

ROINN NA MARA



**Estimating effort by the
Irish gillnet fishery**

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SUMMARY

In order to reach an estimate of the amount of gill-net set, potential sources of information are reviewed. The principal enmeshing gears in Irish waters are briefly described. The following sources of information are examined on the extent of the fishery: salmon drift net licence sales figures, the register of fishing vessels, The European Communities' Logbook and, of greatest value, a survey of gears in use carried out in 1991. Additional information is supplied on sales of netting and on landings by gill net, the latter based mainly on limited sampling data. The total length of large mesh bottom-set gill net is calculated as 100,000 km days annually.

INTRODUCTION

The expansion in the use of enmeshing gears in the recent past is not peculiar to Ireland. It is part of a development which has occurred in various parts of the North east Atlantic, although an older tradition of this kind of fishing for recreational as well as commercial purposes exists in some Northern European Countries.

Reasons for the greater use of these gears are several. Prominent among them is the increasing efficiency of the mobile fleet which has forced smaller and less modern craft to seek their landings by other methods. Inter-related with this is the depletion of whitefish stocks on substrata which can be trawled; enmeshing gears can exploit the refuges on rocky terrain and wreck fishing has become a widespread practice.

The objective of this leaflet is to review the sources of data on which an estimate of fishing effort might be calculated.

TYPES OF GEAR

Nets which enmesh or interact with the catch are one of the oldest methods of fishing. The principal kinds of enmeshing gears in use in our waters at the present time are:

Trammel nets: consisting of three walls of mesh of two different sizes. At one time popular with the fishing community, trammel nets have been displaced by other types of net largely because of their heavy maintenance requirements. Trammel nets take a variety of fish and crustacean species within a wide size range.

Gill nets: consist of a single sheet of webbing. As suggested by the term the catch interacts by wedging in the net which frequently grips the fish in the vicinity of the gills. Gill nets are more selective than trammels, mesh size being targetted on species of suitable dimensions. Gill nets are used exclusively for fish in our waters where they may be set as "fixed" or "static" on the bottom or floating on the surface, free to drift, or anchored. Well known examples of gill nets are those set for salmon, spurdog and gadoids (cod-like fishes) but there is currently a range of mesh sizes appropriate to other species.

Of the two principal kinds of gill net, drift nets used for salmon are not our concern here, gill nets set on the bottom are; the fact that the same kind of webbing may be set as drifting or fixed gear necessitates a brief mention of the salmon fishery.

Tangle nets: also a single sheet of webbing, rigged more loosely than gill nets. Tangle nets have become popular fishing for crustaceans, turbot, anglers and rays. The meshes, being loosely rigged, entangle rather than "gill" the catch.

This review concerns gill and tangle nets only.

Essential technicalities: in order to define the kinds of gears several terms will be used:

The first is mesh size which is measured across the diagonal (Fig. 1). This measurement is literally two sides of the four making up the mesh; it is also referred to as the "two bar length".

The second term is hanging ratio which describes the way in which the webbing is hung from the float line and determines whether the net behaves as a gill or entangling net. Hanging ratio (E) is defined as $a/2b$ where a is the distance from knot to knot of the webbing on the float line and $2b$ is the two bar length or mesh size. Hanging ratios in common use would be fairly typically 0.5-0.7 for gill nets while for tangle nets they would be lower (0.3-0.4).

A reason for the rapid growth in the use of enmeshing gears is their lightness, the ease with which they are used and their invisibility in the water. All derive from the materials with which they are constructed, polyethylene, polyamide and polyester. The first two are plastics in thin filamentous threads. In the webbing they may be used as a single thread (monofilament), or several thin threads twisted together (multimonofilament) or many fine threads combined (multifilament).

