Rectory Farm Trials – 2011

A report by the Farmland Ecology Unit, Game & Wildlife Conservation Trust

Introduction

The chicks of all farmland birds, with the exception of doves and pigeons, require all or a proportion of their diet to comprise invertebrates during the first few weeks, weed and crop seeds forming the remainder. Invertebrates provide the necessary nutrients essential for chick growth and development, whilst also supplying the necessary energy to resist. Invertebrate food supplies within crops can therefore influence chick survival and thereby recruitment and population size. The level of invertebrate chick food has been linked to grey partridge Perdix perdix chick survival at the farm scale and consequently to the national decline of the grey partridge. These studies also revealed that some invertebrates are more important to chick survival than others and led to the development of a chick-food index (CFI) for the grey partridge. In the index each of the five most important invertebrate groups are multiplied by their own correction factor according to their importance to chick survival. The index allows predictions of chick survival based upon invertebrate levels in the areas where the chicks forage. The availability of chick-food insects was also found to affect the breeding success (chick condition or survival) of skylarks Alauda arvensis, corn bunting Miliaria calandra and yellowhammer Emberiza citrinella, although relationships were based upon uncorrected numbers of invertebrates. For yellowhammer, an index based upon uncorrected numbers of invertebrates is available. The Game & Wildlife Conservation Trust has also developed an additional index that applies to all farmland birds that feed their chicks invertebrates. This includes a correction factor for insect size. These indices can be used to predict the value of different habitats for foraging farmland birds and for insect conservation.

Agri-environment schemes are now widespread (70% of farms in ELS in England) yet are not delivering increases in farmland bird populations. Further information is needed on the value of the various options to provide invertebrate food for farmland birds. This will allow land managers to make a more informed choice about the relative value of different habitats to provide food for farmland birds. Habitats that deliver more than one resource e.g. invertebrate and seed food, may also be more efficient, reducing the need to take land out of production.

The trials at Rectory farm were sampled as part of the GWCT's on-going research programme to identify habitats that have the potential to provide resources for farmland birds.

Method

Fourteen different habitats were sampled at Rectory Farm in late June 2011. In each habitat three Dvac suction samples and one sweep net sample were taken. For each habitat there was only one

area with the exception of the pollen and nectar mix for which there were two strips. The data from the different habitats cannot be compared statistically because there is no replication and therefore only subjective comparisons can be made as to the value of each habitat. Consequently we have to be cautious about making any recommendations. The following bird indices were calculated: grey partridge chick-food index (CFI), yellowhammer index and general farmland bird index. In the grey partridge index includes five different groups of invertebrates and each is multiplied by a different correction factor according to how important each group is for chick survival. The yellowhammer index is only a sum of the different invertebrate groups favoured by yellowhammers. The general farmland bird index is comprised of those groups of invertebrates most important in the diet of farmland birds, each group corrected according to size. In addition the number of beneficial predatory insects that can assist with pest control, total invertebrates and total number of taxa (not all invertebrates identified to species) were compiled.

The habitats were either agri-environment options and/or experimental mixes provided by Kings Game Cover and Conservation Crops (Table 1).

Table 1. Type and plant composition of each habitat

Habitat name	Plant composition
Brood rearer	Triticale, Wheat, Linseed, Sainfoin, Bird's foot trefoil, Common vetch
Brood rearer + Special autumn sown wild bird seed	Triticale, Wheat, Barley, Linseed, Sainfoin, Bird's foot trefoil, Common vetch, Gold of pleasure, Kale rape, Chicory, Sweet clover, Lucerne, Fodder radish, Phacelia
Special autumn sown wild bird seed	Triticale, , Linseed, Barley, Gold of pleasure, Kale rape, Chicory, Sweet clover, Lucerne, Fodder radish, Phacelia
Autumn simple wild bird seed	Barley, Wheat, Triticale, Fodder radish, Kings kale rape, Oilseed rape
Winter holding cover	Chicory, Kale, Phacelia
Conservation headland	Wheat
Overwintered stubble (Extended)	Not cultivated or sown (volunteer wheat, charlock, common poppy, wild oats)
Overwintered stubble	Spring cultivated (charlock)
Kings cornfield annuals	Common poppy, Corn cockle, Scentless mayweed, Corn camomile, Cornflower
Pollen & nectar	Alsike clover, Bird's foot trefoil, Black medic, Phacelia, Common winter vetch, Fenugreek, Lucerne, Red campion, White campion, Red clover, Sainfoin, Sweet clover
Floristically enhanced grass	Grasses and wild flowers (seed from arable reversion)
Cocksfoot (2m wide)	
Arable reversion (year 12)	Grasses and wild flowers (knapweed, vetch, lady's bedstraw, oxeye daisy, wild carrot, Bird's foot trefoil
Canary grass	

