

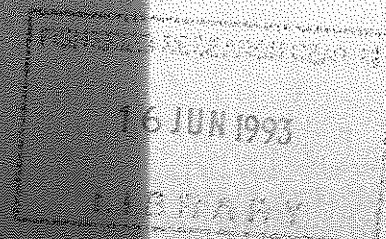
**Herring tagging experiments around
Ireland, 1991**

by

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SUMMARY

The assessment and management of the herring fisheries around Ireland assumes that there are three distinct and separate populations. The management units are based on ICES Areas which, however, are not based on the distribution of the stocks and which do not take into account the mixing that takes place between the different stocks. In July 1992 a herring tagging experiment was carried out, designed to provide information on the migration of the herring around Ireland which would be useful in establishing more realistic management units. In the experiment over 20,000 herring were tagged and liberated - 10,000 southwest of the Isle of Man and 10,000 in Broadhaven Bay. Over 450 tagged fish have been recovered to date and the results suggested considerable movement of herring between the different management units. There appears to be a major link between the Irish Sea stocks and the part of the Celtic Sea stock that spawns off the south east coast of Ireland. A small number of fish tagged off the Mayo coast migrated south to the coast of Kerry. The mixing of these stocks should be taken into account when the various stocks are assessed and when the annual TAC's are estimated.

INTRODUCTION

The herring fisheries around Ireland are now assessed and managed as three separate units. Prior to 1982 these units were based on ICES statistical divisions. Since 1982, however, the management units have been modified to take into account changes that have taken place in the actual fisheries and also new biological information about stock distribution.

At present the management units (Fig. 1) are

1. ICES Divisions VIa South and VIIb - west and northwest coasts.
2. ICES Division VIIa North - north Irish Sea
3. ICES Divisions VIIa South and VIIgk - Celtic Sea and south west coasts.

For some years the various ICES Herring Working Groups, whose task has been to assess the state of the stocks around Ireland and to give management advice, have been concerned about the appropriateness of the boundaries that separate the units. For example, the boundary that separates Division VIIb from Division VIIj ($52^{\circ}30'$ N) bisects the area between Loop Head and Kerry Head where an important fishery takes place each autumn on spawning herring. The Working Groups have consequently had continuous difficulties in allocating catches taken from this area to the correct management unit. The Working Groups have also had difficulty in correctly allocating catches of young herring taken from the Irish Sea (Division VIIa North).

It has always been suspected that the herring larvae which have originated from the spawning grounds off the southeast coast (Celtic Sea) may be carried into the Irish Sea where they may remain for a period as juveniles before returning to the Celtic Sea. During the period 1969-79, when the industrial fishery was exploited in the north Irish Sea, the ICES Herring Working Group consistently drew attention to the possible effects that the heavy catches of juvenile herring from that area could have had on the recruitment to the Celtic Sea stock - thereby implying a possible link between the stocks in both areas. A further indication of the migration of herring across boundary lines between management units is evident from the tagging experiments carried out by the Marine Laboratory, Aberdeen. These experiments showed that in some years small numbers of herring which had been tagged in the Clyde area were recaptured off the northwest coast of Donegal and in the Irish Sea.

There is considerable evidence therefore that the existing boundaries which define the management unit may not accurately reflect the distribution of the stocks. Because of this it was decided that useful information would be obtained on the movements and distribution of the stocks by carrying out a tagging experiment.

Objective

The primary objective of the programme was to tag herring in July off the Kerry Head - Loop Head area, the boundary between Division VIIj and Division VIIb. This was the area about which the greatest doubt about the stock identity had been expressed. It was hoped that, by tagging the pre-spawning concentrations of fish, information would be obtained which would indicate the proportion of fish using various spawning grounds.

METHODS

The tagging was carried out in July 1991 using a Scottish purse-seiner the MFV *Radiant Star* (Skipper Alex Wiseman) from Mac Duff, Scotland. It is considered essential when tagging herring to use a purse-seiner to catch the fish because herring which have been taken in a trawl lose their scales and quickly die. Even with the use of a purse-seine considerable skill is required to enable the fish to be taken on board in a suitably healthy state for tagging. Weather conditions must be nearly perfect with little or no swell while the quantity "ringed" must ideally be between 5 and 20 tonnes. Amounts above or below this will lose their scales - either by rubbing against each other or by coming in contact with the net.

