# CHAPTER 6

# LONG TERM AMPHIBIAN MONITORING SCHEME

## 6.1 Introduction

In order to formulate national conservation strategies it is necessary for the country agencies to be aware not only of current wildlife resources, but also of how they might be changing and the probable agents of change. Chapters one to five of this report provide information on the current amphibian resource in Britain, but the dynamics of the species' status can only be assesed by longer term studies.

Circumstantial and anecdotal evidence exists supporting claims of amphibian declines in Britain in the second half of the twentieth century. Chapter four presents circumstantial evidence in the form of data which indicate that the number of potential amphibian breeding sites, (small water-bodies), has decreased by just under one fifth in the last twenty years; and anecdotal evidence is included in papers and reports dating back to the 1970s in which interviewees report local changes in species status (eg Cooke 1972, Cooke and Ferguson 1974, 1976, Cooke and Scorgie 1983, Hilton-Brown and Oldham 1990).

Further circumstantial evidence may be derived from data collated and analyzed in chapter five from which associations between amphibian species' presence and particular habitat components are inferred. From national statistics, (eg MAFF statistics) it may be possible to determine the extent of losses or gains of apparently important landscape features throughout the country from which to calculate, by extrapolation, the potential effects of land-use changes on amphibian status. However, the national survey pond data are time-specific, and although they were the basis for the generation of general guidelines for landscape enhancement for amphibians, provide no specific insight into the consequences of local environmental changes. For example, if a housing

estate is developed on an area of crested newt terrestrial habitat next to a breeding pond, how might this affect the newt population in the long term? One might envisage an initial decrease in torch or trapping counts during the years immediately following the construction work, but subsequently at least three outcomes are possible:- 1) population size equilibrates at a lower level; 2) population continues to decrease until extinction; or 3) population rises after the initial decrease as newts utilise new garden habitats. Thus, in order to assess the effect of changes in agricultural or industrial practice or human demography on amphibians, more specific knowledge of the ecological processes and time-scales involved is required. This could be achieved in two ways: firstly, by experimentation in closely controlled artificially manipulated situations, or secondly by following the fates of amphibian populations nationwide in non-manipulated but closely monitored sites. The second is the most appropriate option in the context of the national survey where a wide choice of sites is available throughout the country. Ideally, the selection of sites for the national monitoring scheme would have been entirely objective, choices made solely according to geographical, climatic and land-use criteria; and the site monitors would have been contracted subsequently. In the event, however, action was dictated by resources, and the scheme was organised around the voluntary recorder network, the only costs involved being the recorders' travel expenses. Sites were therefore selected initially from the national database according to physical criteria, but ultimately the composition of the final sample depended on the willingness of their original recorders to undertake surveying on a regular basis in the long term.

This chapter describes the site selection criteria and the choice of sites from the national database, the prescription for the survey methodology, and the subsequent recorder response.

## 6.2 Site selection criteria

### 6.2.1 National site distribution

Climate, topography, geology, soil-type and land management all potentially affect amphibians, probably interactively. Thus, in order to devise a nationally representative scheme, the country was initially divided into a series of "zones" to encompass the national range of broad geographical variations. The zonation was based upon two existing land classification systems: the Agricultural Land Classification System (MAFF 1966), Swan and Oldham (1989); and the Institute of Terrestrial Ecology (ITE) Land Classification Scheme (Bunce *et al.* 1981a,b Barr 1991 pers comm).

The former classified land according to its potential and actual agricultural productivity; eg much of central England is grade III land - lowland and productive of both arable crops and livestock - but at the extremes, most of Scotland north of the highland boundary fault consists of grade IV and V land, marginal hill farming country. Much of Kent, on the other hand, under intensive fruit cultivation (MAFF 1966), consists of grades I and II.

The ITE system was developed to provide a framework for national ecological surveys. Initially, existing climatic, topographic, geographic and geological data were obtained from a gridded sample of 1,228 mapped one-kilometre squares. Multivariate analysis of the data (Indicator Species Analysis: Hill, Bunce and Shaw 1975) produced 32 identifiable "land classes"; a further 4,800 squares has since been classified, the total of 6,028 $km^2$ representing about two percent of the surface area of Britain. The system has been used as the basis for national ecological surveys in 1978, 1984 and 1990 in which progressively more detailed information has been recorded from a progressively larger sample of squares in each successive survey (plant species, soil profiles, land-use etc).

The resultant zonation of Great Britain devised for the amphibian monitoring scheme (illustrated in Figure 6.1) comprises 14 zones. The characterisation of the amphibian land classification system with respect to the MAFF and ITE systems is presented in Appendix 26, and general descriptions in Appendix 27. Very generally, zones one to fourteen represent latitudinal decreases from northern Scotland to the south west peninsula. Inland area classifications are different from coastal ones at the same latitudes, as are upland from lowland. Some zones, such as 13, are diverse in terms of land-use and thus encompass varied landscapes; it was decided though not to subdivide the zones beyond comparatively non-specific definitions such as "lowland mixed agricultural" associated with a particular geographical range, in order not to expand the system into too many separate regions. Therefore, the basic scheme subdivides Britain into a series of zones, each exhibiting and realising *potential* for a range of land-uses.

