

CHAPTER 1 INTRODUCTION

1.1 BACKGROUND PERSPECTIVE

The determinants of distributional patterns of animals are poorly understood and complex. In his recent critique, Wiens (1989) states that "the ecological suitability of a site from which a species is missing is not easy to determine, [and that] species often are absent from seemingly suitable sites within their geographical range". He further points out that "ecological tolerances of species dictate the environmental situations they occupy," and that "evaluation of habitat relationship has become an important part of wildlife and resource management". Trying to interpret the factors controlling the distribution of rare species is, therefore, likely to be a difficult, but important, area of conservation related research.

The Red-billed Chough is the rarest member of the crow family (Corvidae) to breed in the British Isles. Many geographical races represent the species across a Palearctic range from the Mediterranean Basin in the west to the Far East (Dementiev & Gladkov 1951; Figure 1.1). Within Britain (Figure 1.2), the Chough is now absent from a substantial part of its former range. An understanding of the reasons behind the retraction of the Chough's range in Britain is central to any discussion of the causes of the change in status. Moreover, such an understanding may help to explain the distributional pattern elsewhere, thereby assisting the conservation of the species. In the next chapter, I shall show why such conservation might have broader implications.

An isolated sub-population, amounting to <20 pairs, still survives in the Breton region of NW France (Guermeur & Monnat 1980; Figure 1.2). Vaurie (1959) recognised 7 subspecies and assigned the Breton population to the race *erythroramphus* of the Alps, Italy and Iberia, whereas Witherby *et al.* (1943) included it with the nominate race (a practice followed by recent authors). In Britain and Ireland, the distribution of the Chough now has a profound bias to some of the more rugged and remote sections of the west coast (1.3.2; Figure 1.2).

Until the early 1970's the nearest population to France was in Cornwall - approximately 80km across the English Channel (Figure 1.2). The last surviving wild Cornish Chough died in 1973 (B. Boothby, pers. comm.): the final act in a decline which had been occurring progressively in southern England throughout the C19 (Bullock *et al.* 1983a; see Section 3.4.2). Thus the retraction inclined northwards, with the population in SW ('West') Wales (Pembrokeshire) becoming the southern limit of the remaining British stronghold and the French population becoming synchronously isolated.

The Chough is the emblem of the Duchy of Cornwall. It is regarded by most Cornish people as their national bird, and it is a matter of considerable local pride embraced in Arthurian legend that it should some day return.

This somewhat subjective desire has found expression within Cornwall for many years, and has recently been fuelled by national and European conservation interest in the species (*i.e.* EC Directive 1985) designed to afford protection within the greater European continent. Consequently, attention has been focussed on the status and biology of the species, notably in North Wales (see, *e.g.* Bullock 1980, Roberts 1985), western Scotland (see, *e.g.* Warnes 1982, 1983; Still 1989), Ireland (Cabot 1965, Bullock *et al.* 1983b) and the Isle of Man (see, *e.g.* Bullock & del-Nevo 1983, Bullock *et al.* 1983c). The southern limit of the range appeared to require similar effort in order to help guard against a continued northward retraction (see Bignal & Curtis 1989 for overview).

