

FIRTA GRANT NO. 84/29

EVALUATION OF SUITABILITY  
OF HERRING GRADER FOR  
GRADING REDFISH (NANNYGAI)

FINAL REPORT

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Note: Attachments 3 and 4 are not  
included in the final report

1) Title of Proposal

Evaluation of suitability of Herring grader for grading Redfish (Nannygai).

2) Name of Applicant

N.S.W Fish Marketing Authority  
Cnr. Gipps and Jones Street  
PYRMONT. 2009.

3) Background

During May 1984 the Authority received advice of approval of a FIRTA grant of \$45,000 for the purchase of three Kronborg Skami Herringgrading machines so that their suitability for grading Redfish could be assessed.

After further investigations and prior to the purchase of this equipment the Authority sought and received approval from the Fishing Industry Research Committee to vary the project as follows:

- (a) An additional \$2,400 was allocated to the project by FIRTA.
- (b) Only one Kronborg Skami machine to be purchased.
- (c) In lieu of the other two Kronborg machines, one Baader Model 485 grading machine plus feed elevator to be purchased.

4) Objectives

The objectives of the proposal were :-

- (a) Operate each of the grading machines to determine:
  - (i) whether or not both machines would efficiently grade Redfish on a commercial basis.
  - (ii) which type of machine is most efficient.and
  - (iii) if the dearer equipment (Baader) is most efficient then is its additional capital cost warranted?
- (b) To increase the financial return to fishermen from Redfish by enabling them to efficiently grade their catches of Redfish.
- (c) Enable the development of standard grades for Redfish.
- (d) Enable Redfish to be more effectively promoted on

the domestic and export markets.

5) Results of Trials

(a) KRONBORG SKAMI

(i) Pre-Purchase Trials

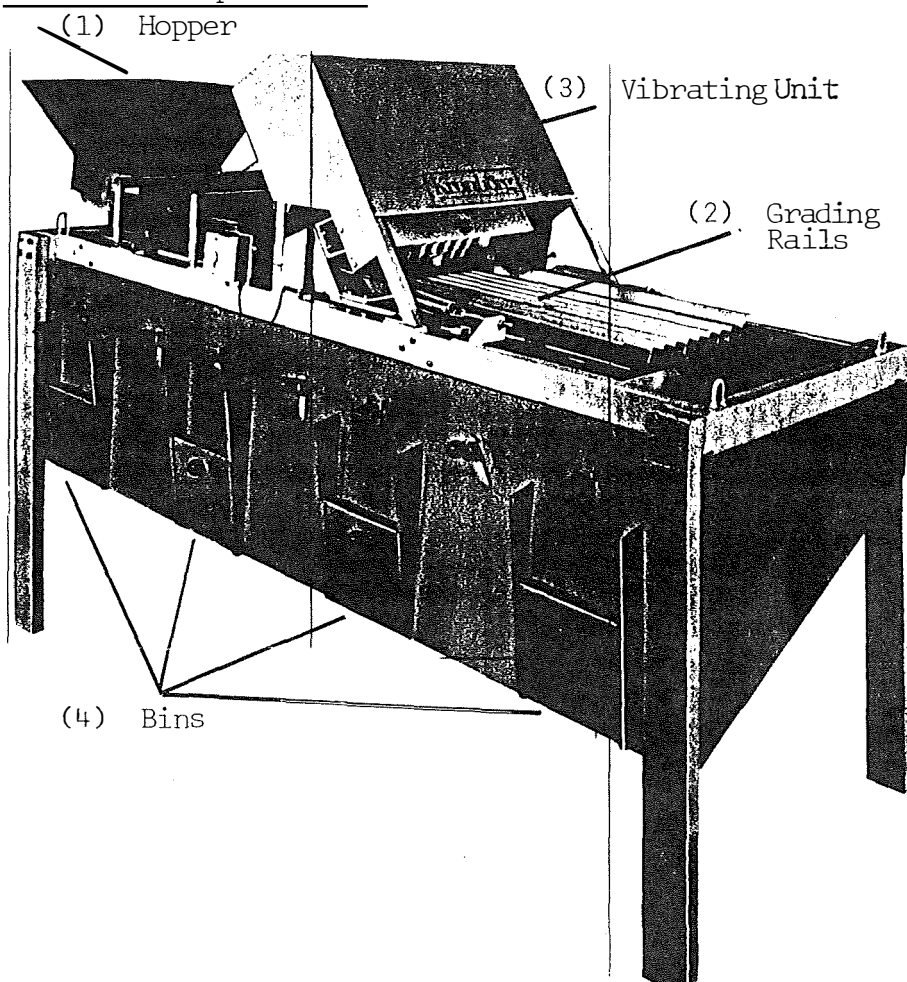
Prior to placing orders for the Kronborg Skami, the Authority forwarded samples of Redfish to the New Zealand headquarters of the distributors, Mair Industrial Marketing Ltd. to enable them to test the machine and determine if any modifications were required.

On September 10, 1984 Mair Industrial Marketing Ltd. wrote to the Authority advising that their development staff have looked at what the Authority requires and would manufacture a machine to grade Australian Redfish which works on the same principle as the Skami or Mac 5 Graders but is fitted with higher grading profiles. The purchase cost of this machine included a development cost of \$3,898.

(ii) Machine Services

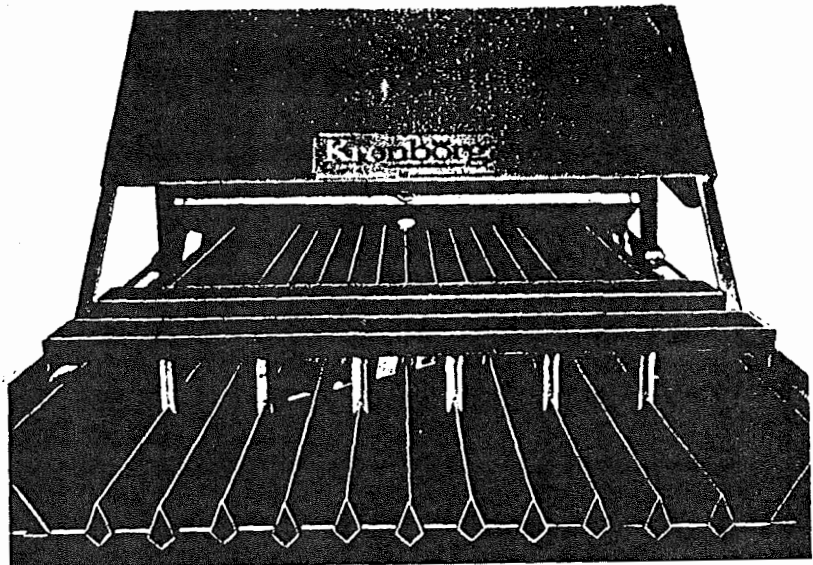
The Skami leaflet (Attachment No. 1) shows the overall dimensions of the machine. In addition, power and water supplies are required.

