5. Assessment of pine marten reintroductions against World Conservation Union guidelines

5.1 Introduction

The World Conservation Union's (IUCN) Reintroduction Specialist Group have drafted guidelines for planning, monitoring and assessment of reintroductions (IUCN 1995). In this chapter we assess pine marten reintroductions to England against these guidelines. Although guidelines are intended to steer rather than instruct practice, we have opted to structure this chapter by almost exactly following the IUCN reintroduction assessment points. Hopefully this permits complete transparency and demonstrates that all constraints and choices concerning the conservation of the pine marten in England have been fully considered. Translocation within a geographic unit like Britain anyway carries fewer potential problems than, for example, reintroduction of animals originating outside the country.

We have not considered various IUCN points referring to the release of captive bred animals. This is because there is no realistic possibility, or desirability, of using captive bred pine martens for reintroductions (Bright & Harris 1994).

In this chapter IUCN guidelines are reproduced in *SMALL ITALIC CAPITALS*, with our assessment in relation to pine marten reintroductions following.

5.2 Pre-project activities: Biological

Feasibility study and background research

5.2.1 AN ASSESSMENT SHOULD BE MADE OF THE TAXONOMIC STATUS OF INDIVIDUALS TO BE RE-INTRODUCED. THEY SHOULD PREFERABLY BE OF THE SAME SUB-SPECIES OR RACE AS THOSE WHICH WERE EXTIRPATED, UNLESS ADEQUATE NUMBERS ARE NOT AVAILABLE. AN INVESTIGATION OF HISTORICAL INFORMATION ABOUT THE LOSS AND FATE OF INDIVIDUALS FROM THE REINTRODUCTION AREA, AS WELL AS MOLECULAR GENETIC STUDIES, SHOULD BE UNDERTAKEN IN CASE OF DOUBT AS TO INDIVIDUALS' TAXONOMIC STATUS. A STUDY OF GENETIC VARIATION WITHIN AND BETWEEN POPULATIONS OF THIS AND RELATED TAXA CAN ALSO BE HELPFUL. SPECIAL CARE IS NEEDED WHEN THE POPULATION HAS LONG BEEN EXTINCT.

Pine martens in Britain have never been considered as a separate race from those in continental Europe (Millais 1905; Barrett-Hamilton & Hinton 1910-1921). Within Britain it is very unlikely that regional divergence would have occurred for such a highly mobile mammal. It would therefore not be expected that pine martens reintroduced from Scotland (as proposed, see below) would be a different race from those that were extirpated in the potential release regions (PRRs) in England.

5.2.2 DETAILED STUDIES SHOULD BE MADE OF THE STATUS AND BIOLOGY OF WILD POPULATIONS (IF THEY EXIST) TO DETERMINE THE SPECIES' CRITICAL NEEDS. A FIRM KNOWLEDGE OF THE NATURAL HISTORY OF THE SPECIES IN QUESTION IS CRUCIAL TO THE ENTIRE REINTRODUCTION SCHEME.

There have been extensive studies of pine marten populations in Britain and Europe, which have been thoroughly reviewed at all stages of the reintroduction feasibility studies. Studies have covered all key aspects of the pine marten's behaviour and ecology including diet, territory size, social organisation, habitat preferences and population limiting factors. Reintroduction feasibility studies have also carefully considered literature on the closely related American marten, *Martes americana*. There is thus a detailed knowledge of the pine martens needs.

5.2.3 THE SPECIES, IF ANY, THAT HAVE FILLED THE VOID CREATED BY THE LOSS OF THE SPECIES CONCERNED, SHOULD BE DETERMINED; AN UNDERSTANDING OF THE EFFECT THE RE-INTRODUCED SPECIES WILL HAVE ON THE ECOSYSTEM IS IMPORTANT FOR ASCERTAINING THE SUCCESS OF THE RE-INTRODUCED POPULATION.

Four other carnivores have potentially impinged on the vacant niche left by the extirpated pine marten: red fox, *Vulpes vulpes*, polecat/ferral ferret, *Mustela putoris*, *M. furo*, stoat, *M. erminea* and mink *M. vison* Stoat numbers have declined in recent years, foxes have probably increased (Tapper 1992). However, foxes utilise a wider range of habitats and prey, and unlike pine martens are not arboreal. In addition fox abundance (indexed as scats/km) was higher on average in sites of current pine marten distribution in Scotland than in the PRRs (Bright & Smithson 1997). Thus, the presence of foxes should not prevent the re-establishment of pine marten populations. It is recognized, however, that foxes may be significant predators of pine martens, and fox abundance was thus taken into account during the selection of PRRs. Polecats and feral ferrets are not present in substantial numbers in PRRs except possibly Dean (Corbet & Harris 1991). Like foxes they utilise a much wider range of habitats than pine martens, so it is not likely that competition from them would be sufficient to prevent re-establishment of pine martens. Mink are riverine and coastal species, and there is less potential for niche overlap between them and pine martens, than between polecats and martens. The impact that a reintroduced pine marten population would have on the native fauna and game has been thoroughly considered (Chapter 2).

5.2.4 THE BUILD-UP OF THE RELEASED POPULATION SHOULD BE MODELLED UNDER VARIOUS SETS OF CONDITIONS, IN ORDER TO SPECIFY THE OPTIMAL NUMBER AND COMPOSITION OF INDIVIDUALS TO BE RELEASED PER YEAR AND THE NUMBER OF YEARS NECESSARY TO PROMOTE ESTABLISHMENT OF A VIABLE POPULATION.

A population model was used to estimate the rate of population growth for different numbers and age structures of released pine martens (Bright & Harris 1994). The effect of additional mortality (traffic accidents, persecution or poisoning) on the probability of extinction of the founding population over a 10 year period was also modelled (Bright & Harris 1994).

5.2.5 A POPULATION AND HABITAT VIABILITY ANALYSIS WILL AID IN IDENTIFYING SIGNIFICANT ENVIRONMENTAL AND POPULATION VARIABLES AND ASSESSING THEIR POTENTIAL INTERACTIONS, WHICH WOULD GUIDE LONG-TERM POPULATION MANAGEMENT.

Extensive studies have been undertaken to determine the availability and quality of habitat for pine martens in PRRs (Bright & Harris 1994; Bright & Smithson 1997). These have focused on environmental factors that would limit pine marten population establishment and spread. From these it appears that the quality and extent of available habitat is sufficient to support viable populations. Behaviour of reintroduced animals would be intensively monitored and results from this used to inform management.

Previous re-introductions

5.2.6 THOROUGH RESEARCH INTO PREVIOUS REINTRODUCTIONS OF THE SAME OR SIMILAR SPECIES AND WIDE-RANGING CONTACTS WITH PERSONS HAVING RELEVANT EXPERTISE SHOULD BE CONDUCTED PRIOR TO AND WHILE DEVELOPING REINTRODUCTION PROTOCOL.

More is known about the behaviour of martens in relation to reintroductions than nearly all other birds or mammals that have been reintroduced. For example, Davis (1978) gives data on the behaviour of martens released using different techniques. In North America there have been many successful reintroductions of American martens *Martes americana* and fisher *Martes pennanti* (Slough 1994). All available literature has been consulted and contact has been made with Canadian researchers who have carried out American marten reintroductions.

The outcome of a pine marten reintroduction to south west Scotland has been intensively studied (Bright & Smithson 1997). This has yielded important insights for planning and conducting reintroductions, *eg* on rates of spread. There is thus an excellent foundation of knowledge from which to develop a reintroduction protocol (Chapter 6).

Choice of release site and type

5.2.7 THE SITE SHOULD BE WITHIN THE HISTORIC RANGE OF THE SPECIES. FOR AN INITIAL RE-ENFORCEMENT THERE SHOULD BE FEW REMNANT WILD INDIVIDUALS. FOR A REINTRODUCTION, THERE SHOULD BE NO REMNANT POPULATION TO PREVENT DISEASE SPREAD, SOCIAL DISRUPTION AND INTRODUCTION OF ALIEN GENES.

The PRRs are all within the pine marten's historic range in England (Langley & Yalden 1977). PRRs in southern England have no pine martens present.

5.2.8 THE REINTRODUCTION AREA SHOULD HAVE ASSURED, LONG-TERM PROTECTION (WHETHER FORMAL OR OTHERWISE).

PRRs contain a high proportion of woodland and forest, felling of which is licensable. It is extremely unlikely that there would be any major decease in woodland in PRRs in the future. In addition, much of the PRRs have formal conservation status as Areas of Outstanding Natural Beauty and Sites of Special Scientific Interest, National Nature Reserves and local nature reserves. Three of the PRRs also include areas of National Parks, which are protected

by legislation. Note however that pine marten territories are large, so this species cannot be protected only within statutory conservation areas.

Evaluation of re-introduction sites

5.2.9 AVAILABILITY OF SUITABLE HABITAT: REINTRODUCTIONS SHOULD ONLY TAKE PLACE WHERE THE HABITAT AND LANDSCAPE REQUIREMENTS OF THE SPECIES ARE SATISFIED, AND LIKELY TO BE SUSTAINED FOR THE FOR-SEEABLE FUTURE. THE POSSIBILITY OF NATURAL HABITAT CHANGE SINCE EXTIRPATION MUST BE CONSIDERED. LIKEWISE, A CHANGE IN THE LEGAL/ POLITICAL OR CULTURAL ENVIRONMENT SINCE SPECIES EXTIRPATION NEEDS TO BE ASCERTAINED AND EVALUATED AS A POSSIBLE CONSTRAINT. THE AREA SHOULD HAVE SUFFICIENT CARRYING CAPACITY TO SUSTAIN GROWTH OF THE RE-INTRODUCED POPULATION AND SUPPORT A VIABLE (SELF-SUSTAINING) POPULATION IN THE LONG RUN.