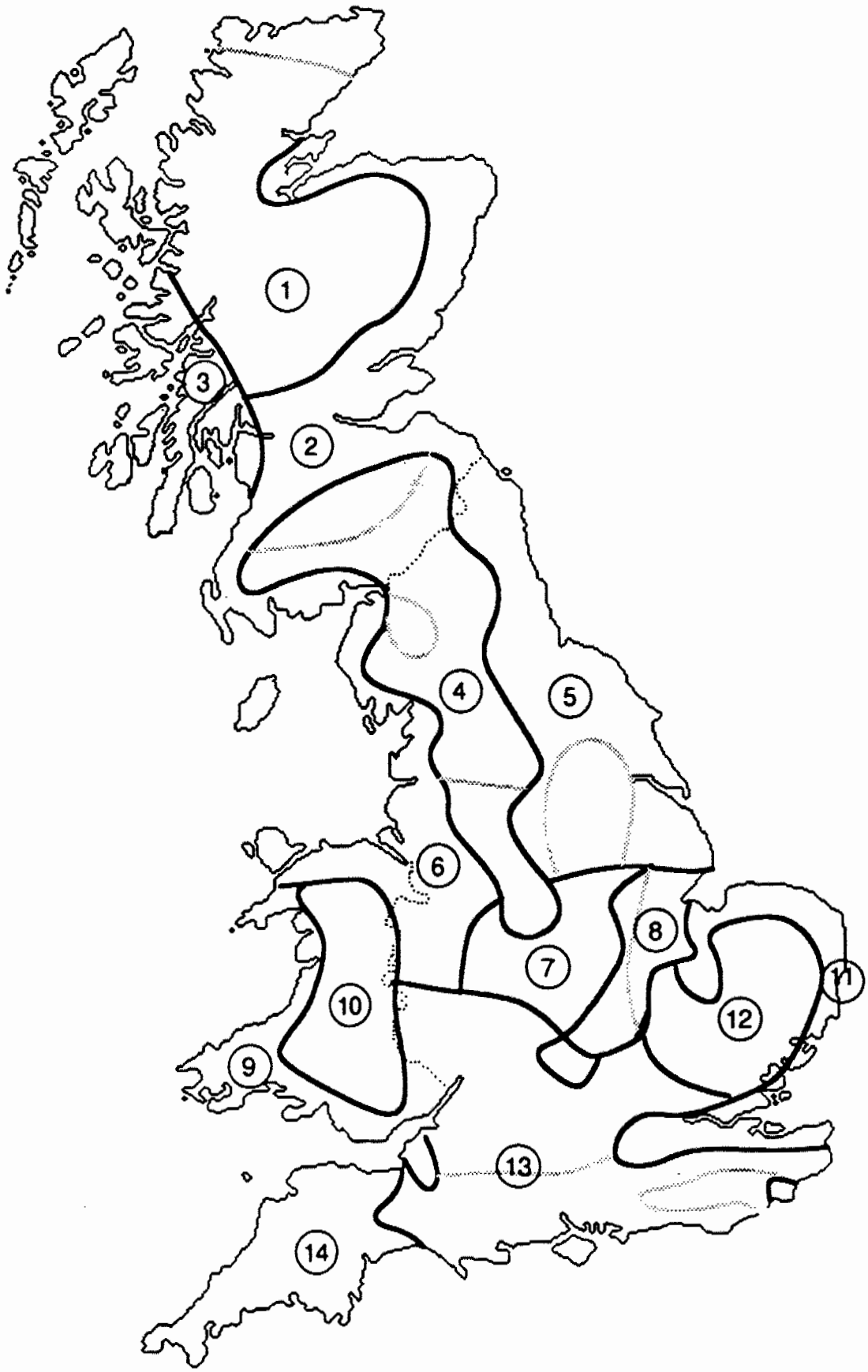
### 6.2.2 Site selection with respect to immediate surrounding land-use

In the previous section, broad geographical land classification zones were defined. However, as also stated above, some of these do contain a wide variety of actual land-uses. It is therefore possible that water-bodies may vary as much within as between zones. It is to be hoped in fact that the scheme will be sensitive enough to identify variations in the ecologies of amphibian populations of sites in similar immediate surroundings, between different geographical regions.

Sites were therefore also selected according to their immediate surrounding land-use (identified in many cases from the national survey pond questionnaires - Appendix 7). Eight basic land-use types were defined, with the possibility of further subdivision at a later stage. These are listed below, with the potential subdivisions enclosed in brackets: pasture (improved, unimproved); arable (cereal, brassica, root crops,

Fig 6.1

Zonal classification of Britain for the Long Term Amphibian Monitoring Scheme.



fruit); mixed agricultural - arable and pasture only; woodland (deciduous, coniferous); moorland, heathland, scrub (dry, wet); gardens, parks; mosaic - two or more land-use types, not including simply arable and pasture alone; sand dune.

However, terrestrial habitat information was available for less than half of the sites recorded on the National Amphibian Survey database, so it was decided:-
a) to select some sites without prior descriptions on a purely geographical and species basis; b) to require all potential long-term monitors of sites to fill in a new questionnaire giving basic details of the land-use immediately surrounding their ponds (Appendix 28); and c) to select at least twice the number of ponds required in order to compensate for recorders unwilling or unable to participate in the scheme.

