Wintering Bitterns in Britain

Colin J. Bibby

The Bittern *Botaurus stellaris* currently numbers less than 50 pairs in Britain and is becoming scarcer (Day & Wilson 1978). It has long been known to be susceptible to severe winter weather (Rivière 1930), which may temporarily affect the population levels or even distribution in countries at the north of its range such as Sweden, Britain and the Netherlands (Cramp et al. 1977).

Bitterns winter widely in Britain but it is uncertain whether such movements are regular migrations as occur in the north and east of their range, or dispersals in response to cold weather. Ringing recoveries indicate that some Continental Bitterns visit Britain in winter, while Bannerman (1957) suggested that British breeders may starve to death rather than move in freezing conditions. Ringing evidence further suggests that there may be rapid post-breeding movements, as found in the case of the Grey Heron *Ardea cinerea* (Rydzewski 1956), but the Bittern's low numbers and skulking behaviour make such movements hard to detect. Thus, non breeding season movements and distribution of Bitterns in Britain are neither well known nor understood.

Numerous reports of Bitterns in a cold spell in early 1979 prompted this investigation which was later extended as a retrospective analysis back to 1960. The paper aims to describe the patterns of winter occurrence and mortality of Bitterns in Britain and relate them to the weather. The implications of winter weather in population fluctuations and the origins of wintering Bitterns are discussed.
Sources of information
Details of occurrences in winter 1978/79 were collected by publishing requests for information in *British Birds* and *BTO News*, and records back to 1960 by study of county bird reports. Details of unpublished records and of those missing from bird reports were checked by correspondence with county bird recorders. All records were collected for individuals away from the few known breeding sites. In cases where a series of records came from a single location, this was assumed to be only one bird unless there was evidence to the contrary. Every attempt was made to eliminate duplication caused by overlapping reports and varying place names.

Weather data were provided by the Wildfowlers' Association of Great Britain and Ireland, having been extracted from Meteorological Office records for another purpose. The records from twelve stations spread around Britain were of ground conditions at 09.00 GMT. If the ground was snow covered or frozen at more than half of the stations, the day was scored as having a frost. For analytical purposes, the number of frosts so defined each winter (from November to February) was used as the measure of winter severity.

Winter numbers and weather
In most winters since 1960, the total number of Bitterns reported away from breeding places has been between 30 and 100. In the exceptional 1962/63 winter there were 110, and in 1978/79 an unprecedented 189. The number recorded each winter was strongly correlated with the severity of the weather as described above (fig. 1, \( r_{17} = 0.697 \)). The relationship was still significant if the two extreme winters were omitted (\( r_{15} = 0.474 \)).

Although the 1978/79 winter was less severe than that of 1962/63, it produced more Bittern records. This may in part have been due to special efforts to acquire records, some of which would not normally have found their way to recorders and eventual publication in county bird reports. It is more probable, however, that the winter of 1962/63 was under-recorded at a time when there were fewer birdwatchers, and bird reports were of a less high standard than nowadays. I tested this possibility by correlating the ratio of Bittern records each winter to that expected for the weather (fig. 1) with the membership of the BTO. There was a significant relationship (\( r_{16} = 0.517 \)), which suggested that the growing strength of birdwatching (as measured by BTO membership) has raised by 70% the chances of a Bittern being reported over the last 20 years. Thus, at present-day levels of birdwatching and recording, the 1962/63 winter would probably have produced about 190 records. On the other hand, the exceptionally severe weather of 1962/63 may have forced Bitterns farther south in Europe, so that there were genuinely fewer in Britain than in 1978/79.

Mortality
Of the 1,299 records in 19 winters, 154 (11.9%) were reported as dead or described in such terms that they would presumably have died if not taken into care. In most winters, the numbers dead were below ten, but there were 36 (32.7%) in 1962/63 and 54 (28.6%) in 1978/79. The percentage of
records referring to dead birds was correlated with the severity of the weather (fig. 2), so Bitterns were not only more likely to be recorded in Britain in cold winters but also individually more likely to die.

1. Bittern *Botaurus stellaris*, Netherlands, December 1977 (P. Munsterman)
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Do cold winters influence breeding numbers?

Breeding population figures for Leighton Moss in Lancashire, Minsmere in Suffolk and two major Norfolk Broadland sites (Hickling and Horsey) were extracted from Day & Wilson (1978) and updated (J. C. U. Day in litt.). The annual totals for these sites, which represent about half the British population, were taken as a national index of Bittern breeding numbers, since full details for other sites cannot be traced every year back to 1960.