The PRRs were selected on the basis of quality and extent of suitable habitat and the probability of establishing long-term viable populations (see 5.2.5; 5.2.8; Bright & Smithson 1997). The extent of suitable habitat for pine martens is likely to increase in many PRRs in the next few years, due especially to planting of community forests. Natural habitat change would not be sufficient to significantly influence habitat quality and most habitat is anyway managed. The current change in management practice towards forests with a more diverse age structure would increase habitat suitability for pine martens. The pine marten was not legally protected when it declined last century and earlier this century. It now receives the current maximum possible legal protection for a wild mammal in the UK, under the Wildlife & Countryside Act (1981, as amended by the Environmental Protection Act 1990) and some protection under the Conservation (Natural Habitats &c) Regulations 1994.

5.2.10 IDENTIFICATION AND ELIMINATION, OR REDUCTION TO A SUFFICIENT LEVEL, OF PREVIOUS CAUSES OF DECLINE: COULD INCLUDE DISEASE; OVER-HUNTING; OVER-COLLECTION; POLLUTION; POISONING; COMPETITION WITH OR PREDATION BY INTRODUCED SPECIES; HABITAT LOSS; ADVERSE EFFECTS OF EARLIER RESEARCH OR MANAGEMENT PROGRAMMES; COMPETITION WITH DOMESTIC LIVESTOCK, WHICH MAY BE SEASONAL. WHERE THE RELEASE SITE HAS UNDERGONE SUBSTANTIAL DEGRADATION CAUSED BY HUMAN ACTIVITY, A HABITAT RESTORATION PROGRAMME SHOULD BE INITIATED BEFORE THE REINTRODUCTION IS CARRIED OUT.

Persecution (mainly trapping) was the cause of pine marten extirpation in England (Langley & Yalden 1977). Last dates of pine marten presence in English counties correlate with gamekeeper density, but not woodland cover, implying that gamekeeping pressure, not habitat availability, was the proximate cause of decline (P.W. Bright, R. McDonald & S. Harris, unpublished). It is clear that gamkeeping has been reduced greatly this century (Tapper 1992) and PRRs were selected partly on the basis of having low gamekeeping density (Bright & Smithson 1997). Thus the cause of past pine marten decline has been greatly reduced and pine martens would be reintroduced in regions away from more intensive gamekeeping. Furthermore, the Pine Marten Action plan (Chapter 7) calls for measures to limit the inadvertent impact of gamkeeping on pine martens and *vice versa*.

Availability of suitable release stock

5.2.11 IT IS DESIRABLE THAT SOURCE ANIMALS COME FROM WILD POPULATIONS. IF THERE IS A CHOICE OF WILD POPULATIONS TO SUPPLY FOUNDER STOCK FOR TRANSLOCATION, THE SOURCE POPULATION SHOULD IDEALLY BE CLOSELY RELATED GENETICALLY TO THE ORIGINAL NATIVE STOCK AND SHOW SIMILAR ECOLOGICAL CHARACTERISTICS (MORPHOLOGY, PHYSIOLOGY, BEHAVIOUR, HABITAT PREFERENCE) TO THE ORIGINAL SUB-POPULATION.

Wild caught pine martens from Scotland, where numbers are increasing, would be used for the reintroductions. Although the pine marten found in the British Isles is the same species as that in continental Europe, animals from Scotland would be most closely related to the stock that formerly occurred in England. Scotland would thus be the most appropriate, as well as practical, source of animals for reintroduction.

5.2.12 REMOVAL OF INDIVIDUALS FOR REINTRODUCTION MUST NOT ENDANGER THE CAPTIVE STOCK POPULATION OR THE WILD SOURCE POPULATION. STOCK MUST BE GUARANTEED AVAILABLE ON A REGULAR AND PREDICTABLE BASIS, MEETING SPECIFICATIONS OF THE PROJECT PROTOCOL.

Only areas where breeding pine martens have been present for at least 15 years were considered to hold potential source populations. Pine martens would be removed only during autumn/early winter to minimize interference with breeding. A trapping programme based on extensive pre-baiting and using proven methods would be employed to ensure a regular supply of pine martens when required for the release programme (see Chapter 6).

5.2.13 INDIVIDUALS SHOULD ONLY BE REMOVED FROM A WILD POPULATION AFTER THE EFFECTS OF TRANSLOCATION ON THE SOURCE POPULATION HAVE BEEN ASSESSED, AND AFTER IT IS GUARANTEED THAT THESE EFFECTS WILL NOT BE NEGATIVE.

Population models were constructed to determine the impact of removing pine martens from populations of different sizes (see Chapter 4). Removal of different numbers of pine martens over various time frames was modeled. Detailed assessments of the size of potential source populations have been made. These approaches allow determination of a safe rate of removal of pine martens from Scotland, that will not damage existing populations.

5.2.13 PROSPECTIVE RELEASE STOCK, INCLUDING STOCK THAT IS A GIFT BETWEEN GOVERNMENTS, MUST BE SUBJECTED TO A THOROUGH VETERINARY SCREENING PROCESS BEFORE SHIPMENT FROM ORIGINAL SOURCE. ANY ANIMALS FOUND TO BE INFECTED OR WHICH TEST POSITIVE FOR NON-ENDEMIC OR CONTAGIOUS PATHOGENS WITH A POTENTIAL IMPACT ON POPULATION LEVELS, MUST BE REMOVED FROM THE CONSIGNMENT, AND THE UNINFECTED, NEGATIVE REMAINDER MUST BE PLACED IN STRICT QUARANTINE FOR A SUITABLE PERIOD BEFORE RETEST. IF CLEAR AFTER RETESTING, THE ANIMALS MAY BE PLACED FOR SHIPMENT.

Pine martens would only moved within Britain and not shipped between countries. They would therefore not be carrying any non-endemic pathogens. Each pine marten would however be given a full veterinary inspection in Scotland, prior to translocation and checked for any signs of disease or illness before it is considered for the release programme.

5.2.14 SINCE INFECTION WITH SERIOUS DISEASE CAN BE ACQUIRED DURING SHIPMENT, ESPECIALLY IF THIS IS INTERCONTINENTAL, GREAT CARE MUST BE TAKEN TO MINIMIZE THIS RISK.

It is not anticipated that pine martens would acquire any diseases whilst being moved from Scotland to England. During translocation (and release) they would be housed separately, and would not come into contact with other species. In addition, translocation would be rapid to minimise the possibility of stress-enduced expression of latent pathogens.

5.3 Pre-project activities: Socio-economic and legal requirements

5.3.1 REINTRODUCTIONS ARE GENERALLY LONG-TERM PROJECTS THAT REQUIRE THE COMMITMENT OF LONG-TERM FINANCIAL AND POLITICAL SUPPORT

The reintroduction would be carried out by English Nature, the government conservation agency, and partner organisations. Funding from English Nature would be from the Species Recovery Programme, which is a long term initiative for the conservation of rare species, including the pine marten. The continuous support of English Nature and the People's Trust for Endangered Species over the last five years, attests to these organisations long-term commitment to pine marten conservation in England.

5.3.2 SOCIO-ECONOMIC STUDIES SHOULD BE MADE TO ASSESS IMPACTS, COSTS AND BENEFITS OF THE REINTRODUCTION PROGRAMME TO LOCAL HUMAN POPULATIONS.

The impacts of reintroduced pine martens on game and native fauna have been thoroughly assessed. Impacts would be small (Chapter 2), except in the case of unprotected pheasant rearing pens. However, methods to prevent pine martens gaining access to pens have now been developed (Balharry & Macdonald 1996; Balharry 1998). Impacts on game rearing would thus not be great provided appropriate precautions were taken. Trials of 'pine marten excluders' for Fenn traps are currently being undertaken to determine whether these would be practical for use by gamekeepers (cf Chapter 7). It is anticipated that pine marten viewing hides would be set up once populations were established. These would have considerable value for education and the promotion of biodiversity conservation.

5.3.3 A THOROUGH ASSESSMENT OF ATTITUDES OF LOCAL PEOPLE TO THE PROPOSED PROJECT IS NECESSARY TO ENSURE LONG TERM PROTECTION OF THE RE-INTRODUCED POPULATION, ESPECIALLY IF THE CAUSE OF SPECIES' DECLINE WAS DUE TO HUMAN FACTORS (E.G. OVER-HUNTING, OVER-COLLECTION, LOSS OR ALTERATION OF HABITAT). THE PROGRAMME SHOULD BE FULLY UNDERSTOOD, ACCEPTED AND SUPPORTED BY LOCAL COMMUNITIES.

