2021

Odonata Survey

Stour Valley · Millhams Mead · Throop Nature Park

BCP Council

Report Reference: BCP-OS-01

18/10/2021

Contents

Odonata presence or absent survey 2021

1. Introduction

Odonata are good species to monitor as they function as environmental indicators for both climate change and habitat quality (Taylor et al, 2021) like lepidoptera species. Monitoring their presence and activities on sites that are managed can provide early warnings to the health and state of these habitats.

Current management plans for both Stour Valley and Millhams Mead Local Nature Reserves (LNR) contain an odonata species list but were produced in 2009 and 2007 respectively and therefore are likely outdated.

The British Dragonfly Society (BDS) have launched a new citizen science project 'Dragonfly Watch' in 2021 (British Dragonfly Society, 2020) to aid recordings of these species across the UK through citizen science led observations, allowing for trends and populations to be monitored on a larger scale. Using the methods outlined in the BDS project, it is the aim of this report to provide an updated count of the odonata species present on 3 sites – Stour Valley LNR (SV), Throop Nature Park (TNP) and Millhams Mead LNR (MM) for BCP Council, however it is not a definite list as surveys capture only a snapshot of that day/time, therefore not all current species may be accounted for.

A baseline of known species will be drawn up using a desktop survey of past observations/sightings for each site. This is followed by mapping the relevant habitat areas that odonata species are likely to be present and surveying throughout the main flight period (April – September). In addition to species presence, any observations of reproduction are to be noted to provide evidence of successful breeding and which may help inform the need to maintain/enhance certain areas within habitats for the benefit of these species.

1.1. Site descriptions

1.1.1. Stour Valley Local Nature Reserve

The two-and-a-half mile of river path, meadows and deciduous woodland contain a suitable number of suitable habitats to support odonata species during their lifecycle. Highlighted aquatic habitats include:

- Ponds
- Slow moving streams/drainage ditches
- Fast flowing river (Stour) and riverbank with a wide variety of marginal and water plants for emergence, feeding platforms and ovipositing.

The open meadows and woodland provide excellent feeding habitats for larger hawker and darter species.

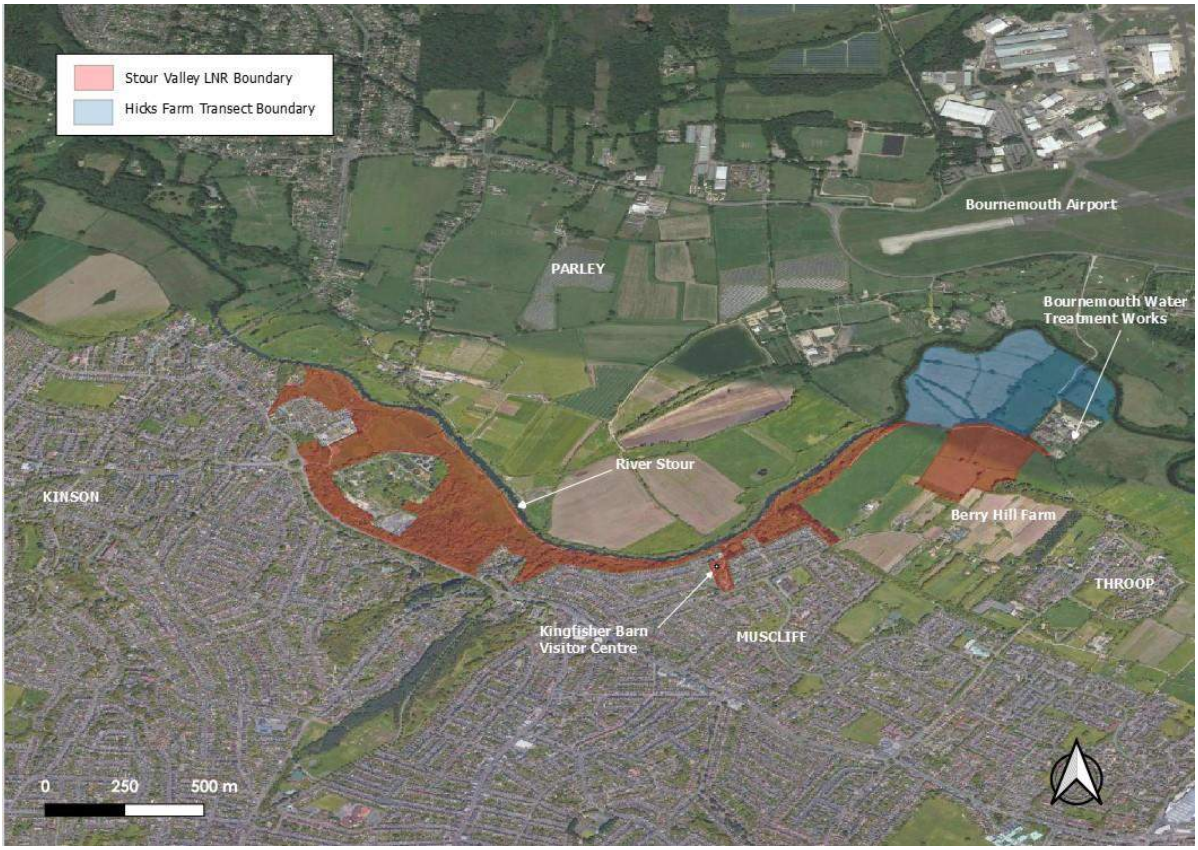

Figure 1. Stour Valley LNR site boundary showing location and landscape features.

1.1.2. Throop Nature Park

This is a newly established site, previously part of a farm tenancy where it was used for hay meadows and horse grazing. The riverside meadows follow the Eastern part of the River Stour, which are under BCP Council's management, up to the Parsons (Throop) mill.

