SEA FISH INDUSTRY AUTHORITY

Industrial Development Unit

ESTUARY PROFILE

CONWY RIVER, NORTH WALES

Internal Report No. 1280

February 1987

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SUMMARY

The Conwy Estuary is the most westerly of the major estuaries on the North Wales Coast. The entrance to the estuary is dominated by the Conwy Sands where there is an important fishery for mussels Mytilus edulis. Production varies considerably and in recent years has been between 200 and 600 tonnes annually. It is a winter fishery normally lasting from September to March and there are some 20-30 licensed fishermen in the estuary. Licences are issued to bona-fide fishermen by the North Western and North Wales Sea Fisheries Committee. The mussels from the Conwy Estuary are of a very high quality and meat yield especially if taken from the sub-littoral beds. Fishing methods are simple and selective and involve hand gathering on the intertidal beds or raking from the sub-littoral areas. All mussels have to be purified at the MAFF purification station at Benarth and are bagged and sealed by the station and sold as purified Conwy mussels. The main markets are Sheffield and Birmingham wholesalers. Prices are above average at £200 to 220 tonne but the fishermen could probably do better if

they formed a marketing co-operative producing retail packs of 2 or 5kg each.

The fishery however is facing a major problem in the construction of a road tunnel to carry the A5 trunk road clear of the town. This will virtually close the fishery for 5 years after which it will no doubt recover but by which time the fishery will have dwindled and the markets will have been lost. Possible solutions are being sought to help the fishermen and the Welsh Office are not opposed to paying for some remedial action to restore the fishery. There is a need for concentrated effort to save this small but nonetheless locally valuable fishery.

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CONWY ESTUARY

1. GEOGRAPHICAL DESCRIPTION

1.1 Location

The Conwy is the most westerly of the major estuaries of the North Wales coast. It is the largest one in the area and is situated at the north-eastern extreme of the Menai Straits and to the south of the prominent limestone headland that forms Great Orme.

Main towns on the estuary are Conwy, Deganwy, and the western part of Llandudno, (west shore) which is a major holiday centre.

1.2 Topographical and Environmental Features

The Conwy estuary is a typical drowned river valley with its axis lying in an approximate N-S direction between Deganwy, close to the mouth, and Llanwrst at the tidal limit - a distance of some 22Km (Figure 1).

The river, with its mountainous catchment area, flows down from Llyn Conwy, (its point of origin) and meanders some 40Km along a flat flood plain to the sea.

The entrance to the estuary is dominated by the extensive Conwy Sands situated in the northern section of the mouth with the main water channel running to the west towards Penmaenbach Point. Adjacent to - and in the low water channel - there are extensive commercial mussel beds.