A questionnaire was sent to randomly selected farmers/landowners, gamekeepers and members of the public in PRRs to determine opinion towards the proposed reintroduction (Chapter 3). There were nearly 1000 replies, which revealed clear and widespread support for the proposed reintroduction and highlighted areas of concern. The latter are incorporated in the Pine Marten Action Plan (Chapter 7) as measures to minimise potential impacts on game rearing and shooting interests. Reintroductions would not go ahead without further consultation of landowners and managers in PRRs. The questionnaire was accompanied by information about pine martens and the potential reintroduction. English Nature will publish a

booklet expanding on this information, prior to reaching a decision on whether to proceed with the reintroduction. Local communities would thus be well informed before any reintroduction proceeded.

5.3.4 WHERE THE SECURITY OF THE RE-INTRODUCED POPULATION IS AT RISK FROM HUMAN ACTIVITIES, MEASURES SHOULD BE TAKEN TO MINIMISE THESE IN THE REINTRODUCTION AREA. IF THESE MEASURES ARE INADEQUATE, THE REINTRODUCTION SHOULD BE ABANDONED OR ALTERNATIVE RELEASE AREAS SOUGHT.

The PRRs were selected to minimize risk from human activities, in particular road mortality and capture or shooting incidental to control of other carnivores (Bright & Smithson 1997). A code of best practice for game keepers in the release regions is being drawn up in conjunction with gamekeeper and shooting organisations and trials of 'pine marten excluders' for Fenn traps are underway (cf Chapter 7).

5.3.5 THE POLICY OF THE COUNTRY TO REINTRODUCTIONS AND TO THE SPECIES CONCERNED SHOULD BE ASSESSED. THIS MIGHT INCLUDE CHECKING EXISTING PROVINCIAL, NATIONAL AND INTERNATIONAL LEGISLATION AND REGULATIONS, AND PROVISION OF NEW MEASURES AND REQUIRED PERMITS AS NECESSARY.

The proposed reintroduction is part of the Species Recovery Programme developed by the government conservation agency, English Nature. It would thus be part of a coordinated, national conservation policy. The policy stems from national, European and international directives to restore threatened habitats and wildlife. Removal of pine martens from Scotland would require licensing from Scottish Natural Heritage. Post-release monitoring would be licensable by English Nature.

5.3.6 RE-INTRODUCTION MUST TAKE PLACE WITH THE FULL PERMISSION AND INVOLVEMENT OF ALL RELEVANT GOVERNMENT AGENCIES OF THE RECIPIENT OR HOST COUNTRY. THIS IS PARTICULARLY IMPORTANT IN REINTRODUCTIONS IN BORDER AREAS, OR INVOLVING MORE THAN ONE STATE OR WHEN A RE-INTRODUCED POPULATION CAN EXPAND INTO OTHER STATES, PROVINCES OR TERRITORIES.

All relevant government agencies are involved in the project or have been consulted from the outset, including English Nature, Scottish Natural Heritage, the Countryside Council for Wales and the Joint Nature Conservation Committee. A meeting was held in June 1996 with these agencies to discuss pine marten reintroductions. Other agencies were consulted in more general terms at a national level in 1994. Regional offices of Forest Enterprise and English Nature have been informed about the reintroduction questionnaire (Chapter 3) and of the progress of work described in the current report. However, further detailed local consultation with Forest Enterprise and other landowners and managers would be undertaken before any decision to proceed with a reintroduction was made.

5.3.7 IF THE SPECIES POSES POTENTIAL RISK TO LIFE OR PROPERTY, THESE RISKS SHOULD BE MINIMISED AND ADEQUATE PROVISION MADE FOR COMPENSATION WHERE NECESSARY; WHERE ALL OTHER SOLUTIONS FAIL, REMOVAL OR DESTRUCTION OF THE RELEASED INDIVIDUAL SHOULD BE CONSIDERED. IN THE CASE OF MIGRATORY/MOBILE SPECIES, PROVISIONS SHOULD BE MADE FOR CROSSING OF INTERNATIONAL/STATE BOUNDARIES.

5.4.4 SECURING ADEQUATE FUNDING FOR ALL PROGRAMME PHASES.

English Nature and the People's Trust for Endangered Species are committed to the long term recovery of pine martens in England. No reintroduction would go ahead without assured long term funding for releases and monitoring.

5.4.5 DESIGN OF PRE- AND POST- RELEASE MONITORING PROGRAMME SO THAT EACH REINTRODUCTION IS A CAREFULLY DESIGNED EXPERIMENT, WITH THE CAPABILITY TO TEST METHODOLOGY WITH SCIENTIFICALLY COLLECTED DATA. MONITORING THE HEALTH OF INDIVIDUALS, AS WELL AS THE SURVIVAL, IS IMPORTANT; INTERVENTION MAY BE NECESSARY IF THE SITUATION PROVES UNFORSEEABLY UN FAVOURABLE.

A proposed release and monitoring protocol is given in Chapter 6. The release strategy would build on experimental approaches adopted by other successful reintroductions *eg* that of the dormouse *Muscardinus avellanarius* (Bright & Morris 1994). Animals would be rapidly transferred between source and release sites. They would be soft-released and provisioned with supplementary food. All animals would be fitted with radio collars. Habitat use, movements and territory areas would be determined immediately post-release and several weeks later to assess development of foraging and territory. Causes of mortality and correlates of breeding would be measured to assess the success of the release. Tracking and intermittent trapping would allow monitoring of condition and veterinary intervention as necessary. A long term monitoring programme would be put in place.

5.4.6 APPROPRIATE HEALTH AND GENETIC SCREENING OF RELEASE STOCK, INCLUDING STOCK THAT IS A GIFT BETWEEN GOVERNMENTS. HEALTH SCREENING OF CLOSELY RELATED SPECIES IN THE REINTRODUCTION AREA.

Before translocation and release, all pine martens would be subject to veterinary inspection. Hair-follicle samples would be taken for subsequent DNA profiling. There are no closely related species present in the PRRs that would require heath screening.

5.4.7 IF RELEASE STOCK IS WILD-CAUGHT, CARE MUST BE TAKEN TO ENSURE THAT: A) THE STOCK IS FREE FROM INFECTIOUS OR CONTAGIOUS PATHOGENS AND PARASITES BEFORE SHIPMENT AND B) THE STOCK WILL NOT BE EXPOSED TO VECTORS OF DISEASE AGENTS WHICH MAY BE PRESENT AT THE RELEASE SITE (AND ABSENT AT THE SOURCE SITE) AND TO WHICH IT MAY HAVE NO ACQUIRED IMMUNITY.

The pine martens would all be checked for parasites and any other signs of disease by veterinarians experienced in wild animal medicine. Since the source and release sites are within the same country pine martens would not be likely to be exposed to new pathogens.

5.4.8 IF VACCINATION PRIOR TO RELEASE, AGAINST LOCAL ENDEMIC OR EPIDEMIC DISEASES OF WILD STOCK OR DOMESTIC LIVESTOCK AT THE RELEASE SITE, IS DEEMED APPROPRIATE, THIS MUST BE CARRIED OUT DURING THE "PREPARATION STAGE" SO AS TO ALLOW SUFFICIENT TIME FOR THE DEVELOPMENT OF THE REQUIRED IMMUNITY.

It is not considered that vaccinations would be necessary for the released pine martens.

5.4.9 DEVELOPMENT OF TRANSPORT PLANS FOR DELIVERY OF STOCK TO THE COUNTRY AND SITE OF REINTRODUCTION, WITH SPECIAL EMPHASIS ON WAYS TO MINIMIZE STRESS ON THE INDIVIDUALS DURING TRANSPORT.

Pine martens would be transported in dark, straw-lined boxes and provided with chew-bars (strips of soft wood for martens to chew and avoid damaged teeth). After capture they would be inspected, sedated, then transported rapidly (mainly by air) to the release site. Pre-release pens would be located in quite, secluded areas where disturbance would be kept to an absolute minimum. Considerable attention would be paid to the design and construction of pens, to avoid risk of damage to animals, especially teeth.

5.4.10 DETERMINATION OF RELEASE STRATEGY (ACCLIMATIZATION OF RELEASE STOCK TO RELEASE AREA; BEHAVIOURAL TRAINING - INCLUDING HUNTING AND FEEDING; GROUP COMPOSITION, NUMBER, RELEASE PATTERNS AND TECHNIQUES; TIMING).

Pine martens would be soft-released. Supplementary food would be provided in and around pre-release pens for at least several months after release. Animals would be release singly, though a male and a female would be released in the same general area. Experiments would be conducted involving placement of scats around release areas, in an attempt to limit post-release movements. Full details are given in Chapter 6.

5.4.11 ESTABLISHMENT OF POLICIES ON INTERVENTIONS.

Radio tracking and intermittent trapping would allow some intervention post release. It must be recognized, however, that intervention to aid sick animals would often be impractical. Use of pre-release pens would do much to allow screening of animals for problems prior to release.

5.4.12 DEVELOPMENT OF CONSERVATION EDUCATION FOR LONG-TERM SUPPORT; PROFESSIONAL TRAINING OF INDIVIDUALS INVOLVED IN THE LONG-TERM PROGRAMME; PUBLIC RELATIONS THROUGH THE MASS MEDIA AND IN LOCAL COMMUNITY; INVOLVEMENT WHERE POSSIBLE OF LOCAL PEOPLE IN THE PROGRAMME.

