CHAPTER 10

OVERALL DISCUSSION AND CONCLUSIONS

10.1 Achievements relative to the objectives set out in the contract annex

1. *To document "new" crested newt and amphibian community sites.*

Since the end of the "Amphibian Communities" project, a total of 4,579 new site records have been added to the amphibian site database, representing an increase of 71%. Of those new records, 109 have been listed as candidate SSSIs, an increase of 145% over the 1989 total. Currently listed are 184 previously-notified or candidate amphibian SSSIs, 1.5% of all recorded sites. The information is reported in detail in Chapter 3.

2. *To develop the recorder network and organise regular national meetings.*

The recorder network was expanded during the contract, in order:- a) to improve amphibian survey coverage throughout the country, and b) to recruit reptile recorders. Between 1989 and 1992, the number of amphibian recorders increased by 20% (Chapter 1). The reptile recorder network is described in Volume 2.

In addition, a computerised, combined herpetological mailing list was compiled which lists recorders, herpetological groups and countryside organisations, (Chapter 1).

The National Amphibian survey was host to the Annual Herpetofauna Recorders' Meeting in each of the three years of the contract. The meetings, held in early February were attended on average by 150 delegates, (Chapter 7).

3. *To organise monitoring programmes, to include SSSIs and other important sites.*

A national long-term monitoring programme has been initiated; the scheme is based around an initial selection of 250 amphibian sites distributed throughout Britain in different geographical and land-use zones (Chapter 6).

4. *To collate and publish information on survey techniques, management methods, habitat requirements etc.*

Meeting this objective requires a wide range of information, most of which has been acquired from the national survey data, and by reference to the experience of national survey recorders and other amphibian researchers.

Survey techniques are outlined in Chapter 6 and described fully in Appendix 29. These include methods already widely used in the national survey, those evaluated during related field studies, and others recommended by herpetological groups.

Aquatic and terrestrial habitat requirements were investigated in the analysis of the national survey site descriptions, from which habitat management recommendations (at landscape and individual site levels) were drawn (Chapters 4 and 5).

In order to assess the status of potential amphibian breeding habitat nationally, types, uses, conditions and rates of loss of small water-bodies in Great Britain, and threats to those remaining, were investigated (Chapters 2 and 4).

The status of the five species nationally and at county and local levels was ascertained by analysis of the systematic survey data (Chapter 4).

5. *To assist NCC on casework at threatened sites.*

NCC personnel have received advice and information on request throughout the project (Chapter 8).

6. *To help with updating BRC information.*

Information on all sites contained in the National Survey databases (amphibians and reptiles) has been transferred to the Biological Records Centre at Monks Wood to be included in the production of the current herpetological atlas of the British Isles (Chapter 9).

7. *To initiate a project on the common reptiles.*

Recorders have been recruited and approximately 5,000 records collected, supplying information from every county in Britain except one. The reptile survey is reported in Volume 2.

10.2 Conservation implications of the survey

10.2.1 Public interest and awareness

The recording of 11,059 sites was only possible through the efforts of 874 volunteer recorders, over 200 of whom contributed information for more than one year; over 500 of them elected to be put on the mailing list. The 1988 press release launching the main data collection phase of the Amphibian Communities project resulted in over 2,000 requests for information, and during the current contract the total has risen to nearly 3,000. This is one of the largest responses to any volunteer-based initiative instigated by NCC.

Amphibians are therefore a group of animals inspiring general interest, perhaps in part due to the apparent success of common frogs in garden ponds. Persistent interest shown in the survey, despite a reduction in publicity output during the last three years, suggests that, with minimal encouragement, members of the public can be a regular and continuing source

of information. Although the majority of surveyors sent information as a "one-off" contribution to the survey, a core of regular recorders has been formed, whose commitment is central to the success of the long term monitoring scheme.

Regular meetings informed and enthused survey participants, and with their pre-publicity not only provided an annual stimulus for amphibian recording, but also served to raise awareness of current issues.

