

A summary of demersal fish tagging data maintained and published by Cefas

G. Burt, D. Goldsmith and M. Armstrong

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1. Introduction

Scientists at Cefas have carried out extensive tagging studies on a wide range of commercially important fish species around the United Kingdom and more distant waters as far north as the Barents Sea and Greenland Sea. Although Cefas has tagged fish since the early 1900s, this Technical Report concentrates on fish tagged since the late 1940s. Mark and recapture experiments using conventional (non-electronic) tags provide valuable information about the movements and growth rates of fish, and provide an insight into stock structure, mixing of stocks and the implications of this for management of the fishery. Appropriately designed tagging studies can also provide estimates of fishing mortality. The development of electronic data-storage tags (DSTs) since the 1990s has allowed continuous records of the horizontal and vertical movements of individual fish between the points of release and recapture. Electronic tags are now also being used to study how fish behaviour is affected by environmental variables such as temperature.

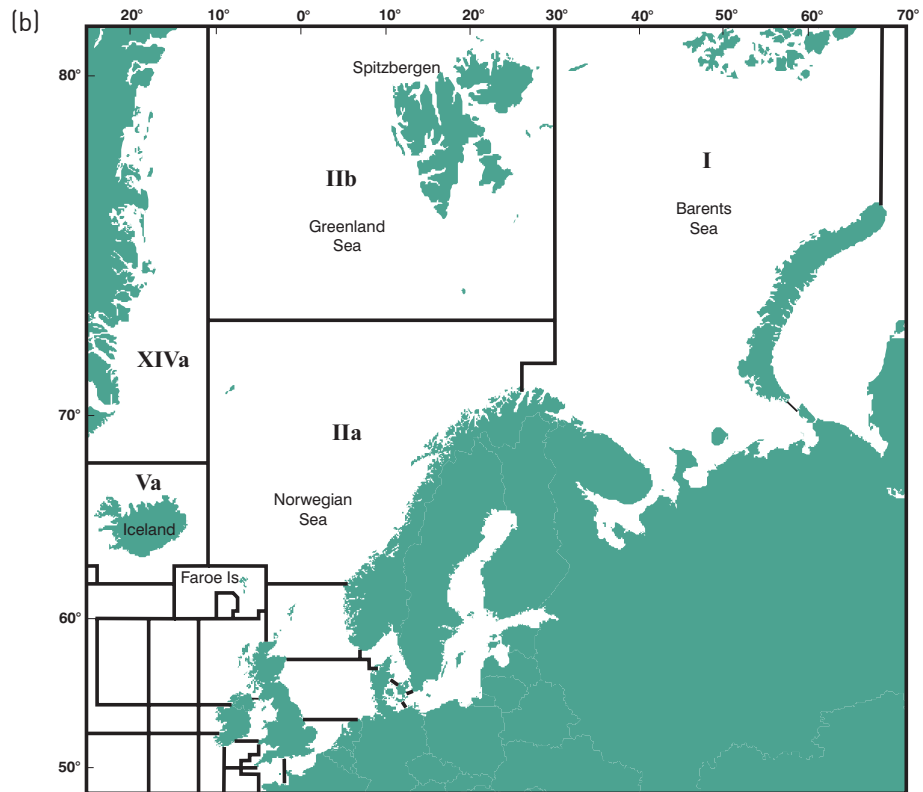
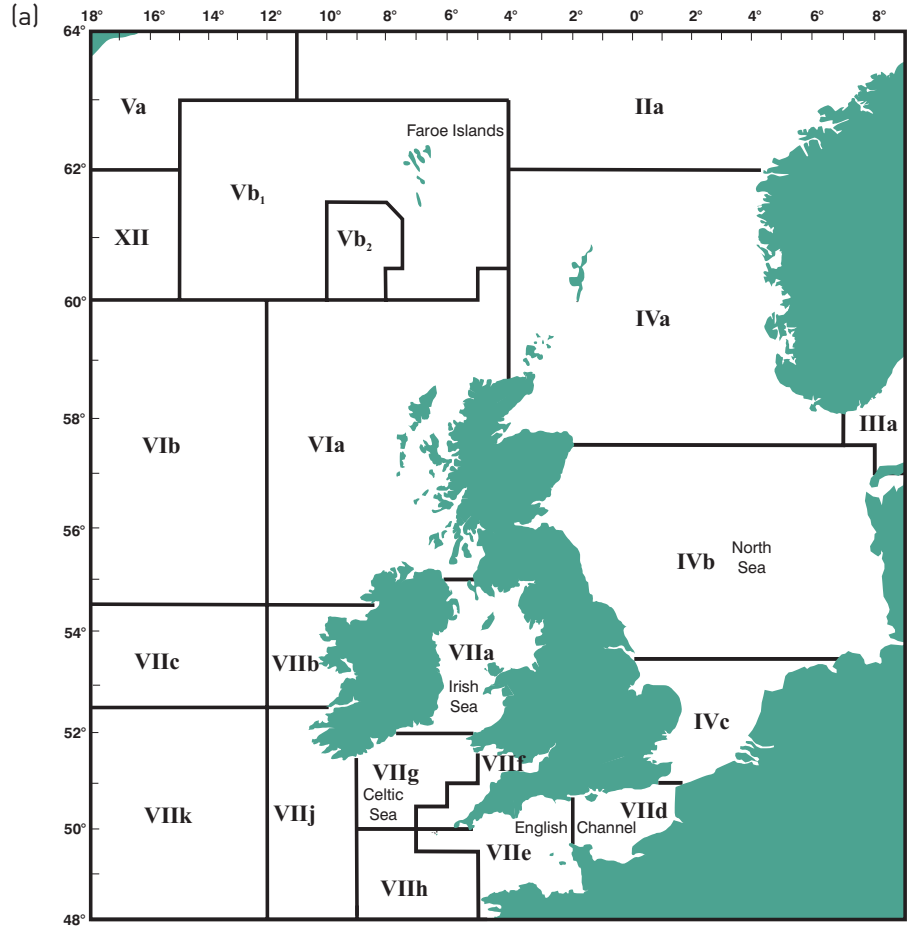
At Cefas, tagging information is maintained in the Tagged Fish Database. The primary purpose of this Technical

Report is to provide a comprehensive inventory of marine demersal fish tagging data held on the database up to the end of 2005. The sources and extent of any historical tagging data not yet captured on the database are identified as far as has been possible. Cefas has also tagged pelagic fish, shellfish and freshwater fin-fish species but these are not covered by the present report. A list of relevant Cefas publications that have used the tagging results is given, in order to increase the accessibility and awareness of historical and current literature for use in future studies and collaborations with other institutes.

Throughout this report, the numbers of releases are summarised at the scale of decades and ICES Sub-Areas or Divisions (see Figure 1.1, overleaf). The data and publications listed in the report summarise all the information available to the authors, but may not be complete.

This report is published on the Cefas Internet site in Adobe® .pdf format. Additional information regarding current tagging programmes, electronic tag technology and how to return a tagged fish can be found by visiting www.cefas.co.uk.

Figure 1.1. ICES Sub-Areas and Divisions. (a) around the waters of the United Kingdom and (b) distant waters north of the Faroe Islands.



2. Tag types

The different types of tag utilised by Cefas for tagging demersal fish can broadly be classified as conventional and electronic. A wide range of different conventional tags (Figure 2.1) have been used to tag a variety of species, and the tags are often specific to particular types of fish (Table 2.1, overleaf). Petersen discs are primarily used for flatfish and elasmobranchs, plastic flags for roundfish and T-bar tags for bass. Conventional tags are uniquely numbered and are prefixed by the letter “E” to denote “English” in accordance with ICES international naming conventions, and continue to be used in conjunction with electronic tags that are not necessarily numbered uniquely.

Data from conventional tagging give only the positions at release and recapture of the individual fish and cannot tell us where the fish have been in the intervening period. It is only by examining the recapture positions of large numbers of tagged fish throughout the year that the extent of the movements and distribution of fish in the population can be inferred. Much useful information has been obtained this way, although results can be biased if the fish move to areas where there is too little fishing to generate recaptures.

Early attempts to monitor in detail the horizontal movements of individual fish by tagging involved releasing a fish with an acoustic transmitter attached, and then tracking the signal using ship-board equipment. More recent Cefas studies on small-scale local movements of cod in the North Sea have used acoustic tags in conjunction with a fixed “listening” buoy that transmits data via satellite to the laboratory.

A different approach to obtaining continuous data on fish movements was developed in the 1990s in the form of DSTs that store continuous data such as water pressure and temperature. DSTs are either attached to the fish externally, or internally placed, depending on the species and on the size of the tag. The data are downloaded from the tag when the fish is recaptured. The data from the tag are then combined with models of water movements and tidal cycles to infer the movements of the fish between release and recapture. To date, DSTs that transmit positional data directly via satellite have only been used for basking sharks because of their large size (Sims *et al.*, 2003).