The meadows annually flood and retain water-logged drainage areas as well as the fast-moving river. At the mill end there is a small fishing pool (Stillwater mill pool) channelled off from the main river. The pool is surrounded by several marginal plants such as reedmace, pondweeds, common reed, and rushes. A small stream feeds both into this pool and under the old mill, in summer this stream holds a high number of aquatic plants, including waterlily and pondweeds.

This area is due to become a new Suitable Alternative Natural Greenspace (SANG) with the potential for a new 'dog pond' to be created within the old grazing meadows which could provide a new habitat for odonata species.

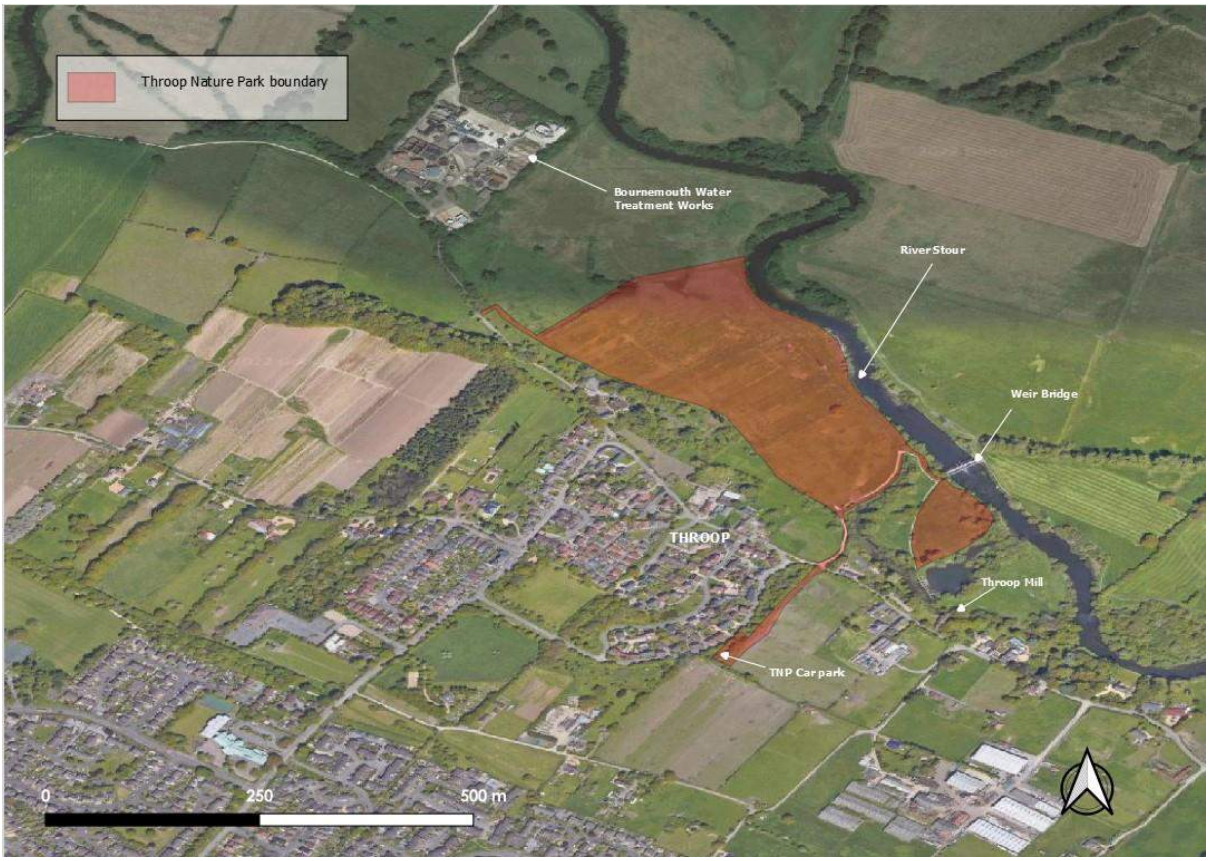

Figure 2. Throop Nature Park site boundary (based on plan in Appendix A.) showing location and landscape features.

1.1.3. Millhams Mead Local Nature Reserve

This site consists of grassland pastures, mature woodland, river paths and slow-moving stream. Like the SV reserve this provides both breeding and feeding habitats for a majority of odonata species:

- River Stour (fast flowing) with a wide variety of marginal and water plants for emergence, feeding platforms and ovipositing.
- Millhams stream (slow moving)
- Open meadows
- Mixed plantations

Figure 3. Millhams Mead LNR site boundary showing location and landscape features.

2. Methods

2.1. Baseline

A brief desktop survey was conducted using BCP Council's past management plans and searching known databases iRecord (Biological Records Centre, 2016) and Living Record (Living Record, 2009) for observations for all three sites. All records are verified by a local expert before being accepted as correct. In addition to this, images taken on each site[1] were viewed as they also provided visual identification records along with the date taken. From this a rough baseline of species that had been recorded prior to 2021 could be established.

2.2. Mapping

Each site was viewed on Google maps (Google Maps, 2021) and a basic transect along the waterways were drawn. At each transect the route was recorded using Garmin GPS handheld unit and this was then used to create precise maps, target noting areas where exuvia were likely to be found and any other relevant plots along the transect (Appendix B.). During the field visit areas of

[1] Photographs taken by the author during their role as a ranger working on these sites or during survey period 2021.

potential emergence points (where exuvia could be collected) were noted and recorded as points on the GPS. Additionally, the route was transcribed so that it could be easily followed by someone with little knowledge of the site.

2.3. Transects (presence/absence survey)

For both SV and MM, the transect was split into smaller sections as either they were quite large (SV) or contained multiple waterways (MM).

The BDS survey, only the waterways were required to be surveyed but for this report areas between the river and stream at MM were also examined for odonata species.

Each transect was walked according to the methods outlined in the BDS Dragon Watch project:

- Between 10 AM – 4PM
- Temperature above 15°C but not more than 30°C
- Wind - four or below using the Beaufort scale
- 60%< cloud cover

2.4. Reproduction evidence

During transects observations of copulating or ovipositing individuals are recorded along with collected exuvia that can be identified later using identification keys and reference books. Another way to confirm reproduction cycles is the presence of identified nymphs within water bodies on site (rivers, ponds, or streams).