The success of the reintroduction would rely on the support and involvement of local people, especially landowners and gamekeepers, who would be kept fully informed about the reintroduction through local meetings and leaflets. It would however be important to keep the location of release sites secret. Consequently mass publicity would need to be carefully organized and naming of release locations would not be desirable until year three of the release.

5.4.13 THE WELFARE OF ANIMALS FOR RELEASE IS OF PARAMOUNT CONCERN THROUGH ALL THESE STAGES.

The welfare of the pine martens would be of paramount concern during the capture, transfer, re-release holding and release of animals. Measures to ensure this have been outlined above.

5. 5 Post-release activities

5.5.1 POST RELEASE MONITORING IS REQUIRED OF ALL (OR SAMPLE OF) INDIVIDUALS. THIS MOST VITAL ASPECT MAY BE BY DIRECT (E.G. TAGGING, TELEMETRY) OR INDIRECT (E.G. SPOOR, INFORMANTS) METHODS AS SUITABLE.

All pine martens would be fitted with radio-collars (1-2% body weight) and marked using passive integrated transponders (PIT tags). Each animals throat patch would also be photographed, as an additional aid to identification. A sample of animals would be tracked intensively to determine movement patterns and habitat use. All animals would be located at daily and then weekly intervals to monitor welfare and survival. Follow-up tracking would be conducted to assess settlement patterns and ensure animals were self sustaining. Pine martens would need to be re-captured after about 10 months to replace radio collars, so that survival and breeding could be monitored over the first two years. Efforts would made to capture and mark juveniles before dispersal. Information collected from the monitoring would be used to refine methods used in subsequent releases.

5.5.2 DEMOGRAPHIC, ECOLOGICAL AND BEHAVIOURAL STUDIES OF RELEASED STOCK MUST BE UNDERTAKEN.

Studies in the first two years of a release were listed in 5.5.1. Subsequent to this, demography and population expansion would be monitored using one or a combination of: automatic cameras; baiting points equipped with transponder readers; and/or transect counts of scats.

5.5.3 STUDY OF PROCESSES OF LONG-TERM ADAPTATION BY INDIVIDUALS AND THE POPULATION.

See 5.5.1 and 5.5.2.

5.5.4 COLLECTION AND INVESTIGATION OF MORTALITIES.

All animals would be fitted with radio collars before release and these would be replaced during the two years following release. Location at daily, then weekly and later bi-monthly intervals should enable though monitoring of mortalities and their causes.

5.5.6 INTERVENTIONS (E.G. SUPPLEMENTAL FEEDING; VETERINARY AID; HORTICULTURAL AID) WHEN NECESSARY.

Supplemental food would be supplied around pre-release pens, for at least several months after release. This would maximise the performance of released animals and probably encourage settlement in the release area. Other aspects of intervention are listed in 5.4.11.

5.5.7 DECISIONS FOR REVISION, RESCHEDULING, OR DISCONTINUATION OF PROGRAMME WHERE NECESSARY.

The release schedule and the success of released animals would be reviewed against the success criteria (5.4.3). Significant departure from these would trigger re-evaluation of the reintroduction programme.

5.5.8 HABITAT PROTECTION OR RESTORATION TO CONTINUE WHERE NECESSARY.

The need for habitat protection or restoration is not envisaged. If woodland felling or thinning is planned in areas near the release sites, pine marten dens or potential dens would be located and protected.

5.5.9 CONTINUING PUBLIC RELATIONS ACTIVITIES, INCLUDING EDUCATION AND MASS MEDIA COVERAGE.

See 5.4.12.

5.5.10 EVALUATION OF COST-EFFECTIVENESS AND SUCCESS OF REINTRODUCTION TECHNIQUES.

Evaluation of would be based on the criteria at out in 5.4.3.

5.5.11 REGULAR PUBLICATIONS IN SCIENTIFIC AND POPULAR LITERATURE.

Once the initial release phase has past (5.4.12), the progress of the reintroduction would be reported in national magazines and journals, such as British Wildlife, BBC Wildlife, ENACT and other. Results from monitoring would form the basis for publications in high quality scientific journals.

5.6 Conclusions and further work

It is clear that the proposed reintroduction very largely meets internationally accepted criteria on planning and implementation. Work remains to be done in two key areas, which could not have been tackled before completion of the current report. These are: (a) consultation with specific individual landowners and managers in potential release regions, to secure support and consent for releases at particular sites; and (b) further consultation and agreement with statutory conservation agencies concerning the removal of pine martens from Scotland.

References

Balharry, E. & Macdonald, D.W. (1996). *A cost effective method for protecting livestock against marten predation.* Scottish Natural Heritage Research, Survey and Monitoring Report No 47.

Barrett-Hamilton, G.E.H. & Hinton, M.A.C. (1910-1921). *A history of British mammals.* Gurney & Jackson, London.

Bright, P.W. & Harris, S. (1994). *Reintroduction of the pine marten: feasibility study.* English Nature Research Report No 84.

Bright, P.W. & Morris, P.A. (1994). *Animal translocations for conservation: performance of dormice in relation to release methods, origin and season. Journal of Animal Ecology* **31**: 699-708.

Bright, P.W. & Smithson, T.J. (1997). *Species recovery programme for the pine marten in England: 1995-96.* Unpublished report to the People's Trust for Endangered Species, London and English Nature, Peterborough.

Bright, P.W., McDonald, R. & Harris, S. (1995). *Initiating a recovery programme for the pine marten in England and Wales.* Unpublished report to the People's Trust for Endangered Species, London.

Davis, M. H. (1978) Reintroduction of the pine marten into Nicolet National Forest, Forest County, Wisconsin. Unpublished M.S. thesis, University of Wisconsin.

IUCN (1995). *Guidelines for re-introductions.* Reintroduction Specialist Group, Gland, Switzerland.

Langley, P. J. W. & Yalden, D. W. (1977) The decline of the rarer carnivores in Britain during the nineteenth century. *Mammal Review* 7, 95-116.

Millais, J.G. (1905). *The mammals of Great Britain and Ireland, vol. II.* Longmans, Green & Co., London.

Slough B.G. (1994). Translocations of American martens: an evaluation of factors in success. In: *Martens, sables and fishers: biology and conservation* (eds S.W. Buskirk, A.S. Harsted, M.G. Raphael & R.A. Powell), pp 165-178. Cornell University Press, NY.

Tapper, S. (1992). *Game heritage: An ecological review from shooting and gamekeeping records.* Game Conservancy Trust, Fordingbridge, Hampshire.

6. Protocol for the translocation of pine martens, their reintroduction and monitoring

6.1 Introduction and outline rationale

The success of reintroductions depends greatly on the use of appropriate translocation and release techniques (*eg* Griffith *et al.* 1989; Wolf *et al.* 1996). Inappropriate techniques have often lead to high mortality during translocation or failure of individuals to adapt to new sites, let alone the establishment and growth of a new population. It is therefore vitally important to formulate detailed plans for the translocation, release and monitoring of animals for reintroduction. It is crucial that the key determinants of the natural history and behaviour of species to be reintroduced are understood. In these respects more is known about martens, including their response to different release methods (Davis 1983; Slough 1994), than almost any other species that have been reintroduced.

Successful reintroductions have involved the release of a large number of individuals (Griffith *et al.* 1989; Slough 1994). Bright and Harris (1994) formulated a simple model of pine marten populations, that has consequently been shown to closely describe the growth of a reintroduced population (Bright & Smithson 1997). This model showed that extinction risk from mortality additional to that normally experienced by pine marten populations (as expected during a reintroduction) was greatly reduced when numbers released were increased from 10 to 20. There was also a major decrease in risk when numbers released were increased to 40 (Fig 6.1). It was therefore suggested that at least 30 pine martens should be released during a reintroduction (Bright & Harris 1994). Slough (1994) showed that all American marten reintroductions which released at least 30 martens in one or several tranches were successful.

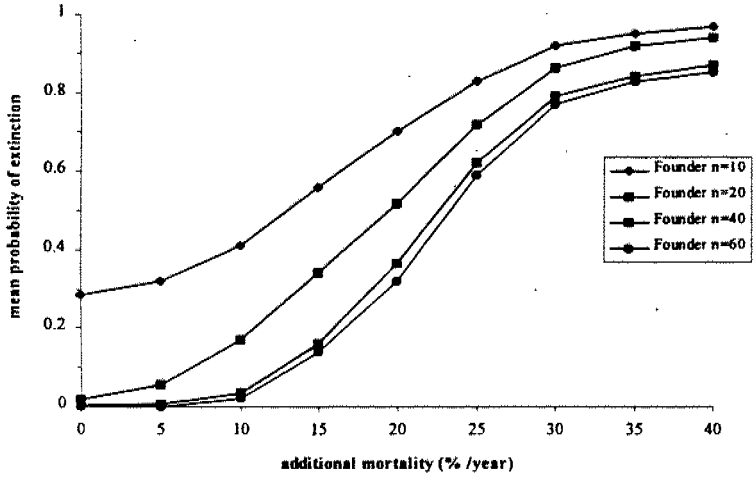

Fig 6.1. Predicted probability of populations extinction in relation to the percentage rate of mortality/yr, additional to that operating on an undisturbed wild marten population. Probabilities are based on 300 simulations for a 10 year period and founder populations of 10, 20, 40 and 60 martens. (Taken from Bright & Harris 1994).