Figure 2.1. The principal types of conventional tags used by Cefas: (a) Petersen disc, (b) soft plastic flag, (c) hard plastic flags, (d) T-bar.

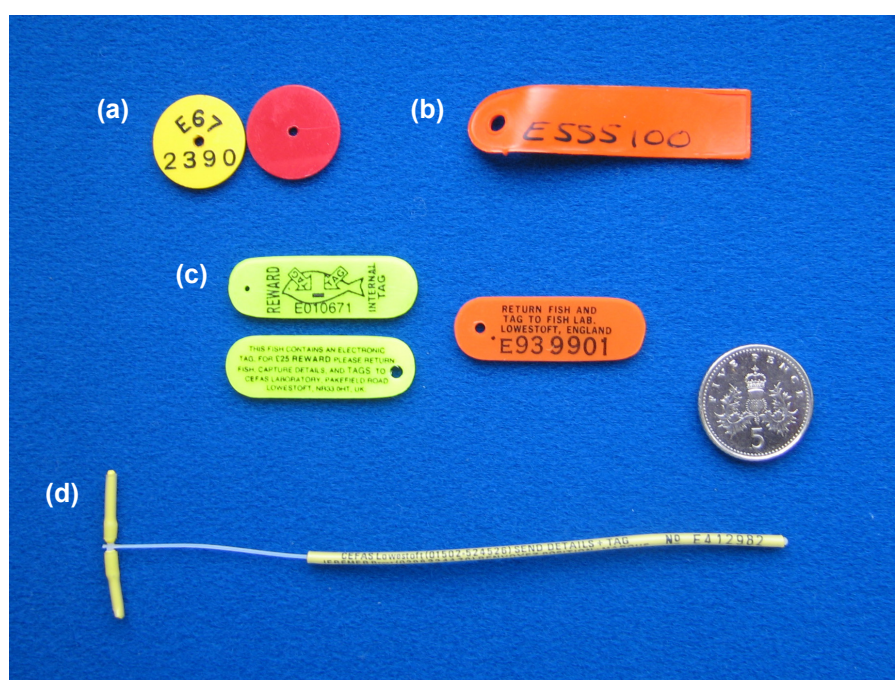


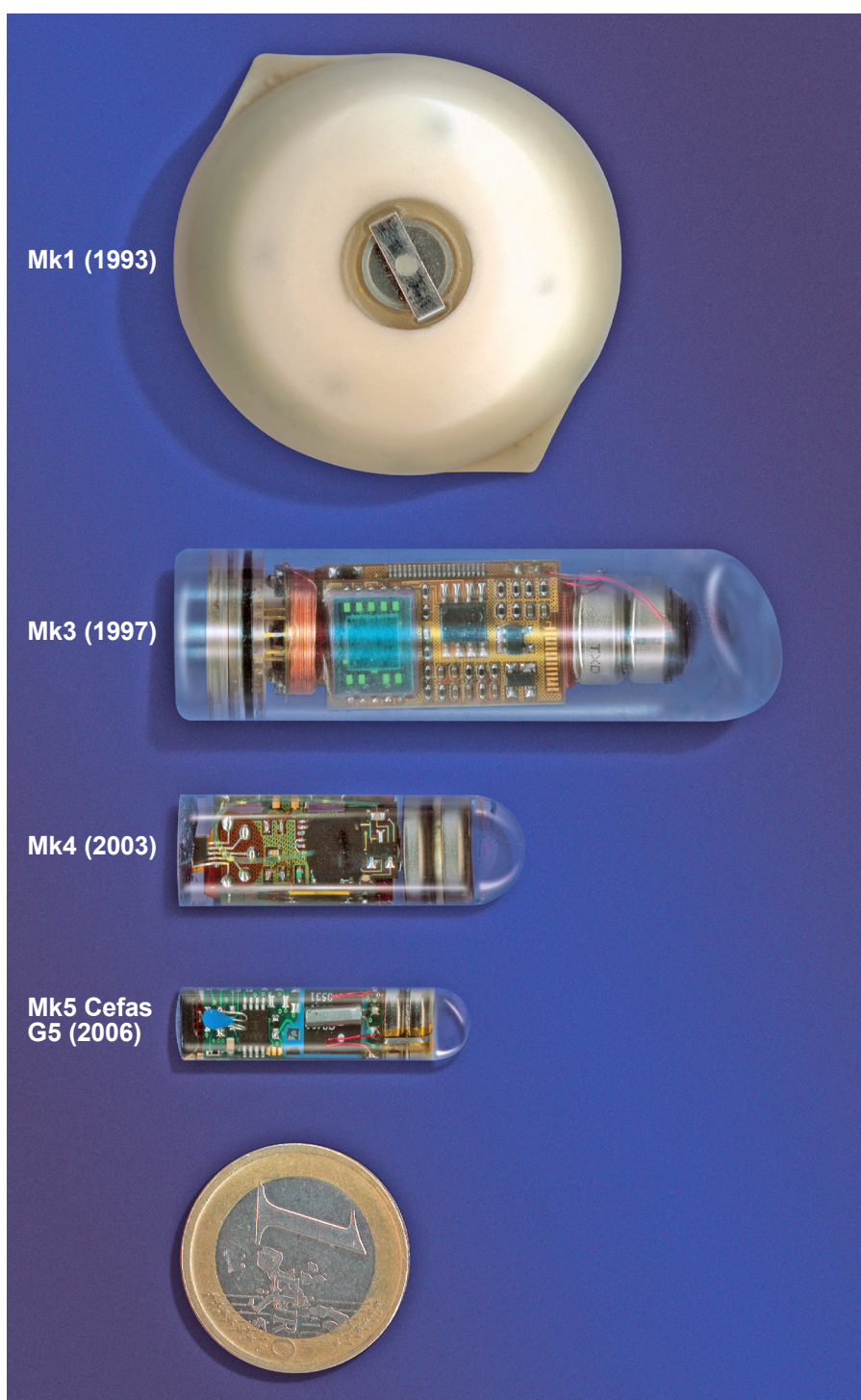
Table 2.1. The percentage of fish of different species tagged with the four general types of conventional tag (based on fish in the Tagged Fish Database).

| Species grouping | Common name | Petersen disc | Soft plastic flag | Hard plastic flag | T-bar |
|------------------|------------------------|---------------|-------------------|-------------------|------------|
| Flatfish | Brill | 100% | | | |
| | Turbot | 100% | | | |
| | Plaice | 97% | | 3% | |
| | Dab | 100% | | | |
| | Lemon sole | 100% | | | |
| | Sole | 94% | | 3% | 3% |
| | Sand sole | 100% | | | |
| | Total | 96% | 1% | 3% | |
| Roundfish | Cod | 1% | 65% | 33% | |
| | Haddock | | 49% | 46% | 5% |
| | Whiting | 15% | | 79% | 6% |
| | Saithe | | 49% | 51% | |
| | Total | 2% | 61% | 36% | |
| Elasmobranchs | Spurdog | 100% | | | |
| | Lesser spotted dogfish | 100% | | | |
| | Nurse hound | 100% | | | |
| | Smooth hound | 100% | | | |
| | Starry smooth hound | 100% | | | |
| | Tope | 100% | | | |
| | Skates and rays | 100% | | | |
| Total | 100% | | | | |
| Other species | Monkfish | | | 100% | |
| | Grey gurnard | | | | 100% |
| | Bass | 2% | | 28% | 70% |
| | Total | 2% | | 28% | 70% |

Cefas has been a world-leader in the development and application of DSTs, and examples developed by Cefas are shown in Figure 2.2. The longevity and miniaturization of these DSTs is continuing to be developed by Cefas technologists and scientists. The size of the first generations of DSTs limited their use to relatively large fish of a species,

for example large female plaice. Progressive miniaturization has extended their use to smaller individuals and a wider range of species. The latest version of these tags records and stores data on light intensity, temperature and water pressure, providing an opportunity to investigate how fish behaviour varies in response to changes in ambient conditions.

Figure 2.2. The different types of data storage tags (DST) used by Cefas, showing the development towards a smaller size.



3. Data archiving

3.1 Paper records and biological material collections

Paper records relating to current and historical tagging studies contain release and recapture details, all of which are indexed by an experiment reference. In addition to these records, release and recapture data are duplicated for some of the experiments on clipped cards, which were used to analyse the pattern of returns prior to the use of computer databases. These records, together with any otoliths, scales or spines retained for age determination purposes, are listed in an inventory and are held in a secure, dry offsite facility.