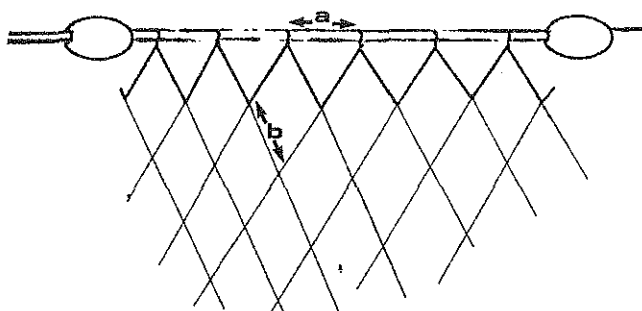


Fig 1: A section of mounted gill-net illustrating the parameters used in the calculation of hanging ratio.

Some of the characteristics of enmeshing gears used by Irish vessels are presented in Table 1.

Table 1 Details of the constructions of gillnet for various target species in Irish waters.

| Species | Mesh Size (2x, cm) | Net structure | Hanging ratio | Materials |
|---------------|-----------------------|------------------|------------------|------------|
| Angler | 26.7 - 30.5 | MO | .35 | ? |
| Crawfish | 41.0 - 46.0 | MO | .35 | ? |
| Gadoids | 8.5 - 9.0 | MO/MU | .5 | ? |
| Hake | 11.4 - 12.7 | MO/MU | .5 | PET/PA |
| Herring | 4.5 - 6.5 | ? | .5 | ? |
| Albacore tuna | 17.0 - 18.0 | MM | .5 | ? |
| Mullet | 9.2 - 11.4 | MO/MU | .5 | PET/PA |
| Ray | 26.7 - 30.5 | MO | .35 | ? |
| Salmon | 11.4 - 12.7 | MO/MU | .5 | PET/PA/PES |
| Sole | 8.5 - 13.0 | ? | .5 | ? |
| Spurdog | 11.4 - 12.7 | ? | .5 | PET/PA |
| Turbot | 26.7 - 30.5 | MO | .35 | ? |

Abbreviations

MO = monofilament; MM = multimonofilament; MU = multifilament

Hanging ratio, $E = a/2b$ (further explanation in text; see also Fig 1).

Material, PET = polyethylene; PA = polyamide; PES = polyester (terylene).

REGULATIONS

The most extensive use of floating or drifting nets is for salmon; these fisheries have been expanding along the west coast since the late 1960's and various controls have been imposed on them in succeeding years.

One of the latest is contained in Bye-law 639 of 1984 which stipulates that, other than hemp or cotton, only a net of multistrand monofilament (the mesh consisting of a number of filaments twisted together) is permissible for salmon fishing. To qualify, each of the filaments contributing to the webbing must be less than 0.1mm in diameter.

Regulations for the use of nets in salmon fishing are the

only ones controlling enmeshing gears. For the same reason the use of fixed gears in estuaries is curtailed.

POTENTIAL SOURCES OF INFORMATION ON ENMESHING FISHERIES.

Salmon drift net licence sales: One of the most widespread and long established of our commercial fisheries is the drift net fishery for salmon. It is regulated by licence which is potentially a source of information. In 1986, the latest year for which figures are available, 768 licenses for drift nets were issued (Department of the Marine). However, this information is of limited use. First, because drift net fishing without a licence has been known to occur; second, because this method of fishing is directed very specifically on salmon and third, because possession of a licence does not always mean it is exercised. However, the salmon drift net fishery is not irrelevant to the pursuit of other species by the use of the same webbing anchored on the bottom (such was the way in which the fishery for spurdog and more recently the fishery for hake, developed).

The register of fishing vessels: This database is evolving. It includes details of gears fished by a boat but these are stored as alternatives rather than as gear(s) in use at any specific time. A summary of the fleet from November 1990 is presented in Table 2. The number of vessels reported to be using enmeshing gears is in close agreement with the number of drift net licenses sold in 1986.

The European Communities' Logbook: Ever since its introduction, the European Communities' Logbook has been a valuable source of information which is used to some extent by all member nations in the estimation of fundamental fishing statistics, like catch per unit effort.

