Survey of Biota in locations along York Stream before and after discharge of blue dye into the newly created Chapel Arches Basin

Introduction

The waterways project which has created a large water body in Maidenhead town centre from what was previously a small stream (York Stream) has brought with it the problem of blanket weed (filamentous algae). This is because the water body has changed from a shallow stream (20cms depth in August 2007) to a much deeper (1.35m) and slower moving one, as was predicted. Also whereas the stream was shaded by several trees and had woody debris on the bottom providing nutrients, the new water body is unshaded, as the trees have been removed, and so the water is more exposed to sunlight. The water will probably also be lower in nutrients due to the groundwater discharge.[1]

Method

To assess the impact of a non -toxic blue food dye (Dyofix) on blanket weed, a 5 week trial was planned, the dye released at 1 litre/week at a site just north of Chapel Arches Basin. The dye is said to inhibit blanket weed growth by restricting photosynthesis.

To establish a baseline level, a survey of three sites along the waterway was done on 19th June, prior to the 1st dose being administered on 21st June. The sites were

1) the stream near to Crown Lane steps (north of Chapel Arches basin) where the dye would be released,
2) the Library Bridge
3) the Boat Lift near to the weir.

Further surveys were done on 28th June, 12th July and 26th July, the latter date being one week after the 5th dose on 19th July. On 12th and 26th July a further sampling site, at the railway bridge, was added to enable comparison with historical data at this bridge. Manual removal of blanket weed from the centre of the waterway took place on 25th July and a record of fauna found was made.[2]

Site 1 North of Crown Lane Steps- the large tube takes the stream into Chapel Arches Basin. Dye first released here on 21/6/20 (photo 19/6/20)

[1] At present groundwater with a high alkalinity is still being discharged into Chapel Arches basin from the nearby construction sites. This apparently will cease in September 2020. Groundwater usually has lower nutrient levels than surface water. The latter receives fertiliser runoff from farmland.

[2] The fauna was broadly similar to that found in other clumps of blanket weed as the clumps provide shelter and food. Within these large clumps bright red bloodworms and pond snails, were found, evidently able to cope if low oxygen levels occur in the interior of the clump at night. Also found were snail eggs attached to BW and WS. See Darracott A *Survey of Fauna in clumps of Blanket Weed and Water Starwort-July 2020*. MCS

Site 2 At the Library Bridge (photo 19/6/20)

Method

The sites were sampled using a pond net and the contents transferred to a water filled container and any fauna were identified.

Site 1 York Stream sampled from the Green Way north of Crown Lane steps: the point where the dye will be discharged
Site 2 at the Library Bridge: data from 2007, when it was a stream, is available for this site
Site 3 at the Boat Lift next to the new weir

Chapel Arches Basin – on 28/6/20, after dye dispersed

Results

D =dominant : A = abundant: C = common: O = occasional: R = rare TL =total length

Site	Fauna sampled 19/6/20 before 1st dye release on 21/6/20	Fauna sampled 28/6/20 after 2nd dye release (on same day)	Fauna sampled 12/7/20 after 4th dye release	Fauna sampled 26/7/20 a week after 5th & last dye release	Notes
Site 1	No fauna	No fauna sampled but D. shoal of small fish seen but not caught.	D. small fish (3cmTL); O. Water fleas (Branchiopods & Copepods), R. Mayfly nymph & sludge worm	D. small fish R. Water flea (Branchiopod) Water louse Bloodworm Mosquito larva	No flora seen on 19/6/20 but on 28/6/20 some evidence of brown Blanket Weed (BW) on bottom and some filaments of it sampled. On 12 & 26/7/20 all fauna (except for the fish) were from the floating patches of BW sampled with some WS and another alga (?Ulvales) .
Site 2	No fauna	D. very small fish fry (ca 1.5cm TL). Water fleas (Branchiopods & Copepods), R. May fly nymph	C. Small fish A. Water fleas R. Pond snail, freshwater shrimp and mayfly nymph	A. Small fish (0.5-1.5cm TL) R. Stickleback C. Pond snail O.Flatworm R. Leech Water flea (Branchiopod) Bloodworm Fish louse Fly larva	On 19/6/20 BW at surface and in water column. Water Starwort (WS) on bottom. On 28/6/20 flora as before, though more of the BW seemed to be decomposing. Small rafts of decaying BW and WS floating down stream. On 12/7/20 rafts of BW still floating. Pillars of BW rising from bottom. WS more prominent on bottom. On 25/7/20 a day after BW manually removed, few floating rafts of BW. mush of BW and WS sprigs sampled. Snails in mush.
Site 3	C. Small Fish R. Lesser Water Boatmen Water Louse Pond snail	No fauna in BW at north end of boat lift. R. Fish Lice (*Argulus* sp) sampled near to weir itself. R. A fish of ca 4cms TL sampled below weir plus a pond snail	C. Pond Snails feeding on decaying BW R. Fish Louse	O small fish Ramshorn snail Pond snail R. Leech Mayfly nymph Bloodworm Mosquito larva	On 19/6/20 build- up of BW plus some Lemna Weed (LW) at the weir and surrounding area including the boat lift &. fauna mostly from blanket weed clump. No WS near site. On 28.6.20 the weir still had a greater build- up of both weeds with much of the BW decomposing into mush. On 12/7/20 BW mush & LW still accumulating. By 25/7/20 BW, LW & WS though less BW mush