(iii) Method of Operation



\* As this machine was not installed with a feed elevator, the fish to be graded are tipped into a hopper on the top of the machine (1). The fish flow from this hopper onto the grading rack (2).

\* The grading rack consists of a series of adjustable aluminium pipes which are shaped to encourage the fish to stand upright.



Adjustable aluminium grading tubes.

\* The grading rails are close together at the end nearest the hopper and become progressively further apart down the length of the rack.

\* The grader is installed so that the grading rails run downhill. The fish are encouraged to slide down the length of the grading rack by the rails being vibrated in unison (3).

When the fish reach the point where the width of the fish match the gap between the rails they drop between the rails into bins (4).

(iv) Efficiency in grading Redfish

The results of initial trials were disappointing and did not support Kronborg's undertaking to adopt the machine to grade Redfish. The following deficiencies were revealed :-

\*A conveyer feed belt is essential as the feed hopper is much too high for direct manual loading requiring the operators to lift full boxes of product (approx. 30 kg. weight) above head height.

\* The existing hopper and hopper outlet are too small resulting in fish becoming blocked even when outlet fully open.

\* The hopper is too close to the grading rails and needs a proper distribution area to ensure that fish are spread evenly over the grading surface.

\* The grading rails need to be raised a minimum of 75mm (3") above transverse frames. At present the larger fish become caught on these obstructions thus preventing their movement down the grading rails.

\* The bins and outlets require modification to prevent fish from becoming caught on obstructions at each side of discharge doors. Baffels would help overcome this problem.

Based on the above results, the Authority wrote to Mair Industrial Marketing requesting them to make the necessary modifications.

The Authority was subsequently advised by Mr. R. Douglas, Australian Manager of Mair Industrial Marketing Ltd. that they would only undertake the modifications if the Authority agreed to pay the additional costs. This was later followed up by a letter advising that Mair had closed its Australian branch and are unable to offer any further assistance in altering the machine for Redfish grading.

(v) Reliability of Equipment

Due to the necessary modifications to this equipment, it has not been operated for any extended periods.

The Authority is however aware that a Kronborg grader is in use at the Clarence River Fishermen's Co-operative for grading Red Spot Whiting and prawns and has proven to be reliable.

However, in view of the lack of back up support, due to the cessation of Australian operations of the distributing company, potential purchasers should have reservations regarding the repair of the equipment in the event of a major breakdown.

(b) BAADER 485

(i) Pre-purchase trials

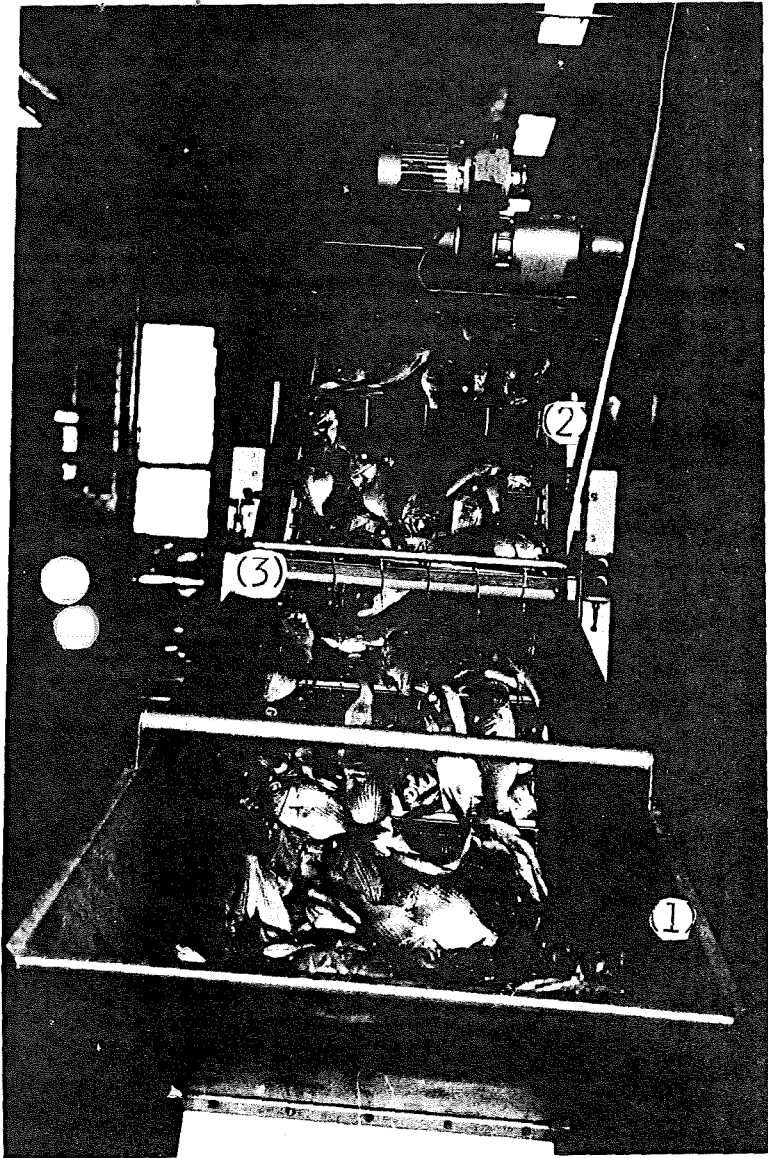
Prior to purchasing the equipment the Authority forwarded a quantity of Redfish to the Baader company in Germany for trials to determine the suitability of the Baader 485 grading machine. The Australian distributors of Baader equipment, Greer Australia Pty. Ltd., reported that these trials were successful. They anticipated that the throughput for Redfish would be 4-6 tonnes per hour maximum utilising a mechanical feed elevator. Greer stressed the importance of a feed elevator as their mechanical grading machine must have a continuous controlled feed of product to ensure both the capacity and accuracy through the Grader. Greer also noted that the limit of the size of individual fish on the Baader 485 is a maximum of 30-35 centimetres length. However, this can comfortably accept the large Redfish which averaged 25-30 cm length during the pre-purchase trials.