Results

For farmland birds the structure of the vegetation is also important as this controls access to the invertebrates. Therefore the value of each habitat for foraging farmland birds should not be judged on the indices alone.

Dvac suction sampling

The density of invertebrates (Fig. 1) was highest in the floristically enhanced grass but this was largely because there were high densities of Collembola (1361). When the smaller invertebrates are excluded that are not important chick-food such as Collembola, Thysanoptera and to a large extent Parasitica, then numbers are relatively similar in all habitats except the Autumn simple wild bird seed, winter holding cover and conservation headlands (Fig. 2). For the grey partridge CFI there is a critical level (0.7) required if the population of grey partridge in a given area is to be maintained. This is achieved by some of the habitats (Fig. 3) but falls short for many. The CFI is very high for floristically enhanced grass and Cocksfoot margins but chicks are unlikely to be able to forage in such dense vegetation. For the yellowhammer index (Fig. 4) the autumn sown WBS performed well as did the overwintered stubble. For the latter the level of weed cover will be crucial but this can be uncertain as indicated by the large standard error bars. The general bird food index provides a good indication of overall value, especially as there is an adjustment for invertebrate size (Fig. 5). High numbers of nitulids (pollen beetles) occurred in the overwintered stubble, probably feeding on the charlock, and explains the high values of yellowhammer and general farmland bird indices. The Cocksfoot margin had the highest value but previous studies of foraging behaviour showed that such areas were little used by foraging birds. Pest natural enemies that can help with pest control were highest in the brood rearer and special WBS, floristically enhanced grass and pollen & nectar mixes, all of which contained flowers (Fig. 6). Parasitic insects were included in this group but not all are parasitic on crop pests and a proportion will be hyperparasitoids.