Once herring were captured and considered suitable for tagging by examining a small quantity, the catch was removed from the purse-seine by means of a canvas lined landing brailer and placed in the refrigerated sea water (RSW) tanks. The *Radiant Star* had six RSW tanks of which four were fitted with nets so that the fish were retained within the top two metres of the tank. Four teams of three people were engaged in the tagging - one team for each tank. One person removed a small number of herring (approximately 10 fish) by means of a small landing net, a second person held the herring which was tagged by the third person. In this way it was possible to tag up to 400 fish per hour. Tagged herring were immediately returned to sea simply by throwing them overboard.

Fish were tagged with external Floy tags using an automatic tagging gun. Tags of four different colours were used - red, green, blue and yellow. It was considered important to determine the most suitable colour for detection and recovery. While red or yellow coloured tags might be more easily detected along the production line in a factory, fish carrying these colours might be more easily noticed by predators. In order to obtain an even distribution of colours the different ones were randomly mixed before tagging. A reward of £3 was paid for returned tags.

Cruise programme

The MFV *Radiant Star* left Dublin on 8th July and proceeded to the southwest coast. The weather conditions in the proposed tagging area were very poor and no herring concentrations were located.

Despite a prolonged search and contact with a number of local skippers on the west coast no suitable concentrations were found in this area either. As the weather continued to be unsuitable the *Radiant Star* steamed to the Irish Sea. Suitable herring concentrations were located west of the Isle of Man and over 10,000 herring were tagged from this area on 15/16 July. The *Radiant Star* then returned to the west coast. A further 10,000 were tagged in Broadhaven Bay on 20/21 July but a further search along the west coast as far south as the River Shannon failed to locate any suitable concentrations.

Return of tags

It was anticipated that most of the tags returned would come from factories engaged in herring roe extraction for the Japanese market. In these factories each herring is individually handled and a high recovery rate could be expected. This was in fact the case and the majority of the tagged fish recovered came from roe factories. Although high numbers of recoveries were achieved, some valuable details were lost about the origin of returned tagged fish and it was sometimes difficult to obtain information about the area in which the fish were caught. However, the relevant information was usually obtained as a result of discussions with individual skippers.

Biological samples

Samples of herring, not suitable for tagging, were analysed in the usual way for each haul and details of age, length, sex, maturity, vertebral counts and maturity state were recorded from all hauls.

The fish tagged off the Isle of Man were mainly 3 year old (46%) 2 year old (19%) and 6 year old (9%). They were mainly immatures and pre-spawners. The average vertebral count was 56.43 which is typical of an autumn spawning component either from the main Manx stock or the Celtic Sea stock.

Those tagged off the Stags of Broadhaven were also mainly 3 year old (60%). Four year old (17%) and 2 year (13%) were also well represented. The maturities were slightly more advanced than those fish from the Irish Sea but again the vast majority were either immatures or pre-spawners. The average vertebral count was 56.54 which might suggest the presence of some winter spawners mixed with the main autumn spawning component.

RESULTS

As the releases were from two widely different areas, the results from both areas are treated separately.

Broadhaven Bay

Approximately 9,250 fish were tagged and 262 had been recaptured by the end of August 1992.

The early returns - those from July and August 1991 - were caught by boats fishing around Donegal Bay and not very far from the release area. Indeed, the majority recovered between July 1991 and February 1992 came from the main fishing areas along the north Mayo and Sligo coasts and from the Rathlin O Beirne - Glen Head area (Fig 2). However a number of tags were recovered from boats fishing off the mouth of the River Shannon during October and November and in Galway Bay during November and December. The maturity stages of those fish caught in the southerly areas would suggest that they had migrated south for the purpose of spawning off the River Shannon or in Galway Bay. At least one fish moved further south than the River Shannon and was captured in Dingle Bay. In general, however, the vast majority of the recovered tags (90%) were recovered from the Donegal Bay area.