3.2 Electronic records

Electronic records are held and maintained in the Tagged Fish Database, which has been developed using Microsoft® Access® software. The database contains records of the experiments undertaken and the geographical and

biological information recorded at release and subsequent recapture. Table 3.1 provides an overview of the main tables and fields associated with the database.

The pivotal feature of the database is the Experiment Index Table, which provides a near complete history of fish tagging experiments undertaken. This table summarises the individual experiments by objective, species and ICES Sub-Area/Division of release. It also shows whether the data are archived on the database, along with the corresponding number of releases and recaptures entered on the database. A data owner is assigned for every experiment, and a level of access to the data is set.

For each tagging experiment, a station list of capture and release dates and positions is compiled, which allows the individual tag release information to be captured. The Release Table in the database gives data on skates and rays at the species level, whereas the Experiment Index Table only indicates the species grouping. Details of the individual recaptured fish are added to the Recapture Table.

Table 3.1. The main tables and their component fields in the Tagged Fish Database.

| Experiment Index Table | Capture/Release Station Table | Release Table | Recapture Table |
|---|-------------------------------|-------------------------------|-----------------------------------|
| Experiment number | Experiment number | Experiment number | Tag number |
| Experiment objective | Station number | Tag number | Recapture date |
| Species | Date | Electronic tag number | Latitude |
| Release ICES Sub-Area/Division | Latitude | Tag type | Longitude |
| Main release ICES Rectangle | Longitude | Electronic tag type | ICES Sub-Area/Division |
| Release period | ICES Sub-Area/Division | Species | ICES Rectangle |
| Number of releases (prior to databasing) | ICES Rectangle | Ray species | Depth |
| Number of databased releases | Depth | Capture station number | Length |
| Number of databased recaptures | Comment | Release station number | Maturity |
| Databased status | | Length | Sex |
| Comment | | Response (Lively or sluggish) | Weight |
| | | Scale condition | Presentation (whole, gutted etc.) |
| | | Parasite present | Otoliths/scales taken |
| | | Sex | Age |
| | | Maturity | Re-released after recapture |
| | | Chemically treated | Comment |
| | | Age (from scale samples) | |
| | | Comment | |

The Tagged Fish Database is accessible dependant upon the level of security set above. Summaries of the experiments undertaken and the numbers of releases and recaptures on the database can be generated using standard reports. More detailed information pertaining to individual tagged fish can be extracted according to selection criteria. For individual recaptures where the exact recapture position is not recorded but the ICES Rectangle is identified, the centre point of the ICES Rectangle is given as the recapture position. This can lead to apparently anomalous recapture positions (eg on land), of which users should be aware.

More information about the design and features of the database can be obtained by reading the internal Cefas document Guide to using the Tagged Fish Database (Loveday, 2005).

Although accurate, the Tagged Fish Database Experiment Index has not been cross-referenced with the paper archive inventory for the purposes of this Technical Report, hence not all of the tagging studies undertaken by Cefas may be covered.

Requests by external bodies for access to data should be made in the first instance to the principal author of this report.

4. Tagging data summaries

Tagging information relating to a total of 38 fish species is maintained in the Tagged Fish Database and this section of the report provides a breakdown of the numbers of fish released and recaptured for each species as of the end

of 2005. In total, 178,692 releases and a corresponding 48,521 recaptures have been entered on the database, and a further estimated 234,273 tag releases have yet to be entered (Table 4.1).

Table 4.1. A summary of the numbers of releases and recaptures recorded on the Tagged Fish Database (up to the end of 2005), by species, and numbers of releases not in the database.

| Species grouping | Common name | Scientific name | Databased releases | Databased recaptures | Non-databased releases |
|--------------------|--------------------------|----------------------------------|--------------------|----------------------|------------------------|
| Flatfish | Brill | <i>Scophthalmus rhombus</i> | 46 | 6 | 1 |
| | Turbot | <i>Psetta maxima</i> | 59 | 4 | 2,349 |
| | Plaice | <i>Pleuronectes platessa</i> | 84,551 | 28,115 | 53,148 |
| | Dab | <i>Limanda limanda</i> | 84 | 1 | 452 |
| | Flounder | <i>Platichthys flesus</i> | | | 969 |
| | Lemon sole | <i>Microstomus kitt</i> | 1,751 | 667 | 613 |
| | Halibut | <i>Hippoglossus hippoglossus</i> | | | 703 |
| | Sole | <i>Solea solea</i> | 39,067 | 9,168 | 12,151 |
| | Sand sole | <i>Pegusa lascaris</i> | 3 | | |
| | Total | | 125,561 | 37,961 | 70,386 |
| Roundfish | Cod | <i>Gadus morhua</i> | 27,471 | 7,601 | 80,774 |
| | Haddock | <i>Melanogrammus aeglefinus</i> | 219 | 5 | 6,294 |
| | Whiting | <i>Merlangius merlangus</i> | 1,843 | 57 | 33,210 |
| | Pollack | <i>Pollachius pollachius</i> | | | 1 |
| | Saithe | <i>Pollachius virens</i> | 151 | 32 | 6,983 |
| | Hake | <i>Merluccius merluccius</i> | | | 406 |
| | Total | | 29,684 | 7,695 | 127,668 |
| Elasmobranchs | Spurdog | <i>Squalus acanthias</i> | 2,011 | 360 | 19,043 |
| | Lesser spotted dogfish | <i>Scyliorhinus canicula</i> | 10 | 1 | |
| | Nurse hound | <i>Scyliorhinus stellaris</i> | 89 | 1 | |
| | Smooth hound | <i>Mustelus mustelus</i> | 22 | | |
| | Starry smooth hound | <i>Mustelus asterias</i> | 89 | 2 | |
| | Tope | <i>Galeorhinus galeus</i> | 47 | | 83 |
| | Basking shark | <i>Cetorhinus maximus</i> | 26 | 15 | |
| | Skates and rays | | 6,213 | 1,506 | 7,180 |
| | Sharks, skates, rays etc | | | | 1,934 |
| | Total | | 8,507 | 1,885 | 28,240 |
| Others species | Eels | Anguillidae | | | 2,922 |
| | Monkfish | <i>Lophius piscatorius</i> | 32 | | 118 |
| | Redfishes | <i>Sebastes</i> spp. | | | 1 |
| | Grey gurnard | <i>Eutrigla gurnardus</i> | 54 | | |
| | Bass | <i>Dicentrarchus labrax</i> | 14,854 | 980 | 4,938 |
| | Total | | 14,940 | 980 | 7,979 |
| Grand total | | 178,692 | 48,521 | 234,273 | |

Tables 4.2–4.6 summarise the historical tagging data as numbers of a) releases entered on the database, b) recaptures entered on the database and c) releases not yet entered, broken down in each case by tag type, release decade and ICES Sub-Area/Division where the fish were released. Each table gives data for a species or species group as follows:

- Table 4.2: flatfish species (brill, turbot, plaice, dab, flounder, lemon sole, halibut, dover sole, sand sole);
- Table 4.3: roundfish species (cod, haddock, whiting, pollack, saithe, hake)
- Table 4.4: elasmobranchs (spurdogfish, lesser spotted dogfish, greater spotted dogfish or nursehound, common and starry smooth hound, tope, basking shark, skates/rays as a group)
- Table 4.5: skates and rays by species (blonde ray, electric ray, cuckoo ray, painted ray, sandy ray, spotted ray, starry ray, sting ray, thornback ray, undulate ray, common skate).
- Table 4.6: other species (eels, anglerfish or monkfish, redfishes, grey gurnard, bass)

4.1 Flatfish

Cefas tagging studies on flatfish (Table 4.2) have been directed mostly at plaice. A large number of releases were made before the 1940s (eg Hickling, 1937) but a summary of these data has not been included in this report. Since the 1940s approximately 136,660 plaice have been released using conventional tags, of which 61% have been entered on the database. The overall recapture rate has been 33%. Most of the experiments were conducted during the 1960s and to a lesser extent the 1950s and 1970s in the North Sea (ICES Sub-Area IV), the Irish Sea (ICES Division VIIa) and the English Channel (ICES Divisions VIId & e). Since the mid 1990s, over 1,000 DSTs have been deployed to study the movements of female plaice in the North Sea. More recently, as the tags have become smaller, male plaice have also been tagged. About 22% of the plaice released with DSTs have been recaptured.

Sole are the second most tagged species of flatfish by Cefas scientists. There have been 51,210 releases with conventional tags, of which 76% are entered on the database. Nearly half of these fish were released during the 1980s. As with plaice, tagging studies have been concentrated in the North and Irish Seas and the English Channel. The recapture rate has been 23% over all years. No sole have been tagged by Cefas with DSTs, although trials are intended to take place in the near future.

