

W H I T E F I S H A U T H O R I T Y

White Fish Authority,  
Market Development Unit,  
7 Ashley Road,  
Epsom,  
KT18 5AQ.

White Fish Authority,  
Sea Fisheries House,  
10 Young Street,  
Edinburgh,  
EH2 4JQ.

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Further Acceptability Trials with  
Farmed Turbot (1975 Harvest).

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## SUMMARY

Following on from the acceptability work carried out in London during the summer of 1974, further trials with farmed turbot from the Authority's Marine Fish Cultivation Unit at Hunterston in Ayrshire, were conducted in different sections of the fish retail trade including wet fish wholesalers, a frozen fish processor and distributor, fishmongers, restaurants and hotels.

The fish for these trials were graded into four different grades by weight ranging from 0.5 - 1.5 kilos and consequently were smaller than the average size of wild caught turbot landed in this country.

Reaction to the quality and freshness of the farmed fish was universally favourable and the response from the high class restaurants and hotels and specialist fishmongers was particularly enthusiastic. Whilst favourably impressed by quality, the wholesale sections of the trade, used to dealing with wild caught turbot, would have preferred larger fish that were lighter in colour on their dorsal sides.

All the evidence collected so far suggests that farmed turbot produced by the Authority are very acceptable for the high class restaurant and hotel, and for the specialist fishmonger. It is possible that by a variation in farming procedures shortly before harvesting, the dorsal sides of the fish could be made significantly lighter in colour.

1. Introduction

Using the warm water discharge from a nuclear power station, the Authority has shown that it is possible to grow turbot under farm conditions, to a size of 500g in approximately 2½ months. Their acceptability for flavour was measured by hall tests conducted in 1974 (Ref.1), when 3 housewives in 5 could not tell the difference between farmed and wild caught turbot and of those who could, there was no significant preference. Previous catering trials conducted in 3 restaurants of the Wheeler chain of speciality fish restaurants and a public house, all in London (Ref.2), have shown that customers in these outlets readily accepted farmed turbot of this size cooked and served whole and on the bone.

However, since farmed turbot of different weights were available as a result of the termination of growth and feeding experiments of two and three years in duration, at the Authority's Marine Fish Farming Unit at Hunterston in Argyshire (Refs. 4,5 and 6) it was decided to use fish weighing from 0.5 - 1.5kg in a further series of consumer acceptance trials. It should be noted that even turbot weighing 1.5kg would be rated as small in comparison to wild caught fish, by the fish trade.

Also, this year it was decided to broaden the scope of the exercise by conducting very limited trials to determine the reactions to the farmed turbot by different sections of the retail trade, including wet fish wholesalers, a frozen fish processor and distributor, and a number of fishmongers' shops.

For the smallest samples delivered, the farmed turbot were supplied free with the recommendation that subsequent sale should be based on a purchasing price of 50p per lb., and larger samples were sold at that price to the participating firms.

2. Sections of the Trade participating in the trials

2.1 Wet Fish Wholesalers

Sid Clarke, Trinity Street, Grimsby.  
(Subsidiary of Ross Foods Ltd.)

S.L. Neill Ltd., Strathmore Industrial Estate, Glasgow.

2.2 Frozen Food Processor and Distributor

Young's English Seafoods, South Humberside Industrial Estate, Grimsby.

2.3 Fishmongers

The farmed turbot were delivered to L. Burkett Limited, but it was decided by the company to divide the fish between a number of shops controlled by that company and its associates.

L. Burkett, Brompton Road, London, SW3.

W.E. George, North Street, Guildford, Surrey.

Rudman & Co., High Street, Putney, London, SW15.

Rudman & Co., High Street, Wimbledon, London, SW19.

John Gow Ltd., Connaught Street, London, WC2.

2.4 Restaurants and Hotels

City Yacht Restaurant, Addle Street, London, EC2.  
(Trust House Forte)

Parkes Restaurant, Beauchamp Place, London, SW3.

Epicure Restaurant, Shandwick Place, Edinburgh.

Gleneagles Hotel, Gleneagles, Perthshire.

Galley of Lorne Hotel, Ardfarn, Argyll.

Lochgair Hotel, near Lochgilphead, Argyll.

Crinan Hotel, Crinan, Argyll.

