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FARMS AS BIOGEOGRAPHICAL UNITS: 3. THE POTENTIAL OF NATURAL/ SEMI-NATURAL HABITATS ON THE FARM TO MAINTAIN ITS SYRPHID FAUNA UNDER VARIOUS MANAGEMENT REGIMES

Martin C. D. Speight
Research Branch, National Parks and Wildlife, Dúchas, 7 Ely Place, Dublin 2, Ireland.
Jervis A. Good
Glinny, Riverstick, Co. Cork, Ireland.

Summary

The potential for gain to and loss from the syrphid fauna of the farm is explored, as caused by subjecting the natural/semi-natural habitat area on the farm to different forms of management consistent with the demands of the farm economy. It is concluded that nearly all probable forms of management, including continued disuse, would be likely to lead to a net reduction in the fauna. It is also concluded that the management alternatives least damaging to the fauna are also the least viable, financially, for the farmer, even given the existence of schemes encouraging "eco-friendly" farming. It is pointed out that there is a close resemblance between the character of the studied farm and the surrounding farmland landscape, suggesting that these conclusions probably relate not just to this farm, but to a much wider segment of the countryside.

Introduction

In parts 1 and 2 of this series (Good, 2001; Speight, 2001), it was pointed out that part of the area of the case-study farm is occupied by what is essentially disused land, when looked at in terms of the function served by different sectors of the farm in engendering an economic product, and semi-natural/natural habitat when looked at in terms of the habitats present on the farm. Evidence has also been presented to show that most of this area has been natural/semi-natural habitat throughout the history of the farm, and that, until partial drainage changed its character recently, a significant part of it supported acid fen (see Good, 2001), a habitat type now almost lost from the farm. At present, this area comprises slightly more than 5ha and

supports:

- Atlantic scrub,
- seasonally-flooded, oligotrophic, unimproved *Molinia/Deschampsia* grassland with a residual acid fen component (and scattered *Salix* scrub),
- *Alnus* woodland.

Definitions of these habitat categories are provided in Part 2 of this series. Also in Part 2, in its present condition, the disused sector land on the farm has been identified as capable of supporting nearly all of the sciomyzid and syrphid species observed on the farm and as being the only part of the farm capable of supporting most of the sciomyzids and a third of the syrphid fauna. It has also been identified as extremely susceptible to loss, in the event that socio-economic and socio-cultural factors caused change in the management regimes operated on the farm (see Part 1).

In Part 3 of this series, the observed syrphid fauna of the farm (see part 2) is used, in conjunction with the Macrohabitats file of the Syrph the Net database (Speight *et al.*, 2000), to predict potential changes in the syrphid fauna of the disused sector under various management regimes to which it could become subject.

Methods

Based on the arguments presented in Part 1 of this series, a list of potential alternative futures for the disused sector land on the case study farm may be assembled:

- continued disuse (i.e. no management),
- maintenance of present condition (light grazing, scrub clearance),
- conversion to improved grassland (drainage, ploughing, nutrient addition, reseeding),
- conversion to conifer plantation (felling, drainage, replanting),
- conversion to oak/alder plantation (felling, drainage, replanting),
- rehabilitation of wetland (reflooding, scrub clearance, blocking of existing drains, light grazing).

Through use of the habitat association data coded into the syrphid database, it is possible to review the effects of adopting these various management regimes in terms of a "gain and loss" account for the existing fauna of the farm i.e. to see how many species are likely to be gained

or lost to the farm as a result of adoption of particular management regimes in the disused land. It is also possible to consider the extent to which these different regimes will provide "support", from the area of disused land, to the fauna elsewhere on the farm i.e. to establish what numbers of species occurring in infrastructural and/or productive sector habitats on the farm will be supported by populations of the same species in the disused land under different management regimes, presenting this information in terms of whether a particular regime would be expected to result in a net "gain or loss" of support. Finally, an overview can also be gained of the predicted effects of each alternative regime on the existing fauna of the disused sector, using this same "gain and loss" approach.

To simplify matters in carrying out the predictions outlined above, it is assumed here that each alternative management regime considered applies to the entire disused sector i.e. that the oligotrophic *Molinia* grassland, the residual acid fen, the Atlantic scrub and the *Alnus* wood are all subject to the same regime. Given the small area of land involved this is, in any case, a realistic assumption - it is much more likely that the entire area of disused land would be converted to some form of use at the same time, than that only part of it would. The only exception is in the case that an attempt is made to maintain the existing situation - under those circumstances it is assumed that the presence is maintained of all habitats currently observed in the disused sector land. The predictions are initially confined to consideration of the syrphids which have been observed on (i.e. which are known to reach) the farm. Thus species known from Co. Cork and which might take advantage of changes in management on the farm to colonise it, are not considered at this stage of the exercise. They are, however, brought into play later on. Other assumptions made, in respect of particular management regimes, are detailed below. Finally, it is assumed that, where drainage is undertaken as part of the process of conversion of the disused land area to serve some specified use, the drainage results in cessation of seasonal flooding of the ground surface (which occurs at present) and drying up of remaining seepages/flushes, such that canalised, seasonal streams become the only form of surface water present.

