

Improved estimates of net primary production, growth, and standing crop of *Macrocystis pyrifera* in Southern California

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Abstract. The giant kelp *Macrocystis pyrifera* forms subtidal forests on shallow reefs in temperate regions of the world. It is one of the fastest-growing multicellular autotrophs on Earth and its high productivity supports diverse marine food webs. In 2008, we published a method for estimating biomass and net primary production (NPP) of giant kelp along with five years of data, to provide a more integrated measure of NPP than those yielded by previous methods. Our method combines monthly field measurements of standing crop and loss rates with a model of kelp biomass dynamics to estimate instantaneous mass-specific growth rates and NPP for each season of each year. We have since improved our approach to account for several previously unresolved sources of biomass loss. These improvements have led to a near doubling of our prior estimates of growth and NPP. At our site with the most persistent stand of giant kelp, NPP averages ~ 5.2 kg dry mass·m $^{-2}$ ·yr $^{-1}$ and results from the rapid growth ($\sim 3.5\%$ per d) of a relatively small standing biomass (~ 0.4 kg dry mass/m 2 on average) that turns over ~ 12 times annually. Here we provide revised estimates of seasonal biomass, growth, and NPP for the five years covered by our previous publication (2002–2006), along with more than a decade of additional data (2007–2017). We also present updated relationships for predicting giant kelp biomass and NPP from much more easily obtained measurements of frond density. These data can be used to understand the mechanisms that drive variation in giant kelp NPP at a wide range of temporal scales. No copyright or proprietary restrictions are associated with the use of this data set other than citation of this Data Paper.

Key words: giant kelp; growth rate; *Macrocystis pyrifera*; net primary production; marine algae; standing crop.

The complete data set is available as Supporting Information at <https://onlinelibrary.wiley.com/doi/10.1002/ecy.2440/supplinfo>