### 6.2.3 Water-body successional stage

Variations in the successional stages of ponds are associated with different amphibian species complements (see Chapter 5). Heavy vegetation growth may indicate high productivity and the potential to support large numbers of amphibian larvae, but may also inhibit some essential activities, such as the courting displays of crested newts. Heavily vegetated ponds may also revert to marsh and subsequent dry land within a shorter time than ponds in the same locality with more open water. Predicting the "lifespans" of water bodies within particular geographical zones or land-use types may introduce a further factor for consideration in the formulation of future conservation strategies by the country agencies, for example. The successional stages of ponds can also affect the success of monitoring, increased vegetation coverage reducing animal visibility, resulting in lowered accuracy of torch counts.

Sites were therefore additionally classified according to the proportion of the pond occupied by combined emergent and submerged vegetation which reached the water surface, and thus occupied the entire water column. An arbitrary cut-off of 25%

was used to separate ponds at an early stage of succession from more mature ones. Information on vegetation cover however was only available for about half of the sites. As for the land-use categories therefore, the second questionnaire provided the basic information.

### 6.2.4 Site selection with respect to amphibians

Irrespective of their classification with respect to the tiered system outlined above, all the sites listed as candidate SSSIs on the basis of crested newt night counts or amphibian species assemblages, were selected. The amphibian resource represented by these "key" sites, and the necessity of maintaining appropriate management regimes justifies their regular monitoring. These sites comprised approximately eight percent of the initial selection. For the remainder of the sample, preference was given to sites with reasonable counts, partly because it was considered that recorders were more likely to continue surveying "interesting" ponds. This is undoubtedly one of the shortfalls of using a volunteer based system - volunteers have been, on the whole, unwilling to survey sites unlikely to contain animals; hence the low number of arable sites on record. Nevertheless, as demonstrated in Chapter 4, some very committed recorders have undertaken "blanket" surveys, systematically surveying all ponds within given areas, even the most unpromising. It was hoped that some of these people would consider continuing to record "blanket" areas, including "empty" ponds. If animal status could be recorded over entire areas rather than in single ponds alone, then extreme fluctuations in individual populations between years would be set in context; changes in the numbers and proportions of water-bodies occupied by the animals, and in species population densities, would provide better indications of trends in status.

Overall, the amphibian status of the final selection of potential sites for the scheme was higher than for the national database as a whole because of the bias towards the larger populations. However, many small populations were also

included, as were some "empty" sites where they were within groups of systematically surveyed ponds.

### 6.2.5 Initial selection

The initial selection would theoretically number:-

(14 zones) X (7 land-use types) X (2 successional stages) X (2 replicates) + (1 sand dune area) + (60 "candidate sites)

= 14 X 7 X 2 X 2 + 13 + 60 = 465 sites

However, in anticipation of the reluctance or inability of many of the recorders to participate, the number of sites selected was 779, involving 233 individuals surveyors (Table 6.1).

More potential monitoring sites were selected from zones four, five and 13 (Appendices 26 and 27) than the rest for three reasons; firstly, these were the largest areas, so in order to obtain a representative geographical spread of sites more were required; secondly, they represented well recorded parts of the country therefore the potential selection choice was far greater than for example the north of Scotland, where choice was severely limited; and thirdly, these zones each contained areas for which blanket surveys had been undertaken, so instead of a habitat type being represented by just one pond, in several instances a discrete group could be chosen. Zones three (the west coast of Scotland), eight (south west of the Wash - south Lincolnshire and west Cambridgeshire) and nine (the south and west coasts of Wales) were the least well represented, less than twenty sites being selected from each because of the small pool of data available.

**Table 6.1**

**Sample of potential long-term monitoring sites selected from the national database.**

| amphibian land classification zone (Appendix 27) | number of sites selected | number of recorders invited to participate |
|---|---|---|
| 1 | 20 | 7 |
| 2 | 65 | 15 |
| 3 | 16 | 4 |
| 4 | 108 | 28 |
| 5 | 123 | 33 |
| 6 | 62 | 18 |
| 7 | 81 | 22 |
| 8 | 13 | 3 |
| 9 | 18 | 5 |
| 10 | 40 | 13 |
| 11 | 35 | 17 |
| 12 | 26 | 10 |
| 13 | 143 | 51 |
| 14 | 29 | 7 |
| **total** | **779** | **233** |

## 6.3 Survey methodology

### 6.3.1 Preliminary investigation

#### 6.3.1.1 Introduction

In 1990, data relating to repeated crested newt surveys of individual sites made between 1983 and 1989 were analysed. Most (77%) of the 35 sites for which such data were available were on the 1989 "key site" list (Swan and Oldham 1989). The investigation was undertaken in order to assess the value of previous "monitoring" efforts and to identify areas of data shortfall, particularly in relation to qualifying environmental information. The results provide pointers for the long term monitoring exercise.