A raising of public awareness may also benefit amphibian conservation practically by increasing levels of concern about local wetlands and other wildlife habitats. Indeed, the analyses in Chapter 2 reveal that ponds subject to public access were apparently less likely to be neglected than water bodies in remote situations.

Nearly half of the site records were sent by herpetological and countryside groups and Biological Records Centres. In most cases, coordination of the national survey by various local groups increased both the quantity and quality of data received. The national survey organisers hope that the contribution of these organisations will be recognised and encouraged.

Both amphibian and water body status in areas of low human population density remain under-recorded. Low recorder density and physical difficulties of nocturnal access are possible reasons. An assessment of amphibian status in these more rural (often upland) areas may therefore require a more directed and/or professional approach to surveying.

Throughout the main survey, potential recorders were given a choice of recording strategies so as to accommodate varying levels of commitment and ability. We consider that this approach has both maximised the number of sites recorded and made the most of the willingness of the more committed surveyors to provide more detailed information. We suggest that the pond questionnaire (Appendix 7) is well within the

maximum level of complexity of data-gathering achievable by volunteers, but that the long term monitoring scheme questionnaire approaches their limit.

10.2.2 Status and characteristics of small water-bodies in Britain - the potential breeding site resource.

Calculated on a county level, the highest pond densities were recorded in the west of Britain and the lowest in Scotland and southeast England.

Pond status data were derived from surveys of approximately 17,000 ponds covering a total area of around 13,500 km^2 of mainland Britain, and information on site threats from approximately 6,500 amphibian survey pond questionnaires.

About 11% of recorded sites were in an advanced stage of succession - severely encroached by emergent vegetation - and 18% were prone to desiccation. Areas of high pond density - lowland agricultural and those containing mineral extraction sites - showed the highest frequencies of severe vegetation encroachment. The shallower groups - moorland, heathland, coastal, flooded or marshy sites - were recorded as those most likely to desiccate.

A wide range of types and sizes of water-bodies was described on pond questionnaires, of which approximately 35% were reported to be threatened by some form of human activity or neglect. Ponds were, however, also perceived as being functional components within landscapes; over 50% were recorded to have a "use", including stock-watering, human recreation, water-abstraction and wildlife conservation. Many of the larger sites were recognised as habitats for birds rather than amphibians, and were also recorded as popular sites for human recreation. Agricultural uses were associated more often with smaller sites. Categories of water-body apparently most at risk, especially from infilling and mismanagement, were mineral extraction and industrial sites. On the other hand, ponds subject to public access were less

threatened overall, but were considered to be prone to disturbance. In Chapters 4 and 5, mineral extraction sites were found to be associated with higher-than-average frequencies of amphibian populations; therefore, continued high levels of damage or destruction to them may represent a significant loss of amphibian habitat.

In the sample analysed in Chapter 2, most ponds fell into four categories - field, garden, woodland and public access. However, the habitat resource represented by the numerically less important types of ponds such as mineral extraction sites, or dune slack ponds may also be of national significance because of the high status of many of the amphibian communities found within them.

The conservation value of sites where public access is enjoyed may not necessarily be measured in terms of species assemblages or population sizes, but rather in the educational and recreational resource they provide, and as their role as foci for individual or community conservation initiatives. On the other hand, less accessible sites, whose "remoteness" could confer greater potential for wildlife conservation, may be more at risk from neglect, their deterioration generally proceeding unnoticed.

Overall, nearly one fifth of Britain's ponds have been lost since the 1950s, over a quarter of counties having suffered a depletion of 25% or more. This has resulted in reductions in water-body density of more than one pond per km^2 in nearly one third of surveyed counties. Net water-body losses have continued into the 1970s and 1980s, but pond restoration or creation may have reduced the net level of loss nationally by almost one half.