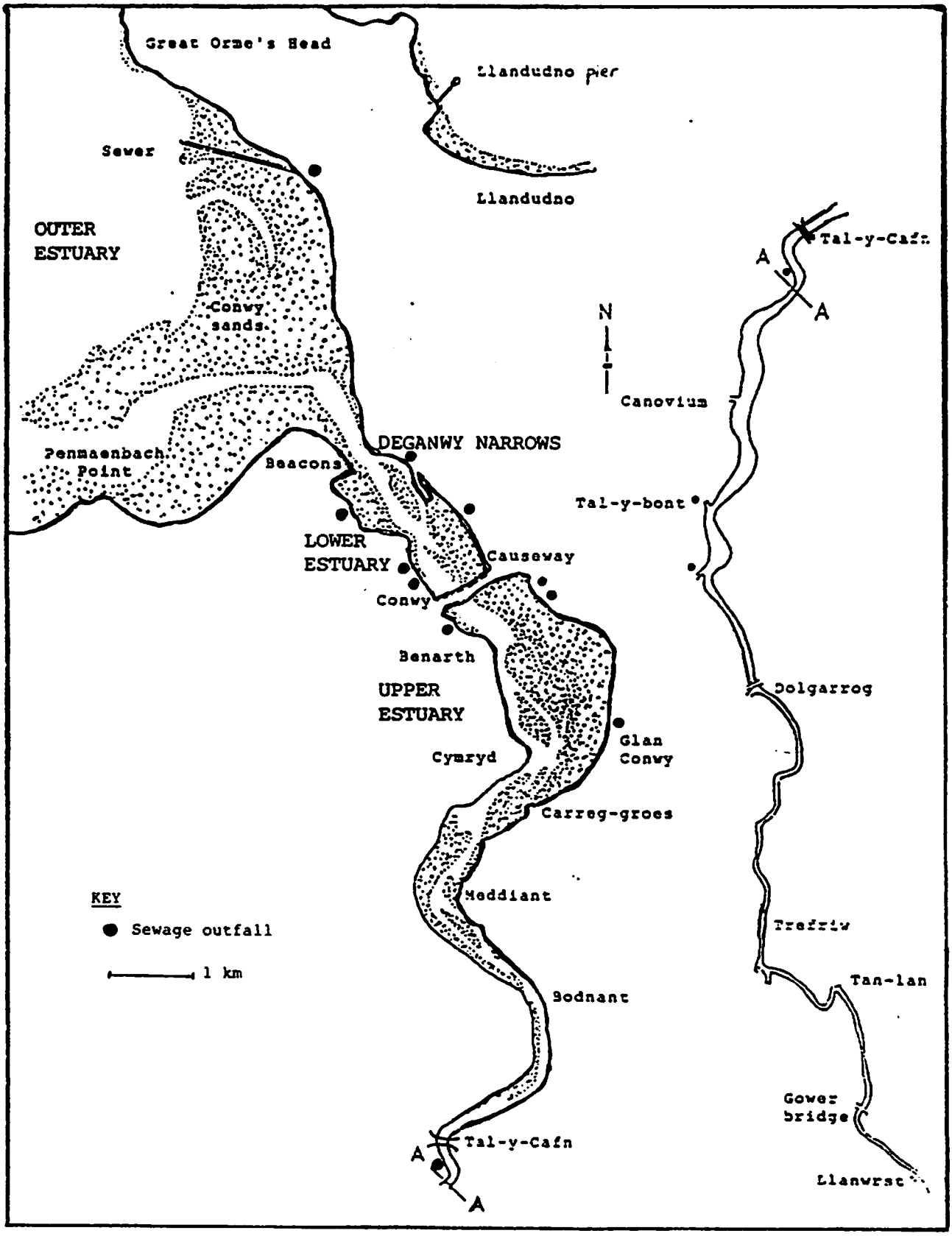

FIG. 1. THE CONWY ESTUARY

The estuary mostly drains out with the tide and is long and narrow - especially at Deganwy Narrows where the channel is only some 200m wide. Between this point and the Conwy bridge is the main inner estuarine basin, dominated by the massive Castle built by Edward I.

This region has extensive yacht mocrings and the Town Quay used by five inshore trawlers (15-20m) which work in the Irish Sea.

At Conwy, the estuary is crossed by a three bridge system which carries road and rail transport over the river. A causeway built in the 1820s links the bridges with the eastern bank at Llandudno Junction. The narrowing of the estuary at this point by the causeway - used by the A55 trunk road - is accompanied by a corresponding increase in depth (to about 18m) where high salinity water is consistently trapped during the ebb tide.

Upstream of the causeway the estuary broadens again to become 1.3Km wide at Glan Conwy, and here the main channel remains close to the western bank. To the side of the Castle at Benarth is the Fisheries Experiment Station and mussel purification tanks run by MAFF (see p10).

1.3 Physical Features

The general physical characteristics and degree of mixing of the Conwy are dependent on three main factors:

tidal action
river flow
topography

The most detailed work concerning the Conwy tidal regime has been undertaken by the Department of Civil Engineering at Birmingham University.

The area has high tidal velocities which are strongly distorted by the entry conditions caused by the shallow entrance channel between the outer estuary and Deganwy and the Conwy Sands which tend to act as an obstacle to the passage of the rising tide between these points. The mean tidal ranges for Conwy are 3.8m for neaps and 6.0m for springs.

The region is subject to large changes in salinity levels which can fall as low as 9°/₀₀ in the upper reaches during periods of high rainfall coinciding with neap tides. However, salinity samples near the Perch, in the outer estuary, fluctuated between 32°/₀₀ and 17°/₀₀; the lower figure being during periods of low river flow.

2. SEABED RIGHTS AND MANAGEMENT REGIMES

2.1 Fisheries legislation

The only mollusc resource is the common mussel Mytilus edulis, abundant in parts of the estuary. The long-established Conwy mussel fishery is managed by the North Western and North Wales Sea Fisheries Joint Committee (previously the Lancashire & Western SFC) under the Conwy Mussel Fishery (Variation) Order 1979.

