References growth charts: a new practical tool for comparing *Posidonia oceanica* growth patterns accounting for age and depth

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Over the past three decades an increasing amount of dating records dealing with *Posidonia oceanica* growth performance was incorporated into a variety of studies, from which a dualistic nature of the factors influencing seagrass growth arose. A large amount of literature focused on the role of exogenous factors in explaining rhizome growth variations, while only few studies invoked the importance of endogenous factors in driving growth. A particular attention was paid on the confounding role of shoot age, as endogenous factor, when the effect of exogenous variables on growth performance is analyzed. Shoot age confounding implies serious interpretation problems, since it is difficult to distinguish between the effects on *P. oceanica* growth due to spatio-temporal exogenous variations or simply to the unbalanced age structure of samples. A practical tool to overcome the problems linked to age confounding is to build references growth charts just used as yardstick for comparison purposes. References growth charts represent the distribution of a given biometric measurement changing with age, and typically are used in Auxology for establishing whether a generic individual at a given age lies within the 'normal' range. Their use can be extended to other disciplines, although very large data set are needed. In this study, *P. oceanica* references growth charts have been built using statistical methods, including GLMM, Segmented Regression and Nonparametric Quantile Regression, working on $4 \cdot 10^4$ lepidochronological measures collected along Sicilian coasts from 1 to 32 m depth. We detected two different trends of growth along depth, separated by a change point estimated at 15 m depth. Above and below this depth two distinct references growth charts have been built. Different curves of growth performance *vs.* age have been estimated at the 10th, 25th, 50th, 75th, 90th percentile, showing nonlinear patterns with the highest values of rhizome elongation and primary production at shoot age of about 4 years, followed by a monotonic decrease with aging. These results highlight the need to control for shoot age and recommend references growth charts as new tools to assess growth performance of *P. oceanica* samples coming from different depths and areas, accounting for their demographic structure.