3. Results

3.1. Stour Valley Local Nature Reserve

3.1.1. Desktop survey baseline

The BCP Council management plan in 2009 (BCP Council, 2009) reported the highest number of odonata (see Table 1.) with twenty species recorded. Photographic sources are the next highest covering a period from 2014-2020 with fifteen species noted. Sightings reported to iRecord only show eleven species with most records being taken during 2019-20 (Appendix C.). In 2018 a BioBlitz was conducted that included pond and river dipping that identified two species of odonata nymphs – emperor (*Anax imperator*) and southern migrant hawker (*Aeshna affinis*).

Table 1. Sources searched for recordings of odonata sightings noting the year up to 2020, type of odonata recorded and total number of species.

Source	Year	Zygoptera	Anisoptera	Total species
BCP Council management plan	2009	9	11	20
iRecord	2012-2020	5	7	11
Living Record	2014-2018	5	5	10
Photographs	2014-2020	8	7	15

3.1.2. Transect

Stour Valley transects follow the main river starting from the entrance at Brecon Close right through to the back of the Berry Hill treatment works (Figure 1.). Due to its size, the route was divided into two parts for ease of surveying. Both transects were walked simultaneously in June and September, for July the two transects were surveyed on consecutive days (Table 2.).

In June there was a higher number of Zygoptera recorded than Anisoptera, this evened out in July then reversed in September with only one species of Zygoptera recorded. This reflects the normal pattern of species throughout the flight season.

In total seven species of Zygoptera and nine species of Anisoptera were recorded during this period with several individuals observed. The main species of note were the white-legged damselfly (*Platycnemis pennipes*) and scarce chaser (*Libellula fulva*) dragonfly – the latter listed as a category three (scarce) species under the British Red Data Book (British Dragonfly Society, 2010).

3.1.3. Reproduction

Exuvia was collected in June due to time constraints for 2021. From these, four species were identified:

- Banded demoiselle (*Calopteryx splendens*)
- White-legged damselfly (*P. pennipes*)
- Broad-bodied chaser (*Libellula depressa*)
- Scarce chaser (*L. fulva*

Copulation between odonata species was observed during the survey period that included:

- Azure damselfly (*Coenagrion puella*)
- Banded demoiselle (*Calopteryx splendens*)
- Blue-tailed damselfly (*Ischnura elegans*)
- Common blue damselfly (*Enallagma cyathigerum*)
- Large red damselfly (*Pyrrhosoma nymphula*)
- White-legged damselfly (*P. pennipes*)
- Emperor (*A. imperator*)
- Migrant hawker (*Aeshna mixta*)
- Scarce chaser (*L. fulva*)

Table 2. Records of odonata recorded during transect surveys June – September 2021. Species in red indicate those recorded on site in the baseline data but not observed during the 2021 surveys.

Zygoptera (Damselflies)		Survey dates		
Common name	**Scientific name**	**01/06/2021**	**01-02/07/2021**	**12/09/2021**
Azure Damselfly	*C. puella*	Present	Present	Absent
Banded Demoiselle	*C. splendens*	Present	Present	Absent
Beautiful Demoiselle	*Calopteryx virgo*	Absent	Absent	Absent
Blue-tailed Damselfly	*I. elegans*	Present	Present	Absent
Common Blue Damselfly	*E. cyathigerum*	Present	Absent	Present
Emerald Damselfly	*Lestes sponsa*	Absent	Absent	Absent
Large Red Damselfly	*P. nymphula*	Present	Present	Absent
Red-eyed Damselfly	*Erythromma najas*	Absent	Present	Absent
Small Red Damselfly	*Ceriagrion tenellum*	Absent	Absent	Absent
Small Red-eyed Damselfly	*Erythromma viridulum*	Absent	Absent	Absent
White-legged Damselfly	*P. pennipes*	Present	Present	Absent
Total		**6**	**6**	**1**
Anisoptera (Dragonflies)				
Common name	**Scientific name**	**01/06/2021**	**01-02/07/2021**	**12/09/2021**
Black-tailed Skimmer	*Orthetrum cancellatum*	Absent	Present	Present
Broad-bodied Chaser	*L. depressa*	Absent	Present	Absent
Brown Hawker	*Aeshna grandis*	Absent	Absent	Present
Common Darter	*Sympetrum striolatum*	Absent	Absent	Present
Common Hawker	*Aeshna juncea*	Absent	Absent	Absent
Emperor Dragonfly	*A. imperator*	Absent	Present	Absent
Four-spotted Chaser	*Libellula quadrimaculata*	Absent	Present	Absent
Golden-ringed Dragonfly	*Cordulegaster boltonii*	Absent	Absent	Absent
Migrant Hawker	*A. mixta*	Absent	Absent	Present
Ruddy Darter	*Sympetrum sanguineum*	Absent	Absent	Absent
Scarce Chaser	*L. fulva*	Present	Present	Absent
Southern Hawker	*Aeshna cyanea*	Absent	Absent	Present
Total		**1**	**5**	**5**

Figure 4. Stour Valley odonata transects covering from Brecon Close to Berry Hill sludge treatment centre. The total transect length is 3.95km, broken into two sections and follows along the entire length of the River Stour within the reserve.

3.2. Throop Nature Park

3.2.1. Desktop Survey

There is no management plan for this site due to being newly established, however past odonata records were found using the sources detailed in Table 3. In total a maximum of eleven species have been recorded between 2012-2020 including scarce chaser (*L. fulva*) and white-legged damselfly (*P. pennipes*) (Appendix D.).

Table 3. Sources searched for recordings of odonata sightings noting the year up to 2020, type of odonata recorded and total number of species.