#### 6.3.1.2. Information available

Thirty-five sites on the NCC database presented two or more night counts and seven presented at least three. Recorders were not a potential source of variation in most cases as 28 of the 35 sites had been resurveyed by the same individuals. Unfortunately, the precise dates of survey had been recorded in two or more years at only 14 sites, although 10 of these had been re-surveyed within one month of the date of the previous count. Thus, in only 29% of the 35 sites could variation due to differences in timing of survey be discounted. Pond size and vegetation cover had been re-recorded at only nine sites. For five of the sites, the same pond statistics (size, vegetation cover etc) had been presented in successive years along with "new" crested newt counts; the recorders had therefore failed to understand the relevance of environmental records in a long term monitoring exercise. However, the lengths and breadths of six water bodies had been recorded twice, and those of three, three times, providing 12 estimations of percentage pond area changes between successive surveys. Eight of the nine sites in question had been re-recorded by the same individuals, therefore recorder variation was not a significant factor.

More than one count per year was available for only five of the sites though, so one could not be sure that the counts represented annual maxima.

#### 6.3.1.3 Recorded changes

Between successive surveys, water-body areas were recorded as increasing in nine sites, decreasing in two and remaining constant in only one. The mean level of change was an increase of 204%, the minimum, 0%; the maximum increase was 900% and the maximum decrease 56%. Within the group of sites for which size data were available, crested newt counts correlated positively with water-body perimeter, depth and area ($p<0.05$, $p<0.01$ and $p<0.01$ respectively). There was, however, no significant correlation between percentage change in water-body size and crested newt count between surveys.

The mean change in emergent vegetation cover between surveys was -3%, the maximum increase 25% and the maximum decrease -58%. Submerged vegetation changed on average by -10%, the maximum increase and decrease being +25% and -27% respectively. The directions of change in vegetation coverage in nine sites are presented in Table 6.2.

Crested newt counts increased on 29 occasions between surveys, decreased on 10 and remained constant (within +/- 5% of the original count) on two. The mean percentage change was +134%, the maximum increase 2,338% and the maximum decrease -86%. The pairs of surveys took place between several combinations of years between 1982 and 1989, therefore the background environmental variation between years would itself have varied between the data pairs.

Because newt counts had been demonstrated to be correlated with pond size, in order to standardise the data for the effect of pond size, count data were standardised as number of newts seen per metre of pond perimeter. These counts subsequently correlated negatively with the current percentage of emergent but not submerged vegetation cover ($p<0.05$).

**Table 6.2**

**Changes in vegetation cover in nine ponds between successive surveys.**

| | vegetation cover | | | | | |
|---|---|---|---|---|---|---|
| | emergent | | | submerged | | |
| | increase | decrease | constant | increase | decrease | constant |
| number of sites | 3 | 3 | 3 | 1 | 4 | 4 |
| mean % change | | -3% | | | -10% | |
| max % change | +25% | -58% | -- | +25% | -27% | -- |

Percentage changes in newt counts did not however correlate significantly with recorded percentage changes in vegetation cover.

#### 6.3.1.4 Implications

Previous repeated monitoring exercises are unlikely to reveal trends in amphibian population levels within the 1980s. Variations in the amounts of environmental information recorded, and the timing of surveys have rendered inter-year comparisons invalid. Without much tighter prescriptions on the exact type and amount of habitat and animal count data collected, long-term trends will continue to be obscured by short-term environmental fluctuations (climatic factors, agricultural rotations, site management etc).

Although crested newt counts were demonstrated to have varied considerably between the years of survey in the sample presented above, little may be inferred from the data with respect to overall trends in population sizes, because of the lack of standardisation in data collection. Effort seems to have been directed at either environmental data collection or repeated counting. In other words, where sites had been counted at least twice per season, no pond descriptions were made, and where detailed pond descriptions were available, only one count had been made during the breeding season. It also appeared that most recorders were unaware of the importance of providing "updated" water-body descriptions along with their annual animal counts.

The exercise did, however, reveal several points important to consider in the prescription of the long-term survey methodology. Firstly, ponds (or recorder accuracy) were demonstrated to vary enormously in size and vegetation coverage from year to year. Thus, pond descriptions must be completed every year of the monitoring exercise, to a higher level of accuracy than for the National Amphibian Surveys, in order to increase the level of confidence in the data. Secondly, animal counts also varied significantly between

years which may reflect true population fluctuations, but which may also result from variations in animal visibility due to vegetation density or water turbidity changes. Thus, in some situations, alternative methods to torch counting may be more appropriate for monitoring. The survey information must therefore provide instructions and recording space for several methods appropriate for a variety of situations. Thirdly, despite the fact that most sites had been re-recorded within a month of the date of the previous survey, the extent of the differences in vegetation coverage suggest that the surveys had taken place at different points in the annual vegetation cycle. Therefore, a minimum of two detailed size and vegetation surveys should be undertaken annually to assess the extent of within-year pond variation. Fourthly, it is likely that more standardised data would result if the significance of the recording requirements were understood by the recorders. Thus, detailed information on not only the "what to do" and "how to do it", but also the "why?", should accompany long-term monitoring recording forms.

