Impact of Starvation on Respiratory Metabolism in the Mysid *Leptomysis lingvura*

A.Herrera[a], M.Gómez[a] & T.Packard[a]

[a]Biological Oceanography Laboratory, Facultad de Ciencias del Mar, Universidad de Las Palmas de Gran Canaria, Campus Universitario de Tafira, 35017 Las Palmas De G.C., Canary Islands, Spain.
(alicia.herrera104@doctorandos.ulpgc.es)

Introduction

Mysids are small crustaceans present in many coastal regions of the world (Mauchline, 1980). *Leptomysis lingvura* is found in east coast of Gran Canaria (Spain) associated with the sandy bottom at depths between 5 and 15 meters. Mysids are an important component in the food chain. They support many coastal fish populations and hold promise to be potential live prey in aquaculture. We conducted studies on mysid survival and reproduction and have found *L. lingvura* to be a suitable species for laboratory experiments. In addition, our results explain how food deprivation influences mysid respiration at both the physiological and biochemical levels.

Methods

Figure 1. Adults of *L.Lingvura* were captured on the coast of Risco Verde, at depths between 5 and 15 m with SCUBA equipment and a hand net of 500 µm mesh size .

Figure 2. The organisms were distributed in tanks with recirculating seawater at a temperature of 20.5ºC, salinity of 37 ‰, pH 8.1 and concentrations of ammonium, nitrite and nitrate, of 0.2, 0.05 and 5 $mg.L^{-1}$ respectively. After an acclimation period of 2 days, males of similar size were subjected to different periods of starvation: 2, 6, 10, 22, 26, 30, 36, 46, 52 and 74 h. At all times mysids were subjected to a daily light-dark cycle of 10 h light and 14 h dark.

Figure 3. At the end of each period of starvation five individuals were separated for measurements of *in vivo* respiration (µl O_2 per hour) with oxymeter (Strathkelvin 928 6-Channel oxygen system) in individual cells of 50 ml at 20.5ºC in dark conditions.

Figure 4. Later, the organisms were frozen in liquid nitrogen and stored at -80ºC. Measurements: ETS activity by the method Gómez *et al.* (1996) and protein by the method of Lowry (Lowry *et al.*, 1951, Rutter 1967).

Results

Table 1. Maximum and minimum values of respiration rate (R) and potential respiration rate (µl O_2. h^{-1}. mg $protein^{-1}$) for different periods of starvation, n = number of samples. Ratio R/ETS (mean ± standard deviations) for each period of starvation.

Hours of starvation	R máx (µl O_2. h^{-1}. mg $prot^{-1}$)	R mín (µl O_2. h^{-1}. mg $prot^{-1}$)	n	ETS máx (µl O_2. h^{-1}. mg $prot^{-1}$)	ETS mín (µl O_2. h^{-1}. mg $prot^{-1}$)	n	R/ETS ± SD
2	87.1	47.8	5	54.4	13.8	5	2.17±0.76
6	58.7	29.7	5	44.8	24.9	5	1.41±0.40
10	70.6	39.8	4	43.4	13.9	4	1.60±0.18
22	28.8	17.3	4	35.2	32.2	3	0.69±0.15
26	42.2	27.3	5	61.0	25.9	5	0.94±0,27
30	51.1	40.3	3	40.7	32.1	3	1.26±0.24
36	59.0	41.5	5	36.9	30.0	5	1.56±0.20
46	26.7	13.2	4	41.2	26.3	4	0.66±0.11
52	30.7	16.1	5	35.3	26.5	5	0.84±0.15
74	31.5	20.0	5	41.0	18.7	5	0.70±0.17

