

# Macaronesian seaweeds wracks. Potential use in diets for grass carp (*Ctenopharyngodon idella*)

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## Introduction

Stranding of macroalgal wracks that regularly appear in coasts from offshore seaweed are usually removed, causing an increasing pressure on the handling and management of beach wracks. The inclusion of algae in fish feed have been described to have beneficial effects in growth performance and lipid metabolism as well as in several physiological processes (Moutinho et al., 2018). The aim of the present study was to assess the inclusion of macroalgal wracks obtained from Gran Canaria island in diets for the freshwater species grass carp (*Ctenopharyngodon idella*), the major fish species produced in the world in 2016, with more than 6 millions tons (FAO, 2018). To this purpose, two complementary experiments were carried out (E1 and E2) in a recirculating aquaculture system (RAS).

## Materials and Methods

### Experimental design

- **RAS.** N=45. Initial weight: 8.6±1.9 g. 133 days.
- **Dietary intake:** 2.5-3 % of biomass weight (2 intakes).
- **Control diet:** diet for tilapia (Skretting) (TD)
- **Experimental diet:** TD + 15% of a 1 mm multispecific macroalgae wrack (MU)\*
- **4 individuals** of each treatment were sacrificed, and the remaining individuals were used for E2.

#### \*MU COMPOSITION

33.8% *Asparagopsis taxiformis*  
28.6% *Lobophora* sp.  
22.6% *Dictyota* sp.  
14.5% *Cymopolia barbata*  
0.5% *Laurencia* sp.

#### Parameters analyzed

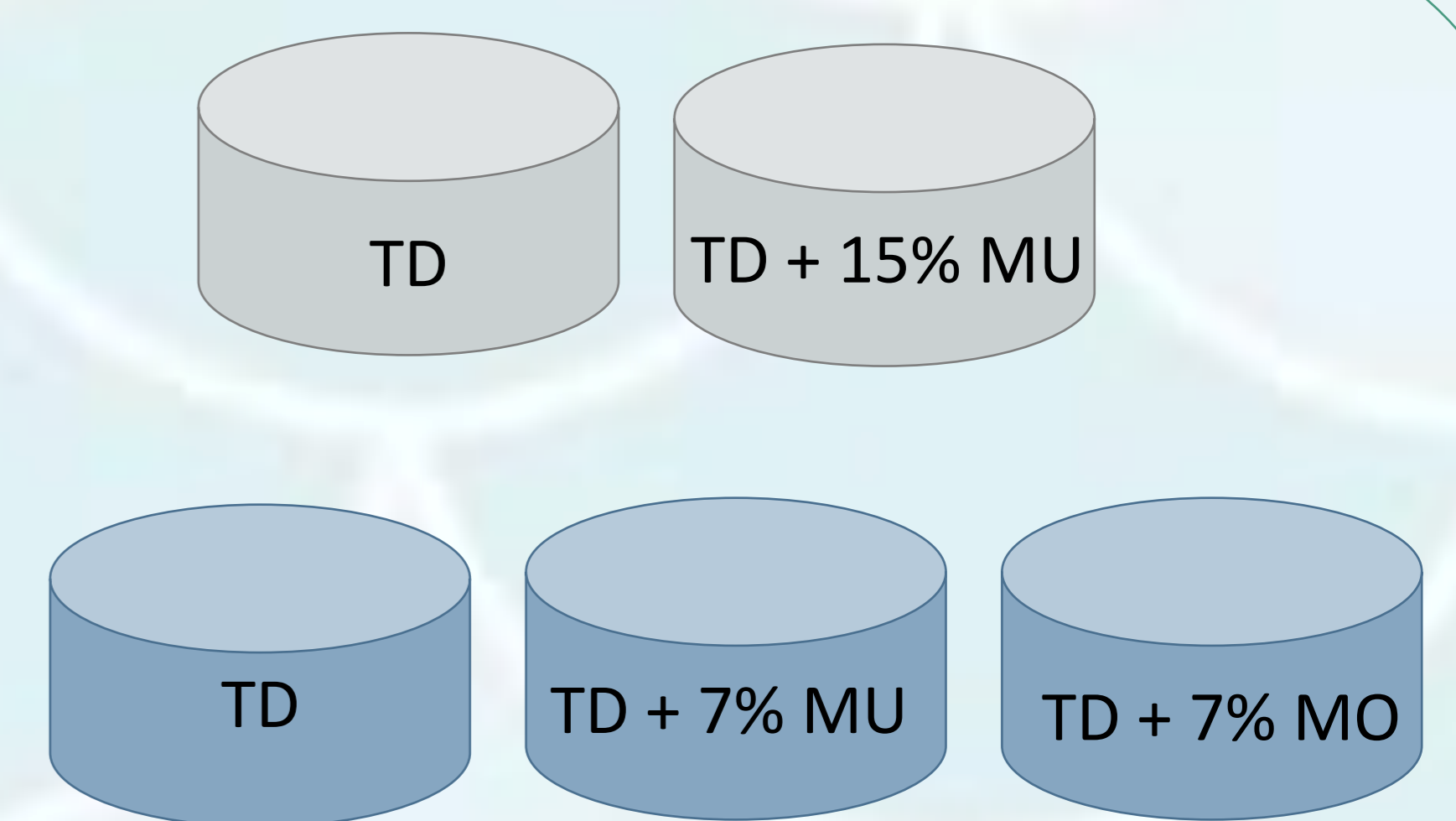
- Survival and growth
- Hepatosomatic index (HSI)
- Viscerosomatic index (VSI)
- Visceral-fat index (VFI)
- Total lipid (TL) and fatty acid (FA) composition of muscle