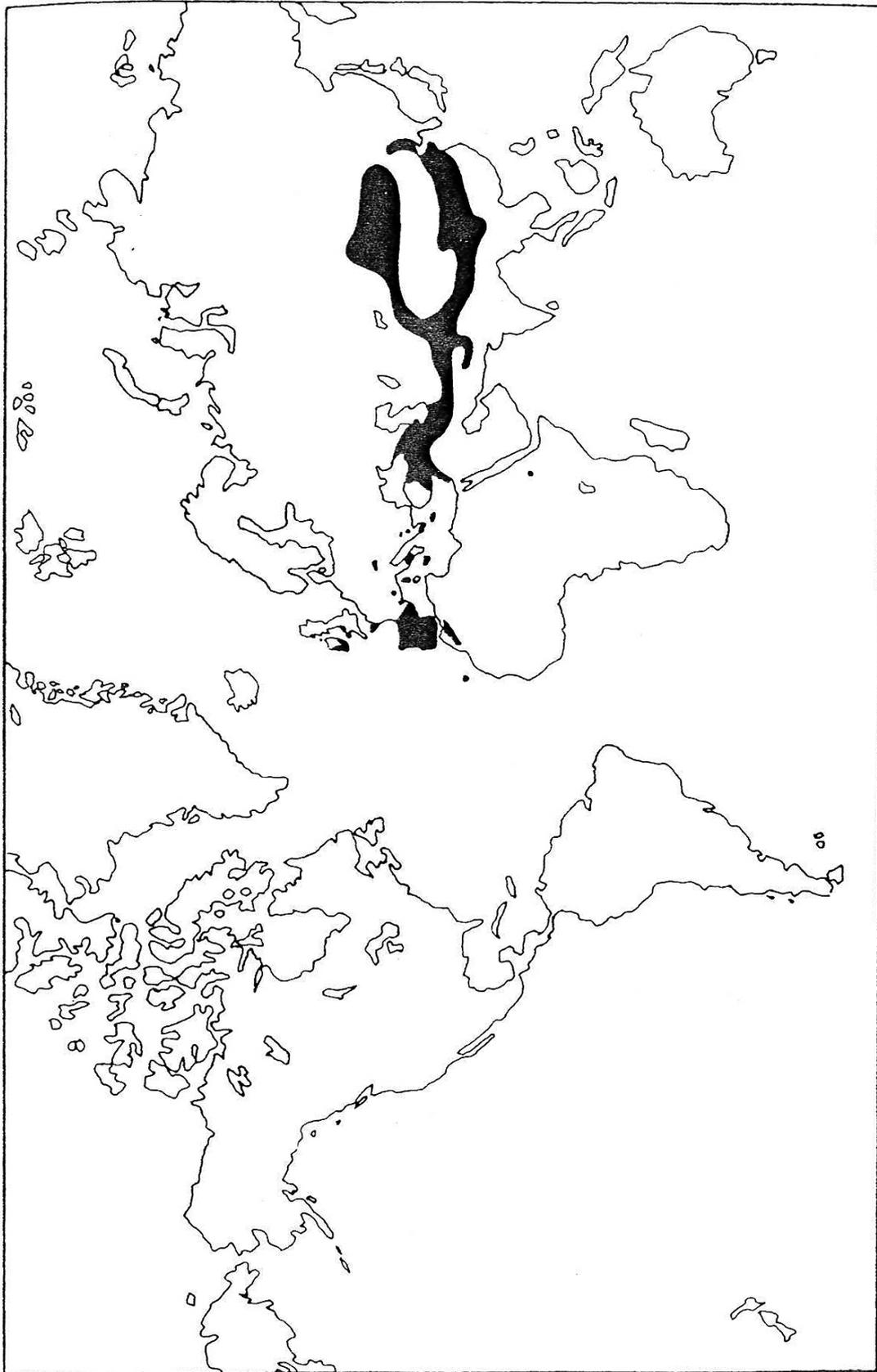


Figure 1.1
World range of Red-billed cormorant *Pyrrhocorax pyrrhocorax* (after Coombs 1978)