Translocations involving the release of more than one tranche of animals also tend to be more successful (Griffith *et al.* 1989). Thus pine marten releases over two years might be preferable to releases of the same number of animals in one year. Our analyses suggest that to be certain removals would not damage existing populations, 30 pine martens could not be taken from a few forest blocks in Scotland per year (Chapter 4). Removal of 30 animals from multiple forest blocks would be impractical (though would not damage the Scottish pine marten population as a whole). Thus from the perspectives of the probability of success, the safety of donor populations, and the practicality of removing animals, reintroductions phased over two years would be most desirable.

Releases of animals in reintroduction programmes may either be 'hard' (animals released immediately upon arrival at a release site) or 'soft' (animals held for a period of time in pens at the release site). Only three reintroductions have involved comparison of these methods (Davis 1988; Carbyn *et al* 1994; Bright & Morris 1994). These include a reintroduction of American martens, which - in common with the other studies - showed that soft releases engender behaviour amongst released animals of key importance to the success of reintroductions. Soft releases encourage animals to return to release sites, so enabling them to benefit from provision of supplementary food and promoting the establishment of cohesive populations (Davis 1983; Bright & Morris 1994; Fritts *et al.* 1997). Though exploratory movements are pivotal to the settlement of individuals, they may also result in high mortality. This is especially so for species like the pine marten that can travel long distances relative to their body size. Soft releases are thus likely to be particularly beneficial for pine martens.

Most marten reintroductions (in north America) have used hard releases, but all those that used soft-released animals resulted in self-sustaining populations (Slough 1994). Thus, for the proposed reintroduction, pine martens would need to be soft released.

Many vertebrate reintroductions have used juveniles or sub-adults in the belief that such young animals retain behavioural flexibility and a propensity to explore which should promote adaptation to novel surroundings. Although such an approach clearly works well with raptors, we believe that there are two key disadvantages to using younger cohorts. Firstly, younger animals have a greater propensity to undertake dispersal movements. These may expose them to high risk of mortality from both predators and anthropogenic sources and militate against the establishment of cohesive populations. Secondly, there will be a longer time lag between the release of young animals and first breeding at a reintroduction site, compared to the time taken for adult animals to begin breeding. These two disadvantages are likely to feed back negatively on one another, so their adverse effects will be multiplicative not additive. Thus if sexually or socially immature pine martens were released, few might survive to reach breeding age. The first releases of black-footed ferrets *Mustela nigripes* illustrate this point: many dispersed beyond the core of the release area and there was a relatively high rate of mortality, especially from predation (Clark 1994). We thus suggest that translocating pine martens of two years old and more would be the most effective reintroduction strategy.

A pine marten reintroduction would initially be in a single region selected from those already identified (Bright & Smithson 1997) following consideration of all sections of this report. The initial reintroduction would be experimental, the results influencing decisions regarding further releases. As such it would be important that there was extensive monitoring of released animals (Soderquist 1994), particularly by radio tracking. The crucial need for detailed monitoring is

exemplified by the history of animal translocations. Of more than 300 vertebrate translocations, only 16% used radio tracking and thus the fate of lost animals, many of them cryptic, (*eg* natural mortality, violent mortality *ie* trapping/shooting/road casualty, or dispersal) could not be determined (Wolf *et al.* 1996). In such reintroductions there was thus little collection of data that could have been used to help formulate improved release protocols. In addition to radio-tracking longer term monitoring methods to chart the fate of released pine martens would be needed, such as automatic cameras placed at bait, or transponder-reader stations (Raphael 1994) and scat surveys.

The forgoing discussion sets the strategic background for a pine marten reintroduction protocol, some of which was also given by Bright & Harris (1994). In the rest of this chapter we develop a practical appraoch to a reintroduction. In particular we set out a staged series of measures of success, as required by IUCN guidelines (Chapter 5). Our scheme is, obviously, idealised and would probably be refined in the light of experience gained during translocations and through the vagaries of work in the field.

6.2 Outline translocation and monitoring protocol

Thirty adult pine martens (15 male and 15 female) would be released over 2 years, 16 in Year 1 and 14 in Year 2, between mid-September and November. Pine martens would be trapped and removed from donor regions in groups of 4 and then held in pre-release pens at the reintroduction site for c.7-10 days. This length of time has been often used in other reintroductions, including of American martens. It appears sufficient to engender some philopatry in most mammals tested. Upon release 2 of the four pine martens would be radio-tracked intensively for 2 weeks, then subsequently located daily. The two other martens would be located only at daily intervals (Fig 6.2). Approximately one week after the first releases, another 4 pine martens would be brought from Scotland and held in pre-release pens for a week. The same radio-monitoring schedule would be followed with these animals, but in addition there would also need to be daily location of the first tranch of released animals. (Fig 6.2). This pattern would continue until 16 pine martens had been released. After 8 weeks of daily locations, or 2 weeks of intensive tracking and 6 weeks of daily locations, pine martens would be located at weekly intervals. Six months after the release there would be a second period of intensive radio-tracking (Fig 6.2)

In Year 2 a further 14 pine martens would be released following the same pattern as in Year 1 (Fig 6.3). In September, location of pine martens released in Year 1 would be reduced to bi-monthly intervals. These locations would be further reduced to monthly intervals in January (Fig 6.3). Additional monitoring techniques would be employed in Year 2, such as cameras at bait stations and scat transects. There would be a trap session at the end of Year 1 to replace radio-collars and at the end of Year 2 to remove radio-collars. This would also provide an opportunity to assess the pine martens' condition and also the number of young produced. Without this level of radio-monitoring it is doubtful whether the fate of released pine martens could be followed, or whether sufficient data to inform subsequent releases

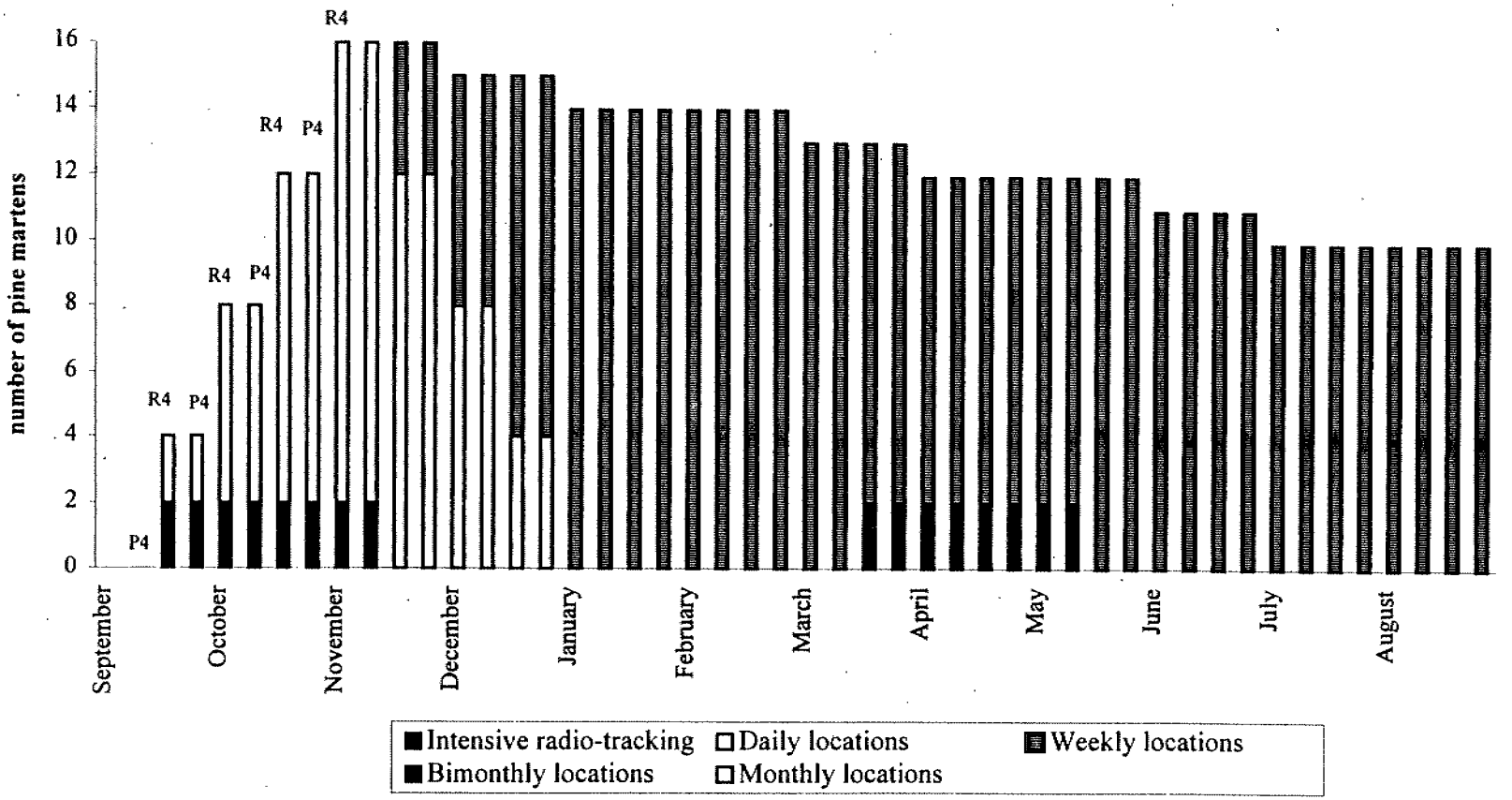

Fig. 6.2. Monitoring timetable for year 1 of a pine marten reintroduction programme. Numbers of released pine martens assumed to be present have been reduced during the course of the year, assuming a mortality rate of 35%; and a radio tag failure and dispersal rate of 15%. P= pine martens in pens; R=pine martens released.