3. Farmed Turbot used for the trials

The farmed turbot used in these trials were wild caught fish netted off beaches in North Wales as 'O' Group fish in 1972 and 1973 and were used in growth and feeding experiments at Hunterston as part of the Authority's marine fish farming programme. (Refs 4, 5, and 6)

At the termination of these experiments in May 1975 the fish were graded into six weight groups prior to harvesting (Ref.3). These groups were as follows:

<u>Size grade</u>	<u>Weight (g)</u>
a	below 500
b	500 - 700
c	700 - 800
d	800 - 1,000
e	1,000 - 1,500
f	above 1,500

Fish weighing below 500g (size grade a) were not harvested but were held on the farm for further growth, while those weighing above 1,500g (size grade f) were kept alive as potential spawning stock.

After harvesting and gutting - two professional gutters (retired fishermen) were employed - on the 2nd and 3rd June 1975, the farmed turbot were packed in ice and despatched to the various participants in the trials as indicated in Table 1. In all cases the weights after harvesting refer to gutted, whole fish. Measurements taken at the time of gutting (Ref.3) put the gut weight at 4 to 5% of the whole weight, irrespective of fish size (note that the fish were starved for 3 days prior to harvesting.)

As distinct from the June harvest, a further 45 farmed turbot in size grades b and c were harvested on the 2nd July, divided into 3 batches each of 15 fish, held in ice in a cool place and transported from Hunterston to 3 hotels participating in the Argyll Seafood Festival on the 4th July.

#### 4. Reactions to the Farmed Turbot

##### 4.1 Wet Fish Wholesalers

Fish delivered to Sid Clarke Ltd. were distributed by that company to a number of outlets including stores offering a traditional fishmonger service in the Carrefour (Telford), Keymarket (Havant and Yeovil), Woolworth (Aylesbury and Guildford) chains and to French fish importers.

The price of 50p per lb. to the wholesaler was felt to be too high - this was the price charged for the 80 fish in size grade e - in fact, for turbot of the size supplied to the stores mentioned above, it was stated that the trade would not wish to pay more than 30-33p per lb. With a retail mark-up of 50-60%, the price to the housewife would then be 45-50p per lb.

Comments were made about the black slime on the dorsal surfaces of the fish, although it was noted that this was easily removed by washing. The fish were thought to be of excellent quality, but on the small side. It was suggested to customers that they should either fillet the fish or bake it on the bone and reports indicated that the flesh content was sufficient to give a satisfying meal for two.

Opinion on taste was divided, perhaps because the farmed turbot were fresher than those normally landed by fishing vessel, and was considered by some to be disappointing.

All the farmed turbot received by S.L.Neill Ltd. were sold to the Gleneagles Hotel at 52p per lb. (This compares with a price of 98p per lb. for wild caught turbot weighing 4½-6 kilos (10-14 lb.) The company stated that it would be quite pleased to handle further supplies on a regular basis.

#### 4.2 Frozen Food Processor and Distributor

Young's English Seafoods commented that the farmed turbot received by the company were of excellent quality and indeed had to be iced back for a day before they were suitable for filleting. The fish filleted well giving a yield of 53-58% which is exceptionally high.

After packing into catering packs, the trimmed farmed turbot fillets were distributed through the company's London region where there was reasonable market acceptance.

Some comments were made about the dark skin on the dorsal surfaces of the fish and the company was not keen to pay above current market prices for wild caught turbot of a similar size. (This price in June 1975 was given as 33-38p per lb.)

However, the company was extremely interested in the fish and asked to be kept informed about future availability of fish over 1kg in weight.

#### 4.3 Fishmongers

Again the excellence of the quality of the farmed turbot supplied to L. Burkett Limited was stressed together with the fresh appearance. It was generally felt that the "rather unusually black" skin on the dorsal surfaces was slightly off-putting as was the "slightly piebald effect" on the ventral surfaces of the fish. However, it was stated that this was comfortably outweighed by the superb fresh bloom on the fish - the same observation was made by the housewives participating in the hall tests held in London last year - and the firm pointed out that the freshness of the fish was all important when offering the fish for sale at retail level. .

The fish were offered for sale at 60p per lb. in all the shops and all were sold after a few hours. (It is interesting to note that one of the fishmongers was situated in Guildford where farmed turbot were also offered for sale at the Woolworths store). Most of the fish were sold filleted - the yield here was also very good at 58% - although a few were sold whole.



Reaction to the farmed turbot by the customers, who were asked to comment, was wholly favourable and it was thought by the company, bearing in mind the small number of farmed turbot available, that fish of the quality received for the trial would find a ready market throughout the country.