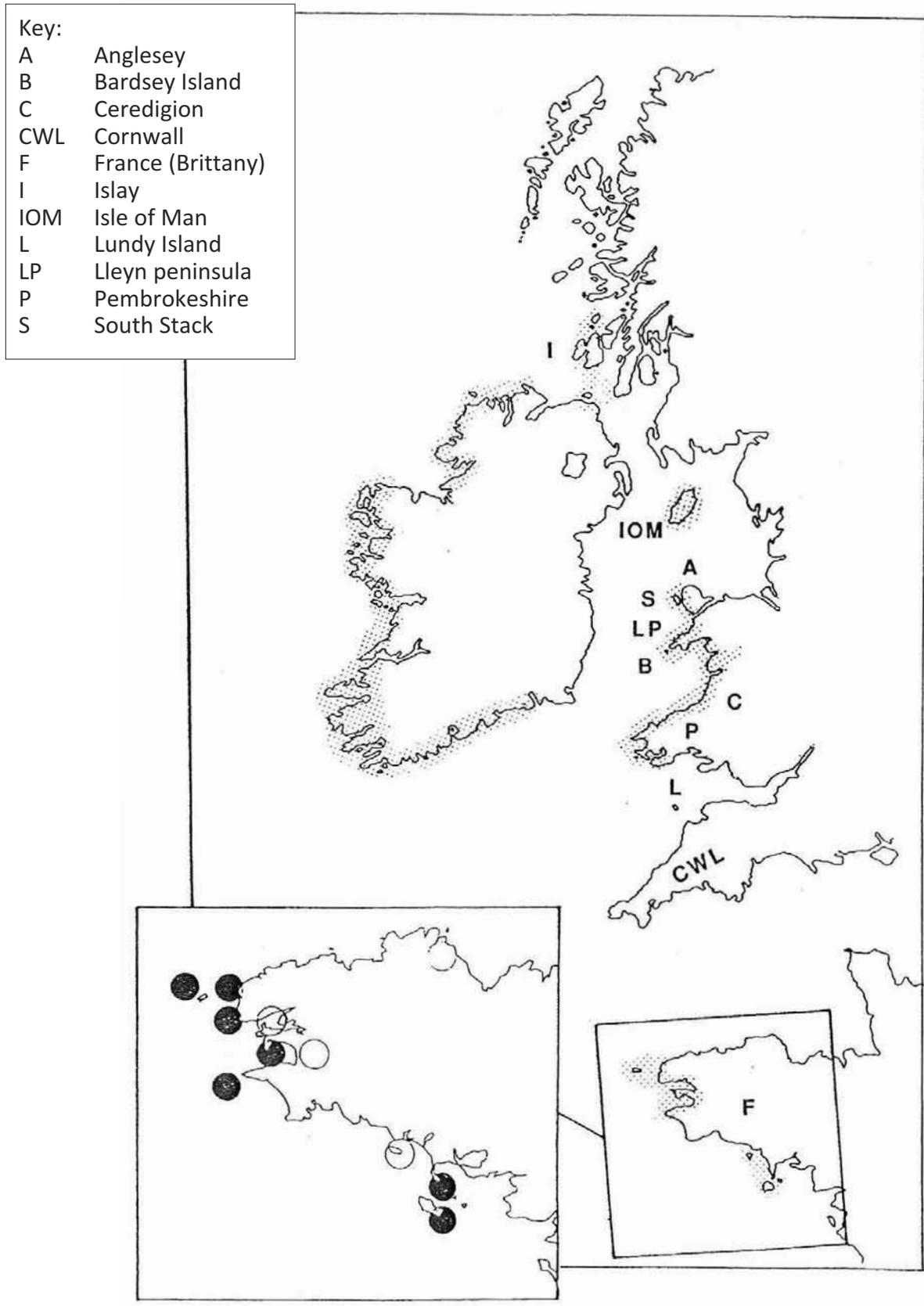


Figure 1.2
 Distribution of the Chough in Britain, Ireland and Brittany, France (after Sharrock 1976, Guerneur and Monnat 1980, Lack 1986), showing also position of Cornwall, Lundy Island, Channel Islands. Stippling denotes breeding areas. Closed circles denote confirmed breeding and open circles denote possible breeding in Breton range

The study was bolstered by a timely opportunity to study wild Choughs in Cornwall when two individuals of unknown origin spent several months in the county during 1986 and early 1987 (see Appendix IV). These birds spent more than 90% of available time actively hunting for food, and helped concentrate the subsequent focus of the main study. By investigating the Chough's feeding ecology in West Wales (principally Pembrokeshire) and by relating these findings to the current situation in Cornwall, the study addresses the question "Can Cornwall support Choughs today?". It also examines factors which control the general distribution pattern of the species (see Sections 1.2 and 3). The ecological study is compared to a habitat assessment in which 185 1km squares in the Welsh and Cornish regions (2.2) were surveyed for quality of habitat. In order to best understand the reasons for the original decline, an historical survey was undertaken which included an analysis of changing land-use practices for 150 years since the 1840s within the coastal kilometre squares of the same two study regions (4.6).

1.2 OBJECTIVES AND RATIONALE OF THE STUDY

The specific objectives of the study are set out in Table 1.1.

Table 1.1 Specific objectives

1	Establish causes of decline of the Chough in England (principally Cornwall)
2	Investigate its feeding ecology in West Wales (principally Pembrokeshire)
3	Relate Welsh findings to current Cornish habitat state in order to establish current suitability for Choughs
4	Recommend management strategies to enable more effective conservation in existing Welsh range
5	Recommend management strategies to improve Cornish habitat

Because of the endangered status of the species, included within Annex I of the EEC Directive of Wild Birds, and particularly in Britain of the nominate race *Pyrrhocorax p. pyrrhocorax* (Schedule I status, Wildlife and Countryside Act 1981), considerable local Cornish and wider scientific interest in the project was evident from the beginning and lay behind its original conception.