Source	Year	Zygoptera	Anisoptera	Total species
iRecord	2012-2020	5	6	11
Living Record	2013-2020	2	3	5
Photographs	2018	2	0	2

3.2.2. Transects

The transect route covers the main river (Figure 2.), a small fishing inlet and the mill stream. Three surveys were conducted between June and September with seven species of both Zygoptera and Anisoptera being recorded. This includes both scarce chaser (*L. fulva*) and white-legged damselfly (*P. pennipes*) species that are of conservation interest.

3.2.3. Reproduction

No exuvia were found due to poor access to river margin (reed beds with soft mud/tree cover) or steep slopes presenting a substantial risk of safety. Paired individuals were observed during the July and September surveys for the following species:

- Azure damselfly (*C. puella*)
- Banded demoiselle (*C. splendens*)
- Common blue damselfly (*E. cyathigerum*)
- Large red damselfly (*P. nymphula*)
- White-legged damselfly (*P. pennipes*)
- Common darter (*S. striolatum*)
- Emperor dragonfly (*A. imperator*)
- Scarce chaser (*L. fulva*)

Table 4. Records of odonata recorded during transect surveys June – September 2021.

Zygoptera (Damselflies)		**Survey dates**		
Common name	**Scientific name**	**02/06/2021**	**17/07/2021**	**13/09/2021**
Azure Damselfly	*C. puella*	Present	Present	Absent
Banded Demoiselle	*C. splendens*	Present	Present	Absent
Blue-tailed Damselfly	*I. elegans*	Present	Present	Absent
Common Blue Damselfly	*E. cyathigerum*	Present	Absent	Present
Large Red Damselfly	*P. nymphula*	Present	Present	Absent
Red-eyed Damselfly	*E. najas*	Absent	Present	Absent
White-legged Damselfly	*P. pennipes*	Present	Present	Absent
	Total	**6**	**6**	**1**
Anisoptera (Dragonflies)				
Common name	**Scientific name**	**02/06/2021**	**17/07/2021**	**13/09/2021**
Black-tailed Skimmer	*O. cancellatum*	Absent	Present	Absent
Broad-bodied Chaser	*L. depressa*	Present	Absent	Absent
Brown Hawker	*A. grandis*	Absent	Absent	Present
Common Darter	*S. striolatum*	Absent	Present	Absent
Emperor Dragonfly	*A. imperator*	Absent	Present	Absent
Scarce Chaser	*L. fulva*	Present	Present	Absent
Southern Hawker	*A. cyanea*	Absent	Absent	Present
	Total	**2**	**4**	**2**

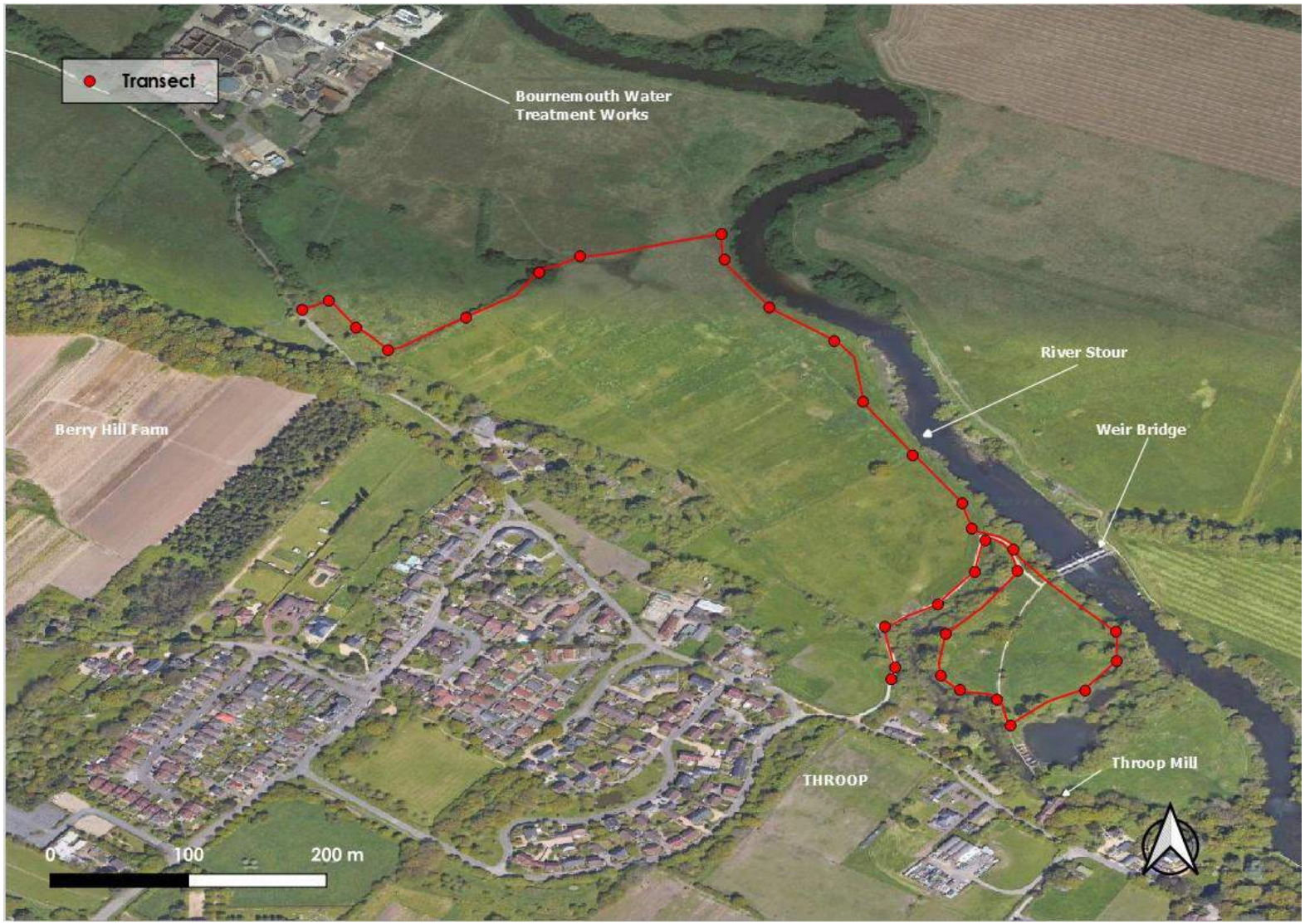

Figure 5. Throop Nature Park odonata transect covering from Berry Hill sludge treatment centre to Throop Mill. The total transect length is 1.71km and follows along the River Stour up towards the weir bridge then along the Western edge of the small fishing inlet (managed by Ringwood & District Anglers Association) then turns to follow the mill's stream diversion back to the main path terminating at Throop Road.

