Craig Goch Field Surveys Group Meeting – Malvern – February 1976

UWIST Paper 6 – Submerged Macrophytes of the R. Wye

Introduction

Substantial growths of aquatic macrophytes are known to occur in the lower reaches of the R. Wye during the summer months and in 1975 the distribution of major plant species was assessed and the biomass of representative plant stands estimated in one 30 km stretch. This very modest programme has now been complemented by a more comprehensive study of macrophytes of the R. Wye by UWIST, under contract to Nature Conservancy Council (UWIST 1976g).

Methods and Sites

The distribution of major plant stands in the R. Wye was established from site visits along the length of the river.

During June 1975 the river was surveyed from a boat between Ross-on-Wye (ST 589242, 190 km from source) and Monmouth (ST 512128 from source) and the distribution of *Ranunculus fluitans*, the principal species, mapped.

On 17 June 1975 the biomass of representative macrophyte stands was estimated, using an optical method (Owens *et al* 1967), at Goodrich (ST 582193, reach 220m long and 55m wide) and Symonds Yat (ST 564182, reach 230m long and 50m wide). Cropping procedures were used to calibrate the optical technique.

Results

Species of submerged macrophytes recorded in the R. Wye during 1975 included *R. fluitans, Myriophyllum alterniflorum, Potamogeton perfoliatus, Potamogeton* sp., *Elodea Canadensis* and *Fontinalis antipyretica.* The most abundant and widespread species was *R. Fluitans* which was recorded at a number of sites from Builth Wells (60km from source) to Redbrook (230 km from source). The most extensive growths of this species were recorded between Ross-on-Wye and Monmouth.

The survey of the river between Ross and Monmouth (30 km) indicated that 17% of this length of river had plant cover *(R. fluitans)*. Cover in individual reaches varied from about 1% to 90% (Fig 1). 'Reaches' in this sense were merely convenient lengths for accurate mapping and varied between 0.6 and 3.0 km.

R. fluitans developed rapidly during May at Goodrich and Symonds Yat (for position in the stretch from Ross to Monmouth – see Fig. 1) and by 20 May had reached maximum cover (45 and 60% respectively). Flowering began in early June and estimates of biomass were made on 17 June (Table 1).

* Calibration of the optical method with cropping techniques indicated that the specific attenuation coefficient for *R. fluitans* was 0.3.

Table 1

Mean biomasses (kg fresh wt / m^2) of *R. fluitans* at Goodrich and Symonds Yat

Place	Mean Biomass in Reach	Mean Biomass in Plant Stand
Goodrich	0.47	0.94
Symonds Yat	0.41	0.62

Wet : dry weight ratio – 9.9 : 1.0

Although biomass estimates were restricted to two sites only, there was some indication that highest biomasses occurred at depths less than 1m (Fig. 2).

After heavy rain during July much of the *R. fluitans*, which had ceased to flower and was dying back, was lost downstream.

Discussion

Morgan (1970) recorded 12 species of macrophyte in the R. Wye in June 1970. These included *Alisma plantago-aquatica, Elodea Canadensis, Myriophyllum spicatum, Polygonum amphibium, Potamogeton crispus, P. pectiatus, P. perfoliatus, Ranunculus aquatilis, R. pennicillatus, R. flammula, Fontinalis antipyretica* and *Jungermannia* sp. Of these *R. aquatilis, Potamogeton perfoliatus* and *Myriophyllum spicatum* were regarded as the most abundant species covering up to 30% of the river bottom below Hereford. This contrasts with the survey in 1975 when *R. aquatilis* and *M. spicatum* were not recorded from the Wye though the taxonomy of *Ranunculus* species is somewhat confused and *R. fluitans*, abundant in 1975, may be equivalent to *R. aquatilis* reported in 1970.

From consideration of the flowering period of *R. fluitans* it is likely that, at the time estimates of biomass were made, the plant was at, or near to, its maximum standing crop. Westlake (1963) reported that the maximum biomass attained by submerged plant communities in temperate climates was about 0.4 – 0.7 kg dry wt/m^2 recorded from the R. Wye. Table 2 compares estimates of biomass from the R. Wye with those from other rivers.

Table 2

Maximum biomass of aquatic macrophytes

Species	Maximum biomass (g fresh wt/m^2)	River	Authority
R. fluitans	0.94	R. Wye	This study
R. pseudofluitans	3.85*	R. Test	Owens & Edwards (1962)
Potamogeton pectinatus	1.2*	R. Colne	Westlake (1961)
Berula eracta	4.0*	R. Ivel	Edwards & Owens (1960)

*Converted from dry weight assuming wet : dry = 10 : 1

Assuming that the quantitative estimates of plant biomass at Goodrich and Symonds Yat were representative of plant stands between Ross and Monmouth then it is possible to calculate that this length of river (30 km) supported about 1250 kg organic C in the form of plant material (assuming that the organic C content of plants was 40% of the dry weight). At death these plants would contribute a significant organic load to the system, equivalent to the daily load of untreated sewage from 40,000 to 63,000 people assuming that the daily contribution per capita was 20 to 30g organic C.