In broader terms, beyond the question "Can Cornwall support wild Choughs?", advice is formulated on habitat management and other conservation strategies which is relevant to the further conservation of the Chough throughout its range. The Chough is increasingly seen as a 'flagship' species (Bignal & Curtis 1989), representative of quality habitat, *e.g.* species-rich habitat. In his Introduction to the 'International Workshop on the Conservation of the Chough in the EC', held in Pembrokeshire in 1988, Pienkowski (1989) described the Chough as being "generally associated with sensitive, threatened, semi-natural agricultural systems." He went on to say:

"All areas supporting good Chough populations have forms of pastoral agriculture which are in sympathy with the natural environment. These areas tend to hold many other features of nature conservation interest, including their plant communities" and "The Chough can be regarded as an indicator of these diverse environments."

Some of the advantages that might ensue from a viable population of Choughs being established in Cornwall are given in Table 1.2.

Table 1.2 Potential benefits accruing from successful re-establishment of the Chough in Cornwall

1	Increased protection of existing population
2	Extension of existing range
3	Reduced isolation of French sub-population
4	Information resulting in the better protection/management of western maritime cliffs
5	Benefits to cultural and economic interests in Cornwall

To sum up, the present British population would be strengthened and the decline reversed in a visible way; the Breton population would be less isolated, and considerable benefits might accrue to local Cornish interests. More importantly, perhaps, in respect of (4) in Table 1.2, because the Chough is a key species at the top of the food chain for the western maritime cliffs, only superseded by the Peregrine falcon, the maritime cliff environment might be better understood, thus enabling more positive management of a biotope, recognised, in national conservation circles, as a priority (Nature Conservancy Council 1989). One way of illustrating this is by reference to the now extinct but formerly closely sympatric Large blue butterfly *Maculinea arion*: the decline of the Large blue occurred at much the same time as that of the Chough (Thomas 1977). The Chough would have certainly predated upon it; and its disappearance would have been a further check to prospects of Chough survival. An implementation of better understood Chough ecology would have helped protect the Large blue's habitat to both species' mutual benefits.

The Chough has declined markedly across southern Britain in historic times (Bullock *et al.* 1983a, Owen 1985). From these surveys, no single cause seems pivotal (Rolfe 1966), but changes (mainly reductions) in sheep-farming and direct persecution (egg-collecting, shooting and trapping) are presented as being crucial (see also Owen 1989). Competition from other species, notably the Jackdaw was commonly cited as the main cause and is still given some credence today. Other changing agricultural practices, as they affected the Chough's habitat, will also have had an effect, either independently or in concert; the decline is discussed in Chapter 3.

It was decided to assess the quality of ex-Chough habitat in the most recently abandoned area (*i.e.* Cornwall) by examining the Chough's ecological requirements in the nearest occupied region (*i.e.* West Wales). These findings are compared to the results of equivalent background work in Cornwall. It was hoped that from these dual inquiries it would be possible to make recommendations towards an improved ecological management of both regions: specifically, to (i) help preserve the population in West Wales; and (ii) improve the Cornish habitat with a view to possible re-establishment.

1.3 A RESUME OF THE BIOLOGY OF THE STUDY SPECIES IN BRITAIN

1.3.1 DESCRIPTION

The Chough is unique among the British Corvidae in being a specialised, largely insectivorous bird, easy to distinguish at close quarters from the 'typical crows' of the genus *Corvus* (Goodwin 1986). It is a medium-sized crow, measuring 350-400mm long and weighing approximately 250-300g.

Table 1.3 Weights of 15 captive Choughs; sexual status determined by laparoscopy

Sex	Mean wt (g)	SD (g)	N
Female	253.5	37.39	8
Male	285.4	39.5	7

t-value = 1.6, N.S.