3.3. Millhams Mead Local Nature Reserve

3.3.1. Desktop Survey

The BCP Council management plan in 2007 (BCP Council, 2007) reported the highest number of odonata (see Table 5.) with sixteen species recorded. Both Living record and photographic sources only show a small number of recorded species covering a period from 2010-2020 (Appendix E.) - iRecord submissions were excluded for baseline assessment due to all records showing as those uploaded in 2021 from the surveys.

Table 5. Sources searched for recordings of odonata sightings noting the year up to 2020, type of odonata recorded and total number of species.

Source	Year	Zygoptera	Anisoptera	Total species
BCP Council management plan	2007	6	10	16
Living Record	2010-2020	2	2	4
Photographs	2017-2020	4	1	5

3.3.2. Transects

The site survey was conducted using three separate transect sections (Figure 3.). Transect one followed the Leaden Stour (a slow-moving tributary) from the St. Andrews church site entrance until reaching Ringwood Road where it then moves through the plantation out onto the open meadow and follows the hedge line along terminating at Longham recycling centre entrance. Transect two begins at Longham bridge and follows the river along to its Eastern boundary. Transect three then begins at the Leaden tributary and heads back towards the St. Andrews church entrance where it terminates below the footbridge.

Two surveys were conducted between June and September (Table 6.) with seven species of Zygoptera and eight species of Anisoptera observed. The main species of note were the white-legged damselfly (*P. pennipes*) and scare chaser dragonfly (*L. fulva*).

3.3.3. Reproduction

No exuvia were located during these surveys but copulation and ovipositing was observed in the September survey for the following species:

- Common darter (*S. striolatum*)
- Scarce chaser (*L. fulva*)
- Migrant hawker (*A. mixta*)

Figure 6. Millhams Mead LNR odonata transects following the Leaden Stour (Transects 1& 3) and the main river (transect 2) contained within the reserve. The total transect length is 2.94km, broken into three sections.

Table 6. Records of odonata recorded during transect surveys June – September 2021. Species in red indicate those recorded on site in the baseline data but not observed during the 2021 surveys.

Zygoptera (Damselflies)		**Survey dates**	
Common name	**Scientific name**	**16/06/2021**	**24/09/2021**
Azure Damselfly	*C. puella*	Present	Absent
Banded Demoiselle	*C. splendens*	Present	Absent
Beautiful Demoiselle	*C. virgo*	Present	Absent
Blue-tailed Damselfly	*I. elegans*	Present	Absent
Common Blue Damselfly	*E. cyathigerum*	Present	Absent
Large Red Damselfly	*P. nymphula*	Present	Absent
White-legged Damselfly	*P. pennipes*	Present	Absent
	Total	**7**	**0**
Anisoptera (Dragonflies)			
Common name	**Scientific name**	**16/06/2021**	**24/09/2021**
Black-tailed Skimmer	*O. cancellatum*	Present	Absent
Broad-bodied Chaser	*L. depressa*	Absent	Absent
Brown Hawker	*A. grandis*	Absent	Present
Common Darter	*S. striolatum*	Absent	Present
Common Hawker	*A. juncea*	Absent	Absent
Emperor Dragonfly	*A. imperator*	Present	Absent
Four-spotted Chaser	*L. quadrimaculata*	Present	Absent
Golden-ringed Dragonfly	*C. boltonii*	Absent	Absent
Migrant Hawker	*A. mixta*	Absent	Present
Ruddy Darter	*S. sanguineum*	Absent	Absent
Scarce Chaser	*L. fulva*	Present	Absent
Southern Hawker	*A. cyanea*	Absent	Present
	Total	**4**	**4**

4. Discussion and recommendations

There were no odonata recorded for April and May due to a combination of cold temperatures and high rainfall during this period, therefore only Zygoptera tenerals were observed in mid-May. However, all three sites showed healthy and diverse populations of odonata with evidence of between four – nine species breeding at each site when surveyed during the remaining flight period.

Both LNR sites had odonata species that had been recorded in the last two-three years previously that were not observed during any of the 2021 surveys. Only a couple of species, common emerald damselfly (*L. sponsa*) and ruddy darter (*S. sanguineum*), have not been officially recorded on the sites for more than 10 years. Whilst the latter species is showing an increase in occupancy across

England, the emerald damselfly (*Lestes sponsa*) is showing the greatest decline in occupancy for the Britain and Ireland (Taylor et al., 2021).

Both the white-legged damselflies (*P. pennipes*) and scare chaser dragonflies (*L. fulva*) were present at all three sites and showing healthy population - with numbers of thirty or more for *P. pennipes* and ten individuals for *L. fulva* being observed during each of the surveys (when present).

Current management plans for the two LNRs aim to maintain or enhance each site that will continue to provide odonata species with quality habitats to continue their lifecycles.