Southwest of Isle of Man

About 10,650 tagged fish were released from west of the Isle of Man. The earliest recaptures were made in August and September 1991 by boats working in the mid Channel area and also southwest of the Chickens Rocks. A number of tagged fish were subsequently recaptured by boats fishing on the spawning grounds on the Douglas Bank during September. During October, tagged fish were recovered from landings made by boats which had been fishing on the spawning grounds off Kilkeel and a solitary tag was recovered from a catch from Kerogh Island off the south Wexford coast. During early December some further tags were recovered from boats fishing in the Lambay/Rockabill area. These shoals were reported to have left this area early in December. A further tag was recovered by a small herring drifter fishing off Wicklow Head. During the remainder of December and during January 1992 increasing numbers of tagged fish were recovered from the catches landed at Dunmore East. These catches were taken from the traditional herring fishing grounds in Baginbun Bay and south of Hook Head and Tramore Bay. A small number of tags were recovered from catches landed in Cobh during late January and early February and presumably came from the Ballycotton Bay-Capel Island areas.

The results from tagging carried out in this area suggest a complex mixing of stocks in the north Irish Sea. At present the ICES Herring Working Group assesses the herring fishery in the north Irish Sea as a single stock divided into two sub stocks - each of which has a separate spawning areas. The presence of an additional component, one

which spawned in the Celtic Sea, further complicates the assessment procedure. The fish which were tagged off the Isle of Man were pre-recruit herring in July and matured and migrated to spawning grounds used by three different spawning components. The catches of herring in the Irish Sea will therefore have an effect on the population of the Celtic Sea herring stock and must be taken into consideration in future assessments of both areas.

By the end of August 1992, 47% of the recovered tagged fish had been recaptured around the Isle of Man and 10% had been recaptured off the Co. Down coast while the remainder, about 41%, had been recaptured in the Celtic Sea or migrating to that area.

