'MUD PLANTS' IN NORTH SOMERSET IN 1989

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The summer drought of 1989 brought the water in North Somerset reservoirs and artificial lakes to unusually low levels, exposing many hectares of dry mud. Three localities, at Cheddar Reservoir, Blagdon Lake and Chew Valley Lake were visited on 8 October 1989. Records were made of the plant communities present, and samples of algae, bryophytes and hepatics collected for identification.

The 'pioneer vegetation of exposed muds' in Britain has been beautifully described in a classic paper by Salisbury (1970), and more recent attention has been focussed on some of its characteristic plant associations by work on the Gearagh Reservoir in Ireland (White, 1985). Opportunities to examine such vegetation are, however, quite infrequent. Not only do few British summers cause significant drops in water levels, but as Salisbury points out 'The interesting and specialised flora of exposed mud is . . . disappearing rapidly' as this 'intermittently available habitat' becomes rarer. Village ponds are drained or have concrete edges and artificially maintained water-levels; ponds on commons have become overgrown, the edges no longer poached and trampled by stock coming to drink or by flocks of ducks and geese. Intensive farming has brought massive draining programmes with former damp grazing fields 'improved' or converted to arable. Farm tracks and forestry rides are now laid with hardcore where previously cart-ruts made miniature winter ponds which dried out in the summer; and many marginal damp areas have been 'tidied up' in the progress of urban spread. All over Britain 'water levels with strong seasonal fluctuation, usually drying out in summer' (White 1982) are becoming more infrequent, and this is the factor governing the exposed mud habitat.

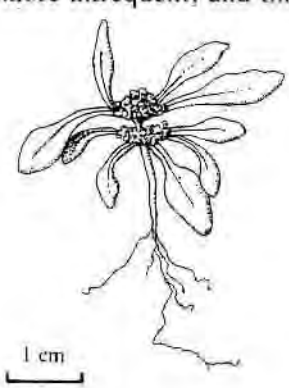

Figure 1. Chenopodium rubrum. (Del. Liz McDonnell)

The October search was planned in case one of the rarer species discussed by Salisbury might have made an appearance in response to the extreme conditions of the 1989 drought. Most mud plants have a very long-viable seed bank, and are famous for intermittent and sometimes dramatically abundant and unexpected appearances; their mostly very small propagules are also known to travel on the feet and plumage of waterfowl such as abound on reservoirs. No rarities were found however, and indeed species such as *Limosella aquatica* Mudwort is now so rare in Britain as a whole that there could be few possible sources for its introduction to a fairly recent water-body such as a reservoir. Also, although there are two previous records for

Limosella aquatica in Somerset, neither was in the Mendip area, and the most recent was in 1848. (Roe, 1981).

The communities actually found were made up of much commoner plants, but in remarkably consistent associations, almost identical in all localities; and this gave a striking lesson on the nature of this strange habitat and the ability of the 'mud species' to exploit this extremely ephemeral, open habitat. Even the much publicised poisonous algae of the Cheddar Reservoir, scumming the decaying aquatics where the water was lowest, could not detract from the impressive progression of plants from substantial brown tangles of mature *Polygonum* and *Bidens* species near the top, down to the fresh green film of minute plantlings and hepatic rosettes on the lowest levels. Sometimes one species could be observed with an extraordinary range of plant size; and Salisbury (1970) has commented on this ability of one of the most frequently seen plants, *Chenopodium rubrum* Red Goosefoot to 'attain a height of 200 cm, but . . . also to be found in abundance on almost dry mud, to a height of scarcely a centimetre but fruiting freely' (Fig. 1).

This goosefoot is listed in Table 1 with other species found in abundance, often forming the few-species stands or thick monocultures typical of these opportunist plants in open habitat with low competition.

TABLE I 'Mud species' widely represented at three North Somerset reservoirs in October 1989.

Species tabled by Salisbury (1970), as pioneers colonising previously submerged muds:

	Cheddar	Blagdon	Chew
Chenopodium rubrum	x	x	x
Bidens tripartita	x	x	x
Bidens cernua	-	-	x
Polygonum lapathifolium	x	-	x
Rorippa palustris	x	x	x
Gnaphalium uliginosum	x	x	x
Myosotis aquaticum	-	x	x
Veronica catenata	-	x	x
Veronica anagallis-aquatica	-	-	x
Ranunculus sceleratus	-	-	x
Littorella uniflora	-	x	-

Other opportunist species present, including perennials able to advance from normal shore levels:

Juncus bufonius	-	-	x
Chenopodium polyspermum	x	x	x
Rorippa sylvestris	-	x	-
Polygonum persicaria	x	x	x
Potentilla anserina	x	x	x
Poa annua	x	-	-
Plantago major	x	x	x
Atriplex prostrata	-	x	x
Ranunculus flammula	-	-	x
Sonchus asper	-	-	x
Triplospermum inoderum	-	-	x
Senecio vulgaris	-	x	-
Solanum nigrum	x	-	-
Carex hirta	x	x	-
Equisetum arvense	x	-	x
Rumex spp.	x	-	-

The presence of characteristic lower plants was also a memorable feature of the sites visited. On the most recently exposed muds where higher plants were still absent or extremely small, the beautiful rosettes of the liverwort *Riccia cavernosa* were very obvious; and at Blagdon and Chew Valley the peculiar algae *Botrydium granulatum* was so abundant that its tiny spherical bodies or 'coenocytes' (West, 1904), looking like green glass, were so massed on the ground that walking produced a crackling sound. The gleaming beadlets were hardly visible when new, but seemed to be swelling gradually until they burst, leaving tiny pale 'craters' of collapsed tissue.