This is a Regulating Order originally granted to the Conwy Borough Council under the Sea Fisheries Act 1868. The original Order was entitled The Conwy Mussel Fishery (Ammendment) Order 1948. Powers under the Order include:

a) No person shall fish or take mussels within the fishery without a licence.

b) Licences shall be issued to any person who 'satifies' the Corporation that he is engaged 'bona fide' in the occupation of a fisherman.

c) Regulations may be made and these may include areas of harvesting, size and condition in which mussels may be recovered. A royalty is collected for cleansing at the mussel purification tanks, through which all mussels have to pass before sale.

In 1979, the Lancashire & Western SFC took over responsibility from the Conwy Borough Council under the Conwy Mussel Fishery (Variation) Order 1979 but the conditions remain the same.

Note

In the 1985/6 mussel season 19 licences were issued free of charge to local fishermen by the N.W & N.W. SFC. The present royalty for purification is 8p per large sack, 4p a small sack.

2.2 Closing Orders

The estuary is generally free of large amounts of urban and industrial pollution and has been classified as Class 4 (unpolluted) by the Department of the Environment for its entire length, despite the 13 raw sewage outfalls and heavy metal input due to past mining within the catchment area (see p14).

There are no closing orders brought in under the Public Health (Shellfish) Regulations 1934 and 1948. However, under the terms of the Conwy Mussel Fishery (Variation) Order 1979 all mussels taken by fishermen from the Conwy estuary for human consumption have to go to the MAFF mussel purification tanks for treatment before sale.

Recent samples show that mussels taken from the estuary are polluted by sewage and could not be sold without approved treatment.

2.3 Nature conservation

The Conwy estuary, despite its popularity, is quite unspoilt and has a fully developed estuarine flora and fauna. The intertidal areas and the surrounding salt marsh, though now encroached by Spartina grass, are third in a ranking of such sites in North Wales.

The estuary also provides feeding and resting grounds for some 5,000 waders and up to 500 shellduck.

So far the area has not been designated as a Site of Special Scientific Interest (SSSI), although the upper reaches of the Conwy are part of the Snowdonia National Park.

3. MOLLUSC RESOURCES AND THEIR UTILISATION

3.1 Species

Apart from a few estuarine molluscs such as winkles, cockles and soft-shelled clam (Mya arenaria) the most abundant species in the Conwy estuary is the common mussel (Mytilus edulis) which can survive the rapid changes in salinity, the strong tidal regimes and the turbidity.

a) Mussels

Stocks

The Conwy estuary supports a valuable mussel fishery based on the wild stocks which have settled in the outer estuary. The main beds are located on the bottom and on both banks of the low water channels extending from Deganwy Narrows seaward for a distance of 1.5Km (Figure 2).

The main intertidal beds are at Cae Conwy, Morfa and Gamlwys. Smaller beds, rarely exploited, occur near Deganwy Pier and off Benarth. Mussels also grow in the sublittoral parts of the estuary which never expose. These sublittoral mussels are the best found in the estuary (see yields p8).

Estimates of the stock of mussels at Conwy are scarce. Savage (1956) records that about 1,000 acres (4.0×10^6 square metres) were covered with seed mussels after the very heavy spatfall in 1940. In 1959, the beds were reduced to an area of about 1×10^6 square metres (Baird, 1966) and in 1964 the area, including an estimate for the sublittoral beds was only about 5×10^5 square metres (Reynolds, 1969).

More recently, in 1982, the Lancashire and Western Sea Fisheries Joint Committee began a mussel bed monitoring programme to help evaluate the effects of the planned Conwy estuary tunnel scheme. This programme, funded by the Welsh Office, involves two surveys a year - one in April and the other in September.

In their Fourth Interim Report (January, 1986) they state that in 1985 the general decline in the mussel stocks was reversed by a heavy spatfall, the first for several years. Stock estimates for the three major intertidal mussel beds are shown below:

Survey Date		Gamlwys (tonnes)	Morfa (tonnes)	Cae Conwy (tonnes)
1982	April	1,184	246	388
	Sept.	1,681	414	391
1983	April	959	435	368
	Sept.	900	443	372
1984	April	401	322	178
	Sept.	466	423	208
1985	April	341	268	139
	Sept.	549	862	263

Table 1. Source LWSFC.

