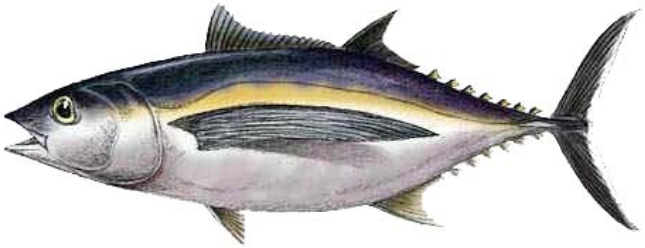
Sea Fish Industry Authority

Technology Division

Drift netting for Tuna:

The feasibility and costs of alternative fishing methods



MAFF Commission

Consultancy Report No. CR153

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Summary

This report describes work carried out under contract to MAFF. It examines the implications of the impending ban on high seas drift netting on that sector of the Cornish fleet that is currently licensed to fish for albacore tuna. More specifically, it covers investigations in the UK, Ireland and northern Spain into alternative fishing methods, the potential for converting the vessels in question and some of the market aspects of these changes.

It is concluded that conversion to the trolling system of towed lines is the most appropriate option for the Cornish vessels, that this conversion could be carried out at a realistic cost, that crews could adapt to the necessary changes quite readily and that market opportunities would be open to re-equipped vessels.

Given the current volatility of the global market for albacore tuna it is not possible to predict whether the converted vessels would be commercially viable. Indications are that, in the long term, conditions in Europe could be favourable to vessels that converted to trolling.

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1 Introduction

Summary of the history of the UK tuna drift net fishery

Opportunities for working with drift nets to catch albacore were first realised in June 1991 when the skippers and crews of three UK vessels took part in the fishery for the first time (Swarbrick, 1992). The three vessels involved were the *Britannia V FH121*, based in Mevagissey, the *Sowenna PZ14* and the *Ar-Bageergan PZ287* - both based in Newlyn. The albacore tuna was seen as a way of relieving pressure on stocks of hake, the other main catch of these vessels. Fishing effort steadily increased from three vessels to twelve in 1994 (Searle, 1996) when the annual landings of albacore were estimated at £0.5 million. In July 1994 an EC limit of 2.5km was imposed on all high seas drift nets used in the North East Atlantic in response to public pressure because of cetacean mortalities and alleged bird mortalities in drift nets.

Between 1994 and 1997 there has been a rapid decline in fishing effort for albacore. In 1997 there was active Government endorsement of measures to phase out the use of high seas drift nets - which included the albacore drift nets - to prevent cetacean mortalities. Such a phasing out is to be completed by December 31st, 2001. Fishing effort in the UK was restricted by the introduction of a limited number of 10 separate and non-transferable licences to the 10 vessels which participated in the albacore drift net fishery in either 1996 or 1997 (MAFF press release 14/98). Four of these licensed vessels have since been decommissioned, leaving the 1998 albacore drift net season with 6 possible participants.

On the 8th June 1998, the EC Council of Ministers announced the imminent ban of the use of drift nets to catch tuna in the north east Atlantic and Mediterranean.

The only UK fishery that will be affected is that for Atlantic albacore tuna *Thunnus alalunga* in ICES Area VII. This report identifies the costs and implications of converting UK registered fishing vessels with a licence for the current drift net fishery to alternative methods of exploiting the same stock. This information can be used by the Fisheries Departments to form a view of the conversion process.

Only two UK based vessels have participated in the albacore drift net fishery in 1998; the Padstow-based *Charisma* BA45 skippered and part-owned by Barrie ‘Manuel’ Ball, and the 67 year old Newlyn-based *Excellent* PZ513 skippered by Joe Andrews and owned by W. Stevenson & Sons.

2 Objectives

There were four objectives for this study. For vessels involved in the albacore drift net fishery to convert to an alternative viable method, it is necessary to:

1. Determine and estimate the costs of conversion to the existing vessels' deck arrangements

2. Determine and estimate the costs of any necessary modifications to the vessels' propulsion systems

3. Establish the cost of training existing crew in new fishing practices

4. Establish and quantify as far as possible the extent to which changed operating practices may affect market opportunities and related outlets for the catch.

3 Field work

3.1 Phases of the study

The proposed work was partitioned into four phases, comprising:

1. A visit to west Cornwall to identify vessels, sketch deck layouts, have discussions with skippers and owners and liaise with the Cornwall Fish Producers' Organisation (CFPO) and/or the National Federation of Fishermen's Organisations (NFFO).