TABLE 2 Algae and bryophytes recorded

Samples were taken at random for identification of the Riccia, so distribution is not significant. More bryophyte species may have been present. *Riccia cavernosa* is rarely recorded in North Somerset and has only previously been recorded at Berrow, Chew Valley, Litton Reservoir and Denny Island.

	Cheddar	Blagdon	Chew
Botrydium granulatum	x	x	x
Riccia cavernosa	x	x	x
Physcomitrella patens	x	x	-
Funaria hygrometrica	x	-	-
Dicranella varia	-	x	-
Bryum klinggraeffii	x	x	-
Bryum argenteum	x	-	-
Eurhynchium swartzii	-	x	-
Drepanocladus aduncus	x	-	-
Fontanalis antipyretica	x	x	-

Botrydium granulatum has been named as a characteristic species of communities of 'temporary open habitats usually waterlogged in winter', ascribed by phytosociologists to the **Isoeto-nano Juncetum Br.–Bl. et Tx. 1943**, the 'Dwarf Rush Class' (White and Doyle, 1981). Other 'faithful' diagnostic species include *Riccia cavernosa, Physcomitrella patens, Juncus bufonius* Toad Rush and *Gnaphalium uliginosum* Marsh Cudweed, making the North Somerset communities clearly attributable to this Class. Also well represented was the **Bidentetea Tripartitae Tx., Lohm et Prsg. in Tx. 1950**, the 'Bur Marigold Class', whose 'faithful' species include Bur Marigolds, *Polygonum lapathifolium* Pale Persicaria and *Rorippa palustris* Marsh Yellow-cress (White and Doyle, 1981). *Bidens tripartita* Trifid Bur-Marigold was present at all three localities visited, usually forming well grown stands with various *Polygonum* species on the highest shore levels, though very small plants just coming into flower were found at lower levels. The ability to flower late and quickly, producing few but perfectly viable seeds from tiny plants, is a well documented strategy of some 'mud plants' (Salisbury, 1970).

At Blagdon Lake added interest came from the presence of *Littorella uniflora* Shoreweed. Mud communities usually consist of annuals only, but *Littorella* is a perennial which forms thick swards in shallow water on lake bottoms, and is often exposed at summer water levels. At Blagdon the water was so low that a true 'warp and woof' community existed with perennial elements closely woven into 'an otherwise annual flora' (White, 1985). *Littorella* (with some encroaching 'land' perennials such as *Potentilla anserina* Silverweed and *Equisetum arvense* Field Horsetail) was abundant near the top of the drought shoreline, mixed with *Polygonum* and *Bidens* species and *Rorippa palustris*.

It would be an interesting exercise to visit the same localities when water levels are next low. The protracted drought and warm weather, enabling the recorded 'mud plants' to flower and fruit well into the autumn, should have made quite colossal additions to the seed bank. As noted above, a whole range of plant size was commonly observed in some species. Seed outputs from average individual plants recorded by Salisbury (1970) total 176,000 for *Chenopodium rubrum*, 33,000 for *Rorippa palustris* and 12,760 for *Gnaphalium uliginosum* but he also records an interesting November sighting of 'mud of a reservoir carpeted with miniature plants of *Chenopodium rubrum*, many with but two leaves and the cotyledons. Nevertheless they bore from 5 to 22 fruits of which a large proportion were ripe, although the plants were probably not more than 2 or 3 weeks old.' (Salisbury, 1970). Exactly similar cohorts of miniature plants seen at Chew Valley Lake and Blagdon in particular, in October (see Fig. 1 above) can be predicted to have had equal success, and of course many much larger plants were seen. So it is probable that even if water levels remain high for years, the seed bank in the inundated muds will remain much enriched. Long viabilities of 'decades, perhaps even centuries', (Salisbury, 1921) are postulated for the dormant seeds of some species in such conditions, and it is possible that when another drought exposes again the wide ephemeral 'shores' seen in 1989, there will be even more spectacular displays of some of these classic pioneer 'mud plants'.

Acknowledgements

We are most grateful to C.D. Preston for his help in identifying the bryophytes, to Miss M.J.P. Scannell for information on *Botrydium granulatum* and Richard McDonnell for typing the final text.

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