Continued disuse

Under this *laissez faire* management option it is assumed that the process of scrub encroachment, already well-advanced, will continue. The logical conclusion to this process is

elimination of the existing open areas of *Molinia* grassland/acid fen, and prediction of the effects of this management option are based on the situation reached when only scrub and *Alnus* wood remain in the disused sector land. This would be the likely fate of the disused sector land under the Rural Environmental Protection Scheme (REPS, see Anon., 2000) as it is operated at present (Hickie *et al.*, 1999) since this could be expected to ensure that the disused sector natural/semi-natural habitats are retained, but not that they are managed to maintain their current interest.

Maintenance of present condition

The assumption made here is that scrub encroachment in, and any further drying out of, the *Molinia* grassland/residual acid fen can be arrested. The continued presence of the *Alnus* woodland is also assumed. This is quite possibly one of the least realistic of the options considered, since it requires active management but without increasing the profitability of the farm, either in the form of production of some saleable commodity or in the form of financial recompense for adoption of "ecologically-friendly" farm management. Current schemes provide recompense for leaving areas of natural/semi-natural habitat on farmland unused, but do not provide targeted finance for the active management of these areas, even if recommending such management.

Conversion to improved grassland

This is effectively the minimum option, in bringing the disused sector land into productive use as fields. It would involve at least the removal of existing vegetation (including trees ands their roots), improving drainage, use of fertiliser and reseeding. It would very probably also involve ploughing, but it is in this instance assumed that ploughing does not occur.

Conversion to conifer plantation

In line with current forestry practice, it is assumed that the conifers introduced to the disused sector would be sitka spruce. It is further assumed that conversion of the entire disused sector land area to conifer plantation would occur at the same time, rather than as a process of progressive replacement of the existing habitats by conifers. This would be normal practice, in order that current grants for planting of conifers might be availed of to the maximum, the scale of grant being dependent upon area planted. Clearance of existing tree and scrub cover, and increased drainage, are assumed to occur as part of the phase of establishment of the conifer

crop.

Conversion to oak plantation

The assumptions made here are similar to those made in relation to conifer plantation installation: conversion of the entire disused sector area is carried out at one time; and the conversion process involves increased drainage and removal of at least existing tree and scrub cover. In this instance, the sapling and mature phases of the tree-crop cycle are considered separately. There are two schemes currently providing financial support for establishment of small plantations of deciduous trees on farmland in Ireland, making this disused land management option financially viable.

Rehabilitation of wetland

Here it is assumed that acid fen is re-established on the disused area, the areas of Atlantic scrub and alder wood being removed as part of the process, though oligotrophic *Molinia* grassland is assumed to remain, as part of an acid fen/*Molinia* grassland mosaic. The mechanism for re-establishment of the acid fen is taken to include blocking of surface drains introduced during the last 30 years, re-introduction of light grazing by cows and the creation of a shallow, permanent, standing-water body. This option carries with it the same air of unreality as accompanies the option to maintain the disused sector in its present condition, and for the same reasons: it involves active management without financial reward.

Results

The predicted results of adopting various alternative management regimes on the area of disused sector land are shown in Table 1. From that table, it is immediately obvious that all forms of active management considered are likely to result in loss of some species from the existing farm fauna and that conversion to conifer plantation would seem no better than conversion to improved grassland in this respect. Further, conversion to oak plantation would be expected to lead to reduction in the farm fauna on a similar scale to that resultant from conversion to conifer plantation, though this would not become fully apparent until the oak plantation reached maturity.

However, when the capacity of the habitats introduced by these management regimes to support the fauna of other parts of the farm is brought into consideration, as shown in Table 2,

TABLE 1. Changes predicted in the present syrphid fauna of the farm under different management options for the disused sector land.