Males are often heavier than females but morphological sexual dimorphism is not marked and no significant difference was found in the weights of a small captive sample (Table 1.3). The bill length of 5 sub-adult females ranged from 480mm to 550mm, that of the solitary male available was 560mm; so it is possible that there is a slight overall size difference as well but sample sizes will need to be increased before it is possible to be didactic about this. The overall black plumage ("its feathers are of a much richer velvet black than those of other crows" said Borlase in 1758) has a distinctive metallic sheen contrasting with the vermilion 50mm decurved bill and legs of the same colour. Like Goodwin (1986), I have also recognised in the structure of its bill (Figure 1.3) and predominant mode of feeding (pecking and shallow probing of the substrate, (Figure 1.4) a resemblance to the Hoopoe; indeed, the Chough was named by Linnaeus as *Upupa pyrrhocorax* ('Fire-raven hoopoe'), and its feeding behaviour and bill structure argue against a closely competitive relationship with the Jackdaw (Goodwin 1986; Section 3.3.5) or, indeed, any other Eurasian crow, which have heavy duty bills with a tearing edge, suitable for a generalist predator-scavenger (Waite 1984).

Decurvature of the bill, unique in British corvids, argues strongly for specialised feeding habits (*ibid.*, Davidson *et al.* 1986). The latter authors, in a paper which may be extended to other species, discuss decurvature in the Curlew's bill structure, and conclude, *contra* Owens (1984), insofar as it aids manoeuvrability beneath ground, that it evolved as a means for gentle probing along precise but complex routes. Other species, including the Hoopoe, wood-hoopoes and treecreepers are introduced in defence of this conclusion, and the Chough might well have been. Such bill structure is also helpful in foraging for insects in grassland, a curved bill also aids the extraction of worms (whole) and provides for the longest effective bill commensurate with shorter leg length, necessary to counteract the effect of buffeting in windy conditions (*ibid.*; and see Section 6.4). To a cliff or montane species, especially one which lives on a windswept coastline, long legs would presumably not be selected for.

The Chough has the virtuoso flying skill expected of a bird which habituates such storm-tossed cliffs and which nests in crevices and sea caves inaccessible to most (if not all) other sympatric terrestrial vertebrates. The Chough hunts for its largely invertebrate diet, supplemented in the autumn with cereal grain (see Chapter 5), on these cliffs and adjoining low grade agricultural land.

The most frequently heard vocalisation is an onomatopoeic '*keeah*' or '*t'cheea*' (Goodwin 1986; see Figure 1.5 and Section 2.5.1). Earlier authors, notably Whittaker (1947) and Williamson (1959), and many since, have described it as '*kee-ah*' or '*ch(w)ee-ow*'. The pronunciation of Chough has likely been anglicized to 'chuff' though it is still pronounced 'chaw' or 'chow' in parts of western Cornwall (Beckerlegge 1972, pers. obs.). Observations in captivity and the wild suggests to me that there might be some sexual dimorphism in the call (Figure 1.5) but this requires further work.



Figure 1.3
Skull of a Red-billed Chough; from a Peregrine kill at Strumble, Pembrokeshire



Figure 1.4
Choughs feeding (in captivity)

Peak egg production in Choughs is during April (Holyoak 1967) through to mid-May (Goodwin 1986). Choughs usually lay 3-4 eggs (range 1-6) (Bullock *et al.* 1983a); Goodwin (1986) gives 3-5, exceptionally 2, 6 or 7. The female alone incubates, during which time she is fed by the male. It has not been conclusively established whether or not incubation begins with the laying of the first egg; in all British corvids, with the possible exception of the Chough, hatching is asynchronous (Holyoak 1967). It is therefore possible that, in the Chough, incubation (17-18 days) begins when the first egg is laid. Guichard (1962) and Witherby *et al.* (1943) concur, but Ryves (1948), who had considerable knowledge of the species in Cornwall, asserts that incubation does not commence until the last egg is laid; maybe, as suggested by Goodwin (1986), there is individual variation.

Young Choughs lack the striking red colouration of bill and legs when they leave the nest, usually in late June or early July, and at that time quite closely resemble their only congener the Alpine Chough *P. graculus*. The red colouration is soon obtained, and by August or September they resemble their parents. Both parents would seem to care for the young post-fledging (Cowdy 1962, pers. obs.) despite the statements of some earlier authors, *e.g.* Schifferli & Lang (1941). There is a lack of data on wild Chough mortality (Holyoak 1971a); *ca.* 50% of fledged Choughs on Islay survived for at least two years (Bignal *et al.* 1987a). A longevity of at least 20 years is suggested by the documented histories of the last two Cornish birds: the last confirmed breeding was in 1947 (Penhallurick 1978) and it is believed that these birds or, as is more likely, their offspring, survived until 1967 and 1973. It cannot, of course, be proved that these birds were the same two; the longest proven longevity of a wild Chough is a Bardsey ringed bird of at least 17 years (Roberts 1985). Captive longevity is predictably greater (3.4.6b).

