Status and Conservation of the Bog hoverfly *Eristalis cryptarum* on Dartmoor

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DARTMOOR NATIONAL PARK

Figure 1. *Eristalis cryptarum* female nectaring on *Caluna vulgaris* © Steven Falk.

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Introduction

Eristalis cryptarum (Fabricuius, 1794), commonly known as the Bog Hoverfly, is a small stout *Eristalis* hoverfly about 10mm long. It resembles other small *Eristalis* species such as *E. interruptus* but has red hairs over the thorax, red triangular spots on tergite 2 and legs that are almost entirely orange-red. There is a very loose resemblance to a small solitary bee, especially when it flies.

UK and European Status

Eristalis cryptarum was once widespread in South West England there are records from Hampshire (1953), Dorset (1938), Somerset (1951) and Cornwall (1947) (Levy, D.A., 1992). This hoverfly has disappeared from what seems to be suitable habitat in the New Forest, Dorset heaths and some scattered sites in Devon and Cornwall. It is now seemingly confined to a handful of sites on Dartmoor in south Devon.

Eristalis cryptarum is clearly extremely rare and has been identified in the UK Biodiversity Action Plan (UKBAP) as a priority species for conservation action. On the continent, it is widely, but sparingly, distributed in northern and temperate Europe and Siberia. Populations have declined in Denmark (Ball, S.G. & Morris, R.K.A. 2000).

Little is known of the larvae and adult ecology of this hoverfly. This knowledge is essential for successful survey and to develop effective conservation measures. However, the general habitat requirement seems to be valley mire of a fairly acidic, boggy nature. This is a scarce habitat in Western Europe and *E. cryptarum* cannot utilise it in all areas (e.g. northern Britain) and seems to specifically require lowland or mid-altitude valley mire in places in the northern parts of its range like Britain and Scandinavia. It will use montane valley mire in the south e.g. in the Pyrenees. Given that over half of Western Europe's lowland valley mire is located within Great Britain (predominantly within the New Forest), Britain may have a disproportionate responsibility for conserving this fly in Western Europe, so its rarity here is a source of concern.

Project Aims

- To confirm current status and distribution of *E. cryptarum* on Dartmoor
- To carry out ecological research on adult and larval ecology
- To develop an informed conservation strategy for this species

Sites

The study focused on six sites on Dartmoor. These included Bartons (previously known as Smoothmoor), Grendon Farm, Buckland Common, Bonehill Down, Pizwell and Challacombe Farm.

Within Dartmoor, *E. cryptarum* is known to associate with valley mires within Rhos pasture grassland and moorland edges that are not too highly acidic (Ball, S.G. & Morris, R.K.A. 2000; Drake, M., Baldock, N., 2005). These valley mires have a variety of nectar sources providing forage resourses throughout the late spring and summer months.

Rhos pastures are marshy grasslands with an abundance of Purple moor grass, *Molina caerulea* and rushes *Juncus* spp., they often feature an abundance of wildflowers. These habitats are found in areas of high rainfall and acid–neutral soils with poor drainage. The pastures comprise several national vegetation (NVC) communities often as an intimate mosaic of unimproved grassland, as valley mires, blanket bog and wet heath. This variation is in response to land topography, landuse history, local climate variation, soil chemistry and hydrology.

The three sites where the Bog hoverfly was found this year feature a range of NVC habitat types. These were predominantly rush-pasture communities (*Juncus effusus* and *J.acutiflorus*, and herbaceous annual Marsh bedstraw, *Galium palustre*, M23) and valley mires (Purple moor grass, *M.caerulea* with herbaceous perennial Tormentil, *Potentila erecta*, M25) (Elkington et al. 2001). Within the sites are a mosaic of other communities including wet heath (M15,M16), mire (M6, M21) and runnels/soakaways (M29) with a rich assemblage of Star sedge, *Carex echinata*, Deer grass, *Scirpus cespitosus*, Cotton grass, *Erica tetralix*, Ling, *Calluna vulgaris*, Bog asphodel, *Narthecium ossifragum*, and Marsh St John's wort, *Hypericum elodes,* over a carpet of bulky mosses (Elkington et al. 2001). It has been suggested that the *Sphagnum*-dominated moss carpet is an essential feature in the ideal habitat for *E. cryptarum* (pers.comm Walters, J., 2012).