The relationship between plant biomass and river depth (Fig. 2) may depend upon the limitations of light in deeper water. Dawson (1973) reported plant biomasses of 0.3 – 0.5 kg dry wt/m^2 at a depth of 0.5m in the R. Frome but only 0.02 – 0.04 kg dry wt/m^2 at 2.0 – 3.0m. If this is a general case then any regulation of discharge substantially influencing river depth in the lower reaches during late spring is likely to affect the pattern of early plant growth, as recorded in the R. Wye. Later in the season plant growth is itself of major significance in determining the depth of the river and this is reflected in changes in stage discharge relationships at gauging stations (Wye River Division, *pers. comm.*). In view of the general importance of aquatic macrophytes in elation to land drainage and flooding the possible influences of river regulation on plant growth, and the consequences of such growth, particularly on river depth and retention time, need more detailed study.

References

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Figure 1

Proportion of plant cover in R. Wye from Ross to Monmouth

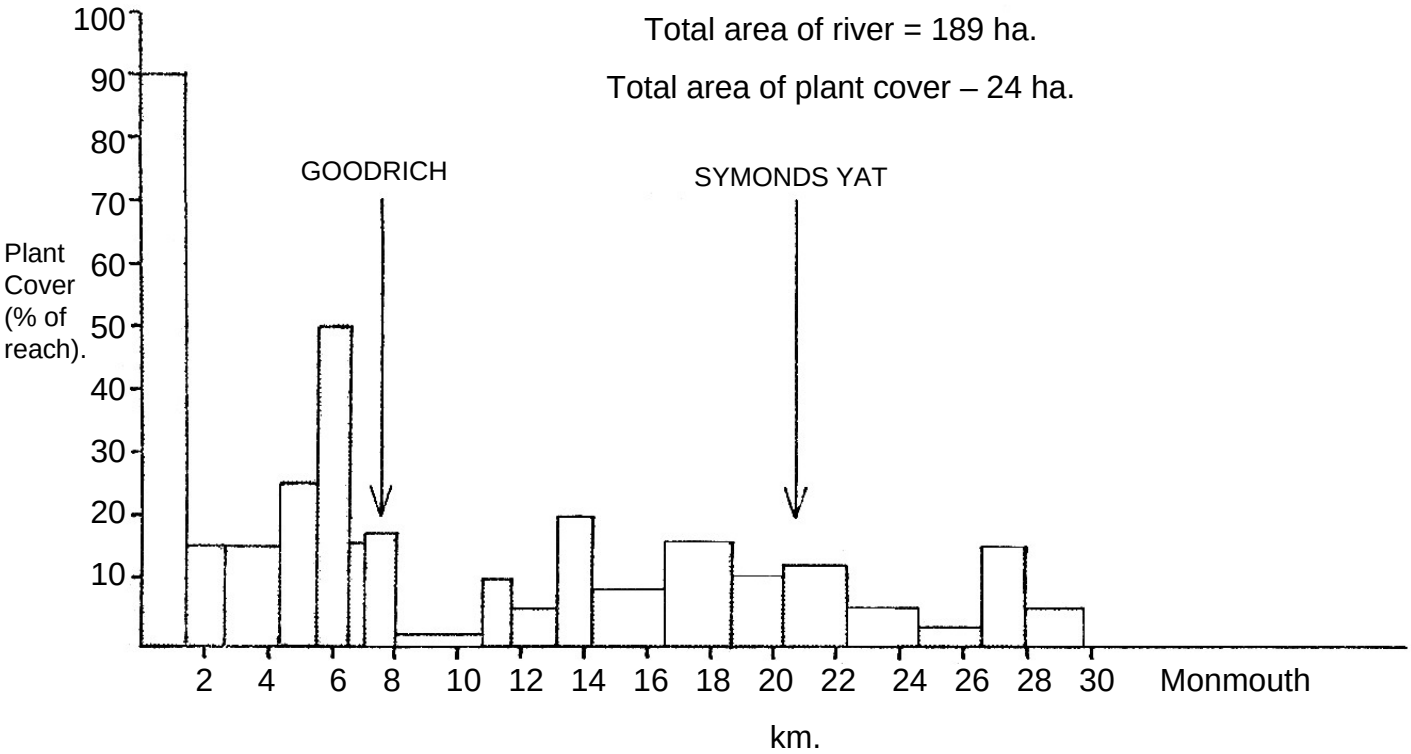

Figure 2

Distribution of biomass of *R. fluitans* with depth