Can zooplankton secondary production models predict growth in the marine mysid *Leptomysis lingvura* (G.O. Sars, 1866)?

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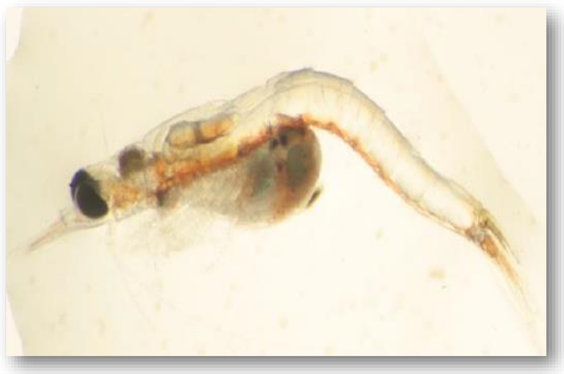


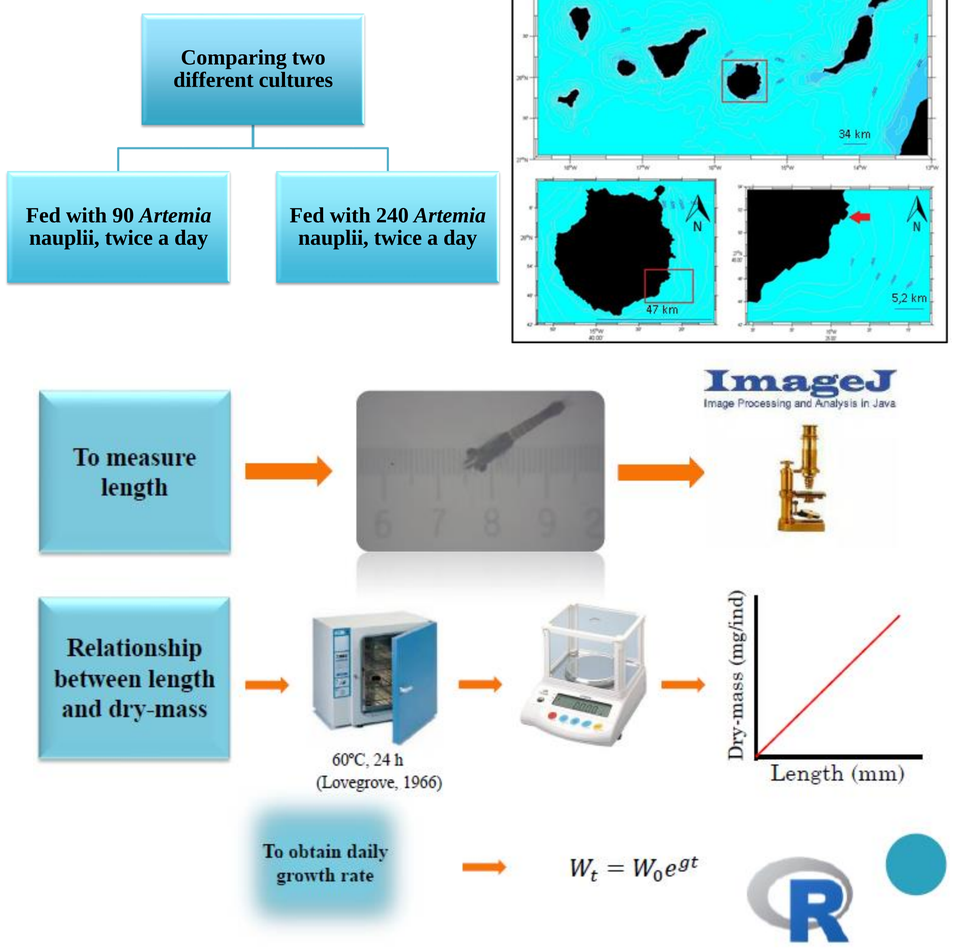
Introduction

Mysids are found, in high abundance in *Cymodocea nodosa* seagrass meadows around the Canary Islands, comprising at least 65% of all organisms that inhabit in this ecosystem (Herrera et al., 2014). If their growth could be predicted their productivity and its impact on this ecosystem could be calculated. *Leptomysis lingvura* is one of the three, most-abundant, mysid species found and was chosen for our experiments because it grows well in the laboratory (Herrera, 2013; Herrera et al., 2011).

Objectives

- Determine the length and dry-mass relationship for *L. lingvura* (Fig.1).
- Study if the growth rate and secondary production are influenced by the food concentration. (Fig.2).
- Study if *L. lingvura* growth can be modelled from temperature and biomass alone with three secondary production models (Huntley and Lopez, 1992; Hirst and Sheader, 1997; Hirst and Lampitt, 1998).
- Evaluate the proposed models to see if they fit reality (Fig.3).

Material and methods



Results

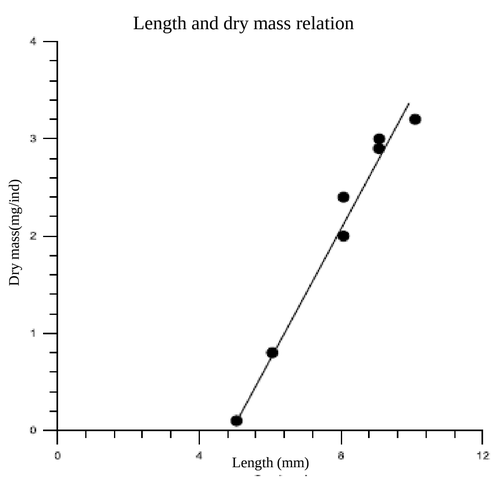


Fig. 1. *L. lingvura* length and dry mass relationship, with the equation:

$$y = 0.6557x + 3.1408,\ r^2 = 0.975$$

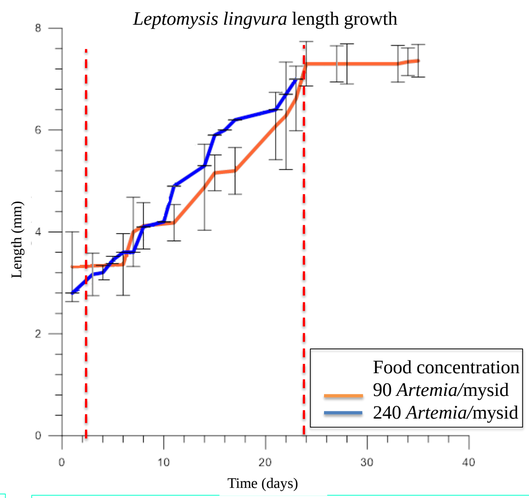


Fig. 2. Two different growth experiments showing *L. lingvura* length as a function of time. Growth equations are: For mysids fed with 90 *Artemia* nauplii per mysid, twice a day: $y = 3.3133 \cdot e^{0.0452x}, r^2$=0.9296. For mysids fed with 240 *Artemia* nauplii per mysid, twice a day: $y = 2.736 \cdot e^{0.0464x}, r^2 = 0.9663$. (p-value=0.0201)

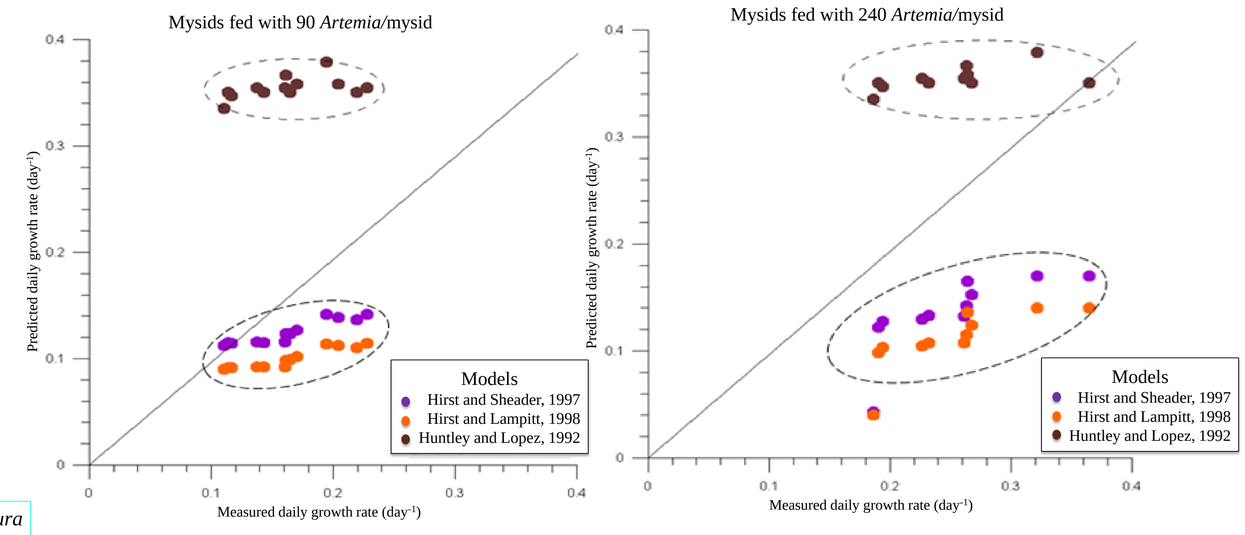


Fig. 3. Predicted daily growth versus measured daily growth in *L. lingvura* with two different food concentrations. (Left) Models for mysids fed with 90 *Artemia*/mysid. (Right) Models for mysids fed with 240 *Artemia*/mysid. The line in both graphics represents a 1:1 correspondence.

Food concentration (Artemia nauplii/mysid)	Measured rate in day^{-1}±standard deviation (day^{-1}±σ)	Huntley and Lopez (1992) (day^{-1}±σ)	Hirst and Sheader (1997) (day^{-1}±σ)	Hirst and Lampitt (1998) (day^{-1}±σ)
		Overestimated secondary production	Underestimated secondary production	
90	0.198± 0.134	0.354± 0.009	0.142 ± 0.025	0.116 ± 0.023
240	0.252± 0.055	0.354± 0.009	0.157± 0.045	0.130± 0.037

Comparison of the predicted daily growth versus measured daily growth

Food concentration (*Artemia* nauplii/mysid)	Huntley and Lopez (1992)		Hirst and Sheader (1997)		Hirst and Lampitt (1998)	
90	r^2=0.001	p-value=13.4 · 10^{-3}	r^2=0.786	p-value=6.10 · 10^{-4}	r^2=0.801	p-value=1.22 · 10^{-4}
240	r^2=0.124	p-value=9.77 · 10^{-4}	r^2=0.551	p-value=9.77 · 10^{-4}	r^2=0.595	p-value=1.95 · 10^{-3}

References

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Conclusions

- The growth of the marine mysid, *L. lingvura* is influenced by its food concentration. There were significant differences between daily growth on 90 *Artemia* nauplii per mysid and 240 *Artemia* nauplii per mysid.
- For this mysid species, we find the length-dry mass relationship. It was:

  Dry-mass = 0.6557·length+3.1408, r^2 = 0.975
- None of the three secondary production models were able to accurately predict measured growth and secondary production of *L. lingvura*. The Huntley and Lopez (1992) model overestimated secondary production, while the Hirst and Sheader (1997) and Hirst and Lampitt (1998) underestimated it.
- The growth of *L. lingvura* cannot be modelled from temperature and biomass alone.

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