### Experimental design

- **RAS.** N=41. Initial weight: 33.5±8.0 g. 99 days.
- **Dietary intake:** 2.5-3 % of biomass weight (2 intakes).
- **Control diet:** TD
- **Experimental diet 1:** TD + 7% MU
- **Experimental diet 2:** TD + 7% of a 1 mm virtually monospecific macroalgae wrack (~95% *Lobophora* sp.) (MO)

#### Statistical analysis

- E1: t-student (p<0.05)
- E2: One way- ANOVA (p<0.05).
- Posthoc: Tukey



**Table 1.** TL and main FA composition (% of total FA) of diets used in E1 and E2 (Mean±SD, n=2).

	TD	TD + 15% MU	TD + 7% MU	TD + 7% MO
TL (% dw)	9.2±1.4	11.3±0.4	8.9±0.1	9.3±0.7
ΣSFA	24.0±0.5	20.7±0.6	23.8±0.1	23.7±0.5
ΣMUFA	41.0±0.4	54.5±0.6	40.4±0.3	40.3±0.7
20:4n-6	0.7±0.1	0.5±0.0	0.7±0.1	0.7±0.0
20:5n-3	3.1±0.2	2.1±0.0	3.5±0.0	3.3±0.2
22:6n-3	2.2±0.3	1.6±0.0	2.5±0.0	2.3±0.2

## Results and Discussion

**Table 2.** Survival, growth parameters and morphological measurements of *C. idella* fed the experimental diets in E1 and E2.

	E1		E2		
	TD	TD + 15% MU	TD	TD + 7% MU	TD + 7% MO
Survival (%)	100.0	100.0	83.3	85.7	95.5
Weight increment (g)	30.7	16.1	15.7	23.2	18.2
WG (%)	345.0	194.5	41.5	95.6	47.3
SGR (% day <sup>-1</sup> )	1.1	0.8	0.4	0.7	0.4
HSI (%)	1.7±0.2	0.8±0.2*	1.5±0.4	1.3±0.5	1.5±0.6
VSI (%)	7.3±0.8	5.6±1.6	8.0±1.3 <sup>b</sup>	6.9±0.9 <sup>a</sup>	7.7±1.4 <sup>ab</sup>
VFI	2.7±0.5	1.0±0.0*	2.8±0.4 <sup>b</sup>	2.1±0.5 <sup>a</sup>	2.7±0.5 <sup>b</sup>

WG, weight gain; SGR, specific growth rate. VFI was calculated from visible fat of organs: 1 (low), 2 (medium) or 3 (high). \* differences between treatments in E1; different superscript letters denote significant differences (P<0.05) in E2.

