

Sawbills 1997

Title

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Description and Summary of Results

The first confirmed British breeding records of Goosander *Mergus merganser* were in 1871 in Perthshire and Argyll, although breeding had been suspected earlier on the Northern and Western Isles. By the end of the 19th Century, it was not uncommon in Argyll, the NW Highlands, the Moray Basin and along the Tay. Breeding was first confirmed in England in Northumberland in 1941 and in Cumbria in 1950. Further increases in these counties occurred until the mid-1960s, but there appeared to be a decrease in NW Scotland, possibly due to persecution to protect fish stocks. From the mid-1960s onwards, the southward expansion continued into Durham, NW Yorkshire and N Lancashire. By the time of the 1968-1972 Breeding Atlas, they were recorded breeding in Cardiganshire. Since then, major increases had occurred in N England, S Pennines, SW England and especially Wales and it had spread into Shropshire and Herefordshire. There have been few breeding records from Ireland, mostly in Co. Donegal. By the time of the 1988-1991 Breeding Atlas it was widely scattered through Scotland and northern England, a few in the south Pennines and SW England and widespread in Wales with an estimate of 150 pairs.

The Red-breasted Merganser *M. serrator* has been resident in Britain since at least Neolithic times. During the first half of the 19th Century, it bred only in western Scotland and no further south than Loch Awe in Argyll, but by the late 19th Century it was throughout the Scottish mainland north of the Clyde and Forth valleys, and occasionally further south. Breeding was first recorded in England in 1950 (Cumbria), followed by rapid expansion to N Lancashire and NW Yorkshire. The first Welsh breeding record came from Anglesey in 1953, and from mainland Wales in 1957. By the First Breeding Atlas they were breeding in the Derbyshire Peak District but since then there has been a thinning of the populations in central and southwest Scotland, but a continued increase in Derbyshire and Wales. In Ireland there have also been declines as the population has retreated towards the north and north-west coasts.

This rapid range expansion was accompanied by increasing calls for action to control both species because of potential damage to stocks of Atlantic Salmon *Salmo salar* and migratory (Sea) Trout *S. trutta*. Both sawbill species are afforded full protection throughout Britain but licences for control can be issued where there is evidence of serious damage to fisheries – in recent years the number of birds culled each year in Scotland has been in the hundreds, and in England and Wales in tens. Young salmonids can form a high proportion of the diet of sawbills in certain situations, but whether such predation has a detrimental impact on game fisheries is uncertain. This has led to increased pressure, and indeed action, towards reviewing both the legislation surrounding licensing and its practical application, and the potential conflict of interests has led to the species being identified as a conservation priority.

The 1987 Sawbill Survey estimated there to be 2700 adult male breeding Goosanders in Britain, although no account was taken of birds away from rivers. The British breeding

population of Red-breasted Mergansers was estimated at 4300 with a further 1400 in Ireland.

In the 1997 survey, 222 of the 300 selected stretches were actually re-surveyed, comprising a total of *ca* 1750km. Goosanders showed a significant increase in density (pairs per 1km section of river) between the surveys – 1987 mean=0.430±0.023 (standard error), 1997 mean=0.706±0.038. There was no significant difference in density of Red-breasted Mergansers – 1997 mean was 0.059 ± 0.013 – although there were regional differences between the two surveys. Goosander density was highest in England and lowest in Wales. Merganser density was highest in Scotland and lowest in England.

The questionnaire part of the 1997 survey covered most regions outside the river survey. Results indicated that potentially 32% of 10-km squares adjacent to those occupied in 1987-1991 had been colonised by Goosanders, and potentially 19% of squares adjacent to those previously occupied may have been colonised by Red-breasted Mergansers.

Cormorants *Phalacrocorax carbo*, Grey Herons *Ardea cinerea* and Kingfishers *Alcedo atthis* were also counted during both surveys although the results must be considered as indications only. Cormorants increased significantly in density (1987 mean=0.053± 0.009, 1997 mean=0.104 ±0.034), as did Herons (1987 mean=0.081± 0.007, 1997 mean=0.121 ±0.011) and there was significant variation among regions. There was significant variation in Kingfisher density among regions, but no change in overall density between the surveys.

