



Survey for One-grooved Diving Beetle (*Bidessus unistriatus*(Goeze)) in 15 Marl Pit Ponds in the New Forest Report

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Robert Aquilina MSc MCIEEM is an independent consulting ecologist specialising in freshwater ecology. He is a Full member of the Institute of Ecology and Environmental Management and abides by their Code of Professional Conduct. For further details see

www.cieem.net
www.aquilina-environmental.co.uk

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Summary

Targetted surveys for One-grooved Diving Beetle (*Bidessus unistriatus*) were carried out at 15 marl pit ponds including the last known historical location within the New Forest HLS agreement area between April and June 2018. The purpose was to attempt to discover previously unknown populations of One-grooved Diving Beetle in ponds likely to be suitable for them.

A standardised method was adopted to search for adult beetles using visual observation and netting on each visit.

No target beetles were observed or captured during this survey and the conclusion is that it has not managed to spread from its last known location in the New Forest.

Introduction

The One-grooved Diving Beetle (*Bidessus unistriatus*) was concluded to be extinct at its last known location in the UK after carrying out surveys at Crockford (Aquilina, 2016).

The purpose of this project was to survey 15 potentially suitable locations including the only known location within the New Forest HLS agreement area for the presence of One-grooved diving beetle. A previous survey (Aquilina, 2016) had surveyed the ponds in the immediate vicinity of its last known location without success. It was therefore decided to explore similar suitable habitats including both its last known location and its previously reported location at Sway Pits (Marl Pit Oaks) within the New Forest from 1909.

The beetle was only discovered at Crockford in 1999 during a Balfour-Browne Club meeting.

Methodologies are discussed below.

Natural history

One-grooved diving beetle adults have been reported historically mostly in April and August across its three UK sites. The trough in records in May and June suggest breeding activity at this time in common with the majority of diving beetles.

It was confined to a single marl pit within the Crockford Bridge complex within the New Forest. Its other locations at Hickling Broad and Catfield Fen in East Anglia are shallow, soft-bottomed peaty pools with high conductivity. The most significant feature appears to be the shallow margins that are bare with fine-leaved plants; in the case of Crockford created by poaching from ponies. Note that *Bidessus unistriatus* was not found at either of its Norfolk sites in 2006 (Foster, G., Collier, M., Lott, D. and Vorst, O., 2007).

Balfour-Brown describes *Bidessus unistriatus* as a coastal species occurring in mossy marsh and drains with some of the spots where it occurs being 'distinctly muddy and thick with decaying vegetation' (Balfour-Brown, 1940).

Discussion with continental Dytiscid expert (Kevin Scheers, *pers. comm.*) suggest that on the near continent in Belgium, the beetle is associated with shallowly submerged mosses and therefore the Crockford site may have been atypical in terms of habitat. Alternatively, submerged mosses may have declined at Crockford leading to its demise.

It is believed that the beetle adult overwinters in deeper water but records are limited. No description of the larvae has been found.

Identification

One-grooved diving beetles are amongst the smallest of the Dytiscidae being only 1.7 to 2.0 mm in length. This characteristic is made use of in the survey methodology which consists of observing the muddy edges of the pond on a sunny day for beetles rising to the surface to renew their air supply. All diving beetle behave thus, but the small size makes *Bidessus* stand out, especially against the light colour of the marly mud. Having said that there are a couple of other diving beetles of similar size, two of which is also present at the location. They are *Hydroglyphus geminus* and *Graptodytes granularis* and so capture is required to confirm the presence and length of grooves ('unistriatus') on the elytra of *Bidessus*. Beetles are released immediately after inspection with a hand lens.