### 6.3.2 Long-term monitoring scheme methodology

#### 6.3.2.1 Survey pack

The "Long-term Monitoring Scheme Survey Pack" (presented in Appendix 29) contains information on the background and organisation of the scheme, the rationale behind the methodology, and detailed descriptions of the methods themselves. The recording form, an accompanying diagram and an introductory letter, plus the terrestrial habitat survey methodology are also included. Because of the detail provided therein, it is not necessary here to repeat the entire rationale and methodology, but simply to describe the general scheme.

It must be emphasised that the recording system was devised to utilise data provided by amateur recorders that would be sensitive enough to reveal trends in amphibian status nationally. (It is envisaged that the data should be analysed

using "time series analysis" or similar statistical methods designed to quantify and assign significance to fluctuations within long-term data sets). Many individual items of data are asked for, but the scheme as a whole does not require any degree of expertise or prior knowledge; just a commitment of time to the programme, and a modest ability to follow instructions.

#### 6.3.2.2 Information requested

##### 6.3.2.2.(i) Water-body description

The survey pond descriptions were to be carried out every year of the scheme. Response to the National Amphibian Survey indicated that, in order to avoid ambiguous responses, as many questions as possible should be presented as a series of options. Some features need to be described only once a year - eg water-body type, occurrence and timing of desiccation, presence of water birds or fish. The dynamic properties of ponds, however, which vary throughout the year need to be recorded more than once to assess the extent of inter-seasonal variation. It was therefore prescribed that pond size, vegetation and shading coverage were to be recorded during early spring (when water levels and vegetation should be at their highest and lowest respectively), and again during mid-summer (when they present their respective lowest and highest values). In order to increase the accuracy of estimations of plant or shade cover beyond the 25% categories of the National Amphibian Survey questionnaires, a series of diagrams of circles with different proportions of their surface areas shaded were provided for visual assistance (see Appendix 29).

##### 6.3.2.2.(ii) Terrestrial habitat description

In order to describe surrounding terrestrial habitats to a greater degree of accuracy then the national survey pond questionnaires, such that relatively small land-use changes would be identifiable, habitat mapping was recommended. The method required the area surrounding the pond(s) to be mapped

and the map(s) to be accompanied by standard annotations and notes identifying field contents, boundary types etc. Details are to be found in Appendix 30. This exercise was recommended to be undertaken every second year except where significant changes occurred in intervening years.

**6.3.2.2.(iii) Animal data**

A choice of several amphibian survey methods was presented, with notes outlining the advantages and disadvantages of each regarding the different species, and situations pertaining. Methods recommended were torch counting, sweep-netting, bottle trapping, frog and toad spawn surveys, newt egg searches and terrestrial searches for newt metamorphs.

For torch counting, qualifying environmental data comprised descriptions of the weather conditions at the time of survey; at least three counts per year were recommended for this method, but five spaces were provided on the form (as also for netting and bottle trapping).

In order to standardise netting and trapping data with respect to effort expended, recorders were asked to estimate the proportion of the pond length netted, and record their net diameter, sweep length and the number of sweeps made; and provide information on the number of traps set, the duration of each trapping session and to note weather conditions at the time.

Spawn surveys were less closely prescribed, recorders being asked to count, or measure the extent of surface coverage by frog spawn clumps. Toad spawn, which can only reasonably indicate breeding toad presence where found, was mentioned but not recommended as a census method for the species. Recorders were asked to note the plant types on which newt eggs were found, but the recording of numbers was limited to "tens", "hundreds" or "thousands". Apart from dates and times, information requested in the metamorph search section required

no more than a brief description of the animals' locations, if found.

## 6.4 Recorder response

### 6.4.1 Overall response

Eighty-five of the 233 recorders approached initially agreed to participate in the scheme, covering 252 ponds between them. Twenty-one of the remaining 148 replied stating reasons for their inability to carry out the task, most having moved home but a few having succumbed to age-related infirmity. Unfortunately, less than half were able to supply names of alternative recorders.

### 6.4.2 Response with respect to geographical zones and immediate surrounding land-use

Within the sample of 252 all 14 "zones" were represented. The response from each zone broadly reflected the proportions of the initial approach directed towards it; zones four, and 13 (large central zones in northern and southern England respectively) were particularly well represented, surveys of at least 40 ponds being promised from each, whereas fewer than 10 ponds in each of zones three, nine, 11 (narrow coastal zones) and 14 (the south west peninsula) were assured of being recorded. The range of habitats was also fully represented overall, but not evenly distributed between the zones. According to the supplementary questionnaires, many more sites were reported to be within the "catch-all" mosaic land-use than had been selected as such, but predictably few were in the arable and sand dune categories. However, within Britain the land-use categories are not found in equal proportions within each of the zones, which was reflected in the national survey data. No "arable" sites, for example, were recorded in zone one (northern Scotland), and dune slack sites were recorded in only a few specific localities.

The number of ponds in each of the two succession categories in turn varied between land-use categories. Approximately equal proportions of each occurred in the "mosaic" land-use type but most ponds in the woodland or moorland categories contained less than 25% vegetation coverage. The majority of ponds in the mixed agricultural or garden categories were, however, well vegetated (57 and 61% respectively).