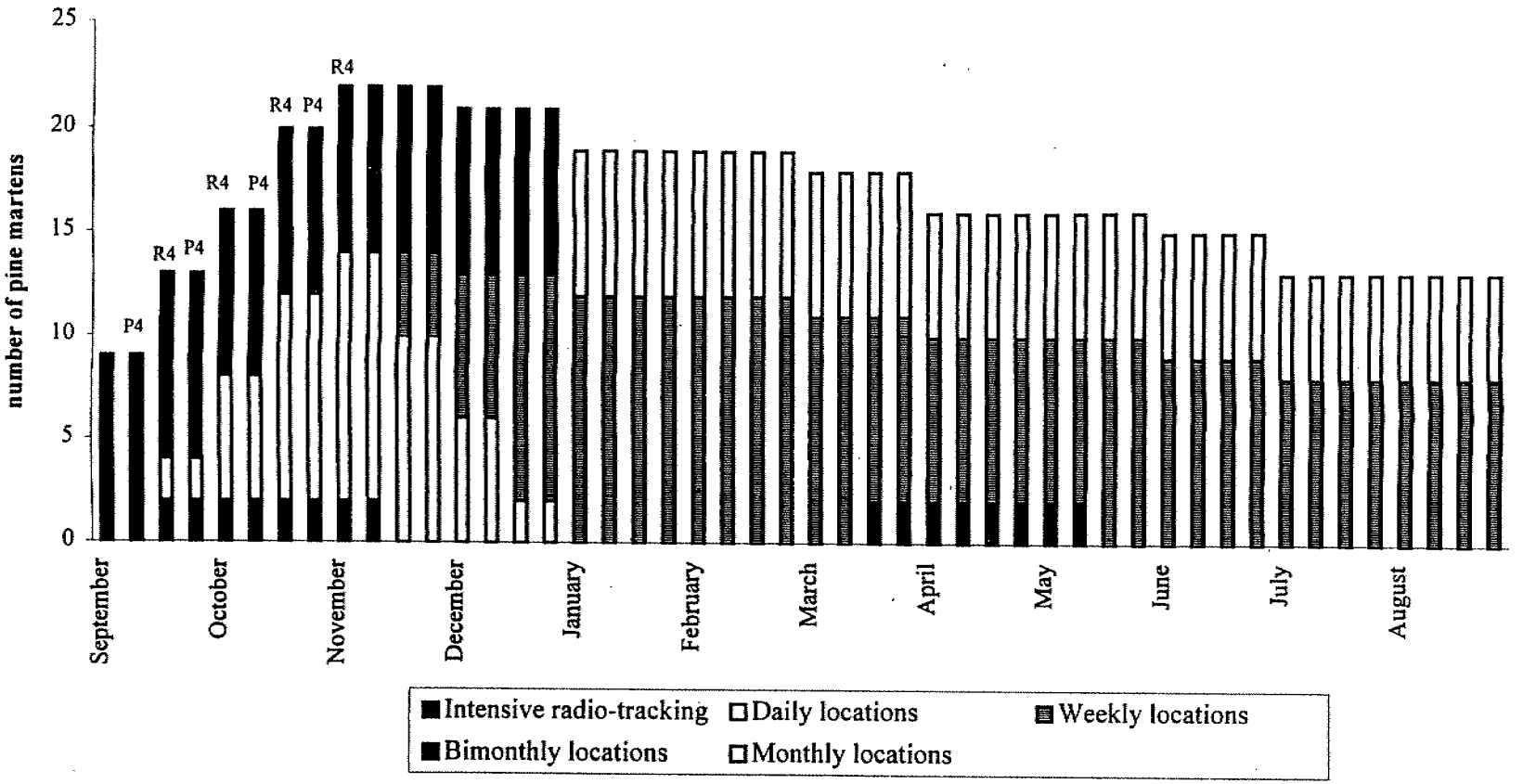

Fig. 6.3. Monitoring timetable for year 2 of a pine marten reintroduction programme. Numbers of released pine martens assumed to be present have been reduced by 50% from year 1 (mortality rate year 1, 35%; mortality rate year 2, 25%; radio tag failure and dispersal, 15%). P= pine martens in pens; R=pine martens released.

could be collected. In particular, longer intervals between locating animals would inevitably result in contact with a significant proportion of them being lost. The capture, translocation, release and monitoring of pine martens would require employment of a full time highly experienced assistant for 27 months (Fig. 6.4). A field assistant at the release site would be needed for about 25 months. In addition, a temporary assistant would need to be employed during release phases, when three people would be required simultaneously to track and feed martens. A second temporary assistant would be needed in Scotland to undertake the capture of pine martens (Fig. 6.4).

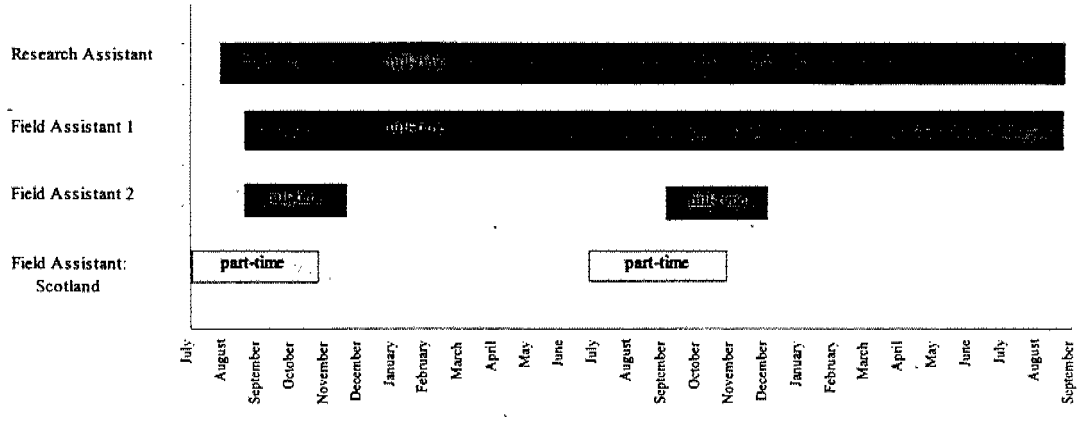

Fig. 6.4. Employment timetable for years 1 and 2 of a pine marten reintroduction programme.

6.3 Capture and translocation

6.3.1 Capture and transfer of martens from donor sites

YEAR 1

Four pine martens would be trapped at each of four donor sites and transferred to the release site at two week intervals. To avoid interference with the breeding season, pine martens would not be removed from the donor populations until mid-September. This is after young are independent and after mating (July-August). Releases would need to be completed by February, when implantation of blastocysts begins (Velander 1991), to maximise the success of potentially pregnant females. Twelve Tomahawk traps (No. 206, 82 x 23 x 23 cm) would be placed throughout each donor site and baited with chicken eggs. To maximise trap success pre-baiting would take place from July and would be intensified 2-3 weeks prior to each trap session.

Upon capture, each pine marten would be anaesthetised and given a full veterinary inspection. Two males and two females would be selected for removal, preferably with a male and a female being taken from the same area so that they would be mutually familiar. Only pine martens that were in good condition and sexually mature (*ie* animals of 2 years of age and over) would be selected. Pine martens that are anaesthetised but considered not suitable for removal would be held in a recovery box and released 4-5 hours later at the trap site.

Pine martens that are selected for removal would be individually marked with ear tattoos and/or PIT tags and the pattern of the throat patch recorded. It would be useful to attempt to accurately age translocated animals using existing techniques (Balharry 1993a; Helldin 1997). A radio-collar would be fitted to all pine martens, ones with external sheathed antennae having functioned well in previous studies (Bright & Smithson 1997). Hair samples would be taken to allow later genetic analyses of the growth of new pine marten populations. Before translocation, pine martens would be given an anti-biotic and a saline injection to ward off infection and dehydration. They would also be given a light, long-acting sedative to help minimise stress. Translocation would be in dark, wooden boxes. These would have smooth sides but contain a wooden 'chew-bar' to prevent damage to teeth, which was prevalent amongst translocated American martens (Davis 1983). The boxes would be lined with bedding material such as straw, with water and food provided when not in transit. They would be kept dark and cool to minimise stress.

Short duration translocation is a key feature promoting the success of reintroductions. Thus every effort would need to be made to move pine martens rapidly. They would be driven from donor sites to Inverness airport (minimum distance: Black Isle site 19 miles; maximum distance: Morvern site 120 miles). From there they would be flown to either London Heathrow (direct), Bristol or Southampton (both via Glasgow) airports. They would then be driven the remaining distance to the release site (minimum distance: Bristol Airport to Forest of Dean 44 miles; maximum distance: Bristol Airport to Bovey 82 miles). Currently British Airways have flights departing from Inverness at about 1730 arriving at the final destinations at between 1900 and 2100. If the Kielder region was to be used as a release site then pine martens would be translocated by road (c. 250 miles).