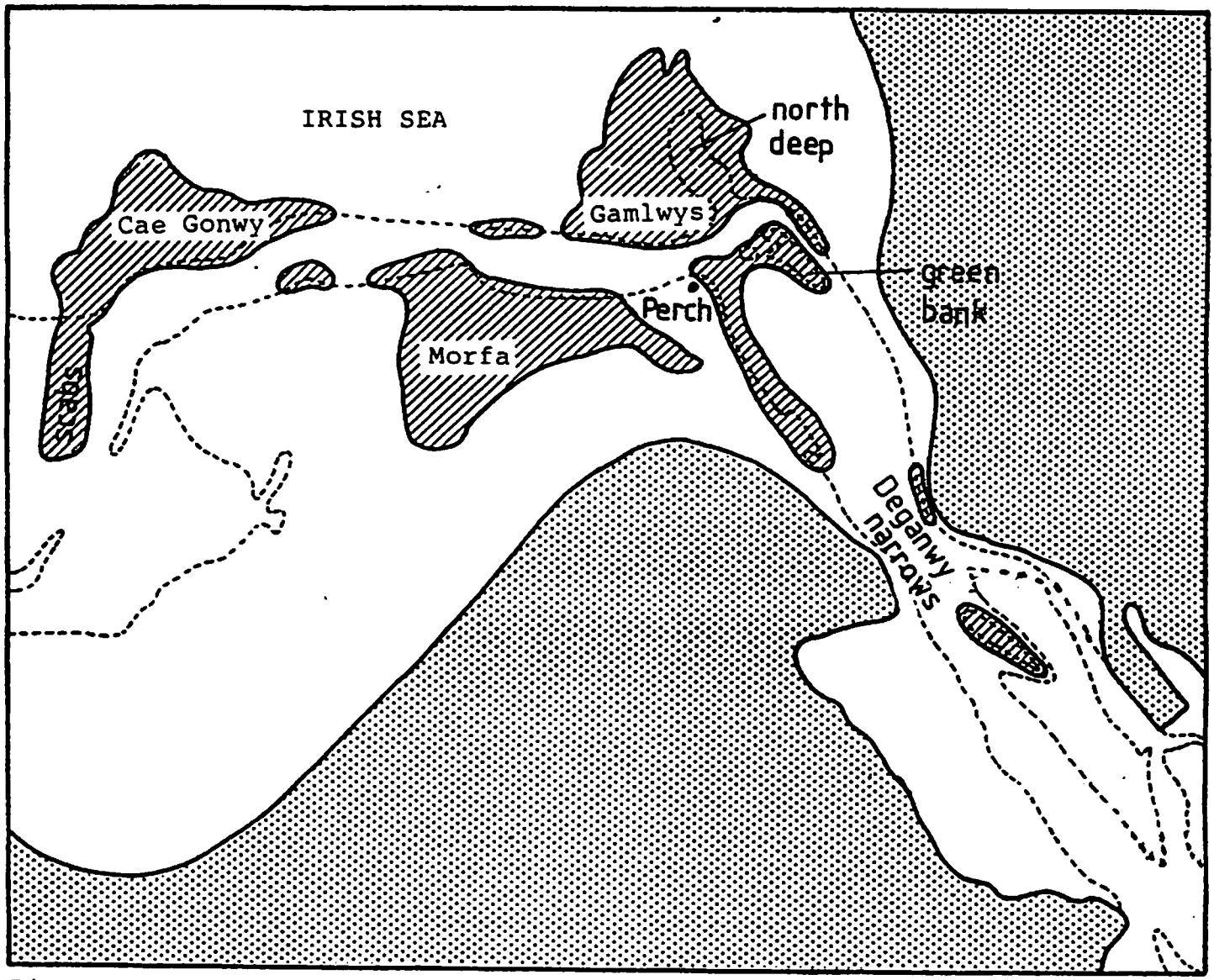

Figure 2. Distribution of the major intertidal and subtidal mussel beds in the Conwy estuary.

b) Growth

Conwy mussels have variable and moderate growth rates when compared with data collected at a number of sites in the British Isles. The mean length obtained after the first year of growth range from 17mm, when overcrowding occurred, to about 30mm in normal years. Whereas, for comparison, in Morecambe Bay and the Wash first year sizes of 36mm and 19mm respectively were obtained.