Changes of populations from year to year show no significant relationship with the severity of the intervening winter (fig. 3). The 1962/63 winter did produce the greatest population drop (−30.0%), though, as shown by Day & Wilson (1978), this affected East Anglian populations (−41.0%), but not that at Leighton Moss (+33.0%). The winter of 1978/79 produced no population change in spite of the large number of birds found dead. Thus it seems that winter weather conditions have no regular effect on Bittern breeding numbers in Britain, though atypically severe winters such as 1962/63 might cause small population declines. The population in East Anglia might be more susceptible to unusual cold weather mortality than that at rarely-frozen Leighton Moss. In East Anglia, however, year-to-year population changes were also not significantly correlated with the severity of the intervening winter.

Timing of movements

All records with an identified date (or first date for a series from one place) were extracted by year. Although there were autumn records in all years, sometimes as early as July, sightings in the period September-November were at a fairly uniform level; numbers rose sharply in December, reached a
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peak in January, and then declined steadily to a low level by late March (fig. 4). Thus, it appears that most Bittern movements occur in early winter, at the time when hard weather becomes probable (perhaps especially on the Continent). Return movements are largely over by the breeding season.

Small year-to-year variations in the pattern were detectable, and these were largely explicable by weather factors. For instance, 1975/76 was a mild winter, with its only cold spell from 24th January to 3rd February: this produced an unusually late flush of Bittern records.

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Geographical distribution and habitats

The distribution of winter Bitterns is shown in fig. 5. Minor peculiarities in this pattern are probably due to varying standards of recording (for instance, the relatively few records for Suffolk) and to varying suitabilities of different counties for Bitterns (for instance, the inferiority of Sussex compared with Kent and Hampshire). Generally, however, the pattern shows a clear bias to the southeast, with a markedly higher incidence of records between Norfolk, Kent and Dorset than elsewhere.

If the Bittern is a cold-weather mover, we might expect records to be more western in more severe winters. This possibility was tested by dividing the records into seven regions and three groups of winters (mild, ordinary and bitter). There were no signs of heterogeneity in these records ($\chi^2_{12} = 20.44$, n.s.). Thus, the extent of immigration is influenced by winter severity, but the subsequent distribution of Bitterns in Britain is not.

Little special effort was made to investigate the winter habitats of Bitterns, but several features stood out. The species is very catholic in

![Figure 3. Year-to-year change of breeding number of Bittern Bolanus stellaris in Britain, plotted against number of frosts in intervening winter.](image-url)
winter, occurring in all manner of rank waterside vegetation at gravel-pits, fish farms, cress beds, reservoirs, ditches, riversides, sewage-farms and other small wetlands. By contrast, in summer in Britain it is virtually confined to dense areas of wet reedbed. In freezing weather, Bitterns seem to seek out open water, which produces numerous riverside records as well as weakened birds in highly unsuitable places (bus stop at Stoke Newington in London, central reservation of motorway at Durham, and shop window at Gravesend in Kent). Several places hold wintering Bitterns regularly or for small runs of winters and it is tempting to suggest that some individuals may be faithful to wintering sites.

**Age, sex and measurements**

Various details were collected from 19 of the 54 Bitterns found dead or dying in the 1978/79 winter. Ten were aged on plumage characters: six were adults and four in their first year, so movements are not made predominantly by young birds. All 19 were sexed either by dissection or by measurement (Cramp et al. 1977): there were ten males and nine females.

Measurements of wing, tarsus, central toe, bill and tail agreed with the small samples of skins from the Netherlands (Cramp et al. 1977). Three males had had accidents, but were apparently in good condition, with weights of 960g, 1,162g and 1,360g. Males in poor condition weighed 661g, 680g, 715g, 796g and 998g, and females 392g, 420g, 480g, 587g and 661g. These figures (males mean 770g and females mean 498g) are slightly at variance with those from Cramp et al. (1977), with the males being heavier and the females lighter (males $t_{12} = 2.284$, $p<0.05$; females $t_{20} = 1.331$, n.s.).

Fig. 4. Dates of occurrences of Bitterns *Botaurus stellaris* in Britain away from breeding areas for winters from 1960/61 to 1978/79. Records assembled by standard five-day periods.
Discussion

The findings presented in this paper suggest that there are two classes of non-breeding Bittern records. Occurrences from as early as July and at a steady—if low—level throughout the autumn show that some movements are unrelated to the severity of the winter. This conclusion is supported by the prediction from fig. 1 that a frost-free winter would still produce some 20-30 records. Some of these birds may well be post-juvenile dispersers, possibly of British origin.