2. A visit to northwest/southwest France and/or northern Spain to acquire definitive information on current fishing practices and equipment, contractors/suppliers and to liaise with local fishermen's associations in order to ensure future co-operation.

3. The drafting of a conversion package within boundaries defined by MAFF and in liaison with CFPO/NFFO.

4. The production of a final package with supporting report and documentation.

After making initial contacts throughout Europe within both the fishing industry and the scientific community, it was decided to modify these initial study phases to form a more appropriate 4-phase structure:

1. Carry out desk studies and literature searches; undertake industry liaison in Cornwall and make a digital photographic record. Liaise with the Seafish Marine Surveyor in Plymouth. Make a visit to Ireland for exchanges of information with Bord Iascaigh Mhara (BIM) and to visit an established albacore trolling gear supplier in Dunmore East, Ireland.

2. Make active observations of working tuna trolling fishery in the Basque Country, Spain. Skipper Barrie 'Manuel' Ball (MFV *Charisma* BA45, based in Padstow, Cornwall) observed these operations with an accompanying Seafish member of staff. Have discussions with the local fishermen's co-op in Bermeo, and visit a Spanish tuna cannery (SALICA INDUSTRIA ALIMENTARIA, S.A.). Take a digital video record of events.

3. Suggest practical conversions for UK vessels currently engaged in drift netting for albacore tuna. Undertake discussions with trolling gear suppliers.

4. Interim reporting as soon as possible; final reporting.

3.2 Target species

The name 'Albacore tuna' refers to *Thunnus alalunga* Bonnaterre, 1788. It is also known as **germon** or **thon blanc** in France, and **atún** or **atún blanco** in Spain.

The albacore tuna is an ocean ranging, fast swimming fish. The albacore follows the 17°C-21°C isotherm, starting in May and June in regions around the Azores and continuing north-eastwards until August. At this time the migration of albacore reach their northernmost limit of about 50 miles from the south-west Irish coast. It is thought that the phenomenon of global warming is encouraging the albacore to migrate further north than usual (Glanville 1997). The fishery is capricious in nature; albacore are capable of moving at a rate of 1° of latitude per day. Nearly all the albacore tuna produced by the North East Atlantic fishery are juveniles (Santiago 1992; Findlay and Searle 1998). The larger adults swim at greater depths than the juveniles and are found ranging across the north Atlantic from the Azores to the Gulf of Mexico and the Caribbean. They can be caught occasionally in the North East Atlantic with longlines set for other species (personal communication).

3.3 Established fishing methods

Albacore tuna are caught in the North East Atlantic with the following fishing gears:

Driftnets (Ireland, France and UK); these are to be phased out by December 31st, 2001.
Trolling lines (Spain and France). A highly selective method requiring small amounts of equipment that can be adopted by a wide range of vessel types.
Poles and lines using live anchovies as bait (Spain). A very specialised method, needing purpose-built vessels and large crews.
Longlines These are usually set below the surface to target large tunas, for example northern Bluefin Tuna *Thunnus thynnus* Linnaeus 1758, and fully mature albacore tuna (Japan, Spain, Ireland).
Pelagic trawls (midwater). Usually worked by two vessels as a pair (France). Six Scottish vessels attempted pair trawling for albacore in 1998 for the first time and found it difficult to be viable.

3.4 Visit to Ireland

The Irish have an active fleet of vessels engaged in drift netting for albacore. The Irish fisheries institute (BIM) are also investigating alternatives to drift netting for albacore. There is one highly successful Irish vessel working longline equipment for tuna species from the port of Castletownbeare. BIM have recently undertaken trials with commercial vessels fitted with trolling equipment for albacore tuna. It was therefore logical to make a visit to Ireland to exchange information on these alternatives to drift nets.