Recorders were also asked to record whether significant changes had occurred to the ponds or their environs since they were recorded for the national survey. Sixty one of the 252 sites (24%) were reported to have changed significantly since their initial recording. Three percent were said to have been "improved" by pond maintenance or sympathetic landscaping but 21% were reported to have deteriorated. Eight of those were either "mismanaged" or overgrown and seven were currently being infilled. The two most significant causes of deterioration were prologued desiccation, said to have affected 13 ponds (5%) since 1989, and destruction of, or serious disturbance to, surrounding terrestrial habitats, affecting 25 sites (10%). A further thirteen ponds, not previously on the National Amphibian Survey database, were added to the list voluntarily by recorders, and for which no descriptive data were supplied. The geographical zones, immediate surrounding land-uses and water-body successional stages of sites with recorders willing to participate are shown in Table 6.3; Figure 6.2 illustrates their national distribution. The complete list with site names is presented in Appendix 31.

Twenty-eight of the 32 ITE land classes (Bunce **et al** 1981) were represented in the sample, three of those missing being in the extreme north and west of Scotland and the fourth, the south western coastal margin of England and South Wales. It is to be hoped that the scheme will develop such that eventually every ITE land class will be represented with at least one site in each land-use and successional category. This would increase the sample size to 969, too many to cope with under

**Table 6.3**

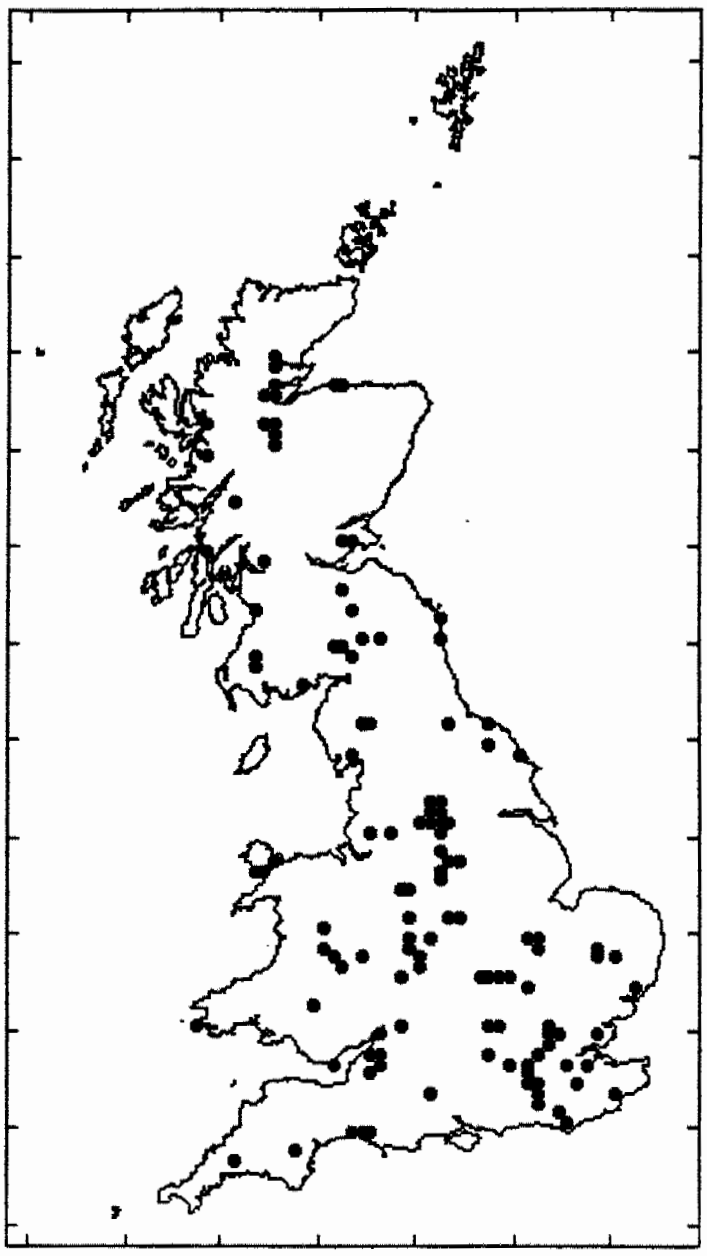
**Immediate surrounding land-use categories and successional stages of selected sites within each amphibian land classification zone.**