All of the other tagged flatfish species including brill, dab, flounder, halibut and turbot were tagged in much lower numbers than for plaice and sole (188 conventional tag releases on the database and 4,474 not on the database, and only one DST release).

Table 4.2. Summary of flatfish tagging data showing numbers of (a) releases on database, (b) recaptures on database, and (c) releases not yet entered on the database, by tag type, release decade and release area (ICES Sub-Area or Division).

| Common name | Tag type | Decade | | ICES Sub-Area/Division | | | | | | | | | | | | | Total | | |
|-------------|--------------|--------|---|------------------------|------|-----|--------|-------|-------|----|-----|------|-------|------|-------|------|-------|------|--------|
| | | | | I | IIIa | IVa | IVb | IVc | Va | Vb | VIa | VIIa | VIIId | VIIe | VIIIf | VIIg | | VIIh | |
| Brill | Conventional | 1970s | a | | | | | 16 | | | | | | 30 | | | | 46 | |
| | | | b | | | | | 6 | | | | | | | | | | 6 | |
| | | | c | | | | 1 | | | | | | | | | | | | 1 |
| | | Total | a | | | | | 16 | | | | | | | 30 | | | | 46 |
| | | | b | | | | | 6 | | | | | | | | | | | 6 |
| | | | c | | | | 1 | | | | | | | | | | | | 1 |
| Turbot | Conventional | 1970s | a | | | 3 | 19 | 3 | | | | | | 32 | | | | 57 | |
| | | | b | | | | 2 | 1 | | | | | | 1 | | | | 4 | |
| | | | c | | | | 4 | | | | | | | | 1,865 | | | | 1,869 |
| | | 1980s | a | | | | | | | | | | | | 1 | | | | 1 |
| | | | b | | | | | | | | | | | | | | | | |
| | | | c | | | | | | | | | | | | 480 | | | | 480 |
| | | Total | a | | | 3 | 19 | 3 | | | | | | | 33 | | | | 58 |
| | | | b | | | | 2 | 1 | | | | | | | 1 | | | | 4 |
| | | | c | | | | 4 | | | | | | | | 2,345 | | | | 2,349 |
| Turbot | DST | 2000s | a | | | | 1 | | | | | | | | | | | 1 | |
| | | | b | | | | | | | | | | | | | | | | |
| | | | c | | | | | | | | | | | | | | | | |
| | | Total | a | | | | 1 | | | | | | | | | | | 1 | |
| Plaice | Conventional | 1940s | a | | | | | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | | | | | |
| | | | c | | | | | | 4,792 | | | | | | | | | | 4,792 |
| | | 1950s | a | | | | 7,210 | | | | | | | | | | | | 7,210 |
| | | | b | | | | 2,553 | | | | | | | | | | | | 2,553 |
| | | | c | 717 | | | 10,776 | 1,598 | | | 2 | | 1,367 | 67 | 100 | 34 | | | 14,661 |

Table 4.2. continued: Summary of flatfish tagging data showing numbers of (a) releases on database, (b) recaptures on database, and (c) releases not yet entered on the database, by tag type, release decade and release area (ICES Sub-Area or Division).

| Common name | Tag type | Decade | ICES Sub-Area/Division | | | | | | | | | | | | | | Total | | |
|-------------|--------------|--------|------------------------|------|-----|-------|--------|--------|-------|-----|------|-------|--------|--------|-------|-------|-------|--------|--------|
| | | | I | IIIa | IVa | IVb | IVc | Va | Vb | VIa | VIIa | VIIId | VIIe | VIIIf | VIIg | VIIh | | | |
| Plaice | Conventional | 1960s | a | | 141 | | 21,277 | 5,548 | | | | 1,029 | 338 | 398 | | | | 28,731 | |
| | | | b | | 60 | | 7,286 | 1,182 | | | | | | 100 | 92 | | | | 8,720 |
| | | | c | 198 | 526 | 249 | 4,510 | 2,654 | 5,217 | | | | 17,073 | 71 | 6 | | | | 30,504 |
| | | 1970s | a | | | 1,229 | 6,756 | 2,786 | | | | | 3,673 | 5,691 | 5,027 | | | | 25,162 |
| | | | b | | | 706 | 2,934 | 1,042 | | | | | 971 | 1,858 | 2,010 | | | | 9,521 |
| | | | c | | | | 1,619 | 603 | | | | | 37 | | 72 | | | | 2,331 |
| | | 1980s | a | | | 792 | | 5,260 | | | | | 3,459 | 2,198 | 115 | | | | 11,824 |
| | | | b | | | 178 | | 2,156 | | | | | 868 | 969 | 9 | | | | 4,180 |
| | | | c | | | | | 27 | | | | | 108 | 537 | 88 | | | | 760 |
| | | 1990s | a | | | | 357 | 958 | | | | | 4,514 | 2,312 | | 2,166 | | | 10,307 |
| | | | b | | | | 153 | 249 | | | | | 997 | 1,012 | | 490 | | | 2,901 |
| | | | c | | | | 100 | | | | | | | | | | | | 100 |
| | | 2000s | a | | | | 207 | 74 | | | | | | | | | | | 281 |
| | | | b | | | | 4 | 6 | | | | | | | | | | | 10 |
| | | | c | | | | | | | | | | | | | | | | |
| | | Total | a | | 141 | 2,021 | 35,807 | 14,626 | | | | | 12,675 | 10,539 | 5,540 | 2,166 | | | 83,515 |
| | | | b | | 60 | 884 | 12,930 | 4,635 | | | | | 2,836 | 3,939 | 2,111 | 490 | | | 27,885 |
| | | | c | 915 | 526 | 249 | 17,005 | 9,674 | 5,217 | | | 2 | 17,218 | 1,975 | 233 | 100 | 34 | | 53,148 |
| Plaice | DST | 1990s | a | | | 368 | 383 | | | | | | | | | | | 751 | |
| | | | b | | | 119 | 74 | | | | | | | | | | | 193 | |
| | | | c | | | | | | | | | | | | | | | | |
| | | 2000s | a | | | 185 | 79 | | | | | | | | | | | | 264 |
| | | | b | | | 20 | 14 | | | | | | | | | | | | 34 |
| | | | c | | | | | | | | | | | | | | | | |
| | | Total | a | | | 553 | 462 | | | | | | | | | | | | 1,015 |
| | | | b | | | 139 | 88 | | | | | | | | | | | | 227 |
| | | | c | | | | | | | | | | | | | | | | |

Table 4.2. continued: Summary of flatfish tagging data showing numbers of (a) releases on database, (b) recaptures on database, and (c) releases not yet entered on the database, by tag type, release decade and release area (ICES Sub-Area or Division).

| Common name | Tag type | Decade | | ICES Sub-Area/Division | | | | | | | | | | | | | Total | | |
|-------------|--------------|--------|---|------------------------|------|-------|-------|-----|----|-----|-----|-------|-------|------|-------|------|-------|-------|-------|
| | | | | I | IIIa | IVa | IVb | IVc | Va | Vb | VIa | VIIa | VIIId | VIIe | VIIIf | VIIg | | VIIh | |
| Flounder | Conventional | Total | a | | | | | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | | | | | |
| | | | c | | | | | 454 | | | | | 515 | | | | | | 969 |
| Lemon sole | Conventional | 1950s | a | | | | | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | | | | | |
| | | | c | | | | | | | | | | | | 8 | 127 | | | 135 |
| | | 1960s | a | | | | 2 | | | | | | | | | | | | 2 |
| | | | b | | | | 1 | | | | | | | | | | | | 1 |
| | | | c | | | | | | | | | | | | | | | | |
| | | 1970s | a | | | 10 | 290 | | | | | | | 305 | 1,144 | | | | 1,749 |
| | | | b | | | | 35 | | | | | | | 92 | 539 | | | | 666 |
| | | | c | | | | 310 | | | | | | | 36 | 16 | | | | 362 |
| | | 1980s | a | | | | | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | | | | | |
| | | | c | | | | | | | | | | | | 115 | | | 1 | 116 |
| | | Total | a | | | 10 | 292 | | | | | | | 305 | 1,144 | | | | 1,751 |
| | | | b | | | | 36 | | | | | | | 92 | 539 | | | | 667 |
| | | | c | | | | 310 | | | | | | | 36 | 131 | 8 | 127 | 1 | 613 |
| Halibut | Conventional | 1960s | a | | | | | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | | | | | |
| | | | c | | | | | | | 619 | 84 | | | | | | | | 703 |
| | | Total | a | | | | | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | | | | | |
| c | | | | | | | | 619 | 84 | | | | | | | | 703 | | |
| Sole | Conventional | 1950s | a | | | 2,201 | 2,914 | | | | | 258 | | | | | 5,373 | | |
| | | | b | | | 433 | 537 | | | | | 71 | | | | | | 1,041 | |
| | | | c | | | | 674 | | | | | 1,708 | | 262 | 608 | 2 | | 3,254 | |

4.2 Roundfish

Cod is, by far, the roundfish species most tagged by Cefas, with a total of around 107,480 fish released with conventional tags, primarily during the 1950s and 1960s (Table 4.3). Tagging took place both in UK waters and in distant-water areas.