4.1. Recommendations

Moving forward from this report, the following recommendations are suggested:

- Continued odonata presence/absence surveying on an annual basis with a minimum of three surveys per flight period (April – September) - more surveys could be conducted (i.e., monthly), increasing the likelihood of recording as many species that inhabit the site.
- Regularly checking for larval stages (nymphs) in as many water bodies as possible by undertaking river/pond dipping around the marginal plants along river, streams, ponds, and semi-permanent pools where possible.
- Collection and identification of exuvia during peak emergence periods (Figures 9 & 10 of Appendix B.).
- Odonata identification training of staff, students and interested volunteers would be of great benefit, allowing more chances of recording all species inhabiting each site.
- Use of social media (Facebook, Twitter, and Instagram) to encourage visitors to record species found on wildlife databases sites such as iRecord[2].
- Conduct population/target surveys for species of interest to gain details such as species abundance and habitat use (ovipositing/feeding/mating).
- Monitor the abiotic factors along the transect sites – preferably at area of interest (up/downstream of water treatment outflows, ponds, areas of high or low aquatic vegetation) – this may be a good project for college/university students.
- Continue to maintain or enhance habitats currently used by odonata to ensure their continuing presence.
- Communication between site owners and the local County Dragonfly Recorder[3], and any local dragonfly groups[4]

[2] App/database recommended and used by the BDS
[3] Current details can be found here: https://british-dragonflies.org.uk/about/county-dragonfly-recorders/
[4] Dorset Dragonfly Group: http://www.dorsetdragonflies.org.uk/

5. References

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6. Appendices

6.1. Appendix A. Throop Nature Park Proposed Plan

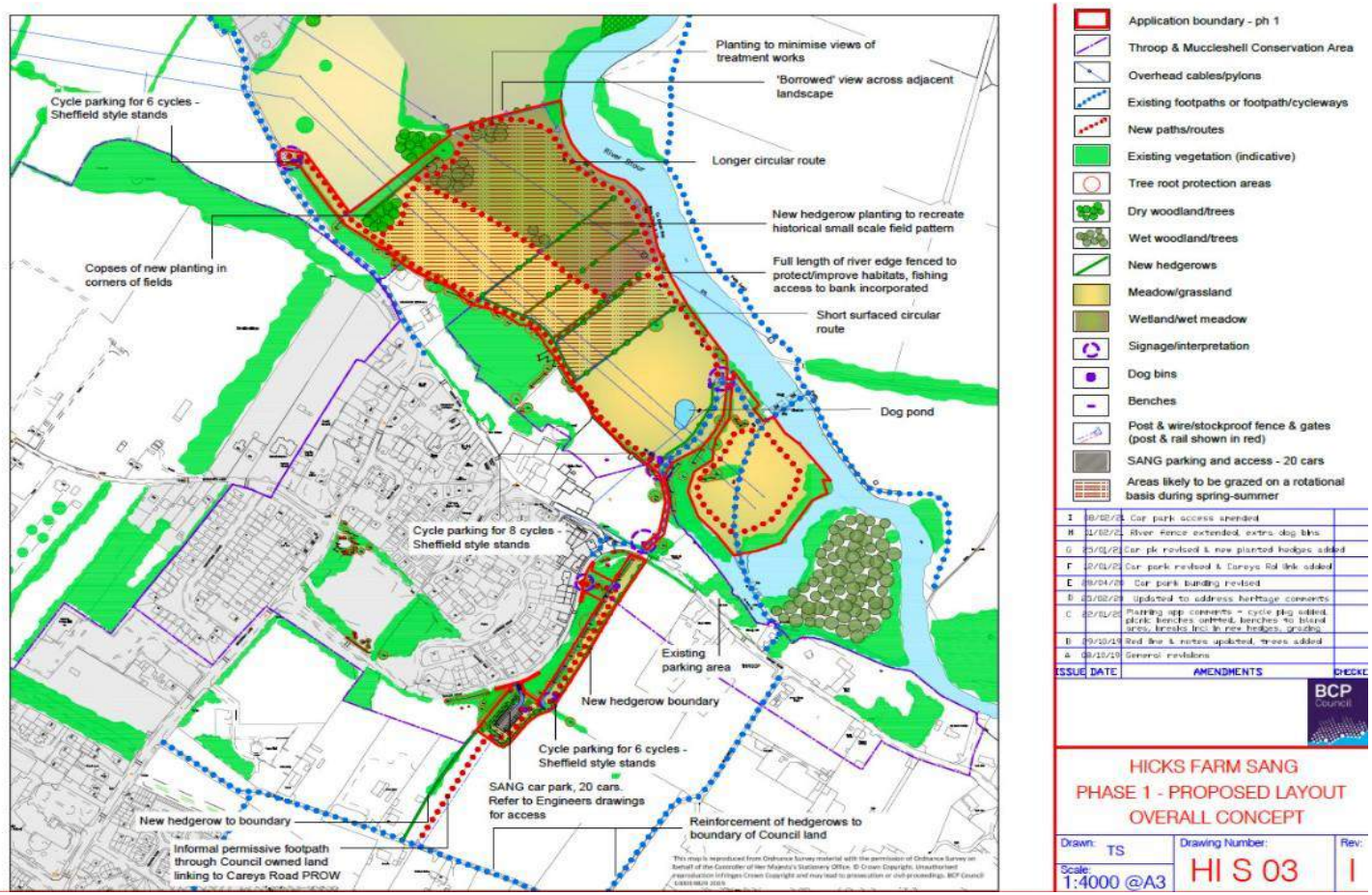

Figure 7. Proposed layout overall concept map of Hicks Farm Sang (referred in this document as Throop Nature Park).

6.2. Appendix B. Exuvia maps for Stour Valley LNR transects

Figure 8. Showing locations along Transect 1 of the SV LNR where exuvia were collected during 2021 surveys.

Figure 9. Transect 1 of the SV LNR site highlighting potential exuvia sites along the riverbank (for descriptions of each point see Table 7.). Checks for exuvia are best performed early morning.

Figure 10. Transect two of the SV LNR showing potential exuvia sites (for descriptions of each point see Table 8.) long the riverbank.