(ii) Machine Services

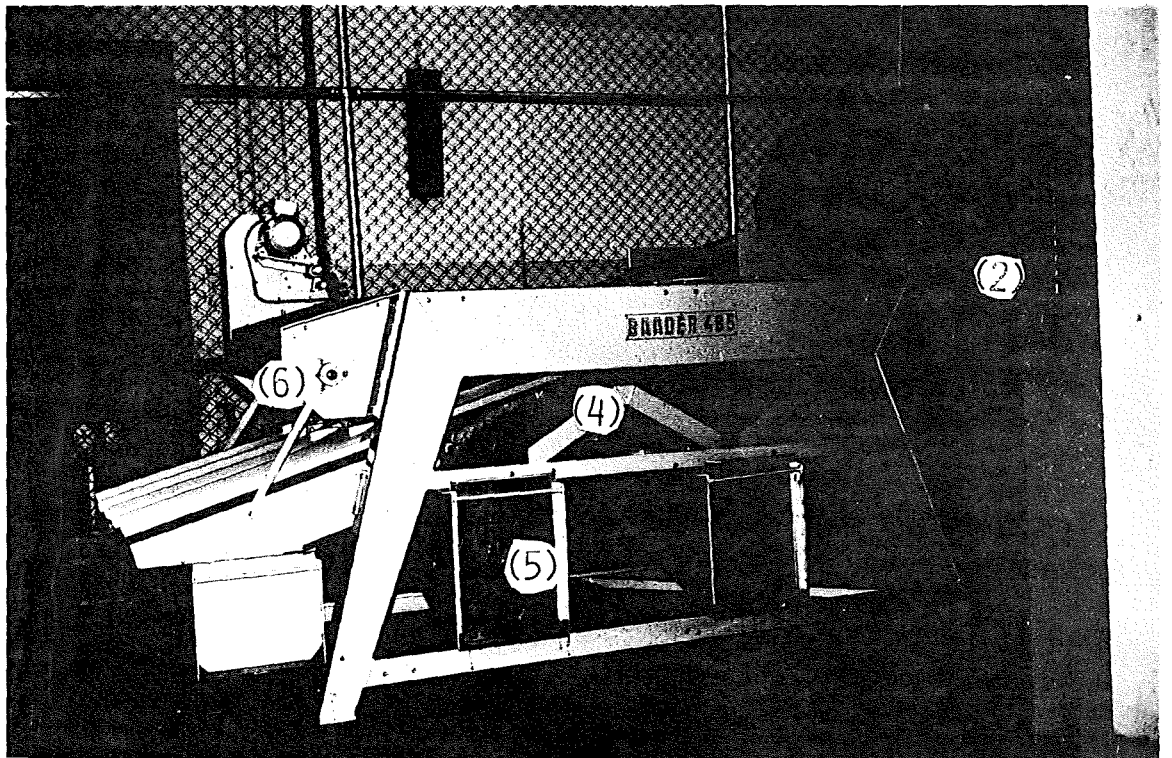
Attachment 2 shows the overall dimensions of the machine. In addition, 3 phase power is required and a water supply (approximately 20 litres per minute).

(iii) Method of Operation

\* The Baader feed elevator accepts product being manually tipped into the feed hopper (1) from standard fish boxes. The fish is then elevated on the conveyor flights (2) passing under water sprays (3) to wet the fish and make it slide along the grading rails.

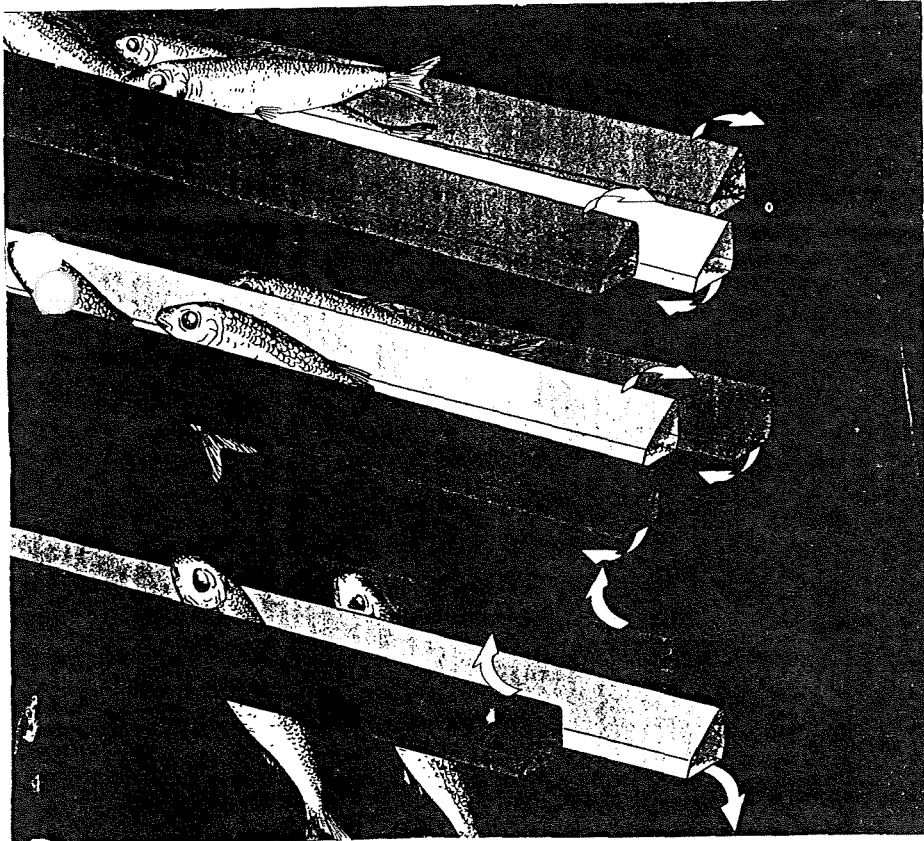


- (1) Hopper
- (2) Conveyor System
- (3) Water Sprays
- (4) Grading Chutes
- (5) Collecting bin for graded fish
- (6) Eccentric shaft driving grading rails