Conwy mussels take 3-5 years to reach a marketable size of 50mm. There is also some variation in growth rates in different areas of the estuary.

Mussel growth rates - mean shell length(mm) at the end of each year

Location	habitat	Tidal level	1yr	2yr	3yr	4yr	5yr
Conwy (outer estuary) channel	sea bed	sublittoral	17	35	48	57	63
Conwy (Cae Conwy bank)	sea bed	near ELWS	15	31	44	52	58
Conwy (Deganwy Narrows)	sea bed	sublittoral	30	47	55	-	-
Morecambe Bay	sea bed	near ELWS	36	50	-	-	-

Table 2.

A notable growth feature common to all mussel stocks is the pronounced seasonal fluctuation in shell increment - the greater part of the annual growth being laid down between April and September.

c) Meat yields

Conwy mussels have a good reputation for quality and have a high meat yield, especially in the autumn and winter.

Tests by LWSFC scientists using a condition factor index:

$$\text{condition factor} = \frac{\text{cooked meat weight}}{\text{total live weight}} \times 100$$

showed that yields were high in the autumn after a period of good fattening conditions during the summer, while in April the yields were lower because of spawning and the effects of the winter.

The sublittoral beds gave the best meat yields in the order of 21-27%, while mussels exposed for longer periods had lower condition factors and gave meat yields around 18-21%.

3.2 Utilisation

There are records to prove that a mussel fishery existed in the Conwy estuary as early as 1835. Accurate records of mussel landings only extend as far back as 1916 when the purification tanks came into full operation.

Data available shows that the fishery has peaked at 950 tons in 1939 but in more recent years landings ranged from 200 to 600 tons annually. During the Second World War the fishery was closed (Figure 3).

The fishery is a winter one and normally begins in September and continues through to March. Around 20-30 licenced fishermen exploited the mussel beds in the early 1980s, but in 1929, the earliest date for which records exist, 55 mussel licences were issued by the Conwy Borough Council. The number rose to 70 in 1938 and to 96 in 1939, but in the post-war years the licences never exceeded 50.