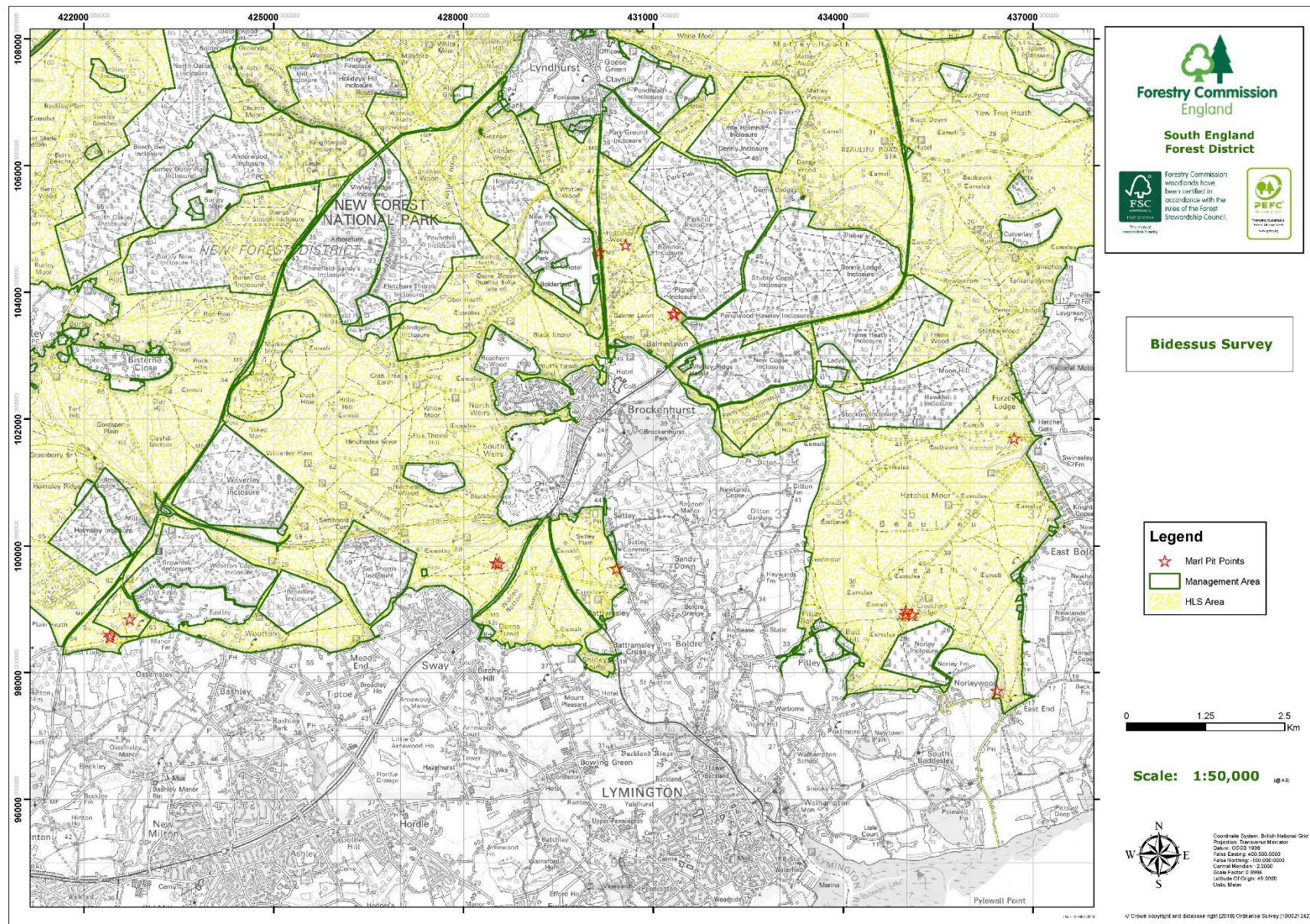
Locations

The following locations were selected as potentially suitable habitats based on discussion and advice from Naomi Ewald. The sites were all old marl pits. Previous work had indicated the importance of a clay substrate in all historical locations (Foster and Carr, 2008).

	Site name	Grid reference
1	Crockford Bridge (pond 30)	SZ3499198978
2	Crockford Bridge (pond 17)	SZ3498298914
3	Crockford Bridge (east of road)	SZ3509298915
4	Marl Pit Oak (pond 16)	SZ2855399721
5	Marl Pit Oak (pond 5)	SZ2850499734
6	Standing Hat Big	SU3131103670
7	Standing Hat Small	SU3133703655
8	Hollands Wood	SU3055804744
9	Spore Lake Lawn	SU3015004640
10	Hatchet Pond	SU3670201698
11	East End	SZ3643197714
12	Cobbler's Corner	SZ3041799642
13	Little Wootton Inclosure	SZ2272098842
14	Marlborough Deeps 1	SZ2240598559
15	Marlborough Deeps 2	SZ2241698598

Table 1 Survey locations

A location map is provided below.



Methods

The sites were visited twice, first at the beginning of May and then at the end of June. April was avoided because of the cold weather which it was felt would delay the beetle's normal activities.

The visits were undertaken under suitable weather conditions (dry and sunny) for observation. Each visit consisted of an hour of visual observation of the perimeter of the pond with gentle disturbance of the shallows with a net. This caused the fine clay to be suspended in the water column and thence made beetles swimming to the surface to replenish their air supplies highly visible. When spotted the beetle was captured in a small hand net and checked under a hand lens. During the first visit basic environmental data was also collected and is presented below. pH and conductivity were recorded using a Hach HQ40d multimeter . Extent of shade and poaching were estimated visually.