All sites where *E. cryptarum* was found had similar nectar sources available, though the abundance of these varied. These included Ling, Tormentil , Marsh St John's wort, Bogbean *Menyanthes trifoliata,* Bog asphodel*,* Bog pimpernel, *Anagallis tenella,* Marsh marigold, *Caltha palustris* and Lesser spearwort, *Ranunculus flammula.* The time of year dictates the dominance of flowers, with Ling and Devil's-bit scabious being most important in late summer.

Figure 2. Bartons © Steven Falk

Figure 3. Buckland common © Steven Falk

Figure 4. Bonehill Down © Tarryn Castle.

Figure 5. Challacombe Farm © Steven Falk

Figure 6. Grendon Farm © Tarryn Castle

Figure 7. Pizwell © Tarryn Castle.

Survey Method

The need to establish current population size and distribution and to further the understanding of adult and larval ecology is essential to advise effective site management regimes.

Surveys were undertaken on six sites on Dartmoor. Due to the short survey season and poor weather conditions in 2012, it was thought better to focus on the locations where individuals were found, to try and learn more about adult and larval ecology. The low count this year is probably a reflection of the poor weather during the spring and summer seasons.

The following survey methods were used:

1. Transects were walked very slowly around each site pausing for observation at approximately 10m intervals for 15 minutes. A search of vegetation and available nectar sources was undertaken using the aid of close-focus binoculars and sweep net. Individuals were initially identified by sweep net collection until identification became familiar. Behaviour and sex of each individual Bog hoverfly were noted. Searches ranged in duration from 45 to 90 minutes.

2. Random sweep net transects were also conducted with continuous sweeping over 10 paces. These where conducted at the end of the slow transect walk to avoid disturbing any *E. cryptarum* individuals that may have been in the vicinity. Species lists were also made for each site.

3. Fresh dung was moved into runnels at each site to provide fresh oviposition sites for gravid females. This was based on previous work by Perrett,J. (2000) who observed female ovipositon on fresh cow dung within a runnel.

Visits were as frequent as possible (weather permitting) from July to early October. This year had many field days rained off. Wet weather has also affected studies in previous years (Drake, M., Baldock, N. 2004; Walters, J. 2008).

Figure 8. Surveying Challacombe with Buglife colleagues © Steven Falk.

Presence of *Eristalis cryptarum*

Within the three survey sites nine *Eristalis cryptarum* were observed. The greatest individual counts were observed at Challacombe Farm. This is a sheltered site giving insight into why the greatest numbers of individuals were observed at this location this year. Five females were found in late August all feeding on Ling. Pizwell is a more exposed site with a strip of wet woodland creating shelter along one side. One male *E. cryptarum* was observed at this site also feeding on Ling and one female was obtained during a general sweep. The third site where *E. cryptarum* was found was Buckland common. This is a well grazed moorland slope with a wet woodland sheltered edge at the lower end. At this site one male *E. cryptarum* was observed feeding on Devil's-bit scabious,.

All hoverflies were seen between late August and early September. Ling was one of the most abundant and dominant nectar sources during the time observations were made.

It was not possible to study larval ecology as no oviposition was observed during the study but it seems likely that runnels/soakaways with waterlogged peat, much Sphagnum and moderated acidity are important for this species. The larvae are presumed to be aquatic, rat-tailed maggots that require elevated areas of enrichment for development (as with other *Eristalis* species).

Observations of adults occurred under variable weather conditions, cloud cover ranged from 20 - 100% and temperature between 15 -21°C. The three sites all had slightly acidic water

pH Buckland common pH ranged from 5.1 – 5.8, Challacombe Farm pH ranged from 5.3 – 5.8 and Pizwell farm pH ranged from 5.2 – 6.

Figure 9. *Eristalis cryptarum* seen nectaring on *Calluna vulgaris* at Challacombe Farm © Tarryn Castle.

Comments

In previous years *E. cryptarum* has been observed in high numbers at Bartons (previously known as Smoothmoor) (Drake, M. & Baldock, N., 2004). This is a sheltered site with wet woodland surrounding a rush-dominated pasture with numerous nectar sources. Grendon Farm has similar vegetation structure and community to Bartons but is a more exposed site. Both these locations were thought to be ideal habitats for the *E.cryptarum* but neither produced such findings. They supported good numbers of several other *Eristalis* species.

It has been suggested that *E.cryptarum* may be a poor competitor, possibly avoiding sites with strong populations of other *Eristalis*. It is possible that both Bartons and Grendon Farm are suboptimal breeding sites. In previous years these two sites have had good numbers of *E. cryptarum*. Bartons may have been a foraging site rather than a breeding site. Both Bartons and Grendon Farm had high numbers of *E.horticola, E.interruptus, E.pertinax* and *E.tenax*. *Eristalis horticola* may be the most important competitor as it is particularly tolerant of mildly acidic peatlands such as soakaways and can often be seen ovipositing in such areas in good numbers. It was noted that sites used by *E. cryptarum* featured lower populations of the muscid *Graphomya maculata* than other damp areas on Dartmoor. The

larvae of these muscids are predators of *Eristalis* larvae and *E. cryptarum* may be particularly vulnerable to them.