1.3.2 DISTRIBUTION, STATUS AND HABITAT

The present western bias of the Chough has already been noted (and see Figure 1.2). It has a linear distribution and is confined mainly to remote yet grazed stretches of cliff-dominated coastline (Sharrock 1976, Lack 1986); these conditions are best met with on off-shore islands which are large enough to support farming (7.3.2).

The species breeds in isolation and not in colonies, contrary to what is often stated. In Wales and Brittany, this has led to overestimates of population size: observed flocks, especially in spring, are assumed to be breeding pairs rather than surviving immatures and non-breeding adults in unknown proportions (Guermeur & Monnat 1980). In historic times, the distribution was wider (see Chapter 3) although, perhaps, always patchy (Monaghan 1989), with inland components and localities in Scotland as extreme as Cape Wrath at the north and St. Abb's Head in the east (Baxter & Rintoul 1953). Inland breeding sites are notable in Ireland (mainly Co. Kerry): <17km from the coast (Ussher & Warren 1900) and 19km (Bullock *et al.* 1983b). The latter authors showed that these sites were still being used in 1985, similarly for the locations in North Wales. The Welsh sites were situated in coastal quarries <2km inland (n=9); Snowdonia, 8-18km from the coast (n=33); with a further isolated three, as far as 28km inland. Bullock *et al.* (1983a) found that 14% of nest sites in Britain and Ireland were inland: mainly in quarries, mine shafts and derelict or little-used buildings. In Wales (due to the Snowdonia population) and Scotland (predominantly Islay) the figure is just over 30%. Irish and Manx figures of *ca.* 8% but of a far greater base (*ca.* 700 prs and 55 prs respectively) account for the lower overall percentage. On Islay, inland nest sites in man-made sites have increased from zero in the early 1970s to 25-30% (Bignal *et al.* 1987, 1989) possibly due to an increase in the population consequent upon more effective protection and a spill-over from preferred natural sites. If so, it not only suggests that, prehistorically, Choughs might have been found wherever there was sufficient good year-round feeding habitat and nest sites for breeding birds, and support ground also for non-breeders (see Bignal *et al.* 1989), but also that a similar expansion within the usual dispersal range is possible.