About 52,630 of the conventionally tagged cod were released in the Barents, Norwegian and Greenland Seas and off Iceland and the Faroes (ICES Sub-Area I and Divisions IIa, IIb Va and Vb respectively). None of these data have been entered on the database, and the recapture rate has not been calculated.

Most of the tagging experiments on cod around the UK have been in the North Sea (ICES Sub-Area IV) where 40,400 fish have been released with conventional tags. About 47% of the North Sea releases have been entered on the database. Smaller numbers of cod (13,120) have been released in other areas off the north-west Scottish coast (ICES Division VIa), in the Irish Sea (ICES Division VIIa) and in the English Channel (ICES Division VIId & e). The recapture rate for cod tagged around the UK has been 28% over all the experiments. The lowest recapture rate (19%) was for cod released in ICES Division VIId, and the highest (35%) for cod released in IVa.

As for plaice, recent cod tagging studies have also utilised DST technology, of which over 720 have been deployed as of the end of 2005.

Over 35,050 whiting have been tagged by Cefas, mainly during the 1950s and 1960s. Only 5% (1,843) of the tags have been logged on the database. Over all the experiments, 39% of the whiting were tagged in the North Sea, 13% in the Irish Sea and 18% in the western English Channel (ICES Division VIIe). The average recapture rate for fish on the database has been only 3%. This may indicate significant tag loss and/or tag-induced mortality. Most recaptures of whiting have been within one year after release (ICES, 2005).

More than 6,510 haddock have been tagged by Cefas with conventional tags, mainly in the North Sea and west of Scotland during the 1950s–1970s. Only 3% of the haddock releases have been entered on the database. Over 7,130 saithe have been tagged, mainly in the 1960s off Iceland and the Faroes. Again, few of these releases are on the database.

Table 4.3. continued: Summary of roundfish tagging data showing numbers of (a) releases on database, (b) recaptures on database, and (c) releases not yet entered on the database, by tag type, release decade and release area (ICES Sub-Area or Division).

| Common name | Tag type | Decade | | ICES Sub-Area/Division | | | | | | | | | | | | | | | | Total | | |
|-------------|--------------|--------|---|------------------------|-----|-----|-----|-------|-----|-----|----|-------|--------|------|-------|-------|-------|------|-------|-------|--------|-------|
| | | | | I | IIa | IIb | IVa | IVb | IVc | Va | Vb | VIa | VIIa | VIIb | VIIId | VIIe | VIIIf | VIIg | Other | | | |
| Cod | Acoustic | 1990s | a | | | | | 3 | 3 | | | | | | | | | | | 6 | | |
| | | | b | | | | | | | | | | | | | | | | | | | |
| | | | c | | | | | | | | | | | | | | | | | | | |
| | | 2000s | a | | | | | 25 | | | | | | | | | | | | | | 25 |
| | | | b | | | | | 3 | | | | | | | | | | | | | | 3 |
| | | | c | | | | | | | | | | | | | | | | | | | |
| | | Total | a | | | | | 28 | | 3 | | | | | | | | | | | | 31 |
| | | | b | | | | | 3 | | | | | | | | | | | | | | 3 |
| | | | c | | | | | | | | | | | | | | | | | | | |
| Haddock | Conventional | 1950s | a | | | | | | | | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | | | | | | | | |
| | | | c | | | 77 | | 1,168 | 6 | 474 | 1 | 749 | 87 | | | | | | 208 | | 2,770 | |
| | | 1960s | a | | | | | | | | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | | | | | | | | |
| | | | c | | | | 737 | 747 | | 86 | 3 | 374 | | | | | | | | | | 1,947 |
| | | 1970s | a | | | | 117 | 8 | | | | 73 | | | | | 10 | | | | | 208 |
| | | | b | | | | 4 | 1 | | | | | | | | | | | | | | 5 |
| | | | c | | | | 13 | 1,564 | | | | | | | | | | | | | | 1,577 |
| | | 2000s | a | | | | | 11 | | | | | | | | | | | | | | 11 |
| | | | b | | | | | | | | | | | | | | | | | | | |
| | | | c | | | | | | | | | | | | | | | | | | | |
| | | Total | a | | | | 117 | 19 | | | | 73 | | | | | 10 | | | | | 219 |
| | | | b | | | | 4 | 1 | | | | | | | | | | | | | | 5 |
| | | | c | | | 77 | 750 | 3,479 | 6 | 560 | 4 | 1,123 | 87 | | | | | | 208 | | | 6,294 |
| Whiting | Conventional | 1950s | a | | | | | | | | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | | | | | | | | |
| | | | c | | | | | 3,277 | 683 | | | 653 | 10,351 | | | 4,390 | 41 | 37 | | | 19,432 | |

Table 4.3. continued: Summary of roundfish tagging data showing numbers of (a) releases on database, (b) recaptures on database, and (c) releases not yet entered on the database, by tag type, release decade and release area (ICES Sub-Area or Division).

| Common name | Tag type | Decade | ICES Sub-Area/Division | | | | | | | | | | | | | | | | | | | |
|-------------|--------------|--------|------------------------|-----|-----|-----|-----|-------|-------|-------|-------|------|--------|-------|------|-------|-------|-------|-------|---|-----|--------|
| | | | I | IIa | IIb | IVa | IVb | IVc | Va | Vb | VIa | VIIa | VIIb | VIIId | VIIe | VIIIf | VIIg | Other | Total | | | |
| Whiting | Conventional | 1960s | a | | | | | | 431 | | | | | | | | | | 60 | | 491 | |
| | | | b | | | | | | 48 | | | | | | | | | | | 7 | | 55 |
| | | | c | | | | | 1,914 | 3,207 | 1 | | 102 | 2,693 | | | 355 | 2,078 | 685 | | | | 11,035 |
| | | 1970s | a | | | | | 897 | 81 | | | | | | | | | | | | | 978 |
| | | | b | | | | | 1 | 1 | | | | | | | | | | | | | 2 |
| | | | c | | | | | 1,264 | 1,389 | | | | | | | | | | | | | 2,653 |
| | | 1980s | a | | | | | | | | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | | | | | | | | |
| | | | c | | | | | | | 90 | | | | | | | | | | | | 90 |
| | | 2000s | a | | | | | 374 | | | | | | | | | | | | | | 374 |
| | | | b | | | | | | | | | | | | | | | | | | | |
| | | | c | | | | | | | | | | | | | | | | | | | |
| | | Total | a | | | | | 1,271 | 512 | | | | | | | 60 | | | | | | 1,843 |
| | | | b | | | | | 1 | 49 | | | | | | | 7 | | | | | | 57 |
| | | | c | | | | | 6,455 | 5,369 | 1 | | 755 | 13,044 | | | 355 | 6,468 | 726 | 37 | | | 33,210 |
| Pollack | Conventional | 1950s | a | | | | | | | | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | | | | | | | | |
| | | | c | | | | | | | | | | | | 1 | | | | | | | 1 |
| | | Total | a | | | | | | | | | | | | | | | | | | | |
| | | | c | | | | | | | | | | | | 1 | | | | | | | 1 |
| Saithe | Conventional | 1950s | a | | | | | | | | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | | | | | | | | |
| | | | c | | | | | | | 29 | 1 | | 3 | | | | | | | | | 33 |
| | | 1960s | a | | | | | | | | | | | | | | | | | | | |
| | | | c | | 965 | | 148 | | 1 | 3,729 | 1,487 | 459 | 95 | 5 | | | | | 1 | | | 6,890 |

Table 4.3. continued: Summary of roundfish tagging data showing numbers of (a) releases on database, (b) recaptures on database, and (c) releases not yet entered on the database, by tag type, release decade and release area (ICES Sub-Area or Division).