#### 4.4 Restaurants and Hotels

It was in this trial with catering establishments that farmed turbot really came into its own. Last year it had been established that customers in 3, Wheeler's restaurants and a London public house readily accepted "single portion" farmed turbot weighing approximately 500g. This year, however, in addition to fish of this size, outlets were supplied with larger fish weighing 800-1,000g to determine the reaction to a "double portion" fish. It was envisaged that, as is the custom in France, two people eating together both of whom ordered farmed turbot, would be served with a fish that had been cooked whole and was then divided into 2 portions at the table. Alternatively, of course, the fish could be divided into 2 portions in the kitchen and each portion cooked and served separately.

A number of outlets including the Gleneagles Hotel, the City Yacht and Epicure restaurants, tried these approaches, but the overall impression gained from the reports received was that "single portion" fish weighing 500g were preferred.

Nearly all the fish served were poached or grilled and served with butter, a flavoured butter, or a sauce such as Hollandaise or Bearnaise.

All comments regarding quality and flavour were entirely favourable and two of the hotels participating in the Argyll Sea Food Festival regretted that the fish had not been more highly priced on their menus. One hotel had priced the fish at £1.50 and the other at £1.95 for the complete fish including vegetables - the hotelier charging £1.95 believed that the price could have been raised to £2.15

for the dish. The prices charged in two other outlets were £2.25 for the farmed turbot alone, but the price charged in the Edinburgh restaurant was only £1.20 for a whole 500g fish or for half a larger fish, which seems very low bearing in mind the 150-200% mark up usually required.

Simple leaflets describing the Authority's progress in marine fish farming were supplied to the hotels taking part in the Sea Food Festival in Argyll (Appendix), but no such material was available for the other hotels and restaurants participating in the trials. One restaurant, the City Yacht, had some of the fish washed and put on display with the fins trimmed and because of the excellent eye appeal had no difficulty in selling the fish to their customers.

The outlets involved with the trial stated a ready willingness to continue to feature farmed turbot on their menus, provided that future supplies would be available on a regular basis.

Apart from the Epicure restaurant where a purchase price of 50p per lb. was quoted for future supplies, the outlets were prepared to pay at least 60p per lb. for whole fish of 500g.

## 5. Discussion

Without exception, the quality of the farmed turbot supplied for the trials was regarded as excellent. The freshness of the fish (2-4 days from gutting) in trade terms was exceptional. This in some respects created problems, as the fish were too fresh in that if they were eaten immediately they were received, the characteristic "turbot" flavour was most probably insufficiently developed and, for the very freshest (2 days from gutting) fish, the texture tended to be slightly rubbery. This phenomenon is well known with Dover sole and indeed many people prefer not to eat cod until it is at least 3-4 days old. It is felt that, ideally, farmed turbot should be stored for a period of 5 days in melting ice before being eaten in order to allow the full development of its flavour. This means, to prevent misunderstandings in the trade, that the fish should not be despatched from the farm until it is 4 days old from gutting.

There was a comment from L. Burkett Ltd. about a "slightly piebald effect" on the ventral surfaces of the fish, which may again have been caused by overfreshness with the blood having had insufficient time to drain before selling: this condition too would be improved by a delay before distribution.

A number of comments were made concerning the black slime on the dorsal surfaces of the fish. The cause of this was to be found in the much darker colouration of the farmed turbot compared to wild caught turbot, which derived from the black linings of the tanks in which the fish were reared and the low light intensity due to canopies covering the tanks. After death, the pigment causing the dark colouration, melanin, is exuded into the surface mucus and becomes apparent to anyone handling the fish as black slime. As several of the outlets observed, the slime was easily removed by washing. It would be expensive to reline the tanks with lighter coloured rubber which is less durable as it is more readily degraded by sunlight. However, it would be a relatively simple matter to alter the light intensity in the tanks during the final stages of fattening the adult fish, if a lighter dorsal colour is preferred. It must be remembered that during a previous test (Ref.1) where farmed turbot were compared to wild caught turbot, the darker surface of the farmed turbot was thought to indicate a fresher fish. It may be a question of degree of darkness, but more probably the comments indicated that the fish, when sold, should be free of unsightly slime.

Fillet yields on the farmed turbot were not measured directly by the Authority, but reports from Young's English Seafoods Ltd. and L. Burkett Ltd. stated that yields of 53-58% had been obtained which are considerably higher than expected from wild caught fish, which are usually around 50%.