Loss of sites, and the consequent reduction in pond densities, may lower the potential for inter-pond dispersal and amphibian (re)colonisation, especially if the surrounding land lacks terrestrial cover. Furthermore, significant proportions of remaining sites are apparently unsuitable for amphibians due

to severe encroachment by emergent vegetation or tendency to desiccate frequently. However, neither high levels of vegetation coverage nor desiccation tendencies are inimical to all amphibian species. Frogs and crested newts, for example, were found frequently in very heavily vegetated ponds which dried out occasionally. However, such ponds tended to revert gradually to dry land. Unfortunately for the crested newt, whose range of site requirements is narrower than that of the frog, pond successional stages associated with high population frequencies may be short-lived transitional phases.

10.2.3 Species distributions, status and habitats

10.2.3.1 Frog

The common frog, recorded in 98% of surveyed 10km squares within Britain, is not only widespread nationally but also ubiquitous within most (but not all) UK counties. However, despite its wide distribution, the species was found in fewer than half of the water-bodies surveyed systematically. In over half of the surveyed counties, average breeding site densities were less than one per km^2. The percentage of sites containing frogs was higher in areas of low pond density, especially uplands, than in than lowland landscapes with high pond densites. Thus, as the frog is considered to be opportunistic in its "selection" of breeding sites, spawning in a wide variety of water-bodies, terrestrial rather than aquatic factors may be limiting the species' abundance in lowland Britain.

The analysis of habitat data indicated that arable land is inimical to frogs. This is true whether or not the landscape is predominantly arable or merely contains arable patches. In this study, water features, in the form of ditches, rivers, streams, etc, were associated with increased frog abundance, suggesting habitat "moisture" to be a significant determinant of frog presence, as suggested by Oldham and Swan (1993). This may contribute to the low frequency of frog breeding sites in arable land, which is generally well drained. Alternatively,

perhaps sensitivity to agricultural chemicals could be reducing the status of this otherwise highly adaptable species in arable environments.

Frogs apparently adapt well to gardens, occurring in a large proportion of recorded sites. The extent to which these populations are self-maintaining is, however, unknown.

10.2.3.2 Toad

The toad shared the same broad distribution range within mainland Britain as the frog, but was found within fewer (57%) 10km squares overall. The species was ubiquitous in only just over half of the counties in which it occurred; ie, toads were found in fewer localities within counties than frogs. Twenty three percent of systematically surveyed ponds contained toads and, like the frog, a higher occupancy rate was recorded for western counties. Overall, in a quarter of British counties, less than 20% of systematically surveyed sites were occupied by toads and half of the counties recorded average densities of less than one population per km^2.

Pond quality is an important determinant of toad status; the species was recorded infrequently in sites smaller than $100m^2$ and in those heavily encroached by vegetation. The species will coexist with fish, and sites managed for angling proved to be suitable if adequate terrestrial cover was present. Toads breed in larger aggregations than frogs, and perhaps for that reason require larger areas of permanent cover around breeding sites. Landscapes dominated by woodland and rough grassland were associated with the highest frequencies of toad occupation; overall, the presence of woodland, neighbouring ponds and flowing water within 500 metres of sites was correlated with increases in toad status.

Toads were recorded in gardens, but due to the small size of most of the garden ponds in which they were recorded, the long-term viability of these populations is doubtful.

10.2.3.3 Smooth newt

This species exhibited a predominantly lowland distribution and was seldom encountered in northern or far western counties of mainland Britain. It was found in 51% of surveyed 10km squares and 82% of counties, being ubiquitous in over half of them. Nationally, smooth newts were found in 17% of systematically surveyed ponds, their frequency being highest in the Midlands and eastern England. However, their average percentage pond occupancy did not exceed 60% in any county and was over 40% in only one tenth of counties. Recorded mean breeding site densities were less than one per km^2 in almost half the counties in Britain.