Management option	**Change in fauna (no spp.)**			
	Disused sector		Farm in general	
	gain	loss	gain	loss
Continued disuse		21		13
Maintenance in present condition				
Conversion to improved grassland	7	30		16
Conversion to conifer plantation		45		16
Conversion to oak plantation	2	43	2	15
saplings	10	30		15
closed canopy/mature	2	43	2	15
Rehabilitation of wetland	0 or 4	2	0 or 4	2
assuming acid fen now present		2		2
assuming acid fen now absent	4	2	4	2

TABLE 2. Changes predicted in the number of syrphid species occurring in both disused sector land and other sectors on the farm (i.e. in the capacity of the disused sector to support populations of species occurring elsewhere on the farm), under different management options for the disused sector land (based on the observed syrphid fauna of the farm).

Management option	**Support of fauna**			
	Infrastructure		Productive sector	
	gain	loss	gain	loss
Continued disuse		8		8
Maintenance in present condition				
Conversion to improved grassland	7	12	7	
Conversion to conifer plantation		18		22
Conversion to oak plantation				
saplings	11	7	6	13
closed canopy/mature		11		14
Rehabilitation of wetland		15		
assuming acid fen now present		15		
assuming acid fen now absent		15		

it is clear that conversion to conifer plantation represents the least useful alternative, faunistically. It would result in a maximal loss of species from the farm. It would also provide least support for species occurring elsewhere on the farm, both through causing a maximal reduction in the number of species existing in both the disused area and other parts of the farm at the moment and through providing a minimal replacement of those species by others.

In Part 1 of this series, acid fen is alluded to as now lost from the case study farm, whereas in Part 2 it is regarded as still represented, but only in a residual condition. In the present (Part 3) text, acid fen has so far been discussed as though it occurs on the farm, but only as a residuum. Four of the syrphid species observed on the farm (see Part 2), *Anasimyia lineata*, *Eristalis abusivus*, *Orthonevra geniculata* and *Platycheirus scambus*, would not be predicted to occur in association with any habitat observed on the farm except acid fen. But it is in any case debateable whether these species could be expected to occur on the farm, in association with the small flushes which constitute the remaining manifestation of acid fen there. At least one other relictual patch of acid fen also occurs within the surrounding landscape, within 1km of the case study farm (see Part 2). In these circumstances, it is only practical to consider acid fen both as though it is a part of the farm and as though it is not. If it is regarded as part of the farm, then its dependent species would be eradicated by all forms of change in the disused sector land that have been considered here, except for maintaining it in its present condition or rehabilitation of wetland there. It would also be expected that these species would be lost if the current *laissez faire* regime remains in place for the disused sector land. If acid fen is regarded as absent from the farm, then so too are the four acid fen-dependent syrphids mentioned above, as resident species. It is in these circumstances that rehabilitation of wetland (i.e. acid fen) on the farm would result in an expected increment of four species to the farm syrphid fauna (see Table 1). But perhaps more importantly, whether these acid fen species are resident on, or visitors to, the case study farm at the moment, their presence there in the future would seem to be dependent upon adoption of a management option for the disused sector land on the farm that is not financially viable - away from sites recognised as having national/international significance for conservation there is no provision for funding the active management of natural/semi-natural habitat within farmland, for conservation purposes.

Leaving aside the complications caused by whether or no acid fen has to be regarded as

present on the farm, species gains to the farm syrphid fauna would seem to be almost non-existent, whatever management regime is introduced to the disused sector land, to judge from the data presented in Table 1. This is because prediction of which species might colonise the farm, by becoming established in habitats introduced to the farm, is in this instance based on which species are known to reach the farm at the moment, but are not known to be associated with any of the habitats there already. All but three of the syrphid species observed on the farm would be expected to occur in association with one or more of the habitats found there now (see Part 2 of this series), if it is assumed acid fen is present. This would mean there are apparently only three species "available" to colonise the farm if appropriate habitat were provided there for them. Of these three, one, *Helophilus trivittatus*, would remain unaffected by the management options considered - appropriate habitat supposedly remains unavailable on the farm whichever option is adopted. In the case of the other two, *Sphegina elegans* and *Xylota sylvarum*, mature oak plantation might be expected to provide appropriate habitat, so that were mature oak plantation to become established upon the farm these two syrphids could then establish themselves there. At least, they might do so assuming that at that point in time they continued to reach the farm from elsewhere. So the prediction that availability of mature oak plantation on the farm would result in a two species increment to the farm syrphid fauna (as shown in Table 1) is dependent upon the assumption that *S. elegans* and *X. sylvarum* will continue to reach the farm from elsewhere in more than 50 years time, which may or may not be realistic. If, alternatively, it were to be argued that both of these species are resident on the farm at present, but that knowledge of their habitat associations is insufficient for their residency to be predicted by the database, then their establishment in mature oak plantation on the farm would not represent an increment to the fauna. And, were these species to be dependent upon the alder wood for their presence on the farm, clearance of the alder woodland, in order to establish an oak plantation, would result in their disappearance long before the oak plantation could have grown to a maturity that could provide them with appropriate habitat. In the latter circumstance they would not be available to colonise mature oak plantation on the farm, once it became available.