| immediate surrounding land-use | number of sites in each zone — zones | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **TOT** |
| grassland | 0 | 1 | 0 | 3 | 2 | 0 | 0 | 1 | 0 | 2 | 1 | 1 | 4 | 0 | **15** |
| | *1* | *0* | *1* | *11* | *0* | *1* | *0* | *0* | *0* | *2* | *1* | *1* | *6* | *0* | ***24*** |
| arable | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| | *0* | *1* | *0* | *0* | *0* | *0* | *0* | *1* | *0* | *0* | *0* | *0* | *0* | *0* | ***2*** |
| mixed agric | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 10 | 0 | **13** |
| | *0* | *0* | *0* | *0* | *1* | *2* | *1* | *1* | *0* | *1* | *1* | *0* | *2* | *0* | ***9*** |
| woodland | 2 | 1 | 0 | 8 | 1 | 3 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | **18** |
| | *5* | *1* | *1* | *7* | *2* | *2* | *0* | *0* | *1* | *0* | *1* | *2* | *1* | *0* | ***23*** |
| moorland/ heathland/ scrub | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | **7** |
| | *3* | *0* | *0* | *2* | *1* | *1* | *1* | *0* | *0* | *1* | *1* | *0* | *1* | 5 | ***16*** |
| garden | 0 | 0 | 0 | 2 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | **11** |
| | *0* | *0* | *0* | *1* | *0* | *1* | *1* | *0* | *0* | *0* | *0* | *0* | *4* | *0* | ***7*** |
| mosaic | 1 | 2 | 0 | 3 | 6 | 2 | 8 | 3 | 4 | 2 | 2 | 1 | 15 | 1 | **50** |
| | *0* | *6* | *0* | *3* | *11* | *0* | *8* | *5* | *3* | *1* | *4* | *1* | *9* | *0* | ***51*** |
| sand dune | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| | *0* | *0* | *0* | *0* | *0* | *3* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | ***3*** |
| **TOTAL** | **13** | **14** | **3** | **41** | **27** | **18** | **28** | **11** | **8** | **11** | **12** | **9** | **57** | **6** | **252** |

n: number of sites with at least 25% surface vegetation cover.
*n*: number of sites with less than 25% surface vegetation cover.

Fig 6.2

Distribution of 252 sites selected for the Long Term Amphibian Monitoring Scheme.



the present contract, but a target to be aimed for in the future.

### 6.5 Data received to date

#### 6.5.1 Quantitative response

A total of 24 recorders had returned completed monitoring scheme questionnaires by the end of 1992, twenty of whom also supplied terrestrial habitat maps. Ninety-two sites, distributed between 10 of the 14 geographical zones, had been surveyed and fully described, zones as yet unrecorded being 1) - north western Scotland, 3) - the west coast of Scotland, 11) - the coast of East Anglia and 14) Devon and Cornwall. Overall, data were returned from 37% of sites from which they were expected, ranging from 0% from four zones to 94% from zone seven. The zones returning a high percentage of expected records were those in which individual recorders had agreed to survey several sites each, and subsequently undertook the recording of all of them; eg the Fens Pool area of W Midlands, and the Warndon area of Worcester, containing 13 and 16 "monitoring" sites respectively, were each surveyed by only one individual.

Eleven percent of the recorders who were initially invited to participate and 28% of those who actually agreed to take part returned completed forms. This latter proportion is similar to the 29% of the 3,000 initial inquirers who returned information to the National Amphibian Survey between 1987 and 1992. However, if numbers of completed pond descriptions returned per recorder are compared between the two surveys, then the average productivity was slightly lower in the current scheme (six compared to four questionnaires per recorder respectively). Nevertheless, considerably more effort is required in completing the monitoring compared to the amphibian survey pond questionnaire; and twenty of the monitoring recorders also undertook the terrestrial mapping exercise. Thus, significant recording effort has already been expended on behalf of the scheme.

Eleven categories of water-body were represented in the sample, ranging from field ponds (39%) to upland sites (11% of the sample); also included were four garden ponds and a canal (Table 6.4). The median "spring survey" area measurement of the sites was 526m$^2$, over twice the 240m$^2$ median value for sites described on the national survey pond questionnaire. Thus, this sample represents a set of larger and probably better quality small water-bodies than would be representative of mainland Britain as a whole. Eight candidate SSSIs have been recorded, including the two composite sites of Lyppard Grange near Worcester (two ponds), and the entire Fens Pool area - W Midlands county (13 ponds).

### 6.5.2 Qualitative response

All but four of the surveyors had undertaken night counts; each of those who had not included torching stated difficulty of access as their reason. However, other methods had also been employed: five people had netted ponds, four had used bottle traps, six had conducted newt egg searches and five had carried out a late summer terrestrial search for metamorphs. Several newt populations were discovered using the first three techniques that had been undetected during nocturnal surveys: netting revealed four smooth newt and two crested newt populations, and one palmate newt breeding site; traps at one site caught smooth newts where a spring search had failed to find them, and an egg search yielded the only evidence of crested newt breeding at yet another. Thus, providing alternative survey options has proved to have been worthwhile.

For 74 of the sites, environmental variables had been recorded twice during the year, as requested - only two recorders had been unable to visit their sites during the summer. In order to try to assess the usefulness of the spring and summer pond area and vegetation cover measurements, the two values are compared. However, with only one year of recording it is difficult to predict the value of this "draw down" data - especially as in 1992, summer rains did not allow the effect of drought to be observed. In dry years the date at which

**Table 6.4**

**Types of water-bodies surveyed during the first recording year of the national amphibian long-term monitoring scheme.**

| water-body type | number of sites surveyed |
|---|---|
| field pond | 38 |
| lake/loch/reservoir | 11 |
| moorland/peat pond/upland grassland | 9 |
| woodland | 9 |
| marsh/bog/fen | 8 |
| parkland | 3 |
| garden | 4 |
| wasteland | 4 |
| mineral extraction site | 4 |
| canal | 1 |
| dune slack | 1 |
| **TOTAL** | **92** |

desiccation occurs is crucial for amphibians and their larvae, but from this year's data we cannot tell which of the sites may be susceptible to early drying.

