Design and Testing of a National Pollinator and Pollination Monitoring Framework

Summary of content of Technical Annexes A – E.

Full Annexes will be embargoed for up to 6 months to allow time for submission for publication in peer-reviewed journals.

Full report citation:


The following text describes the content and datasets that will be published in Technical Annexes A to E to accompany the above final project report.

Note that Figure/Table numbers may change within final published versions.

May 2016
Annex A: Understanding status and trends from existing National Recording Schemes and Societies and other datasets

Lead authors:
Gary Powney, Nick Isaac, Mike Garratt

Details:


b) Summaries of data on abundance of crop visitors generated under the Insect Pollinators Initiative project ‘Sustainable Pollination Services for UK Crops’ between 2011 and 2013. Estimates of trend in demand for crop pollination services as measured by the area of insect pollinated crops and number of honeybee colonies required to provide recommended levels of pollination between 1992 and 2012 (presented in summary report Section 1.2b).

Key data/ results tables not presented in main report:

Appendix A1: Estimates for long-term (1980-2010) and short-term (2000-2010) occupancy trends for each species with upper and lower 95% credible intervals indicating for each species whether it is classed as stable, increasing or decreasing.

Figure A3: Bar charts showing number of visits per transect by different pollinator species and groups to crop flowers of apple, field bean, oilseed rape and strawberries.

Table A2: Summary information with references relating to the crop pollination effectiveness of different pollinator species and taxa.
Annex B. Statistical power analyses using existing datasets to inform sampling design

Lead authors:

Mark Jitlal, Claire Carvell, Mike Garratt

Details:

Detailed description of approaches taken to power analyses conducted to estimate minimum levels of replication required to detect changes in abundance of key pollinator groups and in measures of pollination service provision for 3 crop types (presented in summary report Section 1.3).

Key data/ results tables not presented in main report:

Figures B1 – B5: Power curves and simulated changes in pollinator abundance from different initial mean counts or variance parameters.

Tables B1 – B7: Tables presenting number of sites required to achieve >80% power to detect declines of different magnitude for different pollinator groups and pollination service metrics sampled using different methods.

Appendix Table B1: Power simulations under varying initial mean counts and percentage changes over a 10-year period.
Annex C. Cost-benefit analysis of existing National Recording Schemes and Societies and datasets and proposed scenarios for monitoring pollinators and crop pollination services

Lead authors:
Tom Breeze, Claire Carvell

Details:

a) Detailed report of the assessment of the relative costs of existing monitoring schemes and research projects in collecting and identifying records for use in scientific analysis and identification of the otherwise uncaptured value of voluntary labour (presented in summary report Section 1.4).

b) Detailed description of approaches used to estimate the costs of different monitoring scenarios, with breakdowns of annual and total scheme costs for each (presented in Summary report Section 4).

c) Detailed description of the survey of pollinator experts to estimate site networks required to answer eight key research and policy questions on UK pollinators and pollination services, and evaluation of the potential benefits of a well-designed monitoring network for answering these key questions (presented in summary report Section 5).

Key data/results tables not presented in main report:

Tables C1 – C2: Costs of monitoring and identification when applied to different recorder groups using different methods, including DNA barcoding for specimen identification.

Tables C4a-c: Detailed breakdown of annual and total scheme costs for each scenario (as outlined in report Section 4) across detection rates of 30% and 50% change over 10 years and a range of site networks.

Tables C7a-h: Average, median and standard deviation of site parameters and sensitivity estimated in the expert survey for each research question.

Tables 8 – 10: Analysis of overlaps between expert-generated site networks and those proposed under each NPPMF scenario, and their projected costs.

Table C11: Cost:benefit ratios of different NPPMF monitoring scenarios.
Annex D. Developing robust and realistic survey methods for monitoring pollinators and pollination services

Lead authors:
Rory O’Connor, Bill Kunin, Richard Comont, Simon Potts, Mike Garratt, Claire Carvell

Details:

a) Detailed report of assessments of capacity of different recorder groups and sampling methods to provide data on different measures of interest for pollinators and pollination services (as carried out by the project team).

b) Details of study designs, methods and results of small-scale field trials conducted during 2014 and 2015 to refine methods and protocols.