In the gill-net fishery this source of information is of limited value. Regulations stipulate that only vessels that are longer than 17m must keep logbooks at all times. Vessels of between 10 and 17m need to maintain logbooks if a fishing trip exceeds 24 hours and only vessels of greater than 10m are obliged to complete landing declarations (the third part of the proforma).

Table 2 A Provisional account of the Irish gill-net fleet from the Register of fishing vessels, November 1990.

| Number | Average length (m) | Tonnage, range |
|-------------------------------------|--------------------|----------------|
| 78 | 7.67 | - 2.9 |
| 182 | 8.44 | 3.0 - 5.9 |
| 282 | 9.98 | 6.0 - 10.9 |
| 100 | 11.24 | 11.0 - 20.9 |
| 62 | 14.10 | 21.0 - 30.9 |
| 27 | 15.43 | 31.0 - 40.9 |
| 34* | 19.76 | > 41.0 |
| ----- | | |
| 765 | = Total | |
| * Details of the 34 largest vessels | | |
| 7 | 18.02 | 45.0 - 49.9 |
| 6 | 17.67 | 50.0 - 54.9 |
| 5 | 19.22 | 55.0 - 59.9 |
| 4 | 20.72 | 60.0 - 64.9 |
| 3 | 19.90 | 65.0 - 69.9 |
| 5 | 19.02 | 70.0 - 90.0 |
| 3 | 22.14 | 100.0 - 115.0 |
| 1 | 39.06 | 325 |

Reference to Table 2 indicates that the vast majority of the fleet using gill-nets are less than 17m in length and a majority are probably smaller than 10m and, because their activities are inshore, few spend 24 hours at sea.

1991 Survey: Early in 1991 a survey of gears in use by the Irish fleet was undertaken by the sea fishery officers of the Department of the Marine. The information gathered is particularly valuable because it provides a catalogue of gears actually in use at a certain time. It might, thus, be regarded as a supplement to the Register of fishing vessels which contains details of the range of gears available to a vessel without indicating to what extent any is used.

Of the various fleet components, two are of interest here. The first are gill netters using static gears targeted on fish species. The second is described as the "Crustacean fleet" which uses pots and "tangle nets". Occasional estimates from the observers suggested that these nets were employed by 20-40% of the vessels in this category. The outcome of the survey is summarised in Table 3. The distribution of the vessels is presented by ICES statistical division (Fig 2).

Table 3 The distribution of vessels (by G.R.T and by numbers) using enmeshing gears in Spring 1991, by ICES division.

| G.R.T. | | | | |
|----------|-------------|-----------------------------|-------|-------------|
| Division | Gillnetters | 30% of the Crustacean Fleet | Total | % enmeshing |
| VIA | 1659 | 603 | 22887 | 10 |
| VIIb | 643 | 211 | 4282 | 20 |
| VIIj | 183 | 270 | 5614 | 8 |
| VIIg | 1596 | 430 | 6543 | 31 |
| VIIa | 18 | 107 | 10647 | 1 |
| Totals | 4099 | 1621 | 50000 | 11 |

| Numbers | | | | |
|----------|-------------|-----------------------------|-------|-------------|
| Division | Gillnetters | 30% of the Crustacean Fleet | Total | % enmeshing |
| VIA | 141 | 59 | 505 | 40 |
| VIIb | 50 | 20 | 213 | 33 |
| VIIj | 16 | 35 | 260 | 20 |
| VIIg | 109 | 23 | 285 | 46 |
| VIIa | 7 | 16 | 222 | 10 |
| Totals | 323 | 153 | 1485 | 32 |

Information from net suppliers: A request for information on enmeshing gears supplied to the industry in 1989 elicited the data in Table 4. The information comes from three dealers who supplied details of lengths of unmounted webbing sold in a 12 month period. A conservative estimate could put the national total at 5-10 times the lengths of netting reported; the relevance of the information given to the actual use of these gears is not known. Here, therefore, the information is used to deduce the proportions of various gears in use in Co Donegal.