It should thus be possible to catch and transfer pine martens to a release site in one day. However, it is recognised that despite intensive pre-baiting it may be necessary to set traps over 2 days to capture the four animals needed for each tranch of translocations. Therefore, provision would be made to keep pine martens overnight in a temporary holding-pen. The aim would thus be to establish pine martens in pre-release pens within 18 hours of capture at the donor sites although this might be extended to 36 hours if animals had to be held at the donor site overnight.

- *SUCCESS INDICATORS: TRANSFER OF PINE MARTENS TO RELEASE SITE WITHOUT LOSS OR INJURY AND RELEASE INTO PRE-RELEASE PENS WITHIN THE DESIRED TIME.*

YEAR 2

The protocol adopted in Year 1 would be refined in the light of experience. In total 14 pine martens would be removed, the last tranch consisting of 2 not 4 animals. The donor sites would all be different from those used in Year 1.

- *SUCCESS INDICATORS: AS FOR YEAR 1, PREFERABLY WITH IMPROVEMENT IN HANDLING AND TRANSFER TIMES.*

6.3.2 Holding and release of pine martens from pre-release pens

YEAR 1

Each release pen would contain only one pine marten. The pens should be located to minimise intra-sexual aggression but to encourage the formation of a high density population. This would hopefully be achieved by placing the pens of one male-female 'pair' 400-500m apart, but about 2.5 km from the nearest other 'pair'. This distance between male-female 'pairs' is the diameter of a 625 ha home range, the mean range size of breeding male pine martens in good habitat (Balharry 1993). The release site would preferably be near vole rich habitat, such as a stream with rough grassland. Pre-release pens should be in the interior of large, open canopy woodlands.

Pre-release pens would be constructed from weld mesh panels and would be at least 6m x 4m wide and 2m high, larger than used in previous releases (Davis 1983) so as to minimise stress to pine martens. Pens would be fitted with smooth base panels to prevent pine martens from digging out. Each pen would contain branches for climbing and two nest boxes lined with bedding material. Fresh water and food would be provided daily. The behaviour of pine martens in and around pens would preferably be monitored using infra-red video equipment, allowing identification of animals potentially in need of veterinary attention and assessment as to whether adjustment to pre-release pens was needed.

After 7 days in the pen the pine martens would be released. A door in the top of the pen, with arboreal access, would be left open and pine martens allowed to leave during the night. Release pens would be left in place for a short period to allow pine martens access to nest boxes and food within. Additional nest boxes would be placed in the immediate area. Food would also be provided outside of pens, placed in trees to discourage other scavengers such as foxes. One to two weeks after the pine martens have been released the pens would be removed to be steam-cleaned and then placed in a new location for the next release. The use of eight portable release pens would ensure that four pens were always available for the next transfer of pine martens from Scotland.

- *SUCCESS INDICATORS: RELEASE OF PINE MARTENS FROM PENS WITHOUT LOSS OR INJURY, RETURN OF PINE MARTENS TO PENS TO FEED.*

YEAR 2

The same protocol would be followed as for Year 1, refined in the light of experience gained. The location of the pens would continue to expand on the sites of the previous year unless mortality/dispersal had resulted in large areas of vacant habitat. It would be of paramount importance to release animals sufficiently far apart, especially in year two, to minimise the chance of intra-specific aggression.

- *Success indicator: as for Year 1.*

6.4 Monitoring of released pine martens

YEAR 1

Two of the four pine martens in each release tranch would be radio-tracked intensively, one person following each animal continuously at night for 2 weeks. The remaining 2 pine martens would be located daily (Fig 6.2). After completion of intensive tracking of one tranch of animals, a further 4 pine martens would be released. They would have been held in the pre-release pens for the previous week. Two of these would be tracked intensively and 2 located daily as previously. This pattern would be repeated until a total of 16 martens have been released (Fig 6.2). The workload would increase cumulatively during the release phase, hence the need for three people to conduct the releases and monitoring at this time (Fig. 6.3).

Each pine marten would be located daily until 8 weeks post released, when locations would be reduced to weekly intervals. From mid-March a further period of 2 weeks intensive radio-tracking would take place for each of the pine martens that was initially tracked intensively (Fig 6.2). If some pine martens were not available due to mortality or tag failure, replacement martens of the same sex would be selected.

A fixed-wing aircraft would almost certainly be essential to locate some released animals, which would probably undertake exploratory excursions of several kilometers from a release site. The number of hours of flying time would vary with the intensity of the radio-tracking but would probably range between 6 hours per week and 6 hours per month. Radio-tags would contain mortality switches to help distinguish between inactive animals and mortalities, without the need to approach pine martens too closely and cause disturbance. Post-mortems would be carried out on any corpses found to determine the cause of death.

Currently available radio-tags have a reliable lifetime of about 1 year. Thus, from mid-July of Year 1 traps would be placed throughout the release site to recapture animals for re-tagging. Without re-tagging it would not be possible to reliably determine the success of the reintroduction. Traps would need to be pre-baited for 4 - 6 weeks and set over a 4 week period from mid August to mid September, prior to the commencement of the releases in Year 2. Recapturing pine martens would also enable assessment of condition to be made, especially evidence of lactation in females. Any young martens caught would be marked with ear tattoos or PIT tags and hair samples taken for DNA analysis.

- *SUCCESS INDICATORS: SURVIVAL OF C. 70% AFTER 1 MONTH AND OVERWINTER SURVIVAL OF C. 50%, ESTABLISHMENT OF HOME RANGES BY RELEASED PINE MARTENS, EVIDENCE OF BREEDING BY RELEASED PINE MARTENS, CAPTURE AND REPLACEMENT OF RADIO-COLLARS OF RELEASED PINE MARTENS.*

YEAR 2

Pine martens released in Year 2 would be monitored using the same protocol as for Year 1 (Fig 6.3). Pine martens released in Year 1 would be located twice per month from September of the second year and then monthly from January (Fig 6.3). Other monitoring programmes would then be initiated. These would include the establishment of standardised transects to search for distinctive marten scats and the deployment of automatic cameras at bait stations (Raphael 1994). Scat transects would give an indication of the total areas of used by resident pine martens and allow collection of scats for dietary analysis. The latter would be important for monitoring

potential impacts on native fauna and game. Automatic cameras should enable estimates of pine marten population size and perhaps production of young.

At the end of Year 2 traps would again be pre-baited and set over a 4 week period throughout the release site. Radio-collars would then be removed and any new individuals would be marked and hair samples taken for genetic analysis.

- *SUCCESS INDICATORS: SURVIVAL OF C. 70% AFTER 1 MONTH AND OVERWINTER SURVIVAL OF C.50% FOR PINE MARTENS RELEASED IN YEAR 2; ESTABLISHMENT OF HOME RANGES BY YEAR 2 PINE MARTENS; EVIDENCE OF BREEDING BY YEAR 2 PINE MARTENS; REMOVAL OF RADIO-COLLARS FROM RELEASED PINE MARTENS; CONTINUED SURVIVAL AND BREEDING OF YEAR 1 PINE MARTENS; SURVIVAL OF ANY SITE-NATIVE YOUNG FROM YEAR 1.*

YEAR 3 +

Long term monitoring would be required to determine the success of a reintroduction. It would not be appropriate or cost-effective to continue radio-monitoring. The monitoring techniques established in Year 2 (scat transects and cameras at bait stations) would provide information on the performance and expansion of the reintroduced population. It might also be useful to conduct annual trapping studies to assess survival and breeding success.

- *SUCCESS INDICATORS: ESTABLISHMENT OF SITE NATIVE PINE MARTENS, PRODUCTION OF SECOND GENERATION SITE-NATIVE ANIMALS, INCREASE IN POPULATION SIZE AND COLONISATION OF SURROUNDING AREAS.*

6.5 Data analysis

One of the principal objectives of intensive monitoring would be to inform subsequent releases, especially judgment as to whether intervention with released animals might be needed. In particular it would be crucial to determine whether the release protocol was adequate and whether released pine martens were adjusting to new surroundings. To achieve these ends, the following outline data analysis strategy would be used. As far as possible, an experimental approach would be used with releases *eg* placing pine martens scats within a putative range to encourage animals to settle. Such experimental approaches are likely to yield much greater insights which should significantly increase the success rate of releases (*eg* Bright and Morris 1994; Bright and Morris unpublished).

Adequacy of release methods

This would be assessed largely on the basis of distances travelled from release sites and use of supplementary food. Release site to denning site distances for successive days of intensive and daily radio tracking would be determined. Time spent at release sites would be measured. If the release method is adequate, pine martens should return to release pens, at least initially, and not permanently move away from the release area. Exploratory movements, involving greater travel in a night that is normal for resident pine martens (c. 7km per night; Bright & Smithson 1997), would also help indicate that the release methods were satisfactory.

High levels of stereotypic behaviour of animals in pre-release pens (monitored using infra-red video equipment) would be used to assess whether the length of time animals were confined in pens was appropriate.