Figure 10 &11. *Eristalis horticola* on Marsh St John's-wort (left) and the muscid *Graphomya maculata* (right) © Steven Falk.

Further study and recommendations

The low individual count and occupation of the sites on Dartmoor should be viewed in the light of the poor weather from May to September and the limited survey window for this study. The survey time was only open for the later brood period rather than the earlier, stronger brood period in spring (Drake, M. & Baldock, N., 2004; Walters, J. , 2008). The ideal survey time is from late April to June. Future surveys during this time will hopefully elucidate more information on both adult and larval ecology that this study was not able to reveal.

It would be useful to investigate the abundance of other *Eristalis* particularly *E.horticola* at sites where *E.cryptarum* is found to explore the theory of competition; also the effects of *Graphomya* predation. Presence of *E.horticola* was noted at all three sites where *E.cryptarum* was seen this year but numbers were not as high as places like Bartons and Grendon Farm.

The reason for the apparent decline in *E.cryptarum* populations on Dartmoor and elsewhere is not particularly clear. Climate change may be one of the reasons for population declines. The high rainfall observed this year may be an aspect of climate change; this is likely to have had an affect on the breeding and foraging success of E.cryptarum due to reduced flight periods. It is possible that drought, another feature of climate change, may cause sites to dry up. At a site level it could include invasion of mire habitat by shrubs such as Grey willow *Salix cinerea*, and a lack of grazing, especially if it requires an input of dung onto mire. Another factor to take into account is whether cattle are treated with de-wormers containing

avermectins, a group of insecticides often used to treat cattle. This is also a factor that needs consideration when adding dung onto a mire. Traces are often found in treated cattle dung (McCracken, D.I. 1993). Future studies would benefit from communication with land owners to use un-treated cattle grazing within sites. As noted above, population declines may also be in due to competition with other more dominant *Eristalis* such as *E.horticola*.

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Appendix

Species lists for each site

Bartons

Hoverflies - Syrphidae

Arctophila superbiens

Atylotus fulvus

Eristalis horticola

Eristalis interruptus

Eristalis nemorum

Eristalis pertinax

Eristalis tenax

Episyrphus balteatus

Helophilus pendulus

Helophilus trivitattus

Rhingia campestris

Sericomyia silentis

Other invertebrates

Calopteryx virgo

Tachina grossa

Thymelicus sylvestris

Bonehill Down

Hoverflies – Syrphidae

Eristalis arbustorum

Eristalis tenax

Sericomyia silentis

Other invertebrates

Bombus hortorum

Bombus pascorum

Buckland Common

Hoverflies – Syrphidae

Episyrphus balteatus

Eristalis cryptarum

Eristalis horticola

Eristalis interruptus

Eristalis tenax

Helophilus spp.

Rhingia campestris

Sericomyia silentis

Other invertebrates

Orthetrum coerulescens

Maniola jurtina

Challacombe Farm

Hoverflies - Syrphidae

Episyrphus balteatus

Eristalis cryptarum

Eristalis horticola

Eristalis interruptus

Eristalis tenax

Rhingia campestris

Sericomyia silentis

Other invertebrates

Aglais urticae

Andrena fuscipes

Bombus hortorum

Bombus jonellus

Bombus pascorum

Bombus pratorum

Cordulegaster boltonii

Inachis io

Lycaena phlaeas

Maniola jurtina

Thymelicus sylvestris

Techina grossa

Zygaena trifolii

Grendon Farm

Hoverflies - Syrphidae

Eristalis horticola

Eristalis interruptus

Eristalis pertinax

Eristalis tenax

Helophilus spp.

Rhingia campestris

Rhingia rosta

Sericomyia silentis

Other invertegbrates

Aglais urticae

Bombus pascuorum

Bombus lacorum

Inachis io

Lycaena phlaeas

Pizwell

Hoverflies - Syrphidae

Episyrphus balteatus

Eristalis cryptarum

Eristalis horticola

Eristalis interruptus

Eristalis pertinax

Helophilus spp.

Rhingia campestris

Sericomyia silentis

Other invertebrates

Aglais urticae

Bombus lacorum

Pieris napi