Methods of Data Capture

There were two parts to the 1997 sawbill survey:

1) Of the 615 river stretches surveyed in 1987, 300 were selected for re-survey in spring 1997 in order to evaluate the change in sawbill density in their known range. However, unlike in 1987, all fieldwork was restricted to the spring as it was thought this is the optimum time for assessing the size of sawbill breeding populations.

It must be emphasised that the survey only looked for birds on rivers. For Goosanders the survey therefore gave a good estimate of change for the British population as it does breed mainly on rivers, but for mergansers it only gave part of the story as the species also breeds in coastal areas.

Fieldworkers were requested to survey a river stretch on a single occasion between early March and mid-April to record the numbers of potential breeding pairs of both species. The allocated river stretch was divided into 1km sections with divisions marked on a 1:50000 scale Ordnance Survey map. The observer walked the river stretch, preferably going upstream, recording adult males, redheads and any young birds on each section.

'Redheads' include both females and immature males in their first summer, as they are difficult to separate in the field. The 'young' category was included to record any unusually early duckling broods. Some habitat details were also recorded for each 1km section. As in 1987 the number of Cormorants, Grey Herons and Kingfishers was also recorded.

2) Range expansion was addressed by sending a questionnaire to all BTO Regional Representatives, requesting the following information for 1995-1997 for each 10-km square in Britain: a) presence or absence of each species during the breeding season; b) if present then they were asked for the number of confirmed breeding pairs, the number of possible breeding pairs and the number of male and female sawbills of unknown breeding status. Confirmed breeding was indicated by the presence of young, evidence of nesting or pairs

performing courtship displays. Possible breeding was recorded if pairs were seen together in suitable habitat during the breeding season.

Purpose of Data Capture

To estimate the overall numbers and distribution of Goosanders and Red-breasted Mergansers along the rivers of Britain and to compare these with similar figures produced by the 1987 survey.

Geographic Coverage

300 stretches of river (of variable length) which had been surveyed in 1987 were selected for survey (222 were actually surveyed) and from all of Britain although in practice they were all from the known breeding range of the species primarily in northern and western Britain.

Temporal Coverage

Early March to mid-April 1997.

Other Interested parties

This survey was part of the larger project funded by the then Department of the Environment, Transport and the Regions (DETR) studying the ecology and impacts of fish-eating birds in Britain. (The relevant parts of DETR have now become part of Defra.)

Organiser(s)

Rebecca (Becky) Harris then Mike Armitage, with help from Dr Chris Wernham.

Current Staff Contact

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Publications

The main report of the survey has only been published as a BTO Research Report: Armitage, M.J.S., Rehfisch, M.M. & Wernham, C.V. 1997 (Published Feb 2005). The 1997 Breeding Sawbill Survey. *BTO Research Report 193*: 1-50.

The survey was noticed in *BTO News* numbers 207 and 225.

Available from NBN?

No.

Computer data -- location

BTO Windows network central area.

Computer data -- outline contents

The original data files from the survey and a copy of the 1987 survey data included for comparison. However this file has a very slightly different number of data lines.

There are also copies of some of the analysis programs, electronic copies of forms and instructions.

Computer data -- description of contents

Contents of the directories:

The data files contain: River details: 10-km square; Planned 6-figure starting grid reference sent out to observer; Planned 6-figure finishing grid reference sent out to observer; Planned number of 1km river stretches in section; Actual 6-figure starting grid reference recorded by observer; Actual 6-figure finishing grid reference recorded by observer; Altitude (m) at recorded starting point; Altitude (m) at recorded finishing; Actual number of 1km sections recorded; number of river stretch; Width of river; Nature of flow of river; Bankside vegetation cover; Numbers of Goosanders; Red-breasted Merganser; unidentified sawbills; Cormorants; Herons; Kingfishers. Other files contain a listing of the river stretches to be surveyed, copies of the forms and instructions, data as originally input, copies of various reports and some analysis programs.