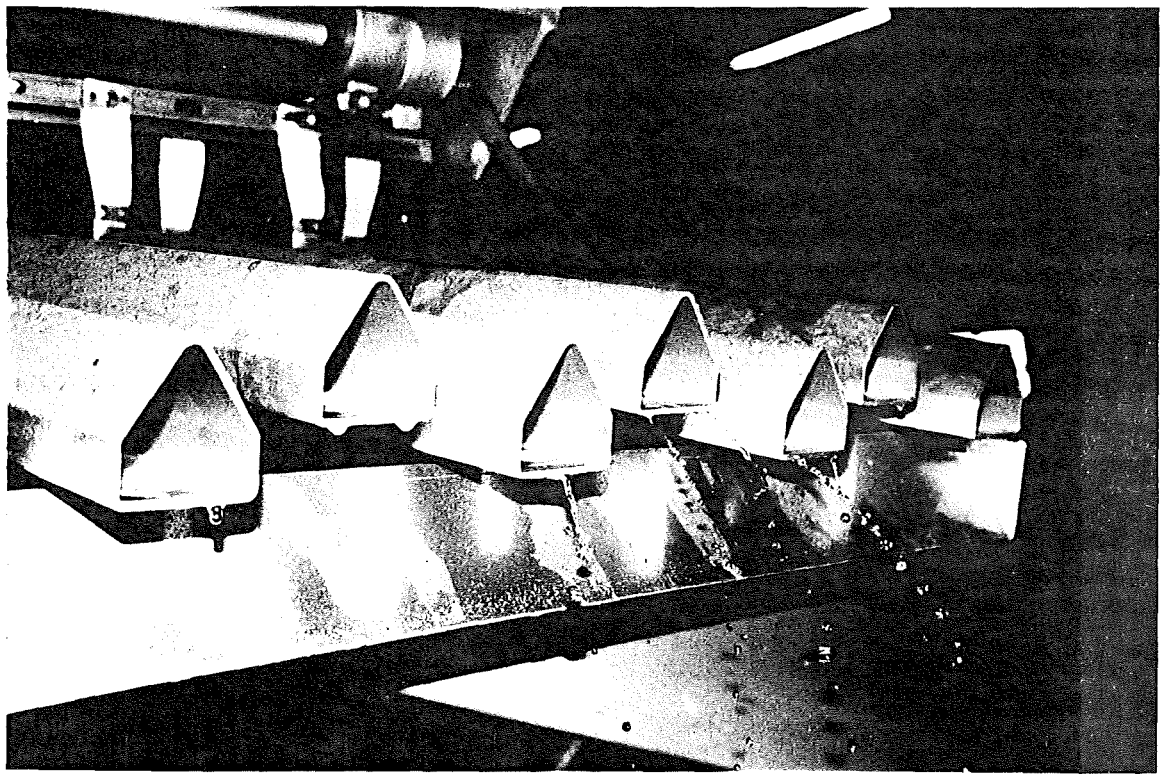


\* Unlike the grading rails on the Kronborg machine, the Baader's rails do not vibrate in unison. Instead the rails are hung at two asynchronously working eccentric shafts. The rails therefore oscillate different in phase relative to each other. Baffles (a) mounted in staggered order on the sorting rails separate the fish over the total width of the sorting area where they are finally laid in a longitudinal direction between the sorting rails.



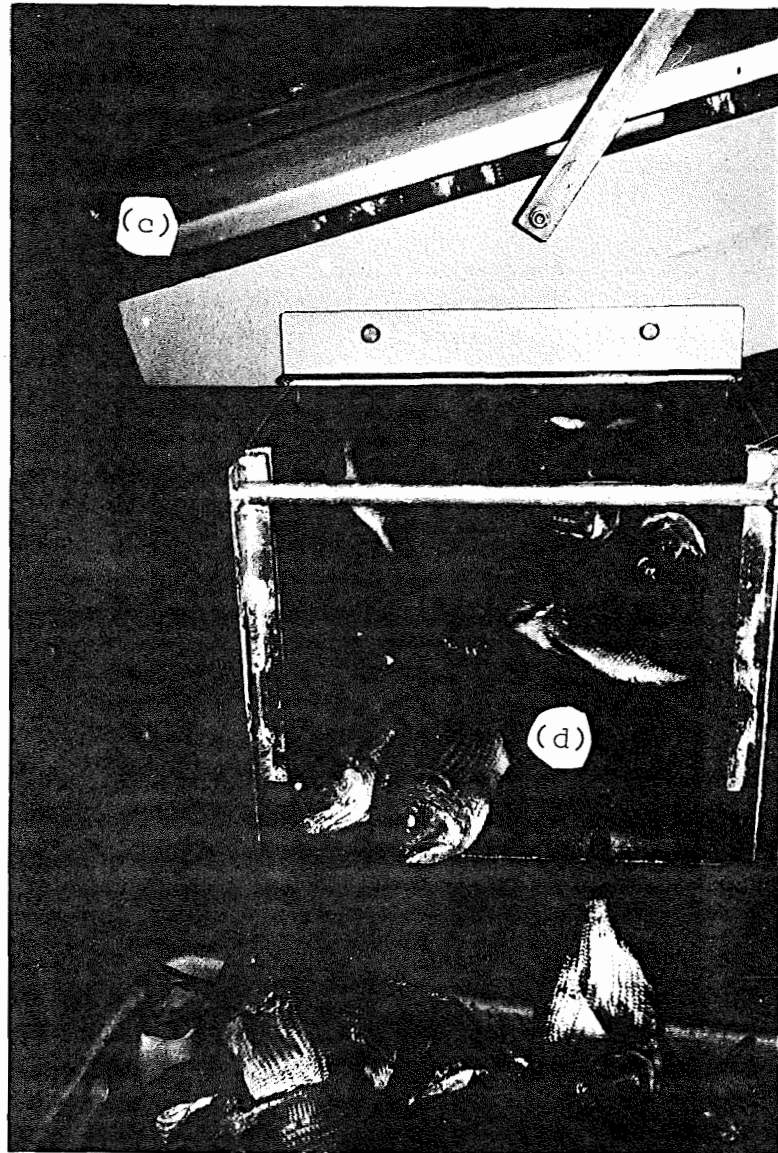
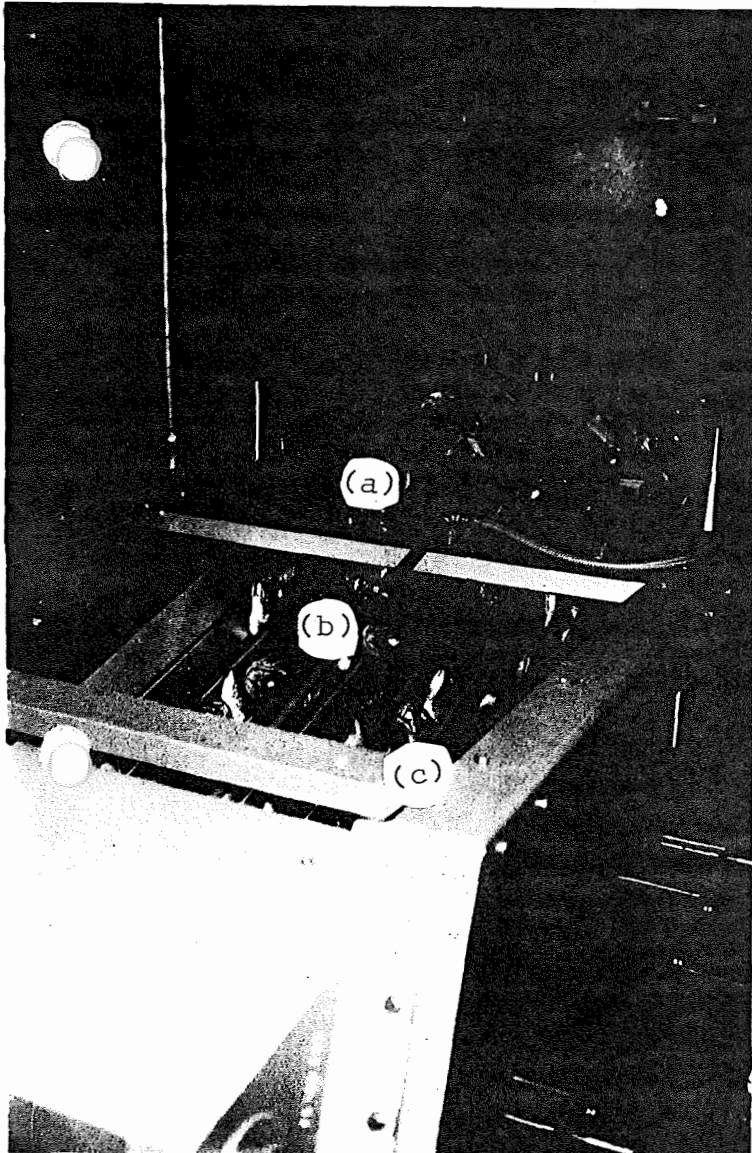
Movement of Grading Rails

Grading Rails



\* The movement of the sorting rails helps prevent the fish jamming and promotes its movement down the rails. This is further assisted by water being sprayed onto the fish (b).