Adjustment to new surroundings
This would be assessed on the basis of use of micro-habitats containing high density of food for pine martens (*eg* areas of high small mammal density) and avoidance of unsuitable habitat (*eg* open areas). There should also be increasing evidence of area restricted foraging (*eg* a higher turning frequency) following released. Conversely there should be a decrease in the amount of supplementary food consumed, in accord with increasing success in finding naturally occurring foods.

Use of high risk habitats
Violent mortality might be the greatest threat to the successful establishment of released animals (Bright & Harris 1994; Bright & Smithson 1997). Intensive monitoring would be used to determine whether the behaviour or habitat use of some individuals exposed them to higher risk of mortality. Behavioural and habitat related correlates of mortality would be assessed. This should permit assessment of the appropriateness of the siting of release pens, whether certain individuals should be recaptured, and ultimately whether the release region as a whole was suitable.

6.5 References

Balharry, D. (1993). Social organization in martens: and inflexible system? *Symposium of the Zoological Society of London* **65**: 321-345.

Bright, P.W. & Harris, S. (1994). *Reintroduction of the pine marten: feasibility study.* English Nature Research Report No 84.

Bright, P.W. & Morris, P.A. (1994). *Animal translocations for conservation: performance of dormice in relation to release methods, origin and season. Journal of Animal Ecology* **31**: 699-708.

Bright, P.W. & Smithson, T.J. (1997). *Species recovery programme for the pine marten in England: 1995-96.* Unpublished report to the People's Trust for Endangered Species, London and English Nature, Peterborough.

Carbyn, L.N, Armbruster, H.J. & Mamo, C. (1994) The swift fox reintroduction program in Canada from 1983 to 1992. In: *Restoration of Endangered Species* (eds. M.L. Bowles & C. J. Whelan. Cambridge University Press, Cambridge.

Clark, T.W. (1994) Restoration of the endangered black-footed ferret: a 20 year overview. In: *Restoration of Endangered Species* (eds. M.L. Bowles & C. J. Whelan. Cambridge University Press, Cambridge.

Davis, M.H. (1983). Post-release movements of introduced marten. *Journal of Wildlife Management* **47**: 59-66.

Fritts, S.H., Bangs, E.E., Fontaine, J.A., Johnson, M.R., Phillips, M.K., Koch, E.D. & Gunson, J.R. (1997). Planning and implementing a reintroduction of wolves to Yellowstone National Park and Central Idaho. *Restoration Ecology* **5**: 7-27.

Griffith, B., Scott, J.M., Carpenter, J.W. & Reed, C. (1989). Translocation as a species conservation tool: status and strategy. *Science* **245**: 477-480.

Helldin, J. -O. (1997). Age determination of Eurasian pine martens by radiographs of teeth *in situ*. *Wildlife Society Bulletin* **25**: 83-88.

Johnston, D.H., Joachim, D.G., Bachmann, P., Kardong, K.V., Stewart R.E.A., Dix, L.M., Strickland, M.A. & Watt, I.D. (1987). Marten. In: *Wild furbear management and conservation in North America* (eds M. Novak, J.A. Baker, M.E. Obbard & B. Malloch), pp 228-243. Ministry of Natural Resources, Ontario.

Raphael, M.G. (1994). Techniques for monitoring populations of fishers and American martens. In: *Martens, sables and fishers: biology and conservation* (eds S.W. Buskirk, A.S. Harsted, M.G. Raphael & R.A. Powell), pp 224-240. Cornell University Press, NY.

Slough B.G. (1994). Translocations of American martens: an evaluation of factors in success. In: *Martens, sables and fishers: biology and conservation* (eds S.W. Buskirk, A.S. Harsted, M.G. Raphael & R.A. Powell), pp 165-178. Cornell University Press, NY.

Soderquist, T.R. (1994). The importance of hypothesis testing in reintroduction biology: examples from the reintroduction of the carnivorous marsupial *Phascogale tapoatafa*. In: *Reintroduction biology of Australian and New Zealand Fauna* (ed M. Serena), pp 159-164. Surrey Beatty, Sydney.

Strickland, M.A. & Douglas, C.W. (1987). Marten. In: *Wild furbear management and conservation in North America* (eds M. Novak, J.A. Baker, M.E. Obbard & B. Malloch), pp 531-546. Ministry of Natural Resources, Ontario.

Velander, K. A (1991). Pine marten *Martes martes*. In: *Handbook of British Mammals* 3rd edition (eds G. B. Corbett, S. Harris), pp 368-376, Blackwell Scientific Publications, Oxford.

Wolf, C.M., Griffith, B., Reed, C. & Temple, S.A. (1996). Avian and mammalian translocations: update and reanalysis of 1987 survey data. *Conservation Biology* **10**: 1142-1154.

7. Species Action Plan for the Pine Marten in England

Although the pine marten in England was added to Schedule 5 of the Wildlife & Countryside Act in 1988, an Action Plan for this species was not included in the Biodiversity Steering Group Report (Anon. 1995). Targets for pine marten recovery were proposed by Whitten (1990), some of which have been superseded by more recent findings concerning status. An outline Species Action Plan for the pine marten is thus provided here. Some of the objectives of the plan have already been met, whilest decisions as to whether to proceed with others (*eg* reintroductions) have yet to be taken.

Objectives

- To determine whether viable pine marten populations still exist in England.
- To assess the feasibility of a reintroduction programme to re-establish pine martens in England. This should include assessing acceptability of reintroductions and their potential impacts.
- To establish the likely outcome of a reintroduction to England.
- To establish self-sustaining pine marten populations in at least four regions in England, whilst developing ways to minimise potential conflicts with gamebird shooting interests.
- To promote the expansion of reintroduced populations into other regions of England that were formerly occupied by pine martens.
- To monitor the expansion and spread of reintroduced populations and instigate a programme of research on habitat use, causes of mortality and potential conflicts with gamebird rearing interests, which would guide policy on pine marten conservation.

Achievements so far

- Surveys of 860km of transects in areas where a previous survey suggested relict populations occurred, revealed no convincing evidence of pine marten populations.
- National countryside, shooting, landowning and conservation organisations were asked to express there views *in principle* about pine marten reintroductions.
- The success of a pine marten reintroduction carried out in Scotland by the Forestry Commission in the 1980s has been studied in detail. This has shown that a self-sustaining population has been established, but that it has spread only 11km in 15 years.
- Six potentially suitable regions for reintroductions have been identified in England. The potential impacts of pine marten predation on vulnerable fauna and game in these regions have been assessed. They are not likely to be significant, especially compared with the impacts of other predators.

- In collaboration with the British Association for Shooting and Conservation, a questionnaire about pine marten reintroductions was sent to gamekeepers, farmers/landowners and members of the general public in the six potential reintroduction regions. Nearly 1000 replies were received. Around 65% of farmers and gamekeepers and over 90% of the public supported pine marten reintroductions. Willingness-to-pay for reintroductions was high. However, a small minority of respondents were strongly opposed to reintroductions.

- A detailed assessment of pine marten reintroductions to England has been made against internationally accepted criteria. Reintroductions clearly meet these criteria. A protocol for the reintroduction and monitoring of pine martens has also been developed.

- In collaboration with gamekeeping and shooting organisations, work is in progress to develop a Code of Best Practise for gamekeepers in regions to which pine martens might be reintroduced. Trials are also being conducted by the Game Conservancy Trust to find ways to help gamekeepers exclude pine martens from traps set for other carnivores. Work conducted in Scotland for the Vincent Wildlife Trust has shown that is it practical and cost effective to exclude pine martens from pheasant rearing pens.

The objectives will be further addressed by:

- Producing a booklet and information sheet about pine martens, containing proposals for their future conservation in England and raising awareness about the need for pine marten conservation.

- Building on the consultation of national organisations and the questionnaire survey already conducted by inviting views about proposals for pine marten conservation. In particular, further comment will be invited from landowners in the potential reintroduction regions.

- Assessing all available information before a decision regarding reintroductions is taken. If a reintroduction were to go ahead, it would initially be in only one region and be intensively monitored.

References

Anon. (1995) *Biodiversity: The UK Steering Group Report.* Volume 2. Action Plan. HMSO, London.

Whitten, A.J. (1990) *Recovery: a proposed programme for Britain's protected species.* NCC, Peterborough.

Acknowledgements

We are greatly indebted to Drs Tony Mitchell-Jones and Valerie Keeble (EN & PTES respectively) for their encouragement and continued help. They, Dr Pat Morris (Royal Holloway) and Dr David Balharry (Scottish Natural Heritage) very kindly provided us with comments on all or part of a first draft of this report.

We are most grateful to Drs Stephen Tapper and Jonathan Reynolds (Game Conservancy Trust) for advice and ideas. Similarly we are indebted to Dr John Haddow, Stewart Skull and Tony Laws (British Association for Shooting and Conservation) for advice and much help with questionnaires.

To Don MacPherson (Royal Holloway) we owe special thanks for perseverance beyond the call of duty with several aspects of the project. Numerous others helped us in different ways including: Jenny Armstrong, Steve Carter and Jacky Swaffield (Royal Holloway); Dr Liz Balharry; Dr Johnny Birks (Vincent Wildlife Trust); Professor Stephen Harris (University of Bristol); Dr Peter Lurz (University of Newcastle); Dr Roger Mitchell (EN); Harry Pepper (Forestry Commission); Susan Sharafi (PTES); Dr Piran White (University of York). We are most grateful to all.