correspond well to the dockside grades.

Since the two systems use very similar methods for determination of defect levels and quality factors, as stated few difficulties would be encountered in adapting the Nickerson grading methods to a system based on the present DFO standards. Some modifications concerning tolerances may be worthy of consideration based on the experience that H.B. Nickerson & Sons Limited have in the marketing of fish products. For instance, the DFO tolerance for bones seems to be somewhat loose. A higher score for each bone defect would serve to tighten the standard. Also, it may be questionable to allow ten percent slightly jelly and moderately chalky fish in a premium grade pack. Any scoring system must take into account fillet size-grading which requires checking for conformance to specifications, although this is not directly related to quality. DFO definitions allow a standard grade fillet pack to be made up of excessively ragged or torn fillets. An acceptable adaptation would be to consider standard grade packs to have a moderately ragged and torn texture. Possible exceptions could otherwise be stated in the specifications for specific products.

4. SUMMARY

4.1 Effect of Stowage & Handling Practices on Dockside Grades

Fish stowed in boxes, on the average, resulted in 12% more dockside Grade A fish as compared to penned stowage. This was primarily due to texture improvement. However, this result was affected by handling practices prior to stowage. The major handling practices affecting fish quality were tow weight and the time lag between the moment the fish is brought aboard until it is iced in the hold.

Where there were large tows and/or extended lag time from tow to hold, the major reasons for downgrading were always bruising and texture. This signifies that the damage occurred while the fish was still alive in the tow or prior to processing aboard the trawler. It also demonstrates that large tows and extended lag time are primary reasons for bruising and texture problems.

In order to maintain a dockside Grade A of 50%, the maximum tow weight should be less than 12,000 lb. and lag time less than three hours, especially during summer months.

Other factors such as gutting, washing and icing procedures also play a large role in downgrading fish at dockside. When all three procedures are performed poorly, then there will most certainly be a reduction in dockside Grade A.

4.2.1 H.B.N. Dockside Grading vs. DFO Dockside Grading

The H.B.N. dockside grading system is based on three grades (premium, standard and reject) while the DFO dockside grading system is based on four grades (A, B, C and reject). Major differences between the two systems lie in sampling, measuring and scoring bruises, measuring and scoring texture and final lot grade.

The H.B.N. dockside grading system is too lenient and the DFO dockside grading system is too strict for grading offshore trawler fish.

It is recommended that if a four grade system similar to the DFO system is adopted, modifications to sampling, odour determination and bruising measurements are necessary. Pricing is one of the most critical elements to a successful dockside grading program. Parasite infestation should be incorporated into the scoring system, given the extreme and rising costs of removal.

4.3 Feasibility of Dockside Grading

When comparing costs and revenues before and during the project, it became obvious that dockside grading did not raise costs. In fact during the project there was a slight reduction in the overall price paid per pound. Comparing 1980 and 1983 pack distributions for the same eight month period, Canso produced 14% more premium packs in 1983. Therefore, dockside grading is not costly and at the same time encourages a higher quality product to be produced.

4.4 Effect of Stowage & Unloading Methods on Production

Crane unloaded boxed fish resulted in lower trimming costs and slightly higher packed up yields than air unloaded penned fish. Boxed fish appear to have an economic advantage over air unloaded penned fish.

4.5 Effect of Parasite Infestation on Production

Parasite infestation levels had a direct effect on increasing trimming costs, increasing block production and decreasing packed up yield. For every 10 parasites/20 lb. of fillets (pretrimmed) trimming costs increased 1.25$/fillet lb., block production increased 5% and packed up yield decreased 0.8%. The cost increase to the plant to process fillets with 10 parasites/20 lb. as opposed to fillets with no parasites is 2.3$/fillet lb.

4.6 DFO End of Line Grades vs. H.B.N. End of Line Grades

DFO end of line grading is based on a four grade scoring system (premium, choice, standard and reject). A score is given for each defect and an accummulative total point score is the basis for each grade.

H.B.N. quality grading is based on product specifications, either a pack is on or off spec. A maximum number of defect instances is assigned each pack and conformance is based on meeting these tolerances.

The H.B.N. system is easily adaptable to the DFO system.

Neither system corresponds accurately to dockside grades because present dockside grading does not consider defects (parasites, bones, etc.) while end of line grades do.