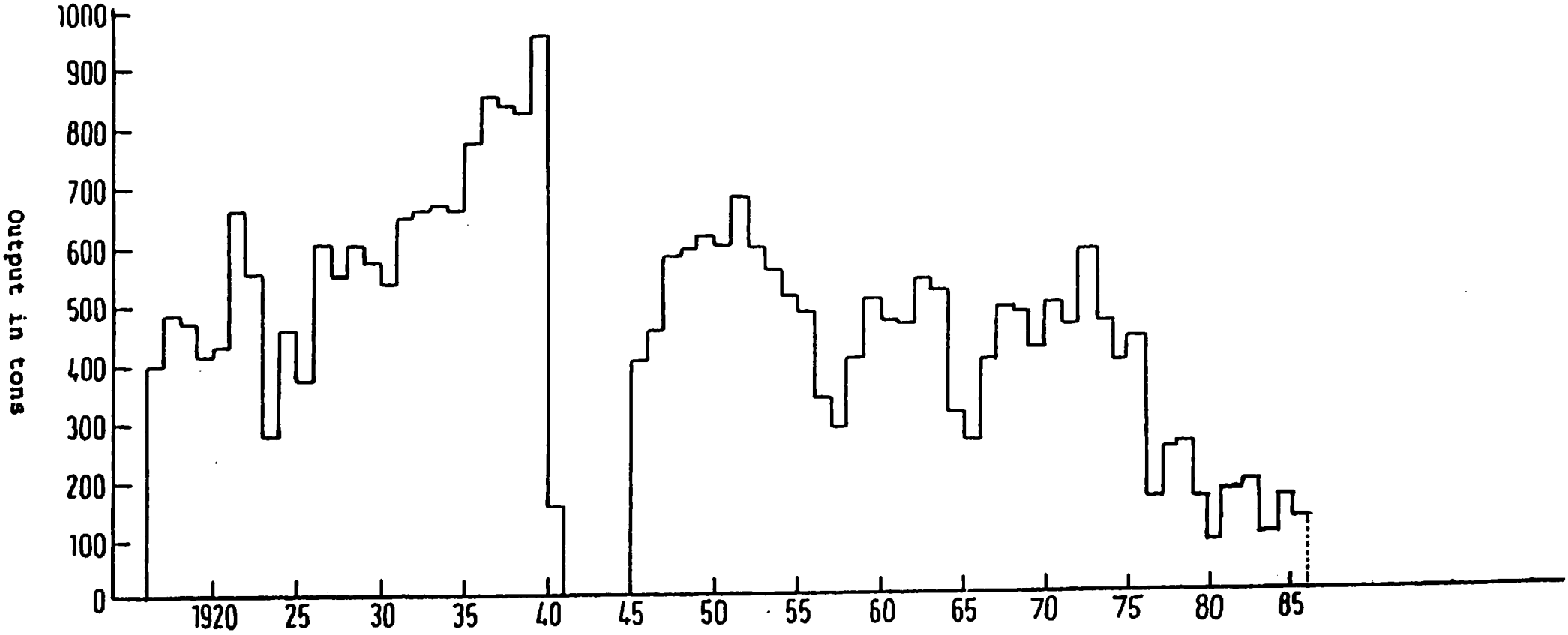

Figure 3. Annual output figures for the Conwy mussel fishery from 1916 to 1986.

Only 19 licences were issued in the 1985/6 season.

The methods used in the fishery have remained the same for generations. The mussel beds are reached by boat where the mussels are then gathered by hand picking on the exposed beds or by using 30-foot long rakes from small boats to get the better quality sublittoral stocks in the channels.

After being sorted on the beds or in the boats the mussels are taken by water to be purified in the M.A.F.F. cleansing tanks at Conwy. After being laid out on wooden grids in shallow concrete tanks the mussels are thoroughly hosed to remove mud and sand. They are then covered with sterilised seawater for 24 hours, when the water is changed and the process continued for another 24 hours. After the two-day treatment the mussels are hosed again and then packed into sterilised sacks and sealed by the tank superintendent. Most of the mussels are then sold to inland markets such as Birmingham and Sheffield. As stated earlier all mussels taken from the Conwy estuary have to pass through the Conwy tanks before sale and cases of contamination are very rare.

The Conwy mussels have always been of a high quality and usually command a high price on the market. However, due to the increased costs of running the boats, cleansing and transporting the mussels to market and the lower prices and higher competition Conwy men have recently faced, the profit margins have been seriously reduced. This has resulted in people leaving the fishery which is now showing some decline.

Table 3 Landings from the Conwy Mussel Fishery Order

Season Ended	Landings (tonnes)	Value (£)	Value per tonne
March 1981	110	21,000	£190
March 1982	190	38,000	£200
March 1983	200	42,000	£210
March 1984	128	23,240	£182
March 1985	189	39,612	£210
March 1986	154	33,946	£220

4. POTENTIAL FOR INCREASING PRODUCTION

4.1 Mussels

The Conwy mussel beds are under threat from a massive tunnel scheme planned to begin in 1987 and expected to take four years to complete.

The proposals for the construction of the A55 trunk road tunnel across the Conwy involves dredging a massive trench into which will be sunk six 35,000-ton concrete tubes - each large enough to hold a dual carriageway. Conwy fishermen fear that the £102 million contract will cause them chaos in the next 50-months as the massive trench is dredged out in the estuary.

A report* prepared by the Unit for Coastal and Estuarine Studies, Marine Science Laboratories, University College of North Wales, also concludes that '....By far the major environmental problem will arise from the dredging out and maintenance of the massive trench before the tube tunnel is laid'.

The planned route involves dredging over 5 million cubic metres of a mixture of sand and clay. There are fears that increased turbidity in the estuary may affect the condition of the local mussel stocks or they may be 'susceptible to smothering by silt and sand put into suspension during dredging. Spatfalls may also be affected by the silty substrate.

There is, therefore, serious concern whether or not the present level of mussel production will be continued during the next few years from the Conwy estuary.

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* See general reading list.

5. WHAT ACTIONS ARE NEEDED TO BENEFIT THE LOCAL INDUSTRY?

5.1 Mariculture

Mussels

The Conwy fishery is based on wild stocks and, despite some encouragement by various bodies, there has been no attempts by local fishermen to use known cultivation methods to increase production.

In fairness the physical factors of the Conwy estuary are not ideal for mussel culture. There is a scarcity of sheltered, stable ground suitable for relaying and mussel seed is not always available in the area.