Key data/results tables not presented in main report:

Electronic Appendix 2 (“NPPMF_Final report_ElectronicAppendix_2_WC1101_methods assessment.xlsx”): Excel spreadsheets giving scores and means from project team assessment of different recorder-method-measure combinations.

Tables D1 – D7: Model results and co-efficient estimates for statistical comparisons of data on pollinator abundance generated by pan traps of different size and duration, focal floral observations of different area, duration and flower type, and transects of different widths.

Figures D1 – D16: Plots of data and/or mean abundance and species richness of bees and hoverflies generated by the small-scale methods trials for pollinators in the wider environment. Also includes correlation plots between pollinator abundance and estimated amount of nectar on a transect.

Figures D18 – 20: Crop pollination measures (mean ± SE) following different pollination treatments for oilseed rape and strawberry.

Table D8: Effects of on crop pollination metrics in oilseed, apples and beans, with results of statistical models comparing treatments.

Figure D21: Plots showing total crop yield of oilseed, apples and beans following field cage treatments to reduce or exclude insect pollinators.
Annex E. Full analysis and results from pilot study of proposed best methods

Lead authors:

Rory O’Connor, Bill Kunin, Mike Garratt, Cathy Hawes, Simon Potts, Claire Carvell

Details:

Detailed reports giving overall objectives, methods, analytical approaches, results, discussion and feedback questionnaires from pilot studies to compare methods and different recorder groups sampling:

a) Pollinators in agricultural landscapes and the wider environment
b) Crop pollinators and measures of pollination service

Datasets generated during these pilot studies will be deposited with the NERC Environmental Information Data Centre (EIDC, see below), and species-level records submitted to the relevant Recording Schemes (BWARS and HRS).

Key data/ results tables not presented in main report:

Tables E1 – E15: Pollinator abundance (total counts, means and SE values at broad group level and species level for common species) and species richness recorded using different sampling methods by different recorder groups. Includes statistical model results and correlations between and within methods.

Figure E4: Number of records by species for all species of bee or hoverfly for which more than 10 individuals were recorded during the pilot, showing variation in total catch accounted for across sites.

Figures E7 – E21: Plots showing mean and variation in site level estimates for abundance, species richness and species coverage for bumblebees, solitary bees and hoverflies as sampled at the same sites by different methods.

Table E16: Statistical model results for effects of recorder group on crop pollinator counts from transects.

Table E17: Counts of insects collected in pan trap arrays in flowering crop fields, as estimated by different recorder groups.

Tables E18 – E19: Responses given by different recorder groups following the pilot surveys in questionnaires, asking about their enjoyment, practicality and willingness to implement different monitoring methods as part of a wider scheme.
Datasets to be deposited with NERC EIDC: (DOI to be provided when available)

1) NPPMF_PollinatorPilot_2015_FinalDataSet

Dates generated: April – September 2015

Spatial extent: 14 sites (1km squares) covering England, Scotland and Wales

Experimental design: See summary report Section 3 and Table 3.1.

Format of the datasets: csv files containing raw data on insects collected along with associated environmental and floral resource data from each sampling visit, collection method and recorder group; scores from feedback questionnaires completed by all recorders participating in the pilot surveys.

Accompanying metadata will describe all data fields/rows in detail.

2) NPPMF_CropPollinationPilot_2015_FinalDataSet

Dates generated: April – July 2015

Spatial extent: Five oilseed rape fields, seven bean fields (in Berkshire and Tayside, Scotland) and an apple orchard (in Kent).

Experimental design: See summary report Section 3 and Table 3.1.

Format of the datasets: csv files containing raw data on flower visitors and floral resource data recorded along transects in crop fields by different recorder groups; scores from feedback questionnaires completed by all recorders participating in the pilot surveys.

Accompanying metadata will describe all data fields/rows in detail.