| Common name | Tag type | Decade | | ICES Sub-Area/Division | | | | | | | | | | | | | | | Total | |
|-------------|--------------|--------|---|------------------------|-----|-----|-----|-----|-------|-------|-----|-----|------|------|------|------|------|-------|-------|-------|
| | | | | I | IIa | IIb | IVa | IVb | IVc | Va | Vb | VIa | VIIa | VIIb | VIIc | VIIe | VIIg | Other | | |
| Saithe | Conventional | 1970s | a | | | 58 | | | | | 91 | | | | | | | | 149 | |
| | | | b | | | 7 | | | | | 25 | | | | | | | | 32 | |
| | | | c | | | | | | 60 | | | | | | | | | | | 60 |
| | | 1980s | a | | | | | | 2 | | | | | | | | | | | 2 |
| | | | b | | | | | | | | | | | | | | | | | |
| | | | c | | | | | | | | | | | | | | | | | |
| | | Total | a | | | 58 | | 2 | | | | 91 | | | | | | | | 151 |
| | | | b | | | 7 | | | | | | 25 | | | | | | | | 32 |
| | | | c | 965 | | 148 | | 61 | 3,758 | 1,488 | 459 | 98 | 5 | | | | | 1 | | 6,983 |
| Hake | Conventional | 1950s | a | | | | | | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | | | | | | |
| | | | c | | | | | 3 | | | 61 | 281 | | | | 5 | 41 | | 391 | |
| | | 1960s | a | | | | | | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | | | | | | |
| | | | c | | | | | | | | | | | | | 15 | | | | 15 |
| | | Total | a | | | | | | | | | | | | | | | | | |
| b | | | | | | | | | | | | | | | | | | | | |
| c | | | | | | 3 | | | 61 | 281 | | | | 15 | 5 | 41 | | 406 | | |

4.3 Elasmobranchs

Spurdog have comprised 57% of the 36,740 elasmobranchs that have been tagged by Cefas, the remainder being mainly skates and rays (Table 4.4). The majority (85%) of the spurdog were released during the 1960s, and about half of the releases have been in the North Sea (ICES Sub-Area IV). The other spurdog tagging experiments took place mainly to the west of Scotland (ICES Division VIa) and to a lesser extent in the Irish Sea, eastern English Channel and Celtic Sea (ICES Divisions VIIa, VIId and VIIg respectively). About 10% of the spurdog releases have been entered on the database, compared to 46% of the 13,390 skate and ray releases. Some 1,930 elasmobranch records in the database do not have identification to the species level. The recapture rate for spurdogs has been 18% over all the experiments and areas. The recapture rate for skates and rays has been 24%.

Table 4.5 gives a species breakdown of the numbers of skate and ray releases and recaptures on the database. Thornback ray has been the most common species tagged with conventional tags, and most of the releases have been in the southern North Sea (ICES Division IVc), and in the Irish Sea. The recapture rate has been much higher in the southern North Sea (31%) compared with the Irish Sea (19%). The most recent studies on thornback ray have utilised DST technology, most significantly for the outer Thames Estuary population where there has been a return rate of 38%. Of 97 thornback rays tagged with DSTs in the Irish Sea, 16% were recaptured. The difference in recapture rate in the southern North Sea and Irish Sea has therefore been similar for both the DST and historical conventional tagging experiments.

Of the 10 other species of skates and rays that have been tagged, the main species was spotted ray (*Raja montagui*) which was tagged mainly in the southern North Sea and eastern English Channel and has 108 recaptures spanning three decades.

Between 2001 and 2004, in association with the Marine Biological Association of the UK, Cefas scientists tagged 26 basking shark utilising sophisticated "pop-up" archival satellite tags to reveal their behaviour and geographical movements.

The majority of conventional tagging work on the other species of shark has been undertaken in the Irish Sea and Celtic Sea and is currently ongoing.

Table 4.4. Summary of elasmobranch tagging data showing numbers of (a) releases on database, (b) recaptures on database, and (c) releases not yet entered on the database, by tag type, release decade and release area (ICES Sub-Area or Division) [see Table 4.5 for skates/rays breakdown by species].

| Common name | Tag type | Decade | | ICES Sub-Area/Division | | | | | | | | | | | | | | | | | Total | | |
|------------------------|--------------|--------|---|------------------------|------|-------|-----|-------|----|-------|-----|------|------|------|-------|------|-------|-------|------|------|-------|------|--------|
| | | | | IIa | IIIa | IVa | IVb | IVc | Va | VIa | VIb | VIIa | VIIb | VIIc | VIIId | VIIe | VIIIf | VIIg | VIIh | VIIj | | VIIk | Other |
| Spurdog | Conventional | 1950s | a | | | | | | | | | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | | | | | | | | | |
| | | | c | | | | 51 | 122 | 50 | | | 404 | | | | | 62 | 8 | | | | | 697 |
| | | 1960s | a | | | | | | | | | | | | | 76 | 122 | 132 | 8 | | | | 338 |
| | | | b | | | | | | | | | | | | | 15 | 22 | 13 | 1 | | | | 51 |
| | | | c | 814 | 1 | 5,451 | 710 | 1,193 | 14 | 5,711 | 10 | 257 | 44 | | 2,003 | 15 | 18 | 1,500 | | | | | 17,741 |
| | | 1970s | a | | | 1,281 | | | | | | | | | | | | | | | | | 1,491 |
| | | | b | | | 287 | | | | | | | | | | | | | | | | | 301 |
| | | | c | | | 419 | 186 | | | | | | | | | | | | | | | | 605 |
| | | 1980s | a | | | | | | | | | | | 28 | | | | | | | | | 28 |
| | | | b | | | | | | | | | | 4 | | | | | | | | | | 4 |
| | | | c | | | | | | | | | | | | | | | | | | | | |
| | | 2000s | a | | | | | 1 | | | | | | 61 | | | | 15 | 67 | 10 | | | 154 |
| | | | b | | | | | | | | | | | 2 | | | | 1 | 1 | | | | 4 |
| | | | c | | | | | | | | | | | | | | | | | | | | |
| | | Total | a | | | 1,281 | | 1 | | | | | | 89 | | | 76 | 137 | 199 | 18 | | | 2,011 |
| | | | b | | | 287 | | | | | | | | 14 | | | 15 | 23 | 14 | 1 | | | 360 |
| | | | c | 814 | 1 | 5,870 | 947 | 1,315 | 64 | 5,711 | 10 | 661 | 44 | | 2,003 | 15 | 80 | 1,508 | | | | | 19,043 |
| Lesser spotted dogfish | Conventional | 1990s | a | | | | | 10 | | | | | | | | | | | | | 10 | | |
| | | | b | | | | | 1 | | | | | | | | | | | | | | 1 | |
| | | | c | | | | | | | | | | | | | | | | | | | | |
| | | Total | a | | | | | 10 | | | | | | | | | | | | | | | 10 |
| | | | b | | | | | 1 | | | | | | | | | | | | | | | 1 |
| | | | c | | | | | | | | | | | | | | | | | | | | |
| Nurse hound | Conventional | 2000s | a | | | | | | | | | 76 | | | | 11 | 2 | | | | 89 | | |
| | | | b | | | | | | | | | 1 | | | | | | | | | | 1 | |
| | | | c | | | | | | | | | | | | | | | | | | | | |

Table 4.4. continued: Summary of elasmobranch tagging data showing numbers of (a) releases on database, (b) recaptures on database, and (c) releases not yet entered on the database, by tag type, release decade and release area (ICES Sub-Area or Division) (see Table 4.5 for skates/rays breakdown by species).

| Common name | Tag type | Decade | | ICES Sub-Area/Division | | | | | | | | | | | | | | | | | Total | | | |
|---------------------|--------------|--------|---|------------------------|------|-----|-----|-----|----|-----|-----|------|------|------|-------|------|-------|------|------|------|-------|------|-------|----|
| | | | | IIa | IIIa | IVa | IVb | IVc | Va | VIa | VIb | VIIa | VIIb | VIIc | VIIId | VIIe | VIIIf | VIIg | VIIh | VIIj | | VIIk | Other | |
| Nurse hound | Conventional | Total | a | | | | | | | | 76 | | | | | 11 | 2 | | | | | 89 | | |
| | | | b | | | | | | | | 1 | | | | | | | | | | | | 1 | |
| | | | c | | | | | | | | | | | | | | | | | | | | | |
| Smooth hound | Conventional | 2000s | a | | | | | | | | 14 | | | | | 7 | | 1 | | | | 22 | | |
| | | | b | | | | | | | | | | | | | | | | | | | | | |
| | | | c | | | | | | | | | | | | | | | | | | | | | |
| | | Total | a | | | | | | | | | 14 | | | | | 7 | | 1 | | | | | 22 |
| | | | b | | | | | | | | | | | | | | | | | | | | | |
| | | | c | | | | | | | | | | | | | | | | | | | | | |
| Starry smooth hound | Conventional | 2000s | a | | | | | | | | 38 | | | | | 35 | 10 | 6 | | | | 89 | | |
| | | | b | | | | | | | | | | | | | | 2 | | | | | | 2 | |
| | | | c | | | | | | | | | | | | | | | | | | | | | |
| | | Total | a | | | | | | | | | 38 | | | | | 35 | 10 | 6 | | | | | 89 |
| | | | b | | | | | | | | | | | | | | | 2 | | | | | | 2 |
| | | | c | | | | | | | | | | | | | | | | | | | | | |
| Tope | Conventional | 1950s | a | | | | | | | | | | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | | | | | | | | | | |
| | | | c | | | | | 8 | | | | 9 | | | 1 | | | | | | | | | 18 |
| | | 1960s | a | | | | | | | | | | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | | | | | | | | | | |
| | | | c | | | 1 | 1 | 57 | | 2 | | 1 | | | | | | | | | 2 | 1 | | 65 |
| | | 2000s | a | | | | | | | | | 37 | | | | | 3 | 7 | | | | | | 47 |
| | | | b | | | | | | | | | | | | | | | | | | | | | |
| | | | c | | | | | | | | | | | | | | | | | | | | | |
| | | Total | a | | | | | | | | | 37 | | | | | 3 | 7 | | | | | | 47 |
| | | | b | | | | | | | | | | | | | | | | | | | | | |
| | | | c | | | 1 | 1 | 65 | | 2 | | 10 | | | 1 | | | | | | 2 | 1 | | 83 |