Fig 1 Vessel rigged for tuna trolling, Kinsale, Ireland

To this end, visits were made to:

1. BIM in Dun Laoghaire, to exchange information

2. The port of Castletownbeare in southwest Ireland to observe drift net vessels and a tuna longline vessel

3. The port of Kinsale, to observe a vessel fitted with tuna trolling equipment

4. The port of Dunmore East near Waterford, to visit an established supplier of tuna trolling equipment

3.5 Visit to Spain

Fig 2 Small tuna trollers in Bermeo, Spain

An observation trip was made on a Spanish trolling boat based in the Basque port of Bermeo. A member of Seafish staff and a skipper from Cornwall who is currently working with drift nets embarked on this trip. The vessel fished some 110 miles north-west of Bermeo in water of between 2000m and 4000m depth. The trolling boat was quite small at 11m and worked with twelve lines; four on each pole and another four over the stern. Each line is retrieved independently of the others by a small hydraulic reel. When a tuna strikes the bait, a slipping clutch device allows the fish to strip line from the reel thus preventing breakage. To reel in the tuna a drive clutch is engaged and the hydraulic motor hauls the line. Once the tuna is close to the boat the line is pulled in to the side to the boat and the fish hauled aboard. The tuna is placed in a wooden crate to cool off before being iced away in the fishroom. Fishing with this equipment is simple, reliable and highly enjoyable!

Fig 3 A young albacore strikes at the lure

The boat normally has a crew of three plus the skipper. A normal trip for this boat lasts a week during which about five tonnes of albacore tuna are caught at a rate of about 100 fish per day. At the time of the observation trip (September) fishing was not as good as expected, with a catch rate of 50 fish per day of juvenile tuna (3-6kg each). The trip lasted 4 days after which catch rates fell to zero and the vessel returned to port.

The small Spanish tuna trollers fish for albacore tuna for about five months of the year (May-September). They then switch to lining for mackerel for two months and some go longlining for another two months. During the winter months the vessels are usually laid up in port until the start of the next tuna season. It must be remembered that the cost of living is lower on the north coast of Spain than in the UK; this permits the vessels to be inactive for some time. The Spanish fishery is very much a social fishery and a way of life for many fishing families. There is plenty of available labour and therefore improving efficiency is not a high priority. The Cornish vessels belong to a fishing regime which is active all year; costs count much more than in Spain and so any trolling gear fitted to these vessels must be cost effective and efficient in terms of labour.

The equipment used for this fishery can easily be fitted to most of the Cornwall vessels engaged in the drift net based fishery with very little vessel modification required.

3.6 Market aspects

A meeting was arranged with a representative of the Bermeo fishing association at the auction hall on the quayside. No objections were raised to the landing of **trolled** tuna by Cornish vessels on the market - the same courtesies would be extended as for a local vessel. Commission charges are high - at 10% of the gross value, which, when considering the distance that a Cornish vessel would have travelled to reach this port may make landing here marginally viable. It is clear that for a Cornish vessel to realise the best prices, its landings must be made into either French or Spanish markets. This necessitates the vessel working around the north east Atlantic for the entire tuna season, not returning to Cornwall (unless absolutely necessary) until the tuna season is finished.

The Bermeo market has a withdrawal price scheme in place, but according to local fisheries representatives, withdrawal has never been necessary due to a consistent and voracious market demand for albacore. Nearly all albacore tuna are destined for canning and a visit was made to a local cannery in Bermeo to observe final processing of the albacore product. The albacore season lasts the duration of the summer; outside this season the cannery utilises supplies of yellowfin and bluefin tuna from worldwide sources to maintain its product range.

The market for tuna in Europe is a *niche* market that is controlled mainly by the Spanish and French canning industries. At present there are few other viable outlets. Worldwide there is currently a surfeit of albacore tuna on the global market from Far Eastern sources and US sources. This surfeit is ensuring that current prices for all albacore, irrespective of quality, are depressed.

It is apparent that while there are still good supplies of drift-net caught albacore tuna on European markets, the high quality trolled tuna will not realise a proportionally high price- especially on the Newlyn market. However, this may well change when tuna are no longer caught with drift nets (after 31st December, 2001).

4 Discussion

4.1 Alternatives for the Cornish Fleet

The Cornwall fleet is an old one, made up of many different classes of vessel from diverse fishing backgrounds (Searle 1996). Many are former Scottish and French trawlers; those that work in the albacore tuna fishery are operating at the very limit of their range capability. Cornwall is not the best place to operate from in the tuna fishery irrespective of fishing method used because of the large distances involved in travelling to viable fishing grounds. The fishing grounds tend to be in the regions around the continental shelf where water depths can reach 4000m. This immediately places Cornwall at a geographical disadvantage when compared with Spain, France and Ireland.