Fig. 1 Total invertebrates

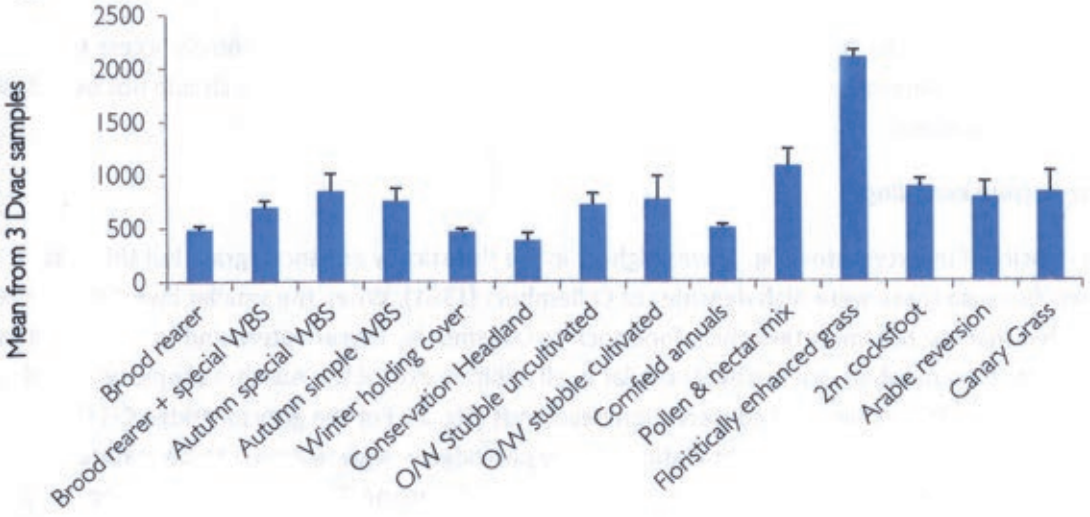


Fig.2. Numbers of the most abundant invertebrate groups in Dvac samples

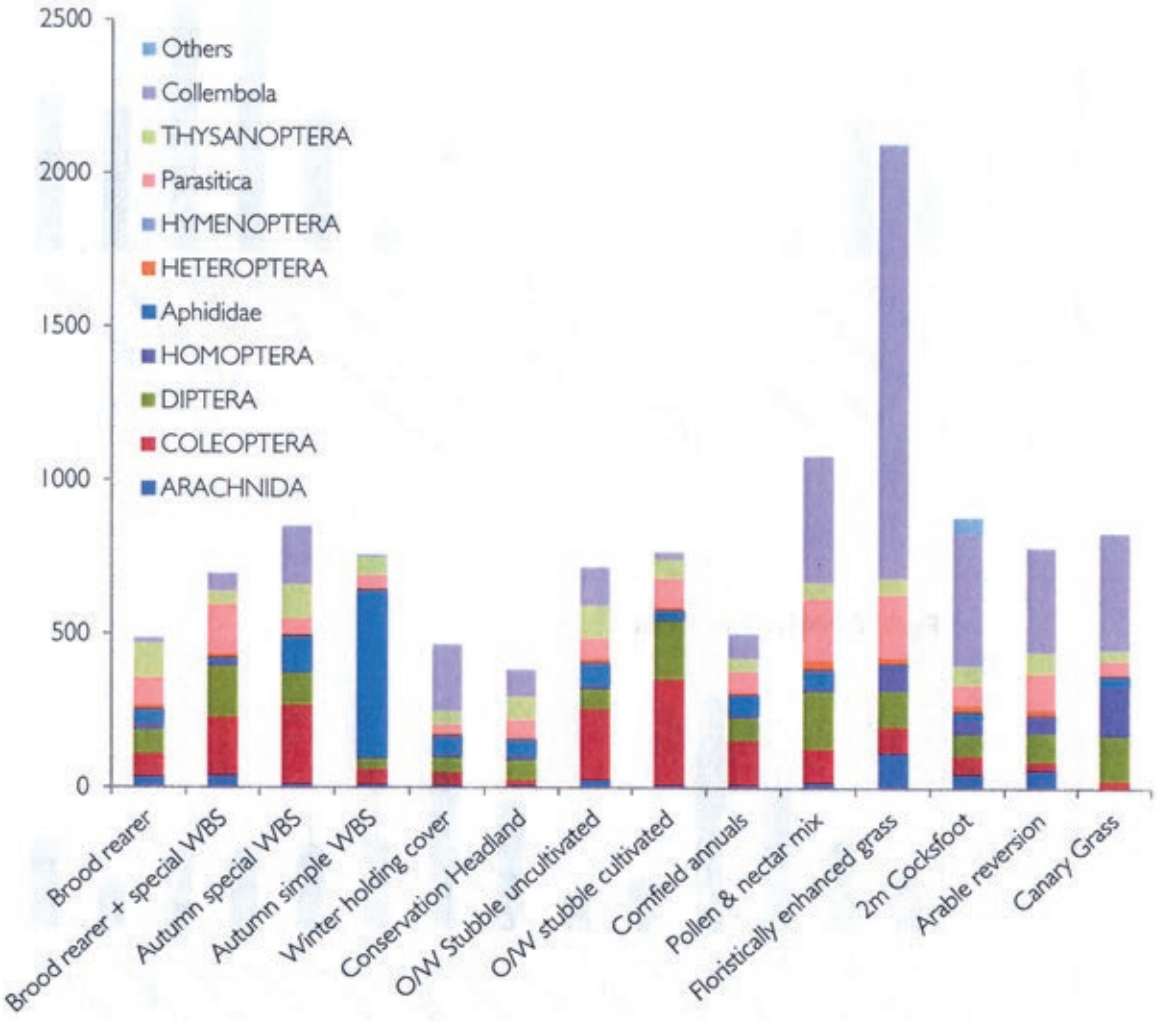


Fig. 3. Grey Partridge Chick-Food Index

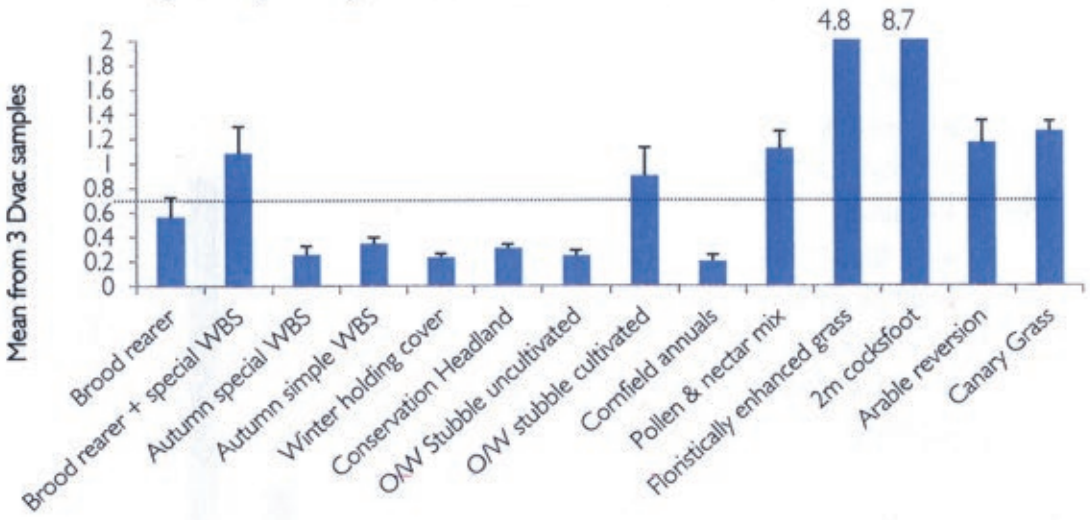


Fig. 4. Yellowhammer Index

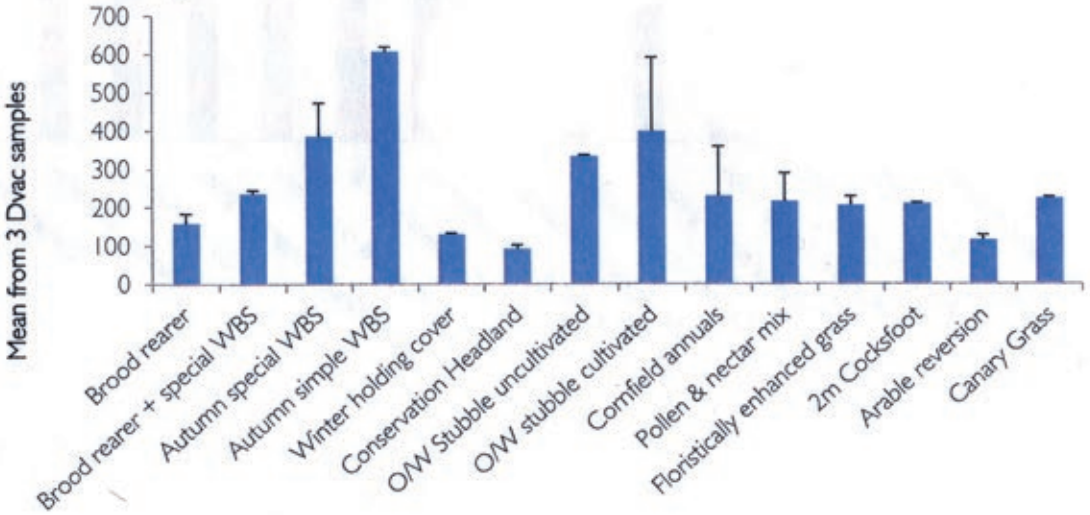


Fig. 5. General Bird Food Index

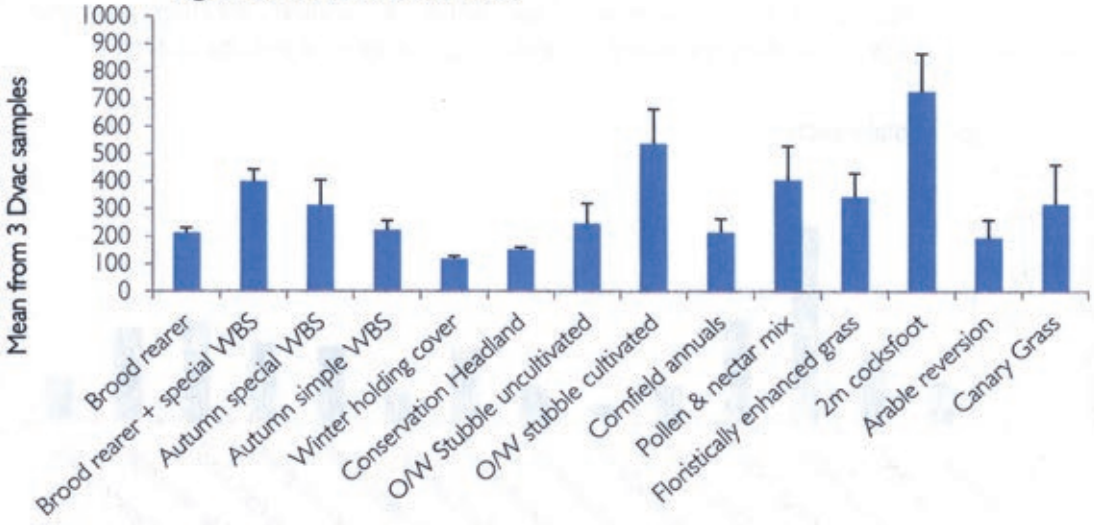
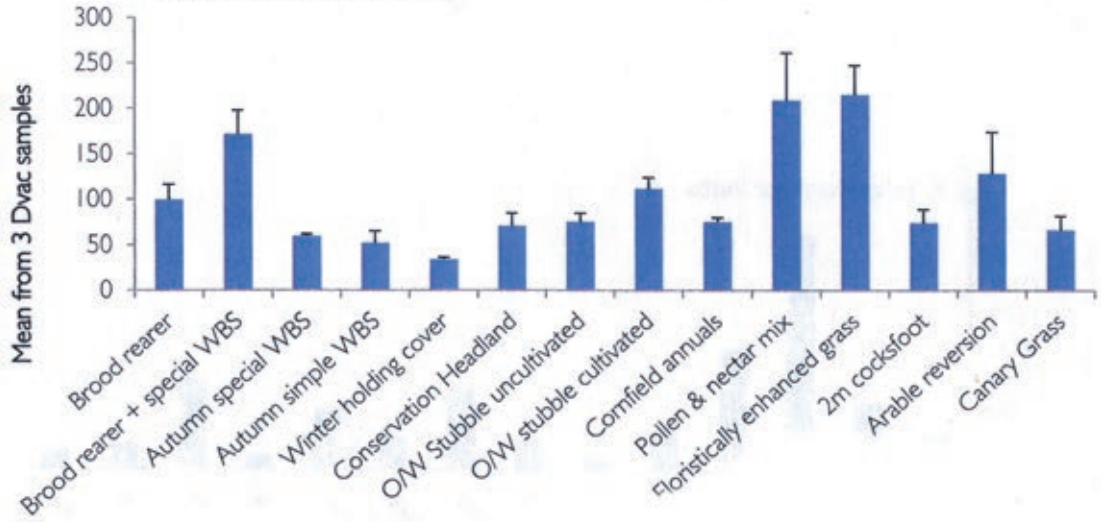


Fig. 6. Pest natural enemies



Sweep net sampling

Results from the sweep net sampling were different to those from the suction sampling because with sweep nets only the upper parts of the vegetation is sampled. Almost twice as many invertebrates were found in the Autumn special WBS mix compared to the other habitats, predominantly because of the high numbers of pollen beetles and aphids. The Conservation Headlands and Cornfield annuals contained the fewest invertebrates. The Yellowhammer Index was similarly highest for the Autumn special WBS mix because this index also includes pollen beetles. The Conservation Headlands, Floristically enhanced grass and Canary grass all had a low Yellowhammer Index. The General Bird Food Index for the Cocksfoot margins was approximately 10 times higher than the other habitats because it contained large numbers of Lepidopteran caterpillars that because of their size are an important

component of the index. Of the other habitats the Autumn sown WBS were the best and the annual habitats the worst. Pest natural enemies were most abundant in the floristically enhanced grass and arable reversion, which was similarly grassy and supported high numbers of parasitic insects.