Site 4 at the Railway Bridge sampled on 12th & 26th July

Site	Fauna sampled 12/7/20 after 4th dye release	Fauna sampled 26/7/20 a week after 5th & last dye release	Notes	Fauna sampled on 14th July 2019 north of the Railway Bridge
4	D. shoals of fish of different sizes (15cm, 3cm TL) A. Water fleas R. Water Louse, Mayfly Nymph and Fish Louse	C small fish O.Water Louse R. Water flea (Copepod) ? Ostracod Mayfly nymph	12/7/20 Rafts of brown BW, with some patches of green. No WS on bottom. 25/7/20 Few rafts of brown & green BW Short survey due to presence of 2 swans & a cygnet	A. Water Louse A. Freshwater Shrimp A. Pond Snail O. Water Fleas O. Juvenile Fish R. ? Stickleback R. Bloodworm (Chironomid larva) R. Ramshorn Snail

Most of the fauna recorded in July 2019 came from a clump of BW. I concluded at the time that although the Blanket Weed looks unpleasant it was providing shelter for certain fauna and is a nursery ground for juvenile fish. Some red blood worms (Chironomid larvae) were found in one clump of brown Blanket Weed suggesting low oxygen conditions in places which would happen if the weed was dying off. This same species is found in North Town Moor pond but is light brown, not red, as the pond water is high in dissolved oxygen.[3]

Presumably due to the effect of the dye release, clumps of blanket weed were not found at this location in 2020. The faunal diversity was slightly less in comparison with 2019 but the presence of small fish more prominent, at least on 12th July. Shoals of fish were not obvious on 25/7/20 though small fish were sampled. This may have been due to the presence at the site of two adult swans, one in the water. Again the fauna was mainly in the raft of blanket weed.

Site 4 At the Railway Bridge (photo 12/7/20)

[3] Darracott A 2019 *Survey of Aquatic Life in York Stream in Maidenhead Town Centre* – report for Maidenhead Waterways

Conclusions

The Blanket Weed (BW) even before the dye was dispersed, as seen from above, appeared to be mostly brown rather than green, though it would still contain bright green filaments when seen under the microscope The effect of the dye, by inhibiting photosynthesis, seems to have had the effect of accelerating any decay process causing the BW to decompose. It is noticeable that on the edge of the waterway at the boatlift the BW on 28th June was bright green, presumably due to increased sunlight compared to that in the waterway (see photos below).

Site 1 Crown Lane Steps

The dye has evidently not affected the fauna as a small shoal of fish were seen in the waterway at Crown Lane steps, on 28th June, the same day as the second dye release. The limited fauna was sampled usually from floating rafts of blanket weed. The brown BW on the bottom was not observed on 19th June, possibly because of dim light conditions. The presence of small fish at this site continued throughout the trial. The presence of other fauna is probably due to the relative absence of submerged and marginal flora. As noted above, such as occurred were associated with floating rafts of blanket weed plus small amounts of other flora.