Table 4.4. continued: Summary of elasmobranch tagging data showing numbers of (a) releases on database, (b) recaptures on database, and (c) releases not yet entered on the database, by tag type, release decade and release area (ICES Sub-Area or Division) (see Table 4.5 for skates/rays breakdown by species).

| Common name | Tag type | Decade | | ICES Sub-Area/Division | | | | | | | | | | | | | | | | | Total | | | |
|-----------------|--------------|--------|---|------------------------|------|-----|-----|-------|----|-------|------|-------|-------|-------|-------|------|-------|------|------|------|-------|------|-------|----|
| | | | | IIa | IIIa | IVa | IVb | IVc | Va | VIa | VIIb | VIIa | VIIb | VIIc | VIIId | VIIe | VIIIf | VIIg | VIIh | VIIj | | VIIk | Other | |
| Basking shark | Satellite | 2000s | a | | | | | | | 5 | | | | | 13 | 8 | | | | | | 26 | | |
| | | | b | | | | | | 3 | | | | | | 10 | 2 | | | | | | | 15 | |
| | | | c | | | | | | | | | | | | | | | | | | | | | |
| | | Total | a | | | | | | | 5 | | | | | | 13 | 8 | | | | | | | 26 |
| | | | b | | | | | | 3 | | | | | | | 10 | 2 | | | | | | | 15 |
| | | | c | | | | | | | | | | | | | | | | | | | | | |
| Skates and rays | Conventional | 1950s | a | | | | 79 | 462 | | | | | | | | | | | | | | 541 | | |
| | | | b | | | | 7 | 173 | | | | | | | | | | | | | | | 180 | |
| | | | c | | | | 50 | 95 | | | | | 1,235 | | | 60 | 15 | 137 | 10 | | | | 1,602 | |
| | | 1960s | a | | | | 177 | 2,038 | | | | | | | | | | | | | | | 2,215 | |
| | | | b | | | | 48 | 575 | | | | | | | | | | | | | | | 623 | |
| | | | c | | | 77 | 1 | 1,089 | | 1,425 | 25 | 1,669 | 8 | 11 | 31 | 113 | 763 | 79 | | 3 | 15 | | 5,309 | |
| | | 1970s | a | | | | | 449 | | | | | | | | 715 | | | | | | | 1,164 | |
| | | | b | | | | | 109 | | | | | | | | 143 | | | | | | | 252 | |
| | | | c | | | | | | | | | | | | 55 | 60 | | | | | | | 115 | |
| | | 1990s | a | | | | | | | | | | | 1,466 | | | | 327 | 91 | | | | 1,884 | |
| | | | b | | | | | | | | | | | 272 | | | | 25 | 12 | | | | 309 | |
| | | | c | | | | | | | | | | | 154 | | | | | | | | | 154 | |
| | | 2000s | a | | | | | 101 | | | | | | | | 1 | 11 | 1 | 1 | | | | 115 | |
| | | | b | | | | | 50 | | | | | | | | | 1 | | | | | | 51 | |
| | | | c | | | | | | | | | | | | | | | | | | | | | |
| | | Total | a | | | | 256 | 3,050 | | | | | | 1,466 | | 715 | 1 | 338 | 92 | 1 | | | 5,919 | |
| | | | b | | | | 55 | 907 | | | | | | 272 | | 143 | | 26 | 12 | | | | 1,415 | |
| | | | c | | | 77 | 51 | 1,184 | | 1,425 | 25 | 3,058 | 8 | 11 | 146 | 188 | 900 | 89 | | 3 | 15 | | 7,180 | |

Table 4.4. continued: Summary of elasmobranch tagging data showing numbers of (a) releases on database, (b) recaptures on database, and (c) releases not yet entered on the database, by tag type, release decade and release area (ICES Sub-Area or Division) (see Table 4.5 for skates/rays breakdown by species).

| Common name | Tag type | Decade | ICES Sub-Area/Division | | | | | | | | | | | | | | | | | | | Total |
|--------------------------|--------------|--------|------------------------|------|-----|-----|-----|-----|-----|-----|------|-------|------|-------|------|-------|------|------|------|------|-------|-------|
| | | | IIa | IIIa | IVa | IVb | IVc | Va | VIa | VIb | VIIa | VIIb | VIIc | VIIId | VIIe | VIIIf | VIIg | VIIh | VIIj | VIIk | Other | |
| Skates and rays | DST | 1990s | a | | | | | 97 | | | | | 97 | | | | | | | | | 194 |
| | | | b | | | | | 40 | | | | | 16 | | | | | | | | | 56 |
| | | | c | | | | | | | | | | | | | | | | | | | |
| | | 2000s | a | | | | | 100 | | | | | | | | | | | | | | 100 |
| | | | b | | | | | 35 | | | | | | | | | | | | | | 35 |
| | | | c | | | | | | | | | | | | | | | | | | | |
| | | Total | a | | | | | 197 | | | | | 97 | | | | | | | | | 294 |
| | | | b | | | | | 75 | | | | | 16 | | | | | | | | | 91 |
| | | | c | | | | | | | | | | | | | | | | | | | |
| Sharks, skates, rays etc | Conventional | 1950s | a | | | | | | | | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | | | | | | | | |
| | | | c | | | | | | | | | | | | | | | 1 | | | 1 | |
| | | 1960s | a | | | | | | | | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | | | | | | | | |
| | | | c | | | | | | | | | 1,125 | | | | | 742 | 59 | 6 | | 1 | 1,933 |
| | | Total | a | | | | | | | | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | | | | | | | | |
| | | | c | | | | | | | | | 1,125 | | | | | 742 | 60 | 6 | | 1 | 1,934 |

Table 4.5. Summary of skates and rays tagging data, by species, showing numbers of (a) releases on database and (b) recaptures on database, by tag type, release decade and release area (ICES Sub-Area or Division).

| Common name | Scientific name | Tag type | Decade | ICES Sub-Area/Division | | | | | | | | | |
|---------------------|---------------------------|--------------|--------|------------------------|-----|------|-------|------|-------|------|------|-------|----|
| | | | | IVb | IVc | VIIa | VIIId | VIIe | VIIIf | VIIg | VIIh | Total | |
| Blonde ray | <i>Raja brachyura</i> | Conventional | 1950s | a | | 2 | | | | | | | 2 |
| | | | | b | | 2 | | | | | | | 2 |
| | | | 1970s | a | | 4 | | 9 | | | | | 13 |
| | | | | b | | 1 | | | | | | | 1 |
| | | | Total | a | | 6 | | 9 | | | | | 15 |
| | | | | b | | 3 | | | | | | | 3 |
| Common electric ray | <i>Torpedo nobiliana</i> | Conventional | 2000s | a | | | | | | 1 | | 1 | |
| | | | | b | | | | | | | | | |
| | | | Total | a | | | | | | | 1 | 1 | |
| | | | | b | | | | | | | | | |
| Common skate | <i>Dipturus batis</i> | Conventional | 1950s | a | | 1 | | | | | | 1 | |
| | | | | b | | | | | | | | | |
| | | | 2000s | a | | | | | 1 | | 1 | 2 | |
| | | | | b | | | | | | | | | |
| | | | Total | a | | 1 | | | 1 | | 1 | 3 | |
| | | | | b | | | | | | | | | |
| Cuckoo ray | <i>Leucoraja naevus</i> | Conventional | 1960s | a | 1 | | | | | | | 1 | |
| | | | | b | | | | | | | | | |
| | | | Total | a | 1 | | | | | | | 1 | |
| | | | b | | | | | | | | | | |
| Painted ray | <i>Raja microocellata</i> | Conventional | 1970s | a | | 1 | | 22 | | | | 23 | |
| | | | | b | | | | 6 | | | | 6 | |
| | | | 2000s | a | | | | | | 10 | | 10 | |
| | | | | b | | | | | | 1 | | 1 | |
| | | | Total | a | | 1 | | 22 | | 10 | | 33 | |
| | | | | b | | | | 6 | | 1 | | 7 | |