After an hour a sample was collected by netting the margins and placing the debris in a large white plastic tray where it was sorted and any small beetles checked.

Results

Environmental parameters

The following environmental parameters were collected.

Pond	Date	Area	pH	Cond (μ S/cm)	Temp ($^{\circ}$ C)	%perim shade	%overall shade	%perim poached	%overall poached	Notes
1	8.5.2018	500	7.36	426	21.3	40	25	60	60	
2	8.5.2018	672	7.08	562	20.9	50	40	20	10	
3	15.5.2018	1600	7.2	319	23	20	10	80	80	
4	4.5.2018	282	6.61	185	16.9	90	90	20	10	<i>Crassula</i>
5	4.5.2018	310	5.29	117.5	17.5	50	40	10	5	
6	7.5.2018	2957	6.66	342	20	50	40	25	20	
7	7.5.2018	614	6.7	213	17.3	2	10	100	40	
8	15.5.2018	6272	6.04	176	17.4	80	70	33	25	
9	15.5.2018	384	6.66	967	16	10	20	90	90	
10	8.5.2018	864	6.59	277	18.8	30	10	40	20	<i>Crassula</i>
11	15.5.2018	576	6.42	201	24.9	20	10	60	60	<i>Crassula</i>
12	15.5.2018	768	6.42	224	18.2	50	40	60	60	
13	3.5.2018	1590	6.4	260	13.3	90	75	0	0	<i>Crassula</i>
14	1.5.2018	90	7.08	366	17.3	0	0	80	50	<i>Crassula</i>
15	1.5.2018	484	7.4	441	15.5	5	2	80	33	<i>Crassula</i>

Table 2 Environmental parameters

The variation across the sites in pH is all around neutral (6.04 - 7.4) with one exception – one of the Marl Pit Oak ponds was quite acidic at 5.29. The range in conductivity is far more extensive running from few dissolved solutes to significant levels at Spore Lake Lawn although this may have been caused by extensive drying down concentrating any nutrients rather than reflecting the normal state. Average values for ponds in the wider countryside are 347 $\mu\text{S}/\text{cm}$ (Pond Conservation, 1998).

The range of shade and poaching is also extensive but is merely an indication that suitable sunny bare edges are present. Some of the ponds chosen may be unsuitable based on this criteria.

Biological data

No *Bidessus unistriatus* were encountered during any of the survey visits.

Whilst a few of the ponds appeared not to be so suitable, most did appear so. However, we do not know the reasons for its decline in any of the UK sites so the appearance of suitability may be misleading.

There were no indications that any of the ponds were unsuitable in terms of water quality as plenty of other water beetles were found.

Photographs of all the sites are included as an appendix below.

The following photographs of Crockford pond 30 show little apparent change over the last fourteen years in vegetation, extent of poaching or structure of the margins. This makes the loss of the population here, difficult to understand.



Crockford pond 7.3.2004



Crockford pond on 27.5.2011



Crockford pond on 16.6.2016



Crockford pond on 8.5.2018

Discussion

Given the isolated nature of all past records of *Bidessus unistriatus* and previous intensive survey work (Foster and Carr (2007), Aquilina (2016)) it is not unexpected that no new sites were found during these surveys. The beetle is isolated both in space and in time as the adults are only really abundant for a few short weeks before they disperse, apparently to ponds where they turn up as single individuals.

There is a slight hint that habitat requirements may include mosses that have previously been ignored as a potential habitat. But in fact all the poached margins which were selected did have mosses present, perhaps in insufficient quantity.

There is also a suspicion that the Crockford site has been drier in spring these past few years than previously. This would reduce the suitable habitat to some extent, but not to nothing. The pond has not dried up completely in this time. The photograph of the site from 2004 in Foster, Bilton and Nelson (2016) shows a much wetter pond but it was taken in March, rather earlier than the other photographs (See photographs above).

In Scandinavia the species is described as widespread 'preferring shallow, grassy pools near lakes or sea bays' and being 'often abundant in open temporary pools on limestone' (Nilsson and Holmen, 1995). Such a range of habitat use suggests that it is limited in the UK by other factors not currently understood.

Foster and Carr (2008) concluded that the chances of locating a breeding centre are low although the chances of new breeding centres being established over a wide area are high. Just how wide an area is not known. Therefore it is reasonable to conclude that the Crockford location has lost its *Bidessus unistriatus* population but much more difficult to conclude that it is extinct across the whole country.

Fortuitous discovery possibly awaits but it appears that this could be anywhere coastal, with temporary pools on marl with open bare edges and submerged mosses.

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