While some Conwy fishermen have lays in the Menai Straits efforts to encourage them to transport seed from other parts of N.Wales to the Conwy have not been met with success. Attempts to move high level mussels lower down the shore have resulted in an improved meat yield but many were swept away due to tidal scour.

Even so, there really has not been any determined efforts - backed up by decent financial incentives - to undertake a proper mussel relay programme. An attempt by MAFF in the 1970s to use a Dutch-type dredger to relay seed taken from the Menai Straits (using royalties collected from purification fees) failed through lack of support by fishermen and relay trials by the Sea Fisheries Committee have been very small-scale.

There is no question that this valuable mussel fishery needs upgrading but, with the Conwy tunnel scheme threatening the estuary for the next five years, there seems no point yet considering any development plans to increase production.

However, under the provisions of the Conwy Tunnel (Supplementary Powers) Act 1983 compensation

can be paid to persons licenced to take mussels if their businesses are affected. There are also plans for 'remedial measures' including expenditure on any action taken for the purpose of restoring, replenishing or renewing -

the mussel beds within the Conwy Mussel Fishery.

The 1980 Impact Study concludes "... should damage occur, it is likely that natural regeneration of the mussel beds will eventually take place though it is impossible to predict how long this will take. An artificial reseeding programme would be possible in principal, though there are a number of factors that make this difficult in practical terms..."

The future for the Conwy mussel fishery, therefore, looks uncertain at present but there is a need for the monitoring programme undertaken by the North Western & North Wales SFC to continue and the interests of the local fishermen supported by the SFIA and the Shellfish Association of Great Britain.

5.2 Technological research

As explained earlier all mussels harvested from the Conwy estuary have to be purified before sale at the local mussel tanks run by MAFF. Some fishermen believe that increased charges on each bag of mussels, passed on to them by the Welsh Office, affects their profits and hits their competitiveness.

The system developed by Dodgson at Conwy is expensive and labour intensive. While it is reliable there is a need to reconsider the method in the light of developments in mussel purification during the past few years.

The question of whether in the future the local industry would benefit by having a Closing Order under the Public Health (Shellfish) Regulations which would allow the mussels to be cooked by an approved method as well as being purified may have to be considered if markets for mussel meats expand.

5.3 Marketing

Local fishermen tend to market the purified mussels to their own merchants or outlets. The Conwy Musselmen & Boatmen's Association is not involved in marketing or publicizing the local industry. A marketing co-operative is essential to help these fishermen do the best for themselves and to help them compete in what seems to be an expanding mussel market.

At present the Conwy mussel fishery is based on bulk sales (1-cwt. or ½-cwt. bags) to inland markets. Future demand may be for direct sales to other wholesale outlets in smaller units. The Seafish marketing team may be able to encourage and advise some of the younger, more progressive, Conwy fishermen on this marketing trend.

But - in view of the Conwy tunnel scheme and the possible disruption to mussel production in the Conwy - it would seem advisable to leave any market expansion activities until a later date, possibly to tie in with redevelopment work on the stocks.

6. GENERAL

6.1 Water quality

The Welsh Water Authority is responsible for the quality of the discharged sewage, most of which goes into the Conwy estuary untreated.

According to the WWA ten sewers discharge continually into the Conwy between Tal-y-Cafn and the Outer estuary (Figure 1) at a rate of 10,000 cu.ml per day. The largest sewage outfall is at West Shore near the Conwy mussel beds. There is virtually no pollution yet from industrial sources.

Despite the fact that the DOE has given the Conwy estuary a low pollution rating (See p5)

information published in the House of Commons Report 'Coastal Sewage Pollution in Wales, Volume 1' suggests that this is not correct and the evidence is quoted below:

"Conwy estuary - discharges within the Conwy estuary are particularly unsatisfactory. The Conwy quay and Morfa Conwy outfalls both cause contamination of bathing beaches at Aber Conwy and Llandudno West by bacteria and gross solids. Remedial works are scheduled, improvements are also planned for the Llandudno (West Shore) outfall. Similar works at Deganwy are also scheduled for modernisation in 1986/7....." H.M.S.O. 1985.

Since the tributaries of the River Conwy rise in an area of past mining activity the estuarine sediments contain enrichments of cadmium, cobalt, copper, lead, zinc and possibly other heavy metals.