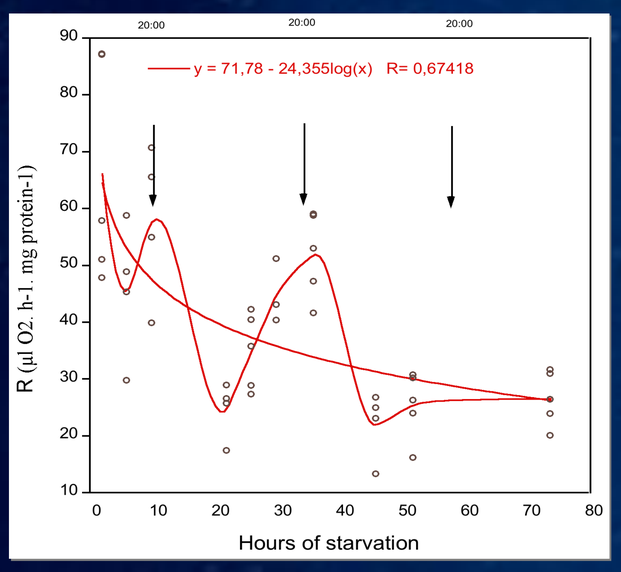

Figure 5. Relationship between respiration rate (µl O_2. h^{-1}. mg $protein^{-1}$) and starvation period (h). The arrows indicate the start of the night. The data shows a correlation represented by the equation: R = 71.78 - 24.36 log (h of starvation), R^2 = 0.67, n = 45, with a Pearson correlation coefficient = -0.613, p < 0.001. Potential circadian rhythm is revealed as two peaks in respiratory rate (arrows) that coincide with the start of the dark period .

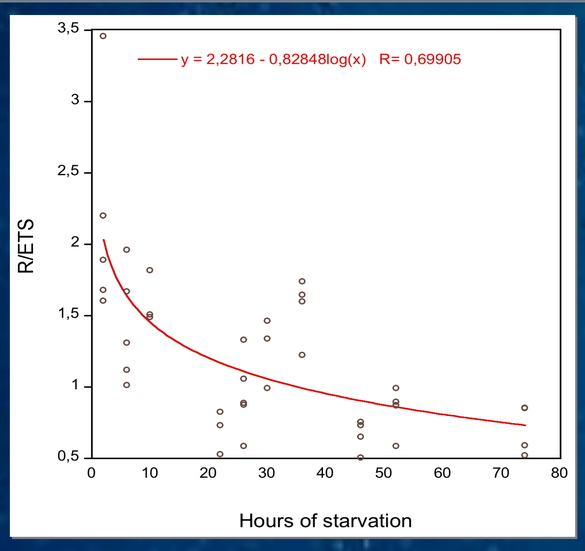

Figure 7. Relationship between R/ETS ratio and starvation period (hours). The correlations observed between respiration rate and hours of starvation in that mysids are reflected in the correlation between the ratio R/ETS and hours of starvation, which is represented by the equation : R/ETS = 2.28 - 0.83 log (h starvation), R^2 = 0.70, n = 42, with a Pearson correlation coefficient of -0.613, p < 0.001.

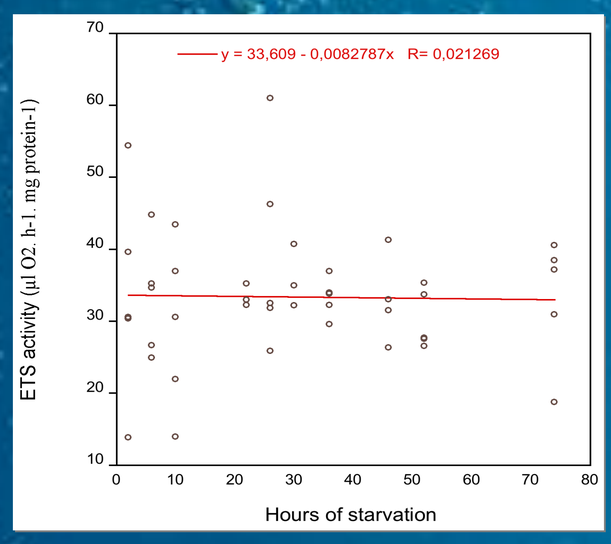

Figure 6. Relationship between potencial respiration (µl O_2. h^{-1}. mg $protein^{-1}$) and the length of starvation (hours), R^2 = 0.021, n = 45.
Potential respiration is not correlated with the period of starvation in mysids (Pearson correlation coefficient = -0.047, p = 0.754). Potential respiration values appear conservative during starvation.

CONCLUSIONS

1. Respiratory activity in *Leptomysis lingvura* decreases with the length of starvation period, and also displays what appears to be an circadian rhythm.
2. ETS activity appears constant as the starvation period lenghtens.
3. R/ETS ratio declines throughout the starvation period as expected from the behavior of the primary measurements.