Fig 4 Newlyn Harbour, Cornwall

Driftnetting allows a vessel operating from Cornwall to make a 10-14 day return trip with a catch of albacore tuna. This method allows the crew to have time off ashore in their home port on a regular basis - an important social consideration. The only vessel modifications needed are additional fuel and water tanks for the 1000+ mile round trip. Nearly all the Cornwall based vessels that have been involved in the drift net fishery are gillnetters with low overheads *(see right).* The skippers and crews are experienced in handling gear of this type and the vessels usually have net hauling and transporting equipment already installed. However, this fishery is to cease by 31st December 2001 so an alternative must be found if skippers and crews wish to continue to catch albacore tuna.

Fig 5 Cornish tuna drift netter, Newlyn

Advantages of driftnetting

1. The method is very efficient for the Cornish vessels as it allows a viable catch to be taken while allowing sufficient time for the journey to and from the fishing grounds. This enables a viable return trip to be based in Cornwall.

2. The method is very species selective compared with some other fishing methods. About 85% of the total catch (both by number and by weight) comprise albacore tuna (Searle, 1996 after Goujon, 1993; McCormick, 1994). This is contrary to popular opinion; the non-selective nature of

driftnetting has often been cited as the very reason for discontinuing their use.

3. The technique lends itself to Cornish fishing skippers who have extensive experience of fishing with static nets. This allows for a short learning curve and innovations to be made within the drift net fishery.

4. Initial capital costs of drift net gear can be recovered within two years.

5. The method can be shown to divert fishing effort away from pressure stock species with technology that can be readily taken up by existing vessels.

Disadvantages of drift netting

1. Any bycatch of cetaceans is unacceptable to environmental pressure groups, some of whom exert considerable public influence. It can be shown that technology exists to reduce the risk of incidental cetacean capture (Goodson, 1997; PDM Group, 1998). However, for any drift net it cannot be shown that they will **never** catch cetaceans.

2. The quality of albacore product from drift nets is not as high as product from other fisheries - notably the Spanish troll fishery and the Spanish pole & line fishery.

3. The Cornish vessels have to operate at the very limit of their range of capabilities. Many Cornwall-based skippers have had to install deck mounted fuel tanks and water tanks to extend their endurance capability further, which may compromise safety.

4. About 85% of the total catch is albacore tuna (see above); the remainder consisting of 8% blue sharks, 6% Ray's bream and 1% miscellaneous. Blue shark tends to form the greatest discard component (Searle, 1996; also personal. communication).

Longlining is not widely practised by Cornish vessels, although much interest has been expressed recently by Cornish skippers in this method. It involves setting baited hooks at a pre-determined depth in the ocean, suspended from surface floats. Target species tend to be large, high unit value fish such as swordfish and bluefin tuna *Thunnus thynnus.* There are restrictions that apply to UK vessels on the numbers of these species that may be landed which makes this operation unviable. Although it is perfectly possible to equip a Cornish vessel for longlining, the capital expenditure involved is considerable and the grounds worked by longliners tend to be even further from shore than the albacore grounds (Findlay and Searle, 1998). It is not therefore considered a practical solution for working in the albacore fishery.

Advantages of longlining

1. The method targets prime quality species like bluefin tuna, the large adult albacore and swordfish. It can form the basis of a highly profitable operation.

2. Longlining places little demand on a vessel (unlike trawling) and a wide variety of vessels lend themselves to longline conversion.

Disadvantages of longlining

1. A large capital outlay is required for fishing gear (up to about £50,000). Fishermen will need tuition in the use of some of the specialised equipment.

2. Trips can be very long and unpredictable; vessels must be capable of remaining at sea for a month.

3. The method involves the crew working long and arduous hours on deck.

4. Cost of hookbait (usually squid) can be high, and the hookbait is often augmented with a chemically powered 'glowstick'. A glowstick emits light when two chemical reagents are mixed for added attraction in dark conditions found at depth. This adds to the overhead costs of a tuna longlining operation.

5. Little is known about fishing for large, prime adult albacore with longlines in the North East Atlantic fishery. In Korea and Taiwan, albacore longlining is carried out very successfully, and exports from these fisheries have depressed the market for albacore tuna in the USA. However, the Far Eastern albacore longline fisheries tend to have little mechanisation as labour costs are very low. This rules out their viability for Cornish vessels in the North East Atlantic albacore tuna fishery.

