Mosquito monitoring to support wetland expansion for human wellbeing

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BACKGROUND

- Wetlands provide benefits to human health and wellbeing, including flood protection and recreational space; their restoration and expansion is mandated by the Government's "UK Wetland Vision".
- However, the possibility that new wetlands may provide habitats for mosquitoes can create community anxiety and opposition to these plans, amid fears of nuisance biting and future potential disease transmission.

OBJECTIVES

- Quantify mosquito species diversity, abundance, phenology and habitat specificity across urban, coastal and rural wetlands in England.
- Develop guidelines to identify and manage mosquito populations in existing wetlands and mitigate associated issues in new or restored wetland areas.
- Build public confidence in the nationwide response to insect nuisance and disease prevention.

METHODS

- Mosquito surveying for adults with "Mosquito Magnet" traps (Fig. 1) and "dipping" for larvae at wetland sites in England.
- Habitat profiling of each site in relation to water and vegetation management regimes and mosquito ecology.
- Testing a predictive algorithm for mosquito presence based on habitat and management practices.

RESULTS

Sampling was conducted at six sites, listed in Table 1 with example catches of adult mosquitoes. Six more sites are planned for sampling in 2018. Sites were chosen to represent the following different habitats:

- **Arable reversion**
- **Coastal**
- **Wet woodland (Fig. 2)**
- **Urban wetlands**

Based on expert knowledge of the species to be expected in each habitat, an algorithm to predict which taxa would occur at each site was devised and validated against field data. An example test for wet woodland is given in Figs. 3 & 4.

Table 1: *Numbers of different mosquito species found at six wetlands (adult samples only) in the 2017 season to date.*

	ARNE	BEDFORD	CHIPPENHAM	DEVON	NORTHWARD	SHAPWICK	
Anopheles claviger	31	212	1502	3	16	18	1782
Anopheles maculipennis		37			59	9	105
Anopheles plumbeus	2		21	32	4	4	63
Aedes cantans/annulipes		10	65		1	1291	1367
Aedes cinereus	540	13	367				920
Aedes caspius	50	2	3	11	48		114
Aedes punctor	194						194
Aedes geniculatus		1	158				159
Aedes sticticus			12				12
Aedes detritus	68	1			131		200
Aedes rusticus			10		8	1	19
Culex pipiens	25	4			4	1	34
Culex modestus					45		45
Coquillettidia richiardii	6	3	198	1	809	277	1294
Culiseta annulata	3	52	61		148	28	292
Culiseta morsitans	4		9			11	24
Culiseta subochrea		1					1
	923	336	2406	47	1273	1640	6624

Fig. 1: *Mosquito Magnet trap (Photo: R.A.Cheke)*

Fig. 2. *Wet woodland at Arne, Dorset. (Photo: R.A.Cheke)*

Fig. 3: *Predictive algorithm for wet woodland showing which species are likely under different circumstances.*

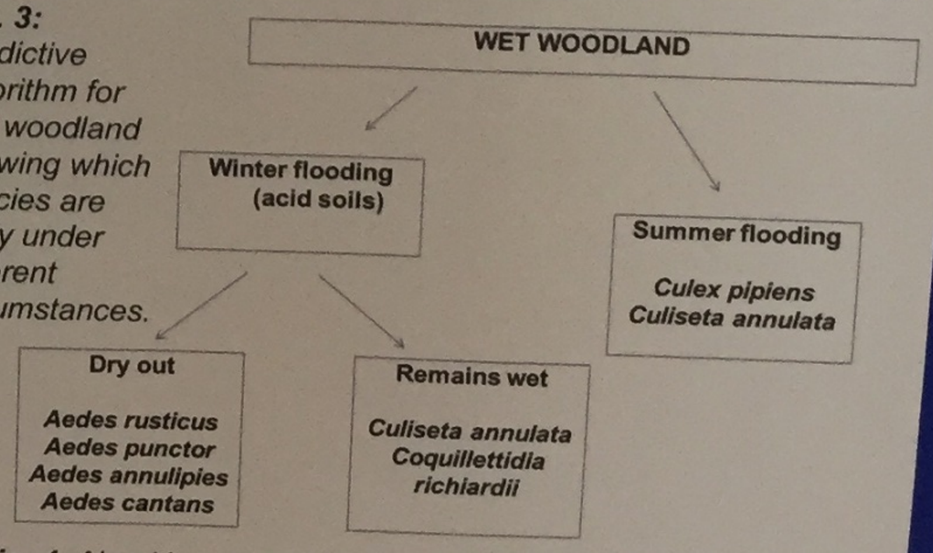

Fig. 4. *Algorithm validation at Chippenham Fen NNR*

PREDICTED		ACTUAL
Ae. rusticus ✓	*Cx. modestus*	*Ae. rusticus* ✓
Or. pulcripalpis	*Cx. pipiens*	*An. claviger* ✓
Ae. geniculatus	*An. claviger* ✓	*An. plumbeus* ✓
Cl. annulata ✓	*An. maculipennis*	*Cl. annulata* ✓
Cq. richardii ✓	*An. plumbeus* ✓	*Cq. richardii* ✓

CONCLUSIONS

Adults of 17 different mosquito species were recorded including some anthropophilic taxa such as *Aedes detritus* and *Culex modestus* (a vector of West Nile virus in mainland Europe). The species recorded in wet woodland were as predicted by the expert knowledge algorithm, which shows excellent promise as a tool for wetland managers to use for planning habitat management to minimise human: mosquito contact in the future.

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