Smooth newts were recorded as breeding with above average frequency in unshaded, relatively small ponds, (between 100 and 400m^2 in area) that were not heavily vegetated. They were shown to occur with fish, but their frequency increased in sites known to desiccate occasionally, benefitting perhaps from a reduction in all aquatic predator levels. Relatively high frequencies of occurrence coincided with areas where rough grassland predominated. In general, open, agricultural lowland with small woodlands present as features constituted more suitable habitat than woodland-dominated landscapes. Newts were present in ponds on arable land in increased frequencies where cover (woodland or rough grassland) was present within 500 metres.

Smooth newts were found in a significant proportion of garden ponds. They are more difficult to translocate than the frog, so garden populations of smooth newts are more likely to have resulted from natural colonisation.

10.2.3.4 Palmate newt

The palmate newt was widespread in northern and western areas, but its distribution in lowland Britain was fragmented. It was found in 76% of counties and was ubiquitous in one quarter of them. Eleven percent of systematically surveyed ponds

contained the species, and it was recorded as absent from over half of the systematic survey areas. The mean density of breeding ponds was less than one per km^2 in 42% of counties. The distribution range of the palmate newt was smaller than that of the smooth newt, but within its range its status was the same.

The species was found in a range of pond sizes similar to that of the smooth newt. Terrestrial habitat analysis was inconclusive.

The palmate newt was also regularly reported to breed in garden ponds.

10.2.3.5 Crested newt

The crested newt showed a national distribution pattern similar to that of the smooth newt, occurring in lowland and eastern Britain; the species was found in 53% of surveyed 10km squares. Crested newts were recorded in 79% of counties and were ubiquitous within about one third of them. They were, however, found in proportionately fewer systematically surveyed ponds than any of the other four species, being recorded in only two percent of sites. Average breeding site densities above one per km^2 were recorded in only nine counties. There is a suggestion from the systematic data of a minimum pond density threshold below which crested newts are unlikely to be found. In the present study, the "threshold" occurred where pond densities were less than 0.7 per km^2. This was the only species of the five for which this trend is suggested: it is not inconsistent with the findings throughout, which indicate crested newts to have more exacting habitat requirements than the other species.

Crested newts were found in above average frequencies in small (approximately $100m^2$ in area), well vegetated ponds with terrestrial pond edge cover. Fish were inimical to the species, and ponds which desiccated occasionally were associated with increased population frequencies: desiccation

reduces the risk of colonisation by fish and may lower predator levels overall. Newt populations were comparatively abundant in rough grassland-dominated landscapes. They were also found in relatively high frequencies in landscapes containing patches of arable land, but almost never in areas dominated by arable land. Ditches were highlighted as positive features, but the presence of flowing water within 100m of ponds was associated with a much-reduced probability of finding newts in them. Habitats were apparently enhanced by the presence of woodland and gardens, fragmented wood having a more positive effect than extensive blanket coverage.

Crested newts were recorded in only a small proportion of garden ponds.

10.2.3.6 Amphibian summary

Each of the species reported above has a wide distribution within mainland Britain. However, none is ubiquitous within every county, even within its overall distribution range. Furthermore, at a local level, recorded "presence" within a 10km square may belie the fact that only a small proportion of available water-bodies is actually occupied.

Thus, none of the species is exploiting the majority of potential breeding sites. Aquatic site characteristics are important in determining the amphibian complement of ponds; significant features relating to the abundance of each species were identified in Chapter 5. However, pond characteristics varied little between the predominant land-use types and it seemed likely therefore that terrestrial factors were involved in the determination of the local status of each of the five species. The multivariate analysis, combining both aquatic and terrestrial variables, not only identified significant pond and landscape features, but also ranked their importance as predictors of species presence. The results of the analysis provided some new evidence relating amphibian status to terrestrial habitat composition, the main points of which are summarised below:-

1) **The status of each of the species was higher in natural, semi-natural or extensively- (as opposed to intensively-) farmed landscapes.** For example, frogs exhibited particularly high status on moorland, toads in woodland and crested newts in rough grassland, respectively.