6.2.1. Potential exuvia point descriptions:

Table 7. Transect 1:

Exuvia points	Position description
E1.1	Right side of the outflow along riverbank
E1.2	Main dog beach (left side)
E1.3	Main dog beach (right side)
E1.4	Around the disabled fishing platform
E1.5	Dog beach by kingfisher carving & bench

Table 8. Transect 2:

Exuvia points	Position description
E2.1	Small outflow left
E2.2	Dog beach left of gateway
E2.3	Shallows just right side of gateway into the wilderness
E2.4	Right of bank by bench
E2.5	Reeds and bank opposite bench
E2.6-7	Groups of reeds along bank of lower path[5]
E2.8	Set of reeds/rushes after willows/nettles – carefully step-down bank to access
E2.9	Wide bank under trees – may be muddy (wellies)
E2.10	Reeds & rushes – check areas that are safely accessible
E2.11	Vegetation along bank under road bridge
E2.12	Check reeds/rushes along flat/lower bank
E2.13	Check reeds/rushes under trees

[5] Area of high yield for damselfly exuvia during transects in 2021

6.3. Appendix C. Stour Valley LNR baseline data

6.3.1. BCP management plan list of odonata species (2009)

Table 9. Recorded list of odonata species from the 2009 BCP management plan

Zygoptera	**Anisoptera**
Banded demoiselle *C. splendens*	Common hawker *A. juncea*
Beautiful demoiselle *C. virgo*	Migrant hawker *A. mixta*
Emerald damselfly *L. sponsa*	Southern hawker *A. cyanea*
White-legged damselfly *P. pennipes*	Brown hawker *A. grandis*
Large red damselfly *P. nymphula*	Emperor dragonfly *A. imperator*
Red-eyed damselfly *E. najas*	Golden-ringed dragonfly *C. boltonii*
Azure damselfly *C. puella*	Four-spotted chaser *L. quadrimaculata*
Common-blue damselfly *E. cyathigerum*	Scarce chaser *L. fulva*
Blue-tailed damselfly *I. elegans*	Broad-bodied chaser *L. depressa*
	Common darter *S. striolatum*
	Ruddy darter *S. sanguineum*

6.3.2. iRecord list of recorded odonata species pre-2021

Table 10. Recorded list of odonata species from iRecords database up to 2020

Odonata species	**Date recorded**
Azure Damselfly *C. puella*	17/05/2020 - 23/05/2020
	05/07/2020 - 11/07/2020
	12/07/2020 - 18/07/2020
	10/05/2020 - 16/05/2020
	24/05/2020 - 30/05/2020
	07/06/2020 - 13/06/2020
	14/06/2020 - 20/06/2020
	28/06/2020 - 04/07/2020
	21/06/2020 - 27/06/2020
Banded Demoiselle *C. splendens*	05/08/2014
	05/07/2016
	30/05/2012
	29/07/2014
Beautiful Demoiselle C. *virgo*	11/06/2014
Broad-bodied Chaser *L. depressa*	28/04/2019 - 04/05/2019
	21/04/2019 - 27/04/2019
	16/06/2019 - 22/06/2019
	19/04/2020 - 25/04/2020
	26/04/2020 - 02/05/2020
Brown Hawker *A. grandis*	19/07/2020 - 25/07/2020
Common Blue Damselfly *E. cyathigerum*	26/05/2019 - 01/06/2019
	09/06/2019 - 15/06/2019

	07/06/2014
	19/05/2019 - 25/05/2019
	16/06/2019 - 22/06/2019
	30/06/2019 - 06/07/2019
	02/06/2019 - 08/06/2019
Common Darter *S. striolatum*	19/07/2020 - 25/07/2020
	04/08/2019 - 10/08/2019
	25/08/2019 - 31/08/2019
	28/07/2019 - 03/08/2019
	28/06/2020 - 04/07/2020
	09/08/2020 - 15/08/2020
	18/08/2019 - 24/08/2019
	12/07/2020 - 18/07/2020
	02/08/2020 - 08/08/2020
	13/09/2020 - 19/09/2020
	14/07/2019 - 20/07/2019
	21/06/2020 - 27/06/2020
	26/07/2020 - 01/08/2020
	16/08/2020 - 22/08/2020
	23/08/2020 - 29/08/2020
	30/08/2020 - 05/09/2020
	05/07/2020 - 11/07/2020
Emperor Dragonfly *A. imperator*	30/06/2014
Large Red Damselfly *P. nymphula*	09/06/2019 - 15/06/2019
	03/05/2020 - 09/05/2020
	24/05/2020 - 30/05/2020
	05/07/2016
	28/04/2019 - 04/05/2019
	12/05/2019 - 18/05/2019
	26/05/2019 - 01/06/2019
	30/06/2019 - 06/07/2019
	19/04/2020 - 25/04/2020
	26/04/2020 - 02/05/2020
	19/07/2020 - 25/07/2020
	05/05/2019 - 11/05/2019
	26/06/2013
	19/05/2019 - 25/05/2019
	16/06/2019 - 22/06/2019
	07/07/2019 - 13/07/2019
	17/05/2020 - 23/05/2020
	05/07/2020 - 11/07/2020
	02/06/2019 - 08/06/2019
Southern Hawker *A. cyanea*	18/08/2019 - 24/08/2019
White-legged Damselfly *P. pennipes*	04/06/2017

6.3.4. Living Record list of recorded odonata species pre-2021

Table 11. Recorded list of odonata species from Living Record database up to 2020

Odonata species	**Date recorded**
Banded Demoiselle (*C. splendens*)	12/07/2016
	12/07/2016
	29/07/2014
	13/06/2013
	12/07/2016
	24/06/2014
	24/06/2014
	29/07/2014
	05/07/2016
	28/06/2016
Black-tailed Skimmer (*O. cancellatum*)	05/07/2016
Blue-tailed Damselfly (*I. elegans*)	01/07/2015
	26/06/2013
	11/05/2016
	28/06/2016
Common Blue Damselfly (*E. cyathigerum*)	05/08/2014
Common Darter (*S. striolatum*)	22/08/2016
Emperor Dragonfly (*A. imperator*)	05/08/2014
Large Red Damselfly (*P. nymphula*)	06/05/2015
	06/05/2015
	11/05/2015
	26/06/2013
	05/07/2016
Migrant Hawker (*A. mixta*)	10/10/2017
	01/10/2014
	26/09/2020
Scarce Chaser (*L. fulva*)	28/05/2018
White-legged Damselfly (*P. pennipes*)	05/07/2016
	12/07/2016
	07/07/2015
	08/07/2014
	05/08/2014
	28/05/2018
	28/05/2018
	28/05/2018