Fig. 7. Total insects

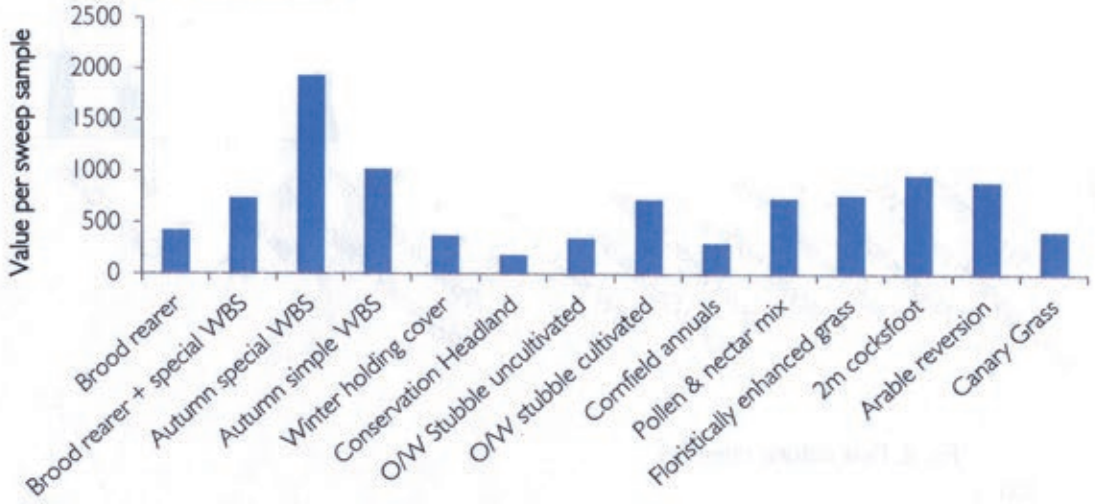


Fig. 8. Yellowhammer Index

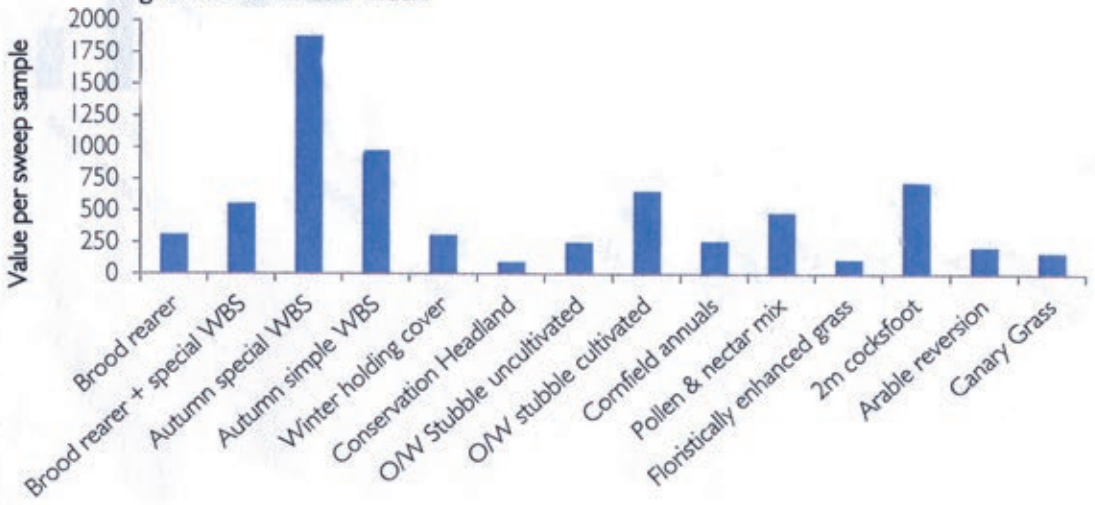


Fig. 9. General Bird Food Index

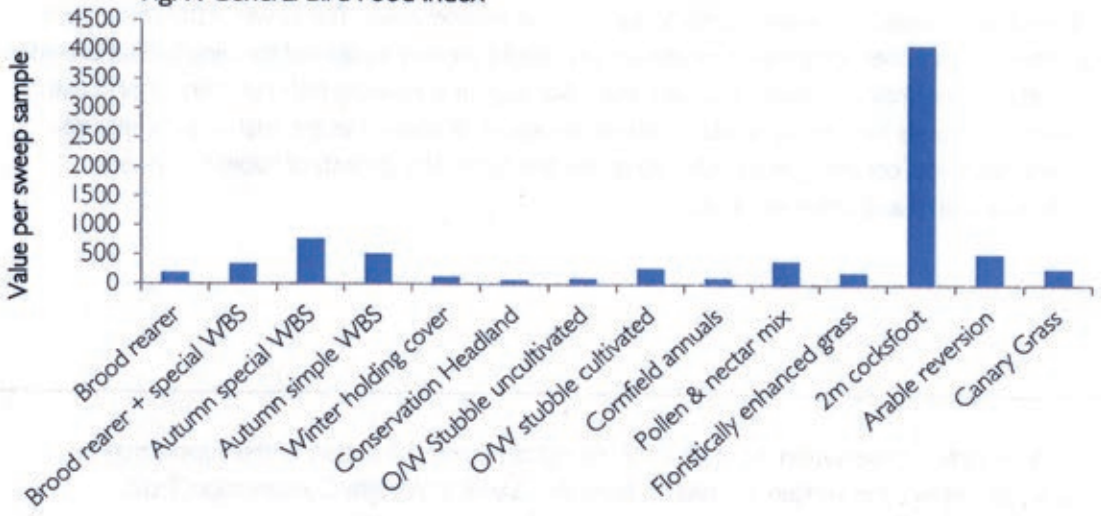
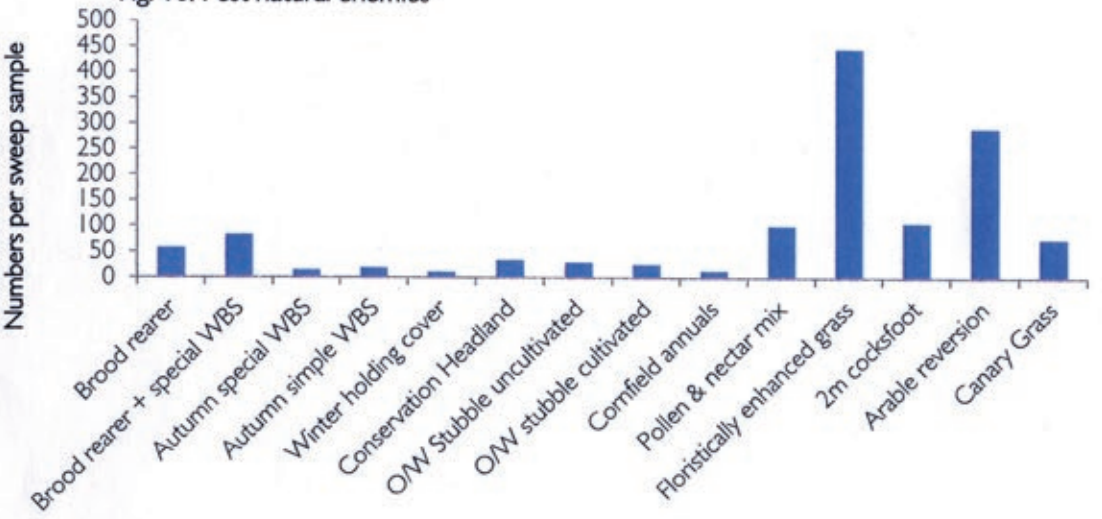


Fig. 10. Pest natural enemies



Conclusions

The habitats most likely to provide food resources for farmland birds were the autumn sown WBS mixes, the relatively value of the different mixes varying to some extent for the different indices. The addition of brood rearer enhancing the value to grey partridge. This approach is preferred to the overwintered stubble option which although providing some resources is dependent on their being adequate growth of insect-supporting weeds and this can be highly variable within and between fields. The cocksfoot margins also supported high densities of invertebrates for farmland birds, especially caterpillars, but previous studies have shown birds will not forage in such areas because they are put off by the dense vegetation. The annual habitats provided the fewest invertebrates especially the

conservation headlands (unfertilised headlands). Again the value of this habitat is very much dependent on there being a weed-rich understorey to support the invertebrates. The flower-rich habitats also supported high numbers of some invertebrates and could provide additional foraging habitat provided the vegetation was not too dense and have the advantage of containing high numbers of pest natural enemies. The results have to be treated with some degree of caution as the trial was unreplicated indicating what was occurring in a single habitat on one farm. The growth of habitats can vary considerably within and between farms.