\* The gap between the sorting rails (c) becomes progressively wider and the fish fall through the gap into a bin at the point where it matches the fish's thickness and the fish drop into the collecting bins (d).



- (a) Baffels
- (b) Water Spray
- (c) Sorting Rails
- (d) Collecting Bins

The Baader 485 grader has a number of operating speed adjustments as it has been found that different qualities and sizes of fish require different speeds of the conveyor belt and the grading rails.

In general, the following applies :-

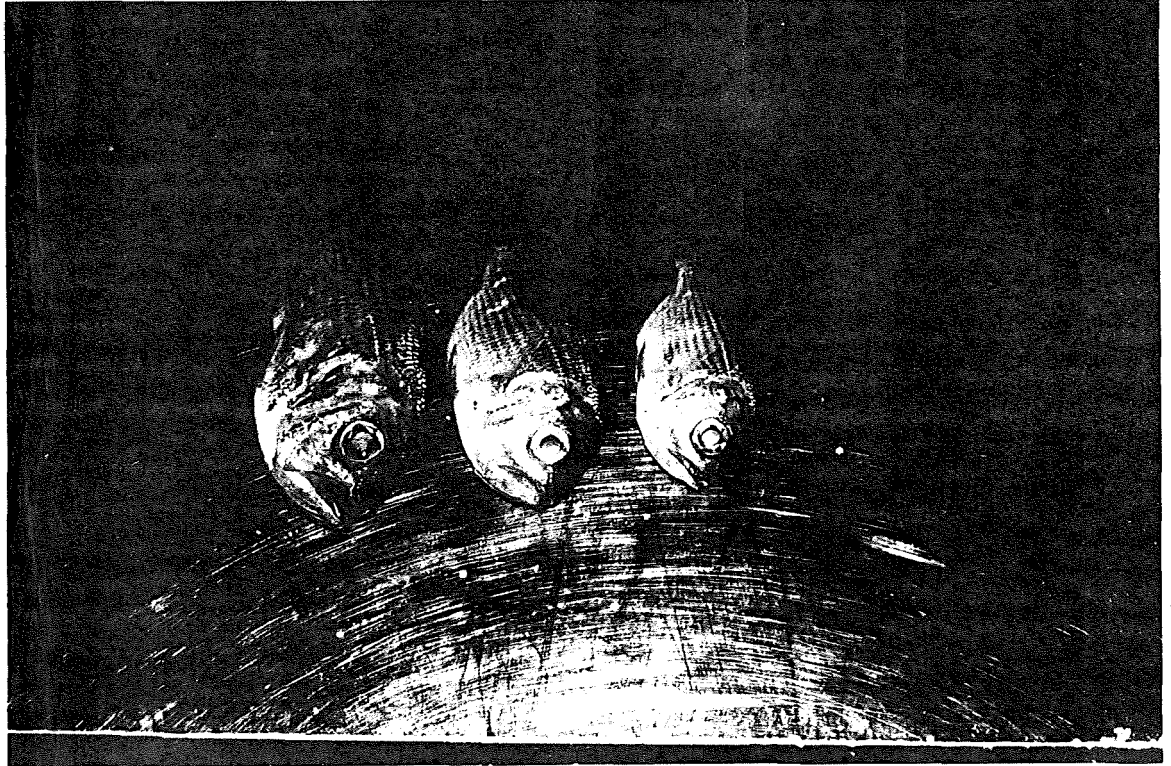
Large and Solid Fish - Conveyor belt - FAST  
- Sorting rails - SLOW

Small and Soft Fish - Conveyor belt - SLOW  
- Sorting rails - FAST

With Redfish it was found that a reasonably quick conveyor belt setting coupled with a moderately slow operation of the grading rails gave optimum results.

(iv) Efficiency in grading Redfish

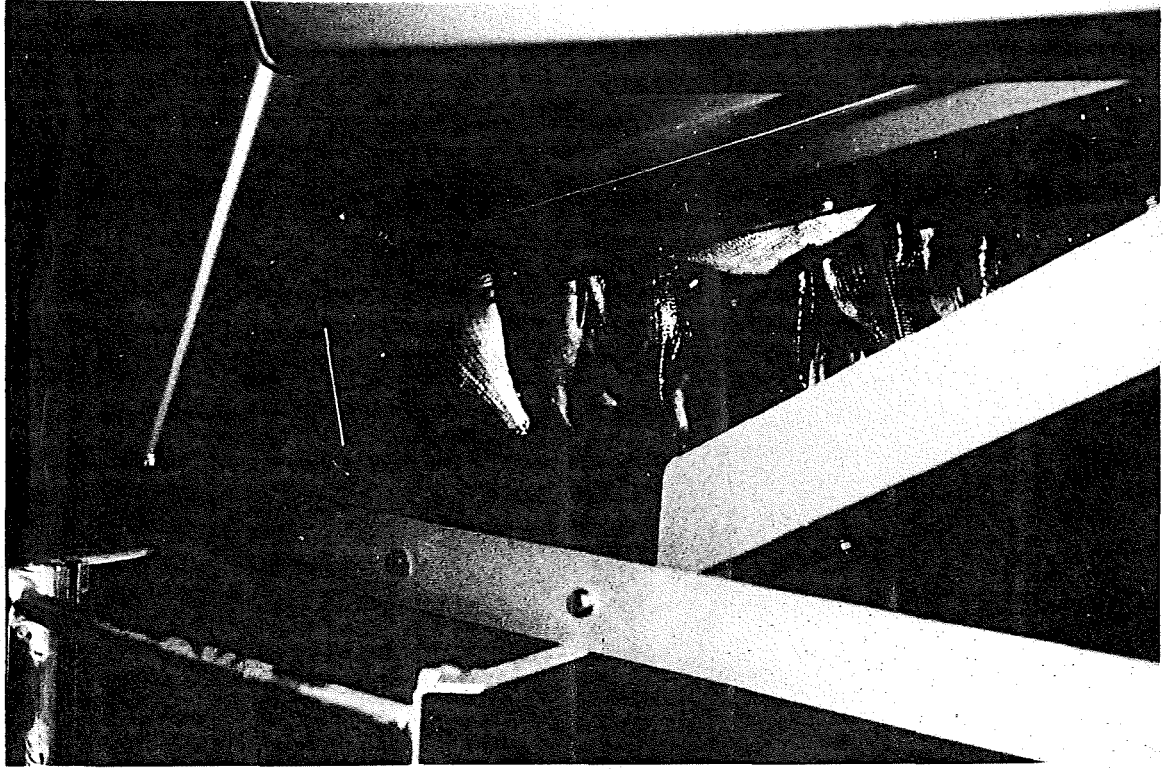
The Baader 485 machine operated far more efficiently than the Kronborg machine enabling Redfish to be sorted into three grades of Redfish to a satisfactory standard.