Heavy metal levels in the Conwy seawater have been implicated in the past in creating difficulties for rearing shellfish at the MAFF Shellfish Culture Unit.

The area is not designated as an EEC Shellfish Growing Water.

6.2 Pests and diseases

The area is free of all known shellfish pests and diseases including the red worm Mytilicola which is a parasite in mussels.

Under the Molluscan (Control of Deposit) Order 1974 (As Varied) the Conwy estuary is designated as Area 20, Braich-y-Pwll to Gt.Ormes Head.

Dr. Eric Edwards
Shellfish Association
of Great Britain,
Fishmongers' Hall, London.

January 1987

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CONWY ESTUARY

1. GEOGRAPHICAL DESCRIPTION

1.1 Location

The Conwy is the most westerly of the major estuaries of the North Wales coast. It is the largest one in the area and is situated at the north-eastern extreme of the Menai Straits and to the south of the prominent limestone headland that forms Great Orme.

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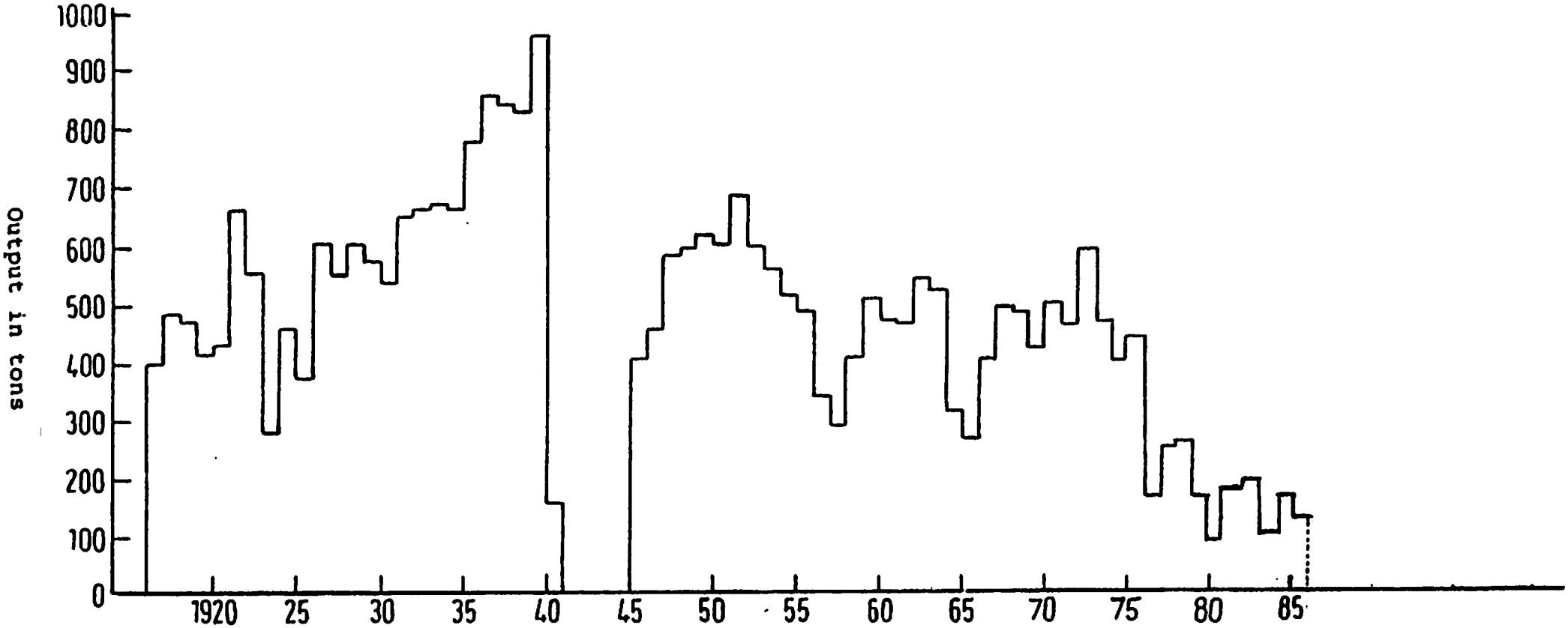

Figure 3. Annual output figures for the Conwy mussel fishery from 1916 to 1986.