6. Longlining for tuna is not always species specific; longline fishermen have to be opportunistic. Bluefin tuna and swordfish form part of the target catch (McCormick 1994). Both of these species are subject to ICCAT exploitation controls (International Commission for the Conservation of Atlantic Tunas). From January 1 1997 under EC law, UK vessels are prohibited from landing more than two bluefin tuna and two swordfish per vessel trip (EC Regulation 65/98). This is likely to make longlining unattractive for Cornish vessel owners.

7. The discarding of bycatch sharks taken with general tuna longlines in the North East Atlantic is much higher than those in the albacore drift net fishery. Indications are that the discard level may be in the order of several hundred percent more (personal communication), a fact that has been acknowledged by the Irish fisheries institute, Bord Iascaigh Mhara (BIM).

Pelagic Trawls are used by some French vessels, generally working in pairs. These nets are necessarily expensive and require deployment facilities not compatible with the majority of the Cornish fleet. In addition, there is concern about potential cetacean by-catch in these gears (Findlay and Searle, 1998). Again, this method does not offer a practical alternative to drift nets for the Cornish boats on grounds of cost and gear handling capability.

Advantages and disadvantages

For the Cornwall fleet involved in the drift net fishery there is little advantage in pelagic trawling for albacore as most of the vessels are not suitable. However, the method is well practised in Scotland, and several Scottish skippers have expressed an interest during 1998.

Fishing with poles and lines is widely practised by Spanish vessels using live bait. The boats that do this are quite large - up to 27m. The live bait is usually anchovies which are a staple diet of the young albacore tuna. These anchovies are caught with a small purse seine in inshore waters before tuna fishing commences. This bait is held in several large vivier tanks with high throughputs of clean seawater until required. Water jets are used on the sea surface *(see Fig 6, right)* to try and drive the albacore into a feeding frenzy; they are then easy to catch with anchovy hookbait. The men that crew these vessels are highly skilled and the boats are purpose built for the job. It is a very labour intensive method; as many as 15 men can be employed on one vessel. In addition, labour costs in Northern Spain are lower than those in the UK. It is therefore not possible to consider conversions of existing Cornish vessels to this method; UK labour costs alone rule this out.

Fig 6 A 22m Spanish pole and line vessel

Advantages of fishing with pole and line

1. It provides a very high quality product, and tends to catch larger fish than the trolling method.

2. Catch rates can be very high, so the fish does not need to spend long stowed in ice aboard the vessel.

3. It is highly species selective, with a minor bycatch of bluefin tuna.

4. It can catch fish when the trolling vessels are unable to. This occurs when the albacore are engaged in chasing schools of anchovies to the exclusion of all else; they are not interested in the artificial lures offered by a trolling vessel. A live anchovy offered as bait will usually succeed where a lure fails, and this was observed to be the case during the Seafish trip in the Spanish troll fishery.

Disadvantages of fishing with pole and line

1. It is a very labour intensive way of fishing, with large crews required to work the individual tuna poles. This rules out adoption by Cornish vessels (see above).

2. Large quantities of live anchovy *Engraulis encrasicolus* or sardine *Sardina pilchardus* must first be caught by using a small purse seine before fishing can commence. The fishery is entirely dependant on the availability of suitable live bait.

3. The vessels required to work this method are purpose built with low gunwales and several deep vivier tanks for the live bait. Conversion of existing Cornish vessels is neither practical nor cost effective.

Trolling lines are used by many vessels from Spain and France to catch albacore tuna. 77% of the Spanish tuna fleet are trollers (Searle 1996). In addition there is a great number of US vessels working with this kind of gear for the same species in both the Pacific and Western Atlantic. A trolling vessel steams ahead at 6-7 knots while towing a number of lightweight monofilament lines from long poles attached at right angles to the vessel and at an angle of about 40° to the horizontal (Glanville 1997). About five lines are attached to each pole with varying arrangements, and another five lines may be worked from the stern making a total of about fifteen lines each vessel.

Fig 7 An 11m Spanish tuna troller, in Biscay

Baits are always artificial and consist of squid-like lures about 10cm in length *(see Fig 8, right).* They usually have a pair of hooks on each lure which may be barbless. Vessel sizes (as observed in the Spanish fishery in Biscay) range from the smallest at 11m in length to the biggest at 27-28m.

Fig 8 Albacore tuna lure made of feathers

The quality of fish caught with this method is very high, and premium prices can be realised in France for these fish when compared with fish caught by drift netting or trawling. However, catches can be as little as 10 - 40 fish per day (McCormick 1994), and on occasions, nothing at all. In order to be viable a Cornish vessel would need to catch at least 100 fish per day, and realise between £2.50 and £3 per kg at market.