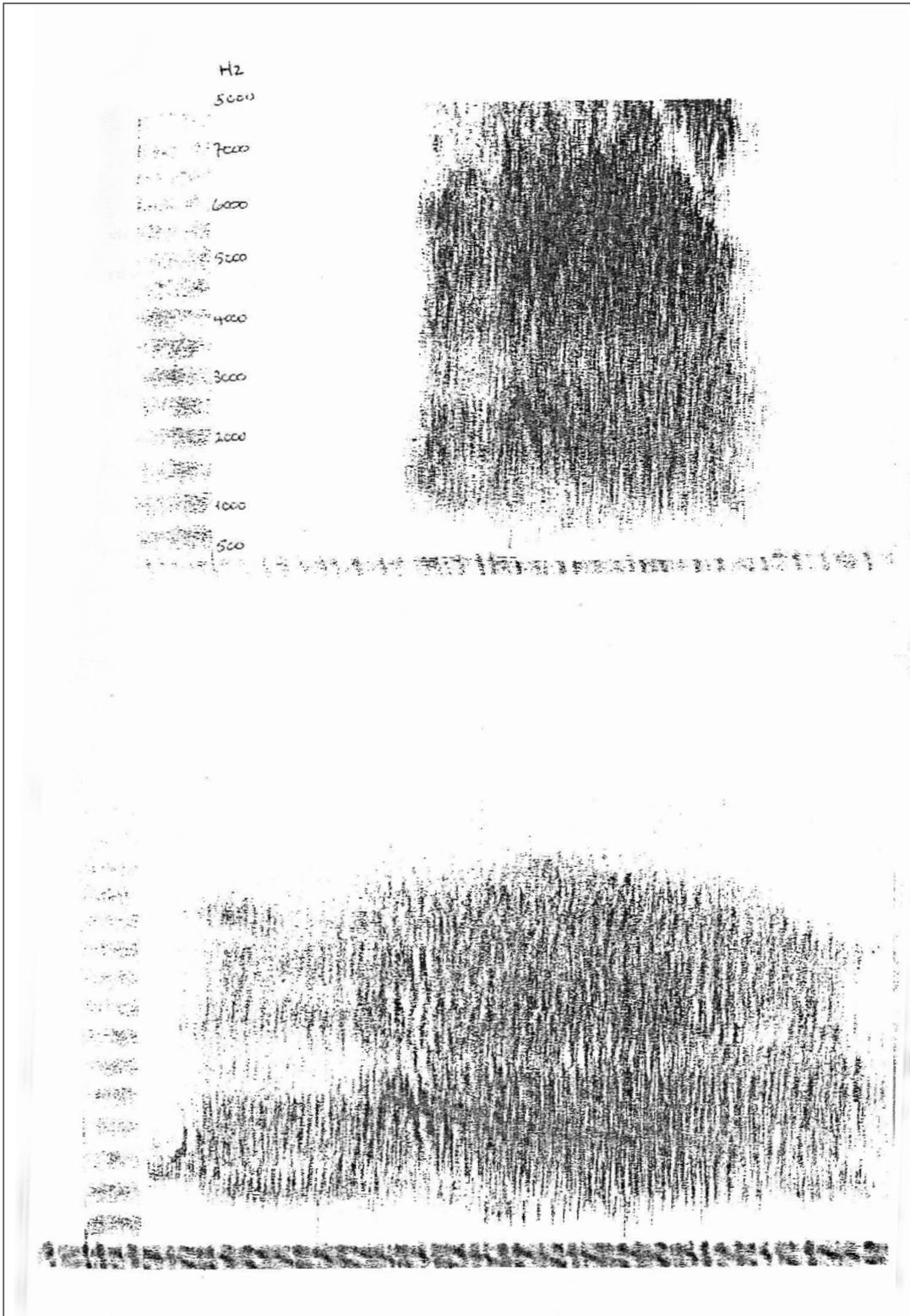


Figure 1.5

Sound spectrograph of Chough calls. A known true captive pair (sexed by laparoscopy) calling in unison. The provisional graphs support the idea that the sexes can be differentiated by their voice.

Top: the call pattern in real time, .63 seconds duration; indication of of point at which second bird call commences, note disjunction of pattern up to and above the 3,000 Hz.

Bottom: the same call at half speed. Density of pattern represents volume.

Classically, though, in Britain, Choughs associate with maritime cliffs. Ratcliffe (1980), in describing the cliff-bound seaboard of SW England for the Chough's only real predator, the Peregrine (3.3.5), also conveyed an accurate impression of Chough habitat:

"...in this strong oceanic climate, the soils tend to be relatively acidic and infertile. The farms have less arable land and a prevalence of permanent grassland. There was once a large extent of unenclosed rough pasture and heathland with heather, bracken and gorse at the back of many stretches of cliff, but the war on unproductive land has spread here; and many such areas have been 'reclaimed'. The combination of plough, fertiliser, pesticides and seed-drill have increasingly brought the enclosed land right to the cliff edge, and much of it is now arable. Some areas ... remain, but here again myxomatosis and the demise of the rabbit have often been followed by development of dense scrub, especially with gorse and brambles."

In Section 3.4.6e, gross changes in land use as they might have affected Choughs are discussed, and in Chapter 4 an attempt is made to assess the change.

The changes in Chough status have received more attention. Bullock *et al.* (1983a), updating and reanalysing an earlier census (Rolfe 1966), showed little change in numbers (2635-2776 individuals, of which 31-32% were non-breeding individuals) or in distribution (*cf.* Sharrock 1976). The population in Wales in 1982 (the most recent full census) was estimated as 139-142 pairs + >100 non-breeders; a "probable increase" since 1963 (Bullock *et al.* 1985). The two strongholds for the Chough in Wales are Caernarvonshire in the north and Pembrokeshire in the south, which support 72% of the Welsh breeding population (*ibid.*). Donovan (1972), midway between the two major censuses, estimated 46 pairs; Rolfe possibly underestimated at 33-36 pairs. The inland population of Snowdonia is about 25 pairs, half that given by Lovegrove (1987) although he might have been including some coastal pairs. A recent census in Scotland revealed 105 breeding pairs, 90% of which were on Islay (Monaghan *et al.* 1989). The population on the Isle of Man represents about 6% of the total for Britain and Ireland: 49-60 pairs (Bullock *et al.* 1983c), approximately the same as for Pembrokeshire.