Biomass dynamics of charophyte-dominated submerged macrophyte communities in Myall Lake, NSW, Australia

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Abstract

The dynamics of submerged macrophytes were studied in a large and shallow near-pristine lake in New South Wales, Australia. The objectives were to investigate the seasonal dynamics in biomass of *Chara fibrosa, Nitella hyalina* and *Najas marina* both in time and space, and to characterise the underlying relationship between the plant biomass and both the gyttja and water depths. Charophytes were most densely grown in the north-east bays of the lake compared to the north-west bays. Average biomass of *Chara fibrosa* was highest at the north-east bays of this lake (e.g. 210 g d.w m^{-2}) followed by north-west bays (e.g. 148 g d.w/m^2), South-west bays (e.g. 60 g d.w/m^2) and lastly central deep area of the lake (e.g. 31 g d./m^2). A similar trend was displayed by *Nitella hyalina* biomass where at the north-east bays the biomass was the highest (e.g. 167 g d.w m^{-2}) followed by north-west bays (e.g. 128 g d.w/m^2), south-west bays (e.g. 38 g d.w/m^2) and central deep area of the lake (e.g. 23 g d.w/m^2). During the summer season the maximum total biomass of charophytes at Corrigans bay was recorded (e.g. 300 g d.w/m^2), mostly being dominated by *Nitella hyalina*. Total biomass of charophyte was reduced during the winter season (e.g. 50 g d.w m^{-2}). *Najas marina* biomass remained low both in time and space except in May at Bibby harbour and Shelly beach where its biomass peaked (e.g. 276 and 175 g d.w m^{-2} respectively). Gyttja depth showed a positive relationship with total charophyte biomass (r^2 = 0.70; p<0.01) and it seemed to favour the growth of charophytes at the expense of other submerged macrophytes, e.g. *Myriophyllum* sp. and *Vallisneria* sp. Water depth displayed a negative relationship with total charophyte biomass (r^2=−0.94; p<0.01). Both *Chara fibrosa* and *Nitella hyalina* correlated positively with gyttja depth (r

$$^{2}_{\text{Chara-gyttja)}} = 0.69$$

, r

$$^{2}_{\text{Nitella-gytja)}} = 0.65$$

; p<0.01) and negatively with water depth (r

$$^{2}_{\text{Chara-depth}} = -0.94$$

, r

$$r^2_{\text{Nitella-depth}} = -0.93$$

; p<0.01). *Najas marina* correlated positively only with water depth (r^2=0.67, p<0.01).