Spring and summer area measurements, available for 72 of the ponds, revealed that in 1992 although the mean size difference between the seasons was a 21% reduction, the median value of zero indicated that over half of them did not change. Four, however, dried up completely during the summer.

The maximum observed increase in emergent vegetation cover was 95% and in submerged vegetation, 80%, the two types of cover undergoing similar mean changes in extent of pond coverage - seven and nine percent increase respectively. In some sites though, vegetation cover was recorded as decreasing, 17 and 15% of ponds showing decreases in emergent and submerged vegetation cover respectively between early spring and mid-summer. The draw-down and cover values are presented in Table 6.5.

That this sample of sites represents above average pond quality is further indicated by the proportions which were occupied by amphibians. Frogs were present in 60 sites (65%), toads in 40 (43%), smooth newts in 35 (38%), palmate newts in 14 (15%) and crested newts in 25 (27%), all these percentages being higher than those calculated from the larger UK samples in chapters four and five. Table 6.6 shows the maximum recorded night counts for each of the species, except for frogs where numbers refer to spawn clump counts. Hitherto, count data have been used only to select sites for special protection; they were not used, for example, in the habitat analysis due to the potentially distorting effects of large intra-seasonal variation. In this sample, however, 21 of the recorders (88%) provided data from at least two counts per site, 10 returning four or more. Thus, we can be as certain as is possible that most of the data represent maximum counts. These reveal that most of the sites contain modest populations, only four for example recording counts of over 50 crested newts, all of those being crested newt SSSIs (already

**Table 6.5**

**Summary of percentage changes in water-body area and vegetation cover between spring and summer surveys, 1992.**

| | pond area | --- vegetation cover ---- emergent | submerged |
|---|---|---|---|
| median % change | 0 | +2 | +5 |
| mean % change(+/-sd) | -21.2+/-32.3 | +7.1+/-17.6 | +9.7+/-21.5 |
| max % increase | 100 | 95 | 80 |
| max % decrease | 100 | 20 | 50 |
| min % change | 0 | 0 | 0 |
| N | 72 | 66 | 62 |

**Table 6.6**

**Summary of animal and spawn clump counts recorded per site for the national long-term monitoring scheme in 1992.**

| | frog (spawn clump counts) | toad | smooth newt | palmate newt | crested newt |
|---|---|---|---|---|---|
| | | | max night counts | | |
| median (where present) | 24 | 30 | 6 | 6 | 9.5 |
| overall mean(+/-sd) | 34.9 +/-86.2 | 27.9 +/-62.6 | 8.3 +/-28.9 | 1.3 +/-4.9 | 5.8 +/-18.8 |
| max count | 500 | 337 | 149 | 40 | 99 |
| tot no of sites where sp present | 60 | 40 | 35 | 14 | 25 |
| no of sites where night counts > 0 | 40 | 39 | 30 | 13 | 22 |

total sample size = 90

notified). Toads recorded the highest head count data -median of 30 animals on peak nights, compared to six for both of the small newt species and nine for crested newts. The median number of frog spawn clumps per pond was 24. Regarding the species complement of the sites, only one contained five species, the majority (62%) containing between two and four. None were found in nine sites, five of which had been recorded as amphibian sites when selected, and four which were part of two "blanket survey" areas (Table 6.7).

### 6.5.3 System evaluation

The data recording system was designed to allow the relatively easy collection of the many basic environmental variables necessary to qualify amphibian count data, over several years. Therefore, detailed analysis of just one, or even two years' worth reveals little or nothing about amphibian population dynamics - ie, the system cannot be properly evaluated until it has been running for several years. At this, stage however, the recorder response and the adequacy of the returns are the most important aspects to consider. If recorders are failing to complete the forms and supply usable data then the exercise is a waste of time. If, on the other hand, a dedicated team of diligent and competent monitors has been recruited, then, with nearly a hundred returns in its first year and the anticipation of similar levels of returns in years to come, the scheme will provide an analyzable sample from which models of amphibian population dynamics in response to climatic and habitat variation can be developed. It is likely that most of those from whom no data have been forthcoming found the size of the recording form daunting. However, it was predicted that at each stage of compiling the site sample, numbers of recorders would diminish. This would not necessarily detract from the value of the scheme, because the overall strategy was to aim for a comparatively small but well distributed sample of sites for which animal and environmental data were being recorded in sufficient detail that long term trends in species status would be detectable. Against these criteria the scheme can be judged a success, likely to produce consistent detailed

**Table 6.7**

**Numbers of species present in sites recorded for the national long-term monitoring scheme, 1992.**

| | number of species present | | | | | |
|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **none** |
| number of sites | 24 | 34 | 19 | 5 | 1 | 9 |

information on selected amphibian population and breeding site status from throughout Britain in the long term. We suggest, however, that the scheme may also represent the limit of commitment that can be expected of a volunteer workforce; ie, if a larger and more evenly distributed sample is deemed necessary, then it should be organised through a centrally funded system, and the recorders recruited on a professional contract basis.