Three grades of fish from Baader 485

There is however a number of deficiencies in the machine's operation as follows :-

\* Extra large fish tended to become caught on the lip of the last sorting bin as shown in the photograph below:



This problem is readily overcome by lowering the level of this bin by approximately 75 cm to allow the largest fish to pass unhindered. There is little cost in this modification as it is largely achieved by relocating bolt holes.

\* The final grading deficiency did not arise as a result of a shortcoming in the machine but is due to the physical attributes of Redfish.

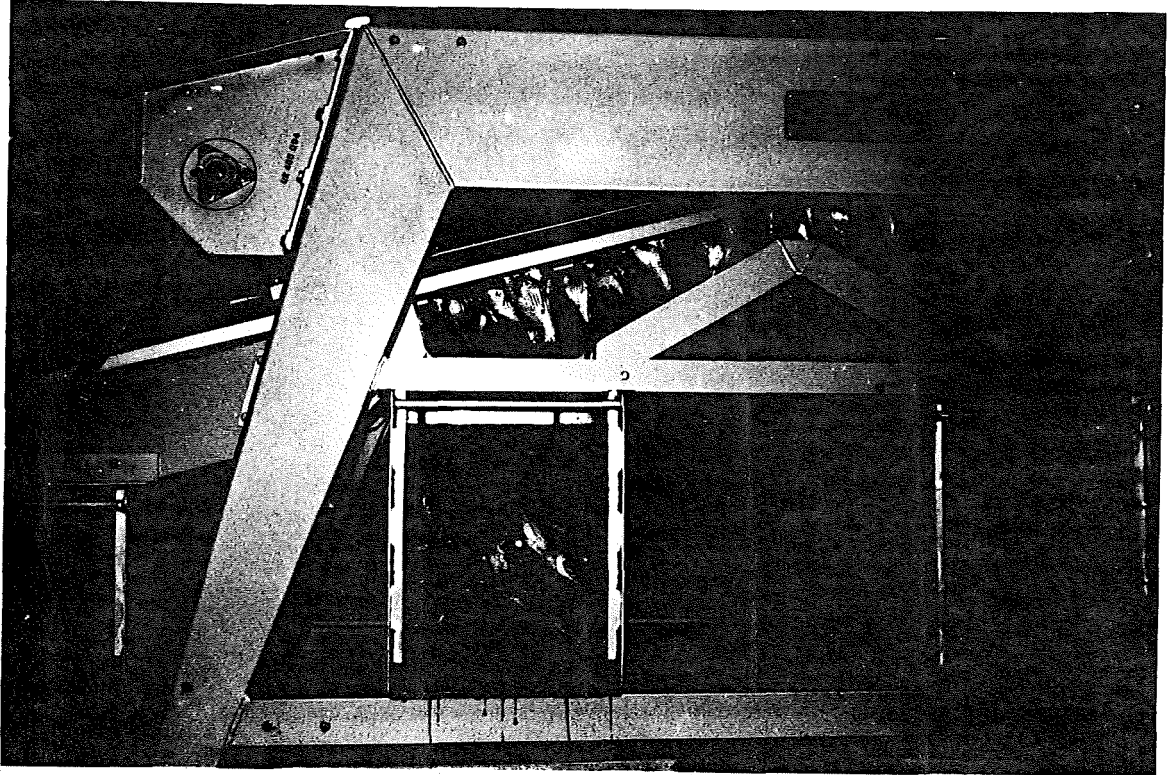
It was found that if fish is bulk packed then once rigor mortis sets in any fish which was bent will remain curved and will not pass between the grading rails thus resulting in a proportion of small and medium fish in the large grade bin.

The only way of reducing this problem is for the fish to be graded as soon as possible after capture.

The other physical attribute of Redfish which presents some problems is that the head and gills are the thickest portion of the fish.



This means that the fish tend to hang by the head between the grading rails and thus their movement along the rails is not as efficient as that of fish of more uniform thickness (e.g. mullet) which tend to lie along the rails.



Redfish hanging  
from grading  
rails

Given the above constraints (most of which can be overcome), the machine performed quite well.

Operation of the machine was quite simple and one operator would be able to handle small loads. However, for increased efficiency and continued operation, two operators would be preferable enabling one to control loading of product onto the machine and the other operator to remove and pack the graded fish.

Product throughput on the machine of up to  $3\frac{1}{2}$  tonnes per hour can be achieved however a more realistic operating level is 2 -  $2\frac{1}{2}$  tonnes per hour (i.e. approx. 60 - 70 boxes per hour) allowing for interruptions to clear blockups, repack fish, etc.

In terms of location of grading machines, it is obvious that they should be installed at the port of landing. Whilst the Baader grader was installed at the Sydney Fish Market during the trials, this location was not desirable in terms of economics of operation

and preservation of fish quality as it necessitated double handling of product; i.e. it had to be packed weighed and iced at the port of landing to enable transport to the Sydney Fish Market where it was graded, repacked and re-iced prior to sale.

This would also help minimise problems caused by "bent fish" as grading will be done as soon as possible after capture.

Finally, the Baader 485 also graded other species such as Morwong, Red Spot Whiting, Trevally, prawns etc. within the constraint that the maximum sized fish which can be handled by the machine is 30 - 35 cm overall length. The machine is however most efficient when handling those species which will lie along the grading rails.

(v) Reliability of Equipment

The Baader 485 has proven to be completely reliable during the trial period and provided it is correctly maintained little operating time should be lost through breakdown.

In the event of a breakdown, Greer Australia Pty. Ltd have both mechanical and electronic service people available from their head office at Mt. Gravatt, Brisbane and Rydalmere, Sydney.

(vi) Regular Maintenance

The equipment came supplied with an adequate operations manual which details the normal regular on-site maintenance. Essentially, this involves daily washing of the machine and regular lubrication of bearings, chains and gears.

Standard Grades for Redfish

The following gradings have been found to be acceptable to the Master Fish Merchants Association :-

SMALL	under 250 mm
MEDIUM	250mm to 340 mm
LARGE	over 340 mm

At present, however, due to the fact that there is only one grader available which can handle Redfish, the majority of fish consigned to the Sydney Fish Markets is ungraded.

## Promotion of Redfish

### (i) Consumer Promotions

The Authority has printed 200,000 copies of a Redfish Recipe leaflet and 1,000 copies of a poster (Attachments 3 & 4) as part of its N.S.W. fish promotional programme. These leaflets are provided to fish retail outlets by the Authority free of charge. Redfish is also featured

in the Authority's Mini Cookbook series.