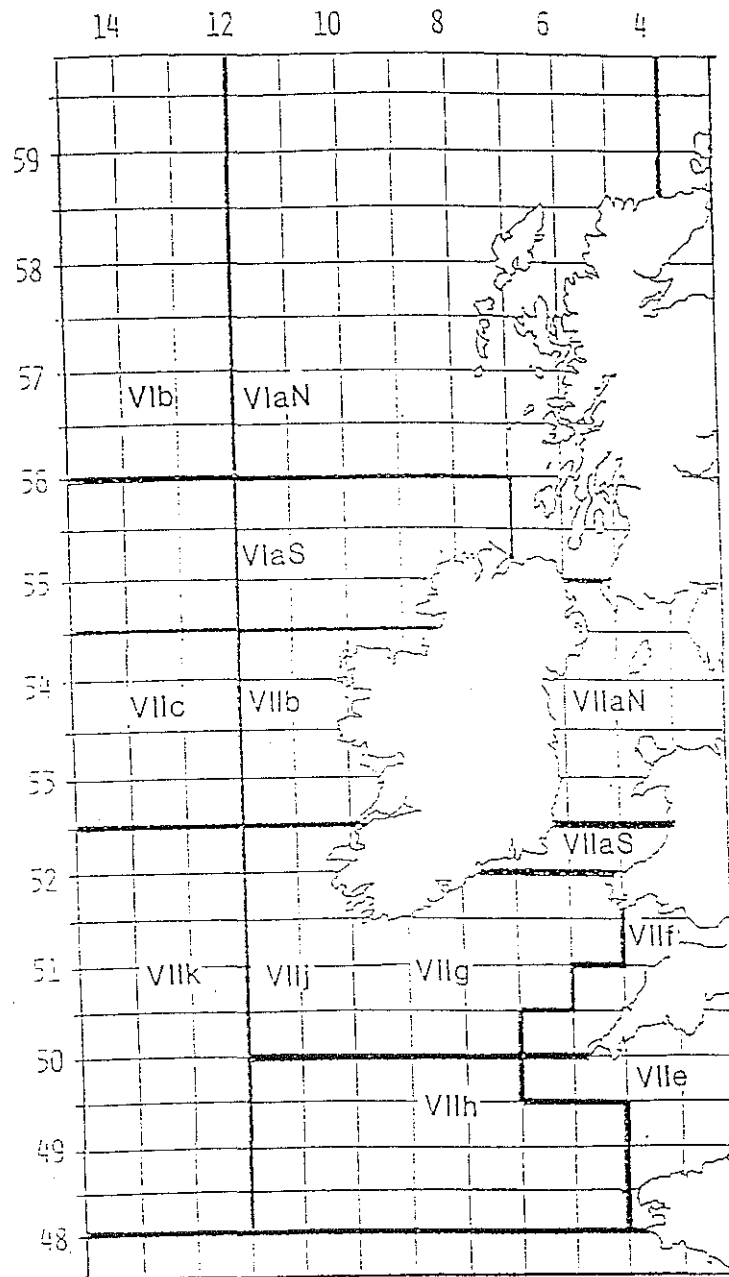


Figure 1. Herring management units

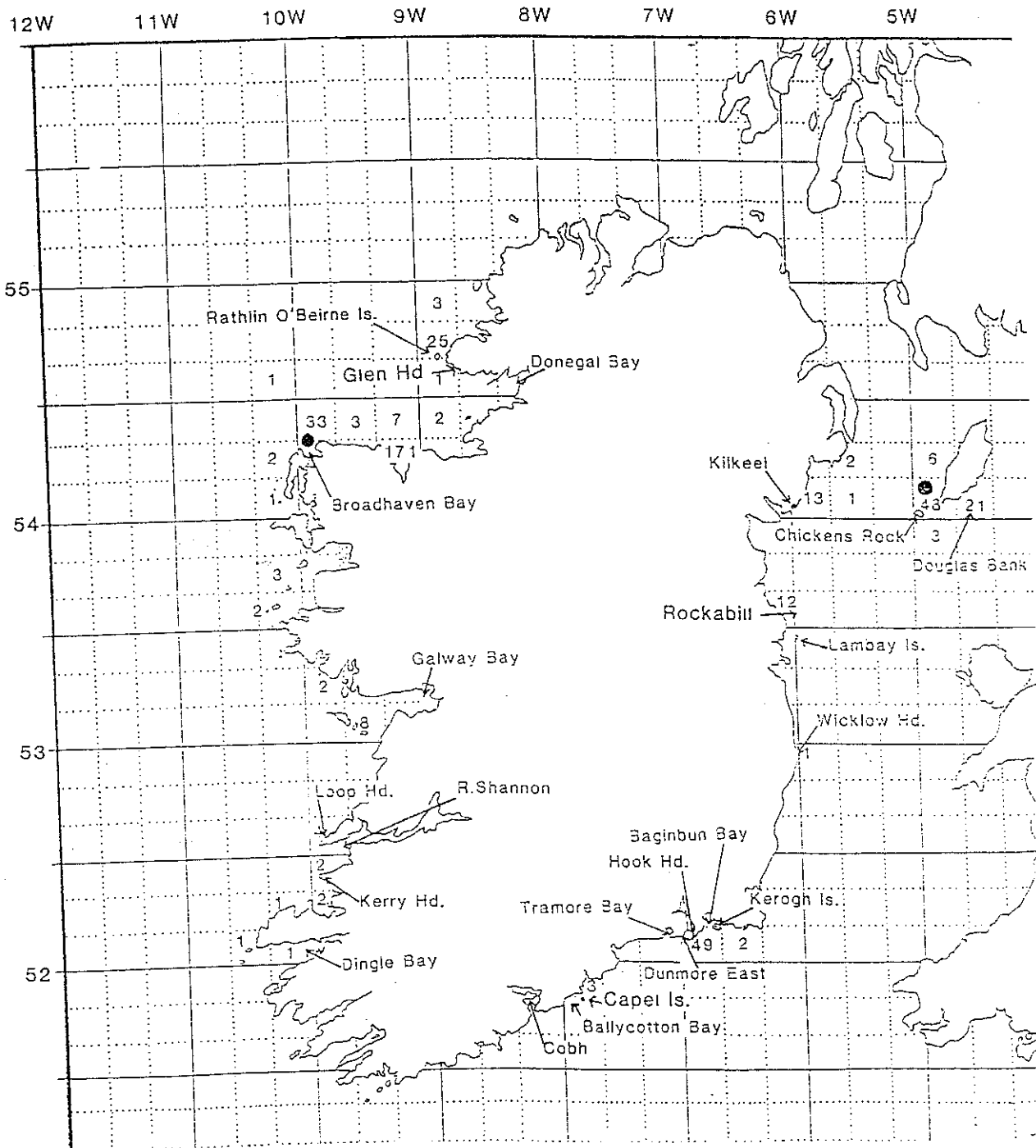


Figure 2. Locations and numbers of tag returns. ● tagging positions.