2) **Terrestrial habitat diversity was an important factor determining the status of amphibians.**

Landscapes dominated by woodland or rough grassland are intrinsically diverse at ground level, compared to arable or improved grassland, and were demonstrated to support relatively abundant amphibian populations. In arable or improved grassland, amphibian abundance was low except where diversity was increased by landscape features such as ditches, woodlands, other ponds, gardens, etc.

3) **In intrinsically high-diversity habitats such as woodland or rough grassland, aquatic factors assumed greater relative importance than terrestrial factors as determinants of species status.**

Within low-diversity arable or improved grassland landscapes, terrestrial variables were ranked above most aquatic variables as factors affecting species presence or absence.

The important habitat features were, however, identified from time-specific data, and give no indication of whether the recorded landscape features were associated with stable, increasing or decreasing populations. Changes in local and national status with respect to landscape development can only be assessed by longer-term studies.

10.2.3.7 Conservation implications, with particular reference to the crested newt

The crested newt, although having a relatively wide distribution, nevertheless has a low status compared to that of the other widespread amphibians. Throughout the status and

habitat analyses, the species habitat requirements have been revealed to be significantly more exacting than those of the other species. For example, the species breeds in a narrow range of pond sizes, is very vulnerable to fish predation, is virtually absent from predominantly-arable landscapes, and is seldom found in garden ponds. These factors, coupled with its possible requirement for water-body densities higher than that found over most of Britain, define a species ecology ill-suited for survival in modern lowland agricultural landscapes and currently not taking advantage of new breeding habitats.

Therefore, on the basis of the National Survey results, we suggest that a conservation strategy based entirely on the notification of the best amphibian sites as SSSIs may not be appropriate for the crested newt, or indeed for any of the other widespread species. The reasons are as follows:-

1) On the basis of current information and criteria, 95% of recorded crested newt sites do not qualify for special protection.

2) Count data are unreliable unless several counts have been made during a complete breeding season under optimal conditions; such data sets are rare. Site selection from the site database is therefore bound to have omitted outstanding populations through lack of adequate count data.

3) Notification of selected sites may in some quarters reduce the status of the rest, in which most of Britain's crested newts are to be found.

4) The maintenance of high populations in certain ponds may be dependent on the presence of neighbouring populations too small to warrant special protection. Destruction of the latter would be likely to reduce the status of the former.

5) The status of amphibians in terms of the presence of large crested newt populations or good species assemblages is very low across large areas of Britain. Lists of "candidate" sites

from such areas will therefore be small, and the conservation effort directed there may therefore be disproportionately small. A national strategy for the conservation of widespread species would logically make provision not only for the maintenance of high status where it exists already, but also for the improvement of species status in currently impoverished parts of the country. Despite wide species distributions, the status of each of the five species in the greater countryside is generally low, especially that of the crested newt. Below are recommendations based upon our interpretation of the data.

Designation of SSSIs based on crested newt and species assemblage criteria provides a level of conservation, but for widespread species equal importance might be attached to enhancement of status throughout the landscape.

Recommendations for achieving enhanced status for the crested newt and for the other four species stem naturally from the information contained in the present report and may be applied at local and national levels. Local enhancement is achievable by managing sites to obtain optimum conditions, as derived in the chapters describing water-body characteristics, pond densities and terrestrial habitat composition. National enhancement may be achieved by combining the specific habitat information with national distribution and status data as follows:

1) Aim to conserve Britain's remaining natural and semi-natural vegetation.

2) Through agricultural and countryside enhancement schemes, aim to increase the diversity of Britain's agricultural lowlands, by the restoration and maintenance of features such as ponds and woodlands.

3) Aim to conserve, restore and in some areas to increase, the small water-body resource throughout Britain.

4) To ensure management decisions are based upon the latest information, maintain and develop the volunteer recorder network. Emphasis should be placed on systematic surveying and long-term monitoring of both amphibians and their habitats.

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