Table 4 Percentage length sold by three suppliers in North west Ireland, of unmounted gill nets in 1989.

| Local name + | Mesh size (2x), cm | Dept, meshes | Percentage sold |
|-----------------|--------------------|--------------|-----------------|
| Cod netting | 8.5 - 9.0 | 20 - 25 | 3 |
| Mullet Gear | 9.2 - 11.4 | 30 | 2 |
| Dog/salmon gear | 11.4 - 12.7 | 30 - 60 | 54 |
| Turbot netting | 26.7 - 30.5 | 6.5 - 8.5 | 42 |
| Sole Gear | 9 - 10.2 | 12 | ? |

+ Local name indicates target species.

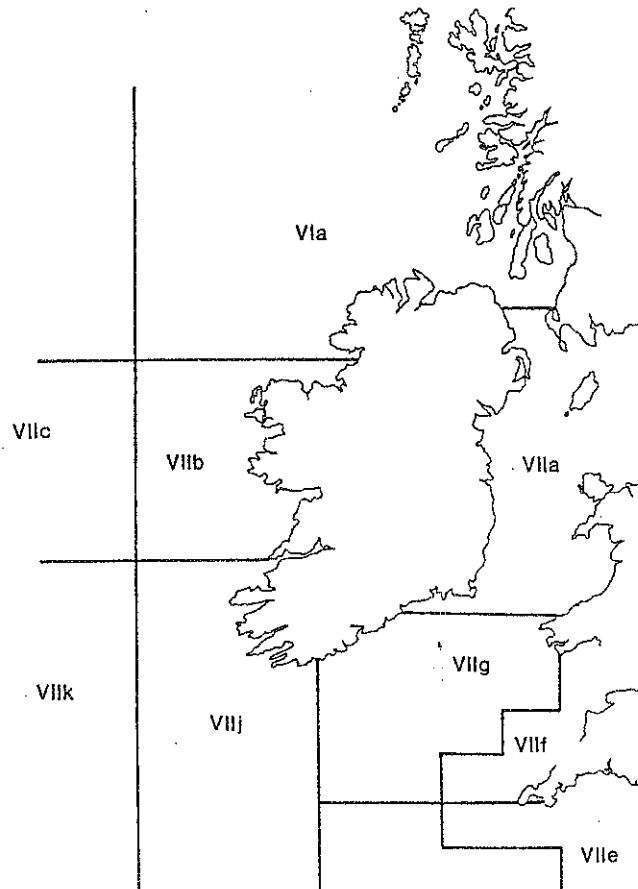


Fig 2: Sea areas adjoining Ireland described using ICES terminology.

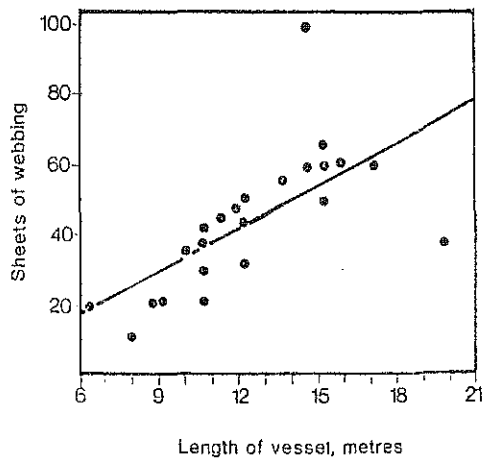


Fig 3: Correlation between number of sheets of mounted gill-net of salmon/spurdog/hake mesh size, and length of vessel in the Carrigaholt gill-net fishery.

LANDINGS BY GILL NET

Only sparse information is available on the capture of fish species by enmeshing gear and that, derived mainly from limited sampling, is presented in Table 5. The importance of this method of fishing for a number of species has altered dramatically in the recent past. Landings of angler by this method, for example, are believed to have greatly increased; For other species, like herring, the use of gill nets has sharply declined.