Information held in BTO Archives

1 archive box containing all the data sheets.

Notes on Access and Use

Other information needed

Notes on Survey Design

The 1987 Sawbill Survey sampled approximately 9000 1km sections of river, half of these in spring and half in summer, with a mean length of a surveyed stretch of 8.2km (range 1-50km, median 7km). The 1997 survey counts were made only in spring in order to concentrate on quantifying numbers of adult males. When selecting stretches of river for survey in 1997 a number were excluded from the 1987 dataset. These were all stretches not counted in the spring survey period, stretches which were duplicates of previous counts, and non-river sections of a stretch (eg lochs). This left 615 river stretches in the 1987 dataset, and only data for adult male Goosanders were used in the simulations. For the 1997 survey, abundance and presence data from the 1988-1991 Breeding Atlas were used to create a stratification scheme and the resulting population estimates, obtained using bootstrap simulations, were compared with those based on simple random sampling.

A potential alternative stratification scheme, based on regional variation in Goosander densities measured in the 1987 survey, was not considered further for two reasons: 1) although there was considerable variation in Goosander density between the 11 regions of Britain used in the 1987 survey, the number of stretches within each region was inadequate to use each region as a separate stratum. Stratification using these regions would have necessitated the amalgamation of non-adjacent regions (based on similar Goosander densities), resulting in strata not dissimilar to those based on data from the Atlas; 2) more importantly, if the data used to test the stratification were the same as those on which the stratification was based, interpretation of a result indicating that the regional stratification was superior would be problematic.

The 10-km squares from the 1988-1991 Breeding Atlas containing Goosanders were put into three strata: HIGH abundance (>0.2 birds per tetrad recorded, 208 10-km squares); LOW abundance (>0 to 0.199 birds per tetrad, 187 10-km squares); and PRESENT (birds recorded in the 10-km square but not during timed counts, 279 10-km squares). Each river stretch from the 1987 Sawbill Survey was matched to one of these using the starting grid reference for the river stretch. 455 river stretches were matched in this way (171 'HIGH', 119 'LOW' and 165 'PRESENT') but 162 stretches could not be, of which 52 had Goosanders recorded in the 1987 survey. The majority of these 162 started in a 10-km square adjacent to square(s) in which Goosanders were recorded in 1988-91. Therefore, all river stretches which started in 10-km squares adjacent to occupied squares were included in a fourth stratum ('EDGE', 139 stretches) for the simulation study. Using these four strata all but 21 river stretches surveyed in 1987 could be used in the simulation study (containing a total of 860 adult male goosanders) to select the sample stretches for the 1997 survey.

As it turned out the stratification scheme had little influence in increasing the precision of the estimate of numbers, even when stretches were sampled in proportion to the variation in Goosander density within each stratum. It was decided therefore to use the stratification proportional to the number of river stretches in each stratum, and attempt to re-survey 500 river stretches. These were 144 stretches from HIGH, 100 from LOW, 139 from PRESENT and 117 from EDGE strata. All-10 km squares which did not record Goosander either during the Atlas survey or during the 1987 Sawbill Survey were addressed using the 'questionnaire survey', as were the 23 squares containing river stretches which were surveyed in 1987 but did not fall into the 'EDGE' stratum for the purposes of the simulation study.

Details of the stretches to be re-surveyed were then sent to the BTO's Regional Representatives, but it was decided that the total length of river to be re-surveyed was far in excess of what was practically possible. Removing the longest stretches from the analysis (eg all those >20 km, 2% of the stretches) was shown to have little effect on the precision when the simulation was repeated with samples of 100 and 500 stretches. A pragmatic approach was therefore taken to reach a compromise between statistical precision and feasibility of coverage. Of the random sample of 500 stretches which had already been sent out to Regional Representatives, all stretches greater than 20km in length were removed, as were three stretches not following the course of a river. A sub-sample of 300 stretches was then extracted randomly from the remaining sample proportional to the number available in each stratum.

Specific Issues for Analysis