Advantages of trolling

1. A low initial investment in equipment is needed when compared with other fishing methods.

2. It provides a very high quality product which has the potential to realise premium prices in the right marketplace. It is perceived as 'environmentally friendly' and therefore enjoys good public relations compared with other fishing methods for albacore - including longlining.

3. It requires low levels of labour, so crew overheads are less than with other fishing methods.

4. It is a very species selective and size selective method of fishing. During the Seafish sea trip in the Spanish troll fishery, the catch comprised 100% albacore tuna, each of about 3kg in weight. Target albacore are juveniles of between 3kg and 7kg; the adults are found in deeper water out of reach of the trolled lures which are usually deployed at the surface, although they can be trolled at depth by using weights (Searle 1996).

Fig 9 Catch taken during the Seafish voyage at Bermeo market

5. The technique can be practised in bad weather that would otherwise prevent drift net deployment.

6. The equipment can be installed on a wide variety of vessels that were not built for the purpose. This is especially relevant in Newlyn where most of the vessels have been recruited from fishing backgrounds other than those they are currently working in.

Disadvantages of trolling

1. Current market prices for albacore are depressed, world-wide. In order to make a troll fishery economically viable for Cornish vessels prices in the range of £2 -£3 per kg must be realised, but it is unlikely that this will happen until the cessation of the drift net fishery at the earliest. Finding the right marketplace for Cornish vessels to supply with trolled albacore will be a considerable achievement.

2. In Europe, the market is almost entirely controlled by France and Spain.

3. The method will involve long periods at sea in small vessels. Cornish vessels may have to base themselves in foreign ports for the duration of the albacore season, as the distance to the fishing grounds is about 400 miles. This will inevitably put strain on the families of the crews. It is likely that

many of the ageing Newlyn fleet will require improvement work in order to be able to operate safely for long periods in the deep water around the Bay of Biscay.

4. A Cornwall based troll fishery for albacore tuna relies on the northernmost ranges of the albacore's migration. These limits might not be reached in forthcoming years despite the implications of global warming, and therefore the fishery might not be reliable in the long term (see *3.2 The target species)*

5. The gear is not very flexible and cannot be used economically to catch other species.

4.2 The best option

It is concluded that the trolling method, as practised in Spain and the USA is the only realistic alternative to drift netting for the vessels in question. It offers:

1. an alternative viable fishing method for Cornish vessels fishing for albacore tuna in place of drift netting which is to be banned;

2. a minimum bycatch compared with alternative methods;

3. a minimum risk to cetaceans compared with alternative methods;

4. acceptability to members of the public.

Fitting out a Cornish vessel for trolling

The cost of appropriate gear needed for tuna trolling with Cornish vessels is approximately half the cost of a full set of drift net gear for one vessel. There is an American made trolling system on the market which is much more efficient than the hydraulic reels used by the Spanish. The system uses five reels on a common shaft. The shaft is driven by a single hydraulic motor operated by a foot pedal, and each reel is engaged/disengaged from the drive shaft by a lever operating a simple dog clutch. A full installation comprises two of these banks of five reels plus a single stern mounted hauler, together with two carbon fibre poles, fairleads and nylon lines.

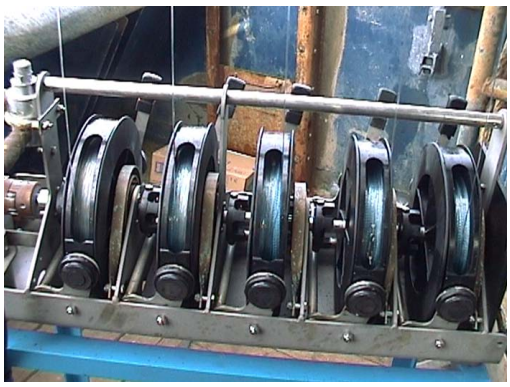

Fig 10 Five reel system installed on an Irish vessel

The system can be operated by a crew of two, compared with four on a similar Spanish boat. Such a system is readily available from the Dunmore Marine Supply Company, Dunmore East, Waterford, Ireland. This system has been observed as a complete installation aboard the Sligo registered vessel *Les Marquises SO899* based in Kinsale, Ireland. This French built vessel is a fully deck-sheltered steel trawler, which indicates the flexibility of this trolling system. There are currently three Irish vessels working with this gear for the first time this year and all report varying degrees of success.