Table 5 Landings of certain species in enmeshing gears by the Irish fleet in recent years.

| Species | Year | % in enmeshing gear | Source of information |
|---------------|--------------|---------------------|-----------------------|
| Angler | 1990 | 37 | Limited sampling |
| Gadoids | Recent Years | 5 | Limited sampling |
| Hake | 1990 | 16 | Limited sampling |
| Herring | Recent Years | 0.01 | Fishery officers |
| Albacore tuna | 1990 | 65 | O'Maoileaidigh |
| Mullet | 1986 | 95 | Limited sampling |
| Rays | 1987 | 5 | Limited sampling |
| Salmon | 1986 | 84 | Department of Marine |
| Spurdog | 1988 | 50 | Sampling |
| Turbot | 1987 | 8 | Limited sampling |

Table 6 Calculated fishing effort by fixed bottom fishing gears directed on hake, spurdog and other demersal species. Data come from sources given in the text.

| Boat size G.R.T. | No. of vessels | No. of nets aboard | Unit length (km) | Soaking time (days) | Frequency of lift | Days fished per year |
|------------------|----------------|--------------------|------------------|---------------------|-------------------|----------------------|
| <5 | 94 | 21 | 0.1 | 1 | 1 | 45 |
| 5-9.9 | 108 | 30 | 0.1 | 1 | 1 | 45 |
| 10-14.9 | 45 | 37 | 0.1 | 1 | 1 | 110 |
| 15-19.9 | 26 | 37 | 0.1 | 1 | 1 | 110 |
| 20-29.9 | 26 | 50 | 0.1 | 1 | 1 | 110 |
| 30-39.9 | 13 | 57 | 0.1 | 1 | 1 | 220 |
| 40-49.9 | 3 | 76 | 0.1 | 1 | 1 | 220 |
| 50-59.9 | 3 | 76 | 0.1 | 1 | 1 | 220 |
| 60-75.0 | 3 | 76 | 0.1 | 1 | 1 | 260 |

TOTAL EFFORT

| Size of vessel (B.R.T.) | km of net set once, per annum. |
|-------------------------|--------------------------------|
| <5 | 8883 |
| 5-9.9 | 14580 |
| 10-14.9 | 18315 |
| 15-19.9 | 10592 |
| 20-29.9 | 14300 |
| 30-39.9 | 16302 |
| 40-49.9 | 5016 |
| 50-59.9 | 5016 |
| 60-75.0 | 5928 |
| Grand total | 98922 |

CALCULATION OF FISHING EFFORT

The yield of a fish species to a particular gear, the yield per effort, is an important indicator of the strength of the stock. Thus, it is desirable to know what effort is being exerted by enmeshing gears. Such information is of fundamental value in the management of fisheries generally.

The fragmentary nature of the available/estimated data on enmeshing gears in Ireland enables something to be said about one kind of gear, that used as fixed nets for the capture of hake, spurdog and other demersal species.

The calculation of fishing effort by gill net is made as follows:

Number of nets on board * Length of unit net * soaking time (days) * Number of lifts per day * Number of days fished annually.

The input data are expressed to give an index in kilometer days per year. Such details are available from the data reviewed earlier, the figures being set out in Table 6. The total of almost 100,000 km days of gill net bottom-fished in Irish waters annually is given with the reservation that it might be an understatement or an overestimate of the true position. The large size of the estimate and the paucity of the data on which it is based emphasises the problems of evaluating the consequences of using these gears.

FURTHER READING

Longer accounts, from which some of the above has been abstracted, come from the following:

Fahy, E (1979) The exploitation of grey mullet in the south east of Ireland Irish Fisheries Investigations B (no 19) 15 pp.

_____ (1986) Capture of sea trout by illegal means in the Western Fisheries Region Fishery Leaflet (no 130) 8 pp.

_____ (1989) The spurdog Squalus acanthias (L) fishery in south west Ireland. Irish Fisheries Investigations B No 22. 32 pp.

_____ and P. Gleeson The post-peak-yield gill-net fishery for spurdog, Squalus acanthias in Western Ireland. Irish Fisheries Investigations B No 35 12 pp.