Site 2 Library Bridge

At the library bridge no fauna was recorded on 19/6/20 though this may be because no clumps of BW were netted. However on 28th June, the day of the second dye release, fauna including many tiny fish fry and water fleas were sampled. If, as seems likely, the dye is causing the decomposition of BW then the presence of these fauna suggests they are feeding directly or indirectly on the decayed material.
In April and August 2007 similar surveys were done to establish faunal diversity when there was once again water in the town centre after several years of the stream drying out in the summer.[4] In August two sites near to the library bridge were sampled, one shaded (by trees), the other unshaded. The fauna recorded then was broadly similar to those found in 2020. However in 2007 these additional species were present: pond skater, water beetle, water mite and newt larvae (recorded from the shaded site). The flora then was blanket weed, water starwort, as at present, but also fools watercress. Not recorded for this site in 2007 was the stickleback and fish louse.

Site 3 Boat Lift

BW and Lemna Weed were accumulating at the weir even before the dye was dispersed. However if the photos of this site taken on 19th and 28th June are compared it can be seen that by 28th June more, apparently decomposing BW, had accumulated at the weir.
By 12th July decomposing BW was still accumulating. There was also an unpleasant smell.

[4] *Faunal Survey of York Stream, Maidenhead town centre* 7th August 2007 by Darracott A, Gifford J & Bowdery M unpub Maidenhead Civic Society

Extent of Blanket Weed on surface at Boat Lift 19/6/20

More Extensive Blanket Weed on surface at Boat Lift 28/6/20

Blanket Weed at the Boat Lift 28/6/20

Whereas this site supported some aquatic fauna on 19th June, prior to the first dye release, no fauna were found on 28th June[5] and only the pond snail was still present by 12th July. This is most likely due to decomposing BW deoxygenating the water. By 25th July , a week after the end of the trial, a greater range of species, including a mayfly nymph, was recorded at this site as the accumulation of blanket weed and other flora was less dense. However the presence of bloodworm and mosquito larva suggest the oxygen concentration in the water are not yet back to pre- trial levels.

Overall Effect of the Dye Trial

The water quality/health before and after the 5-week trial

Evidence from the fauna sampled before and after the trial shows that only the boat lift site has yet to regain some of the species it had before the trial. This is probably because this is here the decayed blanket weed accumulated. However the fauna there is improving in diversity.

Any lasting visible impact on water colour

The dye does hang around because the water body is slow moving but does not seem to havee a lasting impact on colour

Any discernible impact on the 'bad' floating weed (blanket weed etc)

The dye caused some of the blanket weed to decompose and turn into a brown mush. It seemed to reduce the amount floating on the surface. Manual removal on 24th July at Chapel Arches removed the remaining floating weed together with weed in the water column.

Rafts of blanket weed floated downstream together with associated Lemna Weed and accumulated at the weir, especially near the boat lift. This area was most subject to problems of deoxygenation as the blanket weed decomposed.

At the end of the trial the weed is still present as brown mush on the bottom in the waterway but is not as prevalent in the water column or on the surface.

Any discernible impact on the 'good' submerged weed (the dominant water starwort)

The dye only seems to have affected the blanket weed. Water starwort appears unaffected and is present on most of the bottom from the Chapel Arches basin to the Stafferton Link Road though not in the immediate area north of the railway bridge, possibly due to a more gravelly bottom here. This means the water will continue to be oxygenated.

Any discernible impact on the fish and wildfowl

The decay of the blanket weed into a brown mush seems to have provided a food source for fish (especially juvenile ones), female and juvenile mallards and probably moor hens and

[5] fauna were only sampled in places less affected by the accumulated BW: below the weir (a fish and pond snail and two specimens of *Argulus* sp. the fish louse were sampled from just upstream of the weir itself.

swans. A heron was a regular visitor to the waterway prior to the trial and this continued during and after it, almost certainly due to the fish present.

A group of mallards (more than twenty five on 18th July) have been seen swimming up and down the waterway from Chapel Arches Basin to the weir on a regular basis during the trial. Two swans and their cygnet have apparently set up home next to the Green Way, north of the railway bridge

The waterway is part of a stream system that is evidently a nursery ground for fish. Adult fish such as perch and pike are known to occur in this stream system which accounts for the presence of the fish louse. The only adult fish caught was the stickleback, a fish where the male builds nests for the female to lay eggs in.

Over time an increase in the presence of other aquatic plants such as fools watercress should improve the habitat by providing shelter.

Site 3 Mallards at weir on 18/7/20

Site 3 Mallards feeding at weir on 18/7/20

Site 4 The Green Way at the Railway Bridge (photo 26/7/20) plus two swans & a cygnet (lying down)

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