The enthusiastic response to the farmed turbot received from the hotels and restaurants is most encouraging and the results of these trials bear out the reaction in the restaurant trials carried out the previous year.

A "plate sized", single portion fish weighing about 500g (guts out) was generally preferred by the restaurants and hotels participating in the trials. No difficulty was experienced in selling the fish at a price to give the required profit margin for a purchasing price of 60p per lb (133p per kg, or 61p per fish weighing 500g).

Reactions from the trade wholesalers received during the trial indicate an unwillingness, at present, to purchase farmed turbot at above the current market price for the wild caught fish. However, farmed turbot is essentially a new product that will not be available in large numbers on a regular basis in the immediate future and therefore it is difficult to predict, with any accuracy, the wholesaler's reaction to that situation.

In view of the fact that it is relatively simple to achieve a live weight in excess of 450g, but comparatively difficult to achieve a live weight in excess of 500g during the third summer of growth, it will be necessary in future marketing trials to attempt to define the variation in acceptability over the weight range (gutted) of 425g to say 550g.

## 6. Conclusion

It is apparent from these trials, bearing in mind the relatively limited numbers of fish marketed, that the farmed turbot produced by the Authority were very acceptable for the better class hotel and restaurant trade, and also for the specialist fishmonger. So far, the evidence collected indicates that the preferred farm production size is fish weighing approximately 500g each for serving whole and on the bone as a single portions. Larger fish, unless over

1kg in weight, are likely to find the market restricted as the fish are too large for serving as individual portions and too small to be attractive to the processor for filleting. The corollary to this is that for fish that are served whole, it is not a price per unit weight, but a price per fish, that matters.

## 7. References

1. W.R.A. Technical Report No.113 - Consumer Acceptability of Farmed Turbot in London Restaurants.
2. W.F.A. Technical Report No.119 - Acceptability of "Plate sized" Farmed Turbot.
3. W.F.A. Field Report No.114 - The Harvesting and Distribution of Farmed Turbot, June 1975.
4. W.F.A. Field Report No.111 - Husbandry and Management Trials with "O" group Turbot, (December 1973-November 1974).
5. W.F.A. Field Report No. 112 - Survival and Growth of "I" group Turbot.
6. W.F.A. Field Report No.176 - Survival and Growth of "II" group Turbot.