Fig 11 Deck arrangement for five reel system

4.3 Conversion implications and costs

Cost comparisons

Cost of one full set of albacore tuna drift net gear (1994) £26,000 +VAT (Searle 1996).

Cost of complete installation of tuna trolling gear (Dunmore Marine Supply), using innovative 5-spool batteries of reels: £12,000 +VAT. Training in the use of this gear is available from the same company at a rate of about £200 per day +VAT.

Cost of one full set of tuna longline gear suitable for bluefin and possibly albacore tuna (1997) range from £35,000 +VAT for a 15 metre and smaller vessel to £46,000+VAT for a 16 metre and larger vessel, plus installation (Lindgren Pitman Inc., Florida USA).

Other alterations necessary for trolling

The Cornish vessels are operating at the limits of their ranges, so many of them will need fuel tank capacity increasing. Costs for this are on an individual vessel basis, and must be subject to stability assessments by the MCA. If the vessel has a Kort nozzle fitted around the propeller then this should be removed. Nozzles are less efficient at the 6-7 knot speeds that are needed in trolling. In addition they are noisy and are likely to scare albacore.

The Spanish pay great attention to detail in the rudder/propeller area of the hull, and twice a year the hull is thoroughly cleaned. One universal recommendation from the Spanish fishermen is that the propeller itself be painted (a dark red/brown was commonly seen used). It is alleged that this will prevent scaring the albacore with sudden metallic flashes. Another recommendation was that the rudder stock must have absolutely no play or end-float which could set up undesirable vibration and create unwanted noise. A thorough servicing of the prop/shaft/rudder is recommended before embarking on tuna trolling.

For a Cornish vessel entering the trolling fishery for the first time, it may be sensible to carry out a 'sonar survey' of the boat as it travels through the water. This will identify any spurious noise and provide an opportunity to cure it before tuna fishing time is wasted.

A practical method of doing this would be to deploy a *sonobuoy* and steam the vessel past it. A sonobuoy is a floating device with a long cable attached to a hydrophone. The device detects sound underwater and transmits it by radio to a receiver on the boat, where it can be recorded. In this way, 'self-noise' (which occurs if the hydrophone is attached to the boat) is eliminated. Such a survey would need conducting only once for each new participant to the trolling fishery.

It was recommended that a good sector scan sonar be purchased so that shoals of anchovies and feeding tuna can be detected. This is an expensive piece of equipment at about £15,000 installed.

It was noted that the Spanish vessels work as a huge team in the Bay of Biscay, tracking down shoals of tuna that are chasing schools of anchovies. In order for a Cornish vessel to participate in this 'team game' it is very necessary to have a reasonable competency in Spanish. A language course for skippers and crews intending to work in this fishery is therefore a basic requirement.

Fig 12 Stern area of 'Les Marquises' SO899, an Irish based trawler fitted for albacore trolling

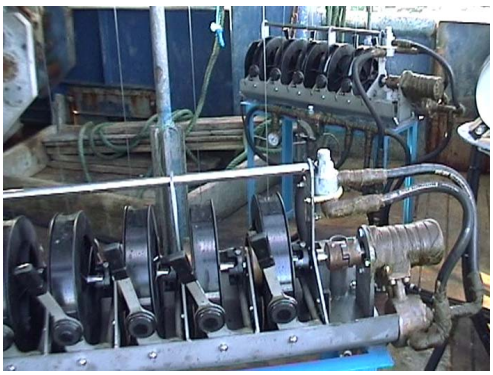

Fig 13 Showing the banks of line retrieval reels mounted on the stern of 'Les Marquises'

Fig 14 The fairleads that guide the nylon lines out over the side of the boat to the trolling poles

Fig 15 The trolling poles on 'Les Marquises' in steaming position. These are aluminium with carbon fibre tips

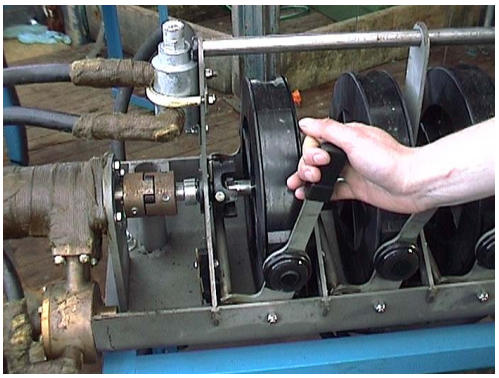

Fig 16 Showing how the clutch system operates, allowing each spool to be engaged separately. In this way, several lines can be operated by one crew member