6.3.5. Photographic records of odonata species pre-2021

Figure 12. Odonata species photographed prior to 2021: (from top L-R) Migrant hawker, copulating common blue damselflies, black-tailed skimmer, blue-tailed damselfly, brown hawker, common blue damselfly, emperor ovipositing and large red damselfly.

6.4. Appendix D. Throop Nature Park baseline data

6.4.1. iRecord list of recorded odonata species pre-2021

Table 12. Recorded list of odonata species from iRecords database up to 2020

Odonata species	**Date recorded**
Azure Damselfly *C. puella*	30/06/2014
Banded Demoiselle *C. splendens*	30/05/2013
	30/05/2013
	30/05/2013
	02/06/2018
	02/06/2018
	22/06/2014
	30/06/2014
Blue-tailed Damselfly *I. elegans*	02/06/2018
	22/06/2014
	30/06/2014
Brown Hawker *A. grandis*	18/08/2020
	18/08/2020
	18/08/2020
	07/08/2015
	07/08/2015
	07/08/2015
	07/08/2015
	07/08/2015
Common Darter *S. striolatum*	26/09/2020
Common Hawker *A. juncea*	25/09/2015
Emperor Dragonfly *A. imperator*	07/08/2015
Large Red Damselfly *P. nymphula*	08/04/2019
	30/05/2013
	03/05/2013

	02/06/2018
	04/05/2018
Migrant Hawker *A. mixta*	26/09/2020
	17/10/2012
	25/09/2015
	25/09/2015
	25/09/2015
Scarce Chaser *L. fulva*	30/06/2014
White-legged Damselfly *P. pennipes*	30/05/2013
	30/05/2013
	02/06/2018
	02/06/2018
	07/08/2015

6.4.2. Living Record list of recorded odonata species pre-2021

Odonata species	**Date recorded**
Brown Hawker (*A. grandis*)	14/08/2021
Common Darter (*S. striolatum*)	26/09/2020
Common Hawker (*A. juncea*)	25/09/2015
Large Red Damselfly (*P. nymphula*)	08/04/2019
Migrant Hawker (*A. mixta*)	17/10/2012
	26/09/2020
	25/09/2015

6.4.4. Photographic records of odonata species pre-2021

Figure 13. The Zygoptera species photographed prior to 2021: (from L-R) banded demoiselle and white-legged damselfly.

6.5. Appendix E. Millhams Mead LNR baseline data

6.5.1. BCP management plan list of odonata species

Table 13. Recorded list of odonata species from the 2007 BCP management plan

Zygoptera	**Anisoptera**
Azure damselfly *C. puella*	Broad-bodied chaser *L. depressa*
Banded demoiselle *C. splendens*	Brown hawker *A. grandis*
Blue-tailed damselfly *I. elegans*	Common darter *S. striolatum*
Common-blue damselfly *E. cyathigerum*	Common hawker *A. juncea*
Large red damselfly *P. nymphula*	Emperor dragonfly *A. imperator*
White-legged damselfly *P. pennipes*	Golden-ringed dragonfly *C. boltonii*
	Migrant hawker *A. mixta*
	Ruddy darter *S. sanguineum*
	Scarce chaser *L. fulva*
	Southern hawker *A. cyanea*

6.5.2. Living Record list of recorded odonata species pre-2021

Table 14. Recorded list of odonata species from Living Record database up to 2020

Odonata species	**Date recorded**
Beautiful Demoiselle (*C. virgo*)	16/05/2020
Common Blue Damselfly (*E. cyathigerum*)	25/05/2016
Common Darter (*S. striolatum*)	16/10/2010
Migrant Hawker (*A. mixta*)	30/09/2015

6.5.4. Photographic records of odonata species pre-2021

Figure 14. Odonata species photographed prior to 2021: (from top L-R) Beautiful demoiselle, copulating scarce chasers, large red damselfly, blue-tailed damselfly, white-legged damselfly, and azure damselfly.

6.6. Appendix F. Peak emergence times for odonata species

Table 15. Peak adult odonata emergence months for collecting exuvia (adapted from Cham, 2012). The light green and blue shades indicate the start of peak emergence or a second peak whilst the darker colours identify when emergence is at its highest.

Species	Apr	May	Jun	Jul	Aug
Azure Damselfly *C. puella*					
Banded Demoiselle *C. splendens*					
Beautiful Demoiselle *C. virgo*					
Blue-tailed Damselfly *I. elegans*					
Common Blue Damselfly *E. cyathigerum*					
Emerald Damselfly *L. sponsa*					
Large Red Damselfly *P. nymphula*					
Red-eyed Damselfly *E. najas*					
Small Red-eyed Damselfly *E. viridulum*					
White-legged Damselfly *P. pennipes*					
Black-tailed Skimmer *O. cancellatum*					
Broad-bodied Chaser *L. depressa*					
Brown Hawker *A. grandis*					
Common Darter *S. striolatum*					
Common Hawker *A. juncea*					
Emperor Dragonfly *A. imperator*					
Four-spotted Chaser *L. quadrimaculata*					
Golden-ringed Dragonfly *C. boltonii*					
Keeled Skimmer *Orthetrum coerulescens*					
Migrant Hawker *A. mixta*					
Ruddy Darter *S. sanguineum*					
Scarce Chaser *L. fulva*					
Southern Hawker *A. cyanea*					