Since Bitterns are so difficult to detect, it is very hard to tell whether the British breeding populations are sedentary. At Leighton Moss, where booming starts sometime in January and most males are vocal by mid February if not before (J. Wilson in litt.), it seems most unlikely that many could have had a winter absence. Furthermore, the level of sightings (never high) is believed not to vary much throughout the year. At Minsmere, by contrast, sightings are very few in winter, even in cold spells, and it is believed that as much as three-quarters of the population may be absent for the winter (J. Sorensen in litt.). Booming does not start until one to two months later than at Leighton Moss.

It seems, therefore, that British breeding populations contribute some but not all of the non-breeding spread of records. There are several reasons to suggest that Bitterns appearing in the November-February period probably have a Continental origin. Their distribution (fig. 5) differs from that to be expected from movements of the British population, whose bulk (at least 60%) is in East Anglia with another stronghold at Leighton Moss, with very small numbers elsewhere (Wales, Lincolnshire, Somerset and Kent). On the other hand, the winter distribution, with large numbers in
south and east England, might be expected of birds arriving via the Low Countries.

A further reason to suggest Continental origin is the numbers involved: 189 individuals were recorded in 1978/79. With their catholic winter habitats and secretive behaviour, it is hard to believe that this could have been as much as half the actual numbers present. Recent British breeding populations have been under 50 pairs, so total autumn numbers could barely exceed 200 individuals. Thus, for British populations to explain the winter records, it would require total emigration from breeding places and 100% probability of an individual being recorded by birdwatchers at its wintering place. That Continental Bitterns winter in Britain is further supported by a limited number of ringing recoveries (not many Bitterns are ringed). These have come from Sweden (2), Germany (2), Belgium (2) and the Netherlands (2).

In 1978/79, 54 Bitterns were found dead or dying. Again, it is impossible to guess the probability of a dead Bittern being found; it must be low, although weakened and emaciated individuals may wander about rather conspicuously and have a good chance of being found (but not necessarily by someone who would report them). Such mortality, if it was confined to the British population, could hardly have failed to have had a substantial impact on the breeding numbers in 1979. Population changes on the Continent are less well known, but several declines were reported between 1978 and 1979 (Day 1981). British Bitterns must have suffered no more than normal winter mortality in spite of the weather. Perhaps they benefit from familiarity with their ranges while immigrants may not arrive until weather conditions make it difficult to find adequate feeding places.

The evidence of fig. 2 suggests that, although differing numbers of Bitterns occur every winter, they suffer high mortality only in the colder years. In normal winters, many obviously survive in their varied wintering places; indeed, there are numerous records of individuals spending long

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2. Bittern *Botaurus stellaris*, Netherlands, December 1977 (P. Munsterman)
periods at particular sites. It is possible that these winter movements are responsible for the maintenance of the breeding distribution of the Bittern by providing colonists at remoter suitable sites, and by boosting established populations. In Britain, it is notable that such a scarce bird, whose exacting habitat requirements are met at only a limited number of scattered sites, is able to maintain several small breeding populations very distant one from another. The lack of site fidelity that such a process would require is known in the case of the better-studied Grey Heron, which also has extensive and partially unpredictable movements (Dementiev & Gladkov 1969). This should give heart to conservationists, since it suggests that, if suitable habitats are maintained or even developed, their remoteness from each other should not be a major obstacle to the Bittern.

Another point that can be taken as welcome news is that there continue to be enough Bitterns in northwest Europe to produce 189 records in one winter in Britain. It might be possible to use the number of records each winter as a population monitoring device, having made due allowance for the weather and the strength of birdwatching. In the present case this is not possible because any long-term trends in north European Bittern numbers would not have been detected separately from the changing effect of birdwatching. Some other measure of the latter could be obtained and tested independently.

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Summary
Between 30 and 100 Bitterns Botaurus stellaris are normally reported away from breeding areas each winter in Britain, the number being correlated with the severity of the winter. A record 189 occurred in winter 1978/79. Mortality (mean 11.9%) also increased with the severity of the winter, but was found to have no effect on year-to-year breeding population changes in Britain. The timing and distribution of records is described. It is suggested that some British breeding Bitterns emigrate in early autumn, but most of the variable number of Bitterns in Britain in winter are of Continental origin.

References
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Dr Colin J. Bibby, RSPB, The Lodge, Sandy, Bedfordshire SG19 2DL