Table 4.5. continued: Summary of skates and rays tagging data, by species, showing numbers of (a) releases on database and (b) recaptures on database, by tag type, release decade and release area (ICES Sub-Area or Division).

| Common name | Scientific name | Tag type | Decade | ICES Sub-Area/Division | | | | | | | | | |
|---------------|-----------------------------|--------------|--------|------------------------|-----|-------|-------|------|-------|------|------|-------|-------|
| | | | | IVb | IVc | VIIa | VIIId | VIIe | VIIIf | VIIg | VIIh | Total | |
| Sandy ray | <i>Leucoraja circularis</i> | Conventional | 1960s | a | 35 | | | | | | | | 35 |
| | | | | b | 7 | | | | | | | | 7 |
| | | | Total | a | 35 | | | | | | | | 35 |
| | | | | b | 7 | | | | | | | | 7 |
| Spotted ray | <i>Raja montagui</i> | Conventional | 1950s | a | | 17 | | | | | | | 17 |
| | | | | b | | 3 | | | | | | | 3 |
| | | | 1960s | a | 24 | 37 | | | | | | | 61 |
| | | | | b | 4 | 6 | | | | | | | 10 |
| | | | 1970s | a | | 310 | | 158 | | | | | 468 |
| | | | | b | | 70 | | 25 | | | | | 95 |
| | | | 1990s | a | | | 2 | | | 1 | | | 3 |
| | | | | b | | | | | | | | | |
| | | | Total | a | 24 | 364 | 2 | 158 | | 1 | | | 549 |
| | | | | b | 4 | 79 | | 25 | | | | | 108 |
| Starry ray | <i>Amblyraja radiata</i> | Conventional | 1950s | a | 74 | 86 | | | | | | | 160 |
| | | | | b | 7 | 32 | | | | | | | 39 |
| | | | Total | a | 74 | 86 | | | | | | | 160 |
| | | | | b | 7 | 32 | | | | | | | 39 |
| Stingray | <i>Dasyatis pastinaca</i> | Conventional | 2000s | a | | 1 | | | 1 | | | | 2 |
| | | | | b | | | | | | | | | |
| | | | Total | a | | 1 | | | 1 | | | | 2 |
| | | b | | | | | | | | | | | |
| Thornback ray | <i>Raja clavata</i> | Conventional | 1950s | a | 1 | 356 | | | | | | | 357 |
| | | | | b | | 136 | | | | | | | 136 |
| | | | 1960s | a | 117 | 2,001 | | | | | | | 2,118 |
| | | | | b | 37 | 569 | | | | | | | 606 |

Table 4.5. continued: Summary of skates and rays tagging data, by species, showing numbers of (a) releases on database and (b) recaptures on database, by tag type, release decade and release area (ICES Sub-Area or Division).

| Common name | Scientific name | Tag type | Decade | ICES Sub-Area/Division | | | | | | | | | |
|----------------|----------------------|--------------|--------|------------------------|-----|-------|-------|------|-------|------|------|-------|-------|
| | | | | IVb | IVc | VIIa | VIIId | VIIe | VIIIf | VIIg | VIIh | Total | |
| Thornback ray | <i>Raja clavata</i> | Conventional | 1970s | a | | 113 | | 507 | | | | | 620 |
| | | | | b | | 36 | | 109 | | | | | 145 |
| | | | 1990s | a | | | 1,464 | | | 326 | 91 | | 1,881 |
| | | | | b | | | 272 | | | 25 | 12 | | 309 |
| | | | 2000s | a | | | 100 | | | | | | 100 |
| | | | | b | | | 50 | | | | | | 50 |
| | | | Total | a | 118 | 2,570 | 1,464 | 507 | | 326 | 91 | | 5,076 |
| | | | | b | 37 | 791 | 272 | 109 | | 25 | 12 | | 1,246 |
| Thornback ray | <i>Raja clavata</i> | DST | 1990s | a | | 97 | 97 | | | | | 194 | |
| | | | | b | | 40 | 16 | | | | | 56 | |
| | | | 2000s | a | | 100 | | | | | | 100 | |
| | | | | b | | 35 | | | | | | 35 | |
| | | | Total | a | | 197 | 97 | | | | | | 294 |
| | | | | b | | 75 | 16 | | | | | | 91 |
| Undulate ray | <i>Raja undulata</i> | Conventional | 1970s | a | | 21 | | 13 | | | | 34 | |
| | | | | b | | 2 | | 2 | | | | 4 | |
| | | | Total | a | | 21 | | 13 | | | | 34 | |
| | | | | b | | 2 | | 2 | | | | 4 | |
| Not identified | | Conventional | 1950s | a | 4 | | | | | | | 4 | |
| | | | | b | | | | | | | | | |
| | | | 1970s | a | | | | 6 | | | | 6 | |
| | | | | b | | | | 1 | | | | 1 | |
| | | | Total | a | 4 | | | 6 | | | | 10 | |
| | | | | b | | | | 1 | | | | 1 | |

4.4 Other species

Of 22,910 releases of “other species” for which records were available, 19,790 were for bass (Table 4.6). Of these, 75% have been entered in the database. Most of the bass records not entered on the database are from experiments carried out in the Irish Sea and western English Channel in the 1970s. Bass tagging has been predominantly in the English Channel, southern North Sea, Irish Sea and Celtic Sea/Bristol Channel. The overall recapture rate has been consistently low at 6–8% in each decade since the 1980s. This could reflect a combination of low fishing mortality and incomplete reporting of tags. In 2005 a study was undertaken to assess the feasibility of tagging wild bass with electronic DST tags, which is being expanded upon in 2006.

Small numbers of anglerfish (monkfish), redfish and grey gurnard have also been tagged, although there are no records of any recaptures on the database.

Table 4.6. Summary of tagging data for other species showing numbers of (a) releases on database, (b) recaptures on database, and (c) releases not yet entered on the database, by tag type, release decade and release area (ICES Sub-Area or Division).

| Species | Tag type | Decade | | ICES Sub-Area/Division | | | | | | | | | | Total | |
|--------------|--------------|--------|---|------------------------|-----|-------|-----|------|-------|------|-------|------|------|-------|-------|
| | | | | IVa | IVb | IVc | VIa | VIIa | VIIId | VIIe | VIIIf | VIIg | VIIh | | VIIj |
| Eels | Conventional | 1980s | a | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | |
| | | | c | | | 2,922 | | | | | | | | | 2,922 |
| | | Total | a | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | |
| | | | c | | | 2,922 | | | | | | | | | 2,922 |
| Monkfish | Conventional | 1980s | a | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | |
| | | | c | | | | | | 93 | | | 13 | 12 | 118 | |
| | | 1990s | a | | | | | 32 | | | | | | 32 | |
| | | | b | | | | | | | | | | | | |
| | | | c | | | | | | | | | | | | |
| | | Total | a | | | | | 32 | | | | | | 32 | |
| | | | b | | | | | | | | | | | | |
| | | | c | | | | | | | 93 | | 13 | 12 | 118 | |
| Redfishes | Conventional | 1960s | a | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | |
| | | | c | | | | 1 | | | | | | 1 | | |
| | | Total | a | | | | | | | | | | | | |
| | | | b | | | | | | | | | | | | |
| | | | c | | | | 1 | | | | | | | 1 | |
| Grey gurnard | Conventional | 2000s | a | | 54 | | | | | | | | 54 | | |
| | | | b | | | | | | | | | | | | |
| | | | c | | | | | | | | | | | | |
| | | Total | a | | 54 | | | | | | | | | 54 | |
| | | | b | | | | | | | | | | | | |
| | | | c | | | | | | | | | | | | |

5. Cefas Tagged Fish Publications

This section of the report provides a list of peer-reviewed papers, grey-literature papers and other reports that have made direct use of the Cefas tagging data. The references are presented by the same species-grouping format used for the data summary tables in Section 4. The list is not necessarily complete, and additional references may exist, particularly with respect to earlier publications.

5.1 Flatfish

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5.2 Roundfish

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