However, more importantly, Redfish is widely used by the Authority in its seafood education programme. Under this programme seafood workshops are conducted in State high schools. During 1984/85 144 high schools were covered under this programme with an average of 60-100 students involved each time. The students are educated in the identification, purchase, preparation and cooking of seafood.

In addition, demonstrations are conducted at regional shopping centres, and co-operatives' retail outlets with Redfish again being prominently promoted.

### (ii) Processing

There is poor demand for small Redfish due to the extremely small fillet which can be recovered from the small grade.

The Authority has, however, been actively encouraging and supporting a small Sydney processor who has secured a market for Redfish mince. In addition, this processor is conducting processing trials on a fish sausage which also incorporates Redfish mince. The smaller grades of Redfish are ideally suitable to this processor and this has created an outlet for a fish which was previously difficult to sell.

Unfortunately, however, the large catches of Redfish which were occurring prior to submission of the FIRTA application are not now occurring and the processor in question has had to resort to other species in spite of a number of trips to co-operatives accompanied by representatives of the Authority seeking additional supplies of Redfish.

## Increased Returns to Fishermen

There have been significant increases in returns to fishermen for Redfish (both graded and ungraded) since the Authority submitted its application to FIRTA as is evidenced by the following statistics :-

Grade	<u>Average Prices</u>			
	1.10.83 to 30.9.84	1.10.84 to 30.9.85	1.10.84 to 17.5.85 \$	1.10.85 to 16.5.86 \$
Large	70	88	.96	1.36
Medium	40	55	.60	.80
Small	(No stats)	57	.60	.87
Ungraded (Mixed)	50	46	.47	.99
Total	54	63	.66	.96

Grade	<u>Quantities Sold</u>			
	1.10.83 to 30.9.84	1.10.84 to 30.9.85	1.10.84 to 17.5.85	1.10.85 to 16.5.86
Large	420531	340906	173466	147093
Medium	474311	435638	272178	185169
Small	(No stats)	30181	18825	41942
Ungraded (Mixed)	910043	898821	486713	379124
Total	1804885	1705546	951182	753328

It will be noted that whilst prices have increased significantly (1985/86 currently 96 cents per kg versus 54 cents in 1983/84) there has been a dramatic reduction in catch rates for Redfish. This has meant that the need for mechanical grading is currently nowhere near as great as it was in 1983/84.

### Summary

Two Redfish graders were purchased as follows :-

One only Kronborg Skami which was located at Ulladulla.  
One only Baader 485 grader plus feed elevator which was located at the Sydney Fish Markets.

Trials on the Kronborg Skami revealed that it is completely unsuitable for grading Redfish in commercial quantities without substantial modifications even though it was supposedly specially adapted by the distributors to grade Australian Redfish.

Furthermore, the distributors of this machine have since closed down their Australian branch offices and consequently back up support for the machine could be lacking.

The Authority is, however, aware that the Clarence River Fishermen's Co-operative has been successfully using a Kronborg Skami to grade Red Spot Whiting and prawns so the machine would have a potential use in this area.

Trials with the Baader 485 have revealed that with some minor modifications this machine will successfully grade Redfish subject to :



- \* Some grading inaccuracies created by fish which are permanently bent after rigor mortis, plus
- \* The operating efficiency of the machine is hindered somewhat because the head of Redfish is far thicker than the body thus causing the fish to hang between the grading rails by the head and hindering progress down the grader. The machine is more efficient for fish of a more uniform body thickness.

The Baader machine has proven to be sturdy and reliable providing it is regularly maintained and kept clean.

It is evident that any grading machine used for grading Redfish must be located at the port of catch and not at the Sydney Fish Market. This has the following benefits :-

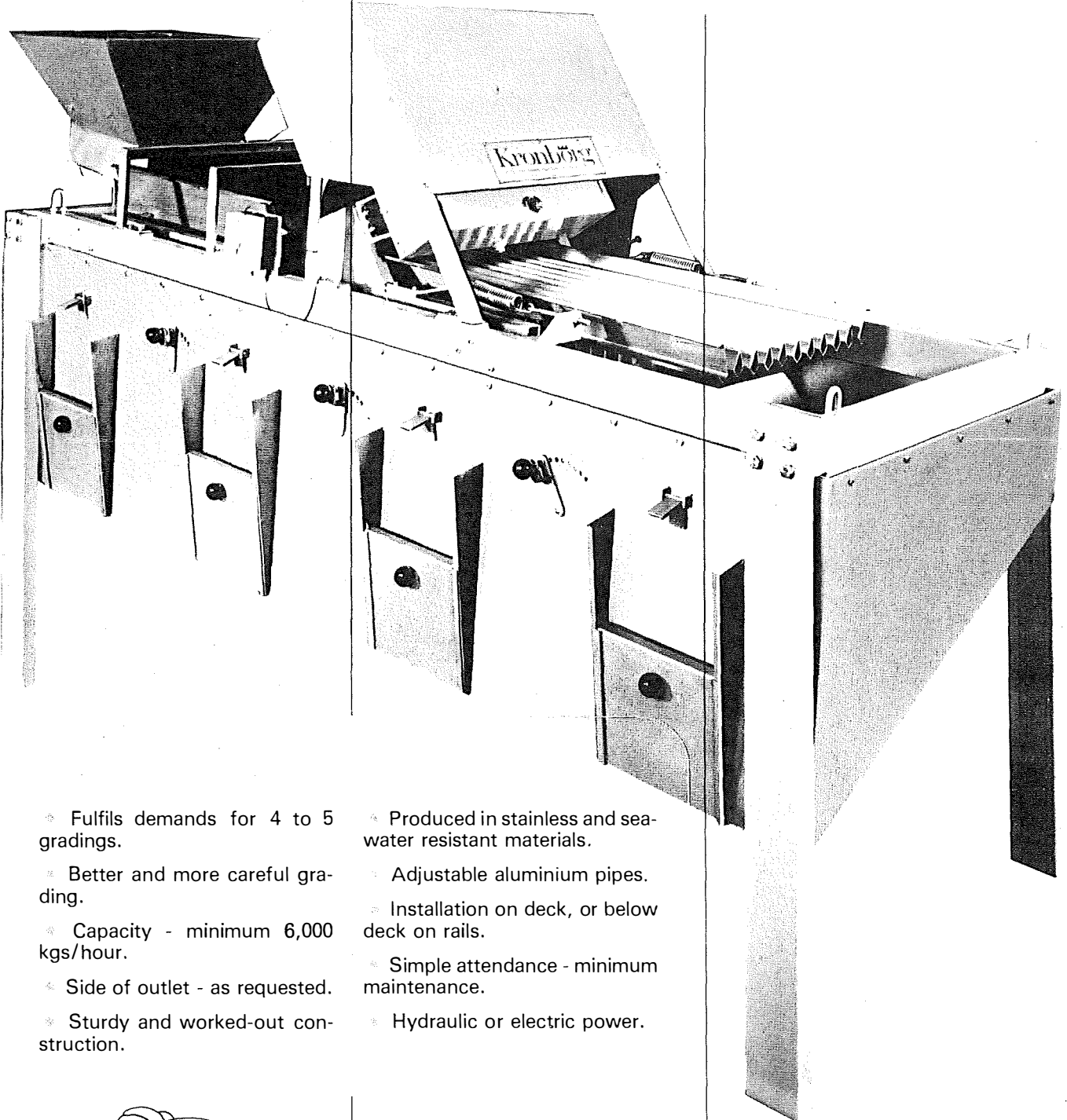
- \* It facilitates bulk unloading, grading, weighing and packing of Redfish.
- \* It prevents the need for double handling of product which would occur if the machine were at the Sydney Fish Markets.
- \* Minimises incorrect grades caused by "bent fish".