Fig 17 A rubber shock-cord attached to the pole. This helps to protect the nylon from sudden fish strikes

Fig 18 The 'Charisma' BA45, a Cornish vessel with a drift net licence that could be converted to trolling

Fig 19 The net pounds at the stern of the 'Charisma' would need to be removed to accommodate the trolling reels. Poles would mount directly on the deck shelter

Fig 20 Elevated view, Newlyn harbour, Cornwall

Fig 21 Bermeo harbour, Basque Country, Spain

4.4 Summary of the modifications needed for trolling

1. Remove any existing netting gear that may impede the trolling operation. This may comprise net pounds and net transport mechanisms as well as the main net hauler. However, vessels with deck shelters fitted may be able to retain most of their netting gear.

2. Ensure that the fuel and water storage capacities of the vessel are sufficient to enable the vessel to operate for long periods at long range. Any necessary increase in tank capacities must be subject to stability assessments by the MCA.

3. Ensure that the standard of life saving equipment provided on the vessel is appropriate for long trips at long range.

4. Install trolling equipment, comprising efficient hydraulic line retrieval reels and trolling poles, together with all necessary fairleads, lines and lures (see section 4.2).

5. Clean and paint the hull thoroughly. Check the fastening of exterior cooling pipes, transducers and any other hull protrusions. Ensure that all hull protrusions are hydrodynamically smoothed and will not create any unneccessary noisy turbulence. Remove Kort nozzle from the propeller, if fitted.

6. Overhaul the propeller; check for signs of blade damage that may cause unneccessary noise. Paint the propeller a dark red/brown colour, to prevent ‘flash’ from scaring albacore tuna

7. Overhaul the prop shaft and rudder stock assemblies; check for unneccessary end-float than may cause noise. Check that all drive belts and pumps are quiet in operation.

8. Ensure that the existing fishroom has enough chilling capacity to cope with the ambient summer water temperatures of the Bay of Biscay region. Ensure that the fishroom can accommodate albacore tuna on shelves in ice, as boxing the fish will cause damage.

9. It is strongly recommended that the skipper of the converted vessel becomes competent in Spanish and French.

10. It is recommended that a newly converted trolling vessel undergo a ‘sonar survey’ (see section 4.3).

11. It is also recommended that the vessel fit a sector-scanning sonar. This will allow the skipper to detect and to home in on albacoretuna that are feeding on small pelagic fish ahead of the vessel.

Expected total costs:

£12,000+VAT for all trolling equipment, fitted. Hull, fuel and water tank modifications and propeller modifications that are necessary for trolling must be costed on an individual vessel basis, as boatyards will need to survey the vessel(s) in question. The estimated cost of a suitable sector scan sonar is £15,000 purchase price.

5 Conclusions

The trolling method as practised in Spain and the USA is the only realistic viable alternative to drift netting for vessels currently engaged in drift netting in Cornwall.

1. The method requires little or no modification to existing deck arrangements.

2. The only modifications to the vessel propulsion system - including the rudder and rudder stock - are to ensure that it is very clean, well maintained and quiet in operation to prevent any possible scaring of tuna.

3. Costs of training are minimal and amount to about £200+VAT per day per vessel. The method is simple to learn and easy to deploy, with low operating costs. Fuel costs are estimated to be similar to current costs incurred while drift netting.

4. Once the drift net fishery has been ended by December 31st, 2001, there may be an initial shortage of albacore tuna that could encourage certain market prices to rise. Vessels using trolling equipment (and therefore landing a high grade of tuna) will be well placed to take advantage of this.

5. Trolling in the albacore tuna fishery will require a vessel to be away from Cornwall for long periods of time. To be viable, it is likely that vessels will have to work the entire season away from home, unless there is a marked change in albacore migration patterns.

6. There may be social implications for vessel crews being away from home during an entire summer season when trolling for tuna and landing into foreign ports.

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Web sites of interest:

Alliance Fishing, USA: http://www.albacoretuna.com

Albacore Regulations, ICCAT, Spain: http://www.iccat.es/conservn.htm

European Commission, Belgium: http://europa.eu.int/en/comm/dg14/info/info34_en.htm

Western Fishboat Owners' Association, USA: http://www.wfoa-tuna.org