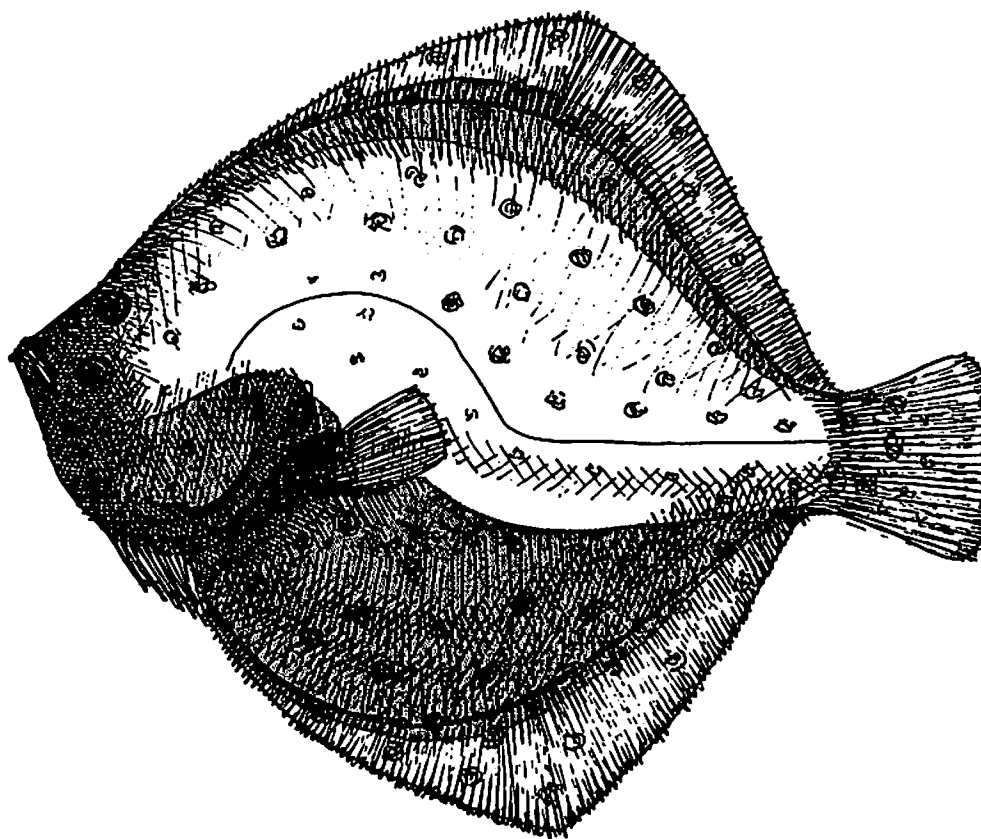
TABLE 1

Details of Consignments in ice from the Authority's Farm

Consignee	Size Grade	Number of fish (wt.kg)	Packaging	Time of despatch	Time of arrival	Method of Transport
1. L. Burkett Limited, London (Golden Sea Produce Ltd)	b	20	5 wooden boxes	1130 hrs	0830 hrs	Pick up truck to Glasgow, Red Star, British Rail, 1400 from Glasgow Arrive Euston 2020. Picked up by 2200 and delivered by car
	c	10		3.6.75	4.6.75	
	d	20				
	e	12				
		<u>52kg</u>				
2. City Yacht Restaurant, London (Trust House Forte Ltd.)	b	20	4 wooden boxes	1130 hrs	1200 hrs	As above (1), but held in refrigerator during 4/6/75
	c	10		3.6.75 from	5.6.75	
		10		Hunterston		
	e	10				
		<u>30kg</u>				
3. Sid Clarke Ltd., Grimsby (Rossfish Ltd.)	b	20	7 plastic boxes	1700 hrs	1230 hrs	Flatbed truck with canvas cover
	c	10		3.6.75 from	4.6.75	
	d	20		Hunterston		
	e	80				
		<u>133kg</u>				
4. Young's English Seafoods Ltd., Grimsby	e	180	9 plastic boxes	As above	1200 hrs	As above (3)
		<u>214kg</u>			4.6.75	
5. Hull Cold Stores for freezing	b	144)	9 plastic boxes	As above	0900 hrs	As above (3)
	c	25)			4.6.75	
	d	52)				
	e	1)				
		<u>153kg</u>	1 cardboard box			
6. S.L. Neill Ltd., Glasgow	b	20	3 plastic boxes	1600 hrs	1730 hrs	Pick-up truck
	c	10		3.6.75 from	3.6.75	
	d	20		Hunterston		
		<u>37kg</u>				
7. Epicure Restaurant, Edinburgh	b	15	Wooden boxes	1400 hrs	1700 hrs	Ford Cortina
	c	10		3.6.75 from	3.6.75	
	d	10		Hunterston		
		<u>26kg</u>				

# Farmed Turbot

from the west coast of Scotland



Farming fish is not new. The Chinese have been growing carp in ponds for over a thousand years, and other fresh water fish, notably trout, are actively cultivated in many countries. However, the farming of *salt water* fish is a new venture and now the White Fish Authority gives you the opportunity to enjoy really fresh turbot of a tender size – fine and delicate in flavour.



*See overleaf for notes on the development leading up to this tasting.*

Farmed turbot are best served whole and on the bone, with or without the head. They are generally preferred poached or grilled, but can be steamed, baked, or shallow-fried. Serve with a sauce like Hollandaise, white wine, Bearnaise, caper or shrimp. Or simply cover with melted butter.

Fish weighing 500 to 750g (approx. 1 to 1½ lbs.) with the head on make an excellent portion for one. Those weighing 750 to 1000g (approx. 1½ to 2 lbs.) are ideal for two.

As part of its overall research and development programme in fisheries, the White Fish Authority has, for a number of years, been studying the possibilities of rearing certain species of salt water fish in captivity, rather like the farming of animals on land.

Following early work carried out at the laboratories of the Ministry of Agriculture, Fisheries and Food, the Authority established two experimental fish farm sites in the late sixties on the west coast of Scotland – near West Kilbride in Ayrshire and Ardtoe in Argyllshire.

Here the work has now progressed to such an extent that in the summer of 1974 farmed turbot were used for the first time in three separate market trials. In London the fish were tasted by housewives and customers in specialist fish restaurants, and in Grimsby they were sold in the fish auction market.

The results of these trials were so encouraging that further marketing work is now being carried out with the 1975 harvest in a number of different outlets including restaurants, fishmongers' shops and in the frozen food trade.



WHITE FISH AUTHORITY · EDINBURGH · EH2 4JQ