The interpretation of results provided in the previous paragraphs is virtually dependent upon the premise that species reaching the case study farm during the course of the year 2000 can be

regarded as the sum total of species potentially available for colonisation of the farm. This may well represent an inadequate perception of reality, the species complement reaching the farm from elsewhere varying somewhat from year to year. This could only be established by repeated survey carried out over a number of years, which has not been carried out for any farmland landscape in Ireland. In these circumstances, it has to be recognised that there may be a greater potential for colonisation of these habitats than has been assumed in the previous paragraphs, even if there are no directly relevant data to support that argument. So, if there are species intermittently reaching the farm from elsewhere, but not detected during course of our survey, where would they be coming from? Realistically, they are most likely to be derived from some other part of Co. Cork, given the location of the farm within that county. They would otherwise have to originate either from somewhere in Ireland outside Co. Cork or even further afield - some part of the Atlantic zone of Europe other than Ireland. On the basis that most such potential colonisers would be derived from Co. Cork rather than further away, potential gains to the farm fauna, from adoption of these various alternative managements, can be reconsidered. The result is shown in Table 3.

Clearly, if species from elsewhere in Co. Cork can be assumed to reach the farm intermittently, even if we are unable to demonstrate this, then there is an increased possibility for the farm fauna to be augmented by adoption of most of the alternative approaches to management of the disused sector land. But the greatest gains would once more result from either maintaining the disused sector in its present condition, or re-instatement of wetland there, and the relative utility of the other alternatives also remains much as before. The exception is continued disuse, which in these circumstances would appear less beneficial than establishment of either conifer or oak plantations.

TABLE 3. Predicted changes in syrphid fauna under different management options for the disused area of the farm, based on the Co. Cork species pool.

Management option	gain to farm (from Cork list)
Continued disuse	3
grassland/fen	
scrub	1
alder wood	2
Maintenance in present condition	13
grassland/fen	10
scrub	1
alder wood	2
Conversion to improved grassland	
grassland/fen	
scrub	
alder wood	
Conversion to conifer plantation	7
grassland/fen	
scrub	
alder wood	
Conversion to oak plantation	9
saplings	
closed canopy/mature	9
Rehabilitation of wetland	14 or 18
assuming acid fen now present	14
assuming acid fen now absent	18

Discussion and conclusions

In Part 1 of this series, it was demonstrated that the character of the disused sector land on the case study farm was dependent upon the use history of the farm, and that it has remained as semi-natural/natural habitat up to the present because it was not worthwhile to do otherwise with it, except in that part of its area was planted with *Pinus sylvestris* during the 19th century. In Part 2, it was shown that this relatively small enclave within the farm area is probably uniquely responsible for maintenance of more than 20% of the farm's syrphid fauna and, in Part 3, it has been shown that the very factor responsible for survival of the disused sector as semi-natural/natural habitats (i.e. lack of management) is now likely to result in loss of nearly 20% of the farm's syrphid fauna, from those disused sector habitats (due to uncontrolled scrub encroachment). Further, if there are changes in its status, evoked by the sort of socio-cultural and socio-economic forces detailed in Part 1, these will almost inevitably result in an even greater net loss to the farm's present syrphid fauna, without counterbalancing gains. And, in most instances, the only gains which would be predicted are dependent upon the supposition that there is a greater capacity for species to reach the farm from the surrounding countryside than we have been able to demonstrate during the course of this study. Finally, the only management options identified as likely to maintain the existing fauna of the disused sector land - which are also the options identified as likely to lead to the greatest increments in the farm's syrphid fauna - are not financially viable, even bringing into consideration schemes currently in existence for promoting "environmentally friendly" farming.

There is no reason to suppose that the disused sector land on the case study farm is atypical of land that has gone out of use on other farms, either in the vicinity of the case-study farm or in Ireland in general. The potential role of the disused sector habitats in maintaining the fauna of the farmed landscape is highlighted by all three texts in this three Part series, as is their vulnerability to change and as are the difficulties of maintaining them. Our efforts here have been focussed on considering the potential role of enclaves of disused sector land at present, and their possible fate in the immediate future. We have not attempted to address issues of long-term survival by species within these enclaves, that for many of their dependent species are fast becoming biogeographical islands within an otherwise uninhabitable farmland landscape. Even if it might be felt that the long-term survival of a species in such enclaves is

questionable, the potential for their loss to impact upon the biogeography of Ireland would seem to be considerable.

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