Allometric Coefficient

The allometric coefficient can be calculated in various ways depending on how relative growth rates (RGR) are defined. Using the simplified definition in Eq. (10) in Pommerening and Muszta (2016) RGR for a particular time period in general plant science is commonly defined as

$$p_{t=\log y_t - \log y_{t-1}} \tag{1}$$

p_t can now be calculated separately for stem diameter (d) and tree total height (h) and thus result in p_t^d and p_t^h. The allometric coefficient then corresponds to

$$m = \frac{p_t^d}{p_t^h} \tag{2}$$

Guide to interpreting the allometric coefficient: (1) Small allometric coefficients indicate that height growth is large relative to diameter growth, resulting in slender trees with little taper. Large allometric coefficients indicate growth patterns with slower height relative to diameter growth and trees have more pronounced taper. In the graph relating to tree 486 (Gwydyr Forest) you can see that biomass allocation has more or less equal proportion (isometric growth) up to the age of 40 years. After that the tree increasingly "invests" more in diameter than in height growth. This increase is exponential. As far as diameter growth is concerned we can conclude that there is a positive allometric relationship ($m > 1$) between diameter and height growth, i.e. diameter grows faster than height. This is different from the point of view of height growth: Here we have a negative allometric relationship ($m < 1$) beyond the age of

40 years, i.e. height grows more slowly than diameter (Modified from Murphy and Pommerening, 2010).

References

Murphy, S. T. and Pommerening, A., 2010. Modelling the growth of Sitka spruce (*Picea sitchensis* (BONG.) CARR.) in Wales using Wenk's model approach. *Allg. Forst- u. J.-Ztg.* **181**, 35-43.

Pommerening, A. and Muszta, A., 2016. Relative plant growth revisited: towards a mathematical standardisation of separate approaches. *Ecological Modelling* **320**, 383-392.