Unfortunately, however, there has been a significant reduction of over 20% in Redfish production for the current year (only 753,328 kg from 1.10.85 to 16.5.86 compared with 951,182 kg for the same period in 1984/85).

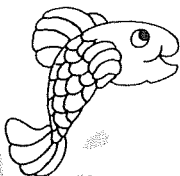
This has created a shortage of Redfish for processing into Redfish mince based products resulting in difficulties for processors of this product. If the trend for catch reductions continues then the need for Redfish grading machines is drastically reduced.

# SKAMI Herringgrading machine

Kronborg SKAMI herringgrading machine, is a new-improved model in order to get much more efficiency in the grading and includes furthermore a number of functional advantages:



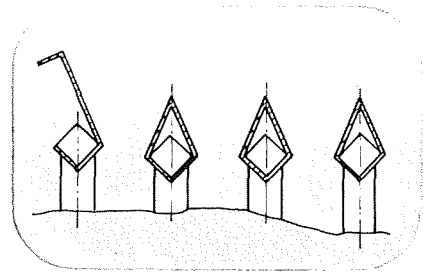
- \* Fulfils demands for 4 to 5 gradings.
- \* Better and more careful grading.
- \* Capacity - minimum 6,000 kgs/hour.
- \* Side of outlet - as requested.
- \* Sturdy and worked-out construction.
- \* Produced in stainless and sea-water resistant materials.
- \* Adjustable aluminium pipes.
- \* Installation on deck, or below deck on rails.
- \* Simple attendance - minimum maintenance.
- \* Hydraulic or electric power.



# SKAMI Herringgrading machine

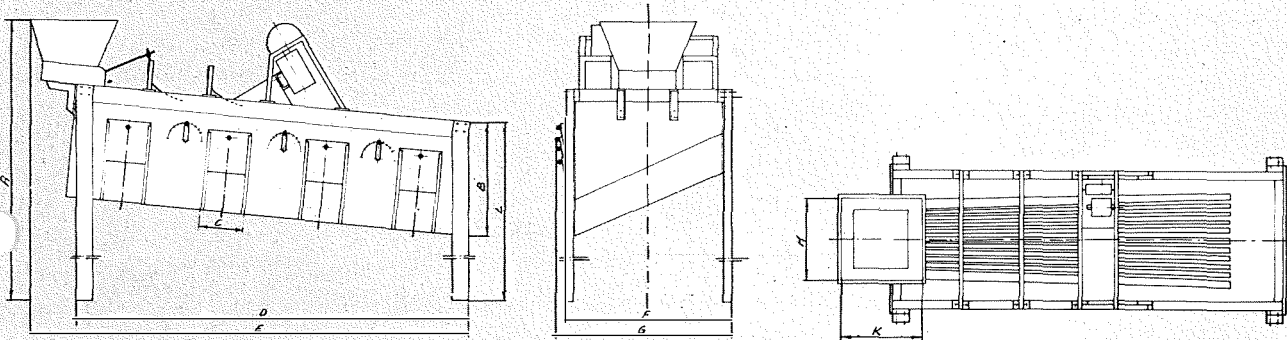
A well-qualified technical staff with many years of experience are at your disposal - both before and after installation has been performed. Effective service guarantees continuous and reliable performance.

**Kronbörg**

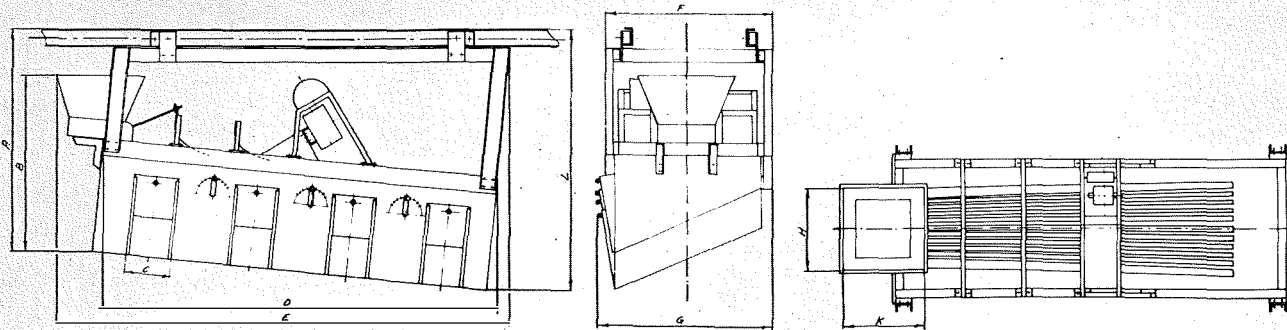


Adjustable aluminium pipes.

## Installation on deck



## Installation below deck



Model	Installation	A	B	C	D	E	F	G	H	K	L
<b>SKAMI 4</b> (4 gradings)	On deck	after order	710 2'4"	280 11"	2430 7'11"	2720 8'11"	1030 3'5"	1070 3'6"	580 1'11"	500 1'8"	after order
	Below deck	1375 4'6"	1090 3'7"	280 11"	2440 8'	2800 9'2"	1030 3'5"	1070 3'6"	580 1'11"	500 1'8"	1620 5'4"
<b>SKAMI 5</b> (5 gradings)	On deck	after order	710 2'4"	280 11"	2930 9'8"	3220 10'7"	1030 3'5"	1070 3'6"	580 1'11"	500 1'8"	after order
	Below deck	1375 4'6"	1090 3'7"	280 11"	2940 9'8"	3300 11'	1030 3'5"	1070 3'6"	580 1'11"	500 1'8"	1620 5'4"

Capacity: 6 t herrings/hour.  
HP = 1. Oil motor: 20 l/m at 70 bar.  
Weight: approx 360 kg.

45 Falkevej . DK-9352 Dybvad . Denmark  
Telephone: 08-86 42 33 . Telex: 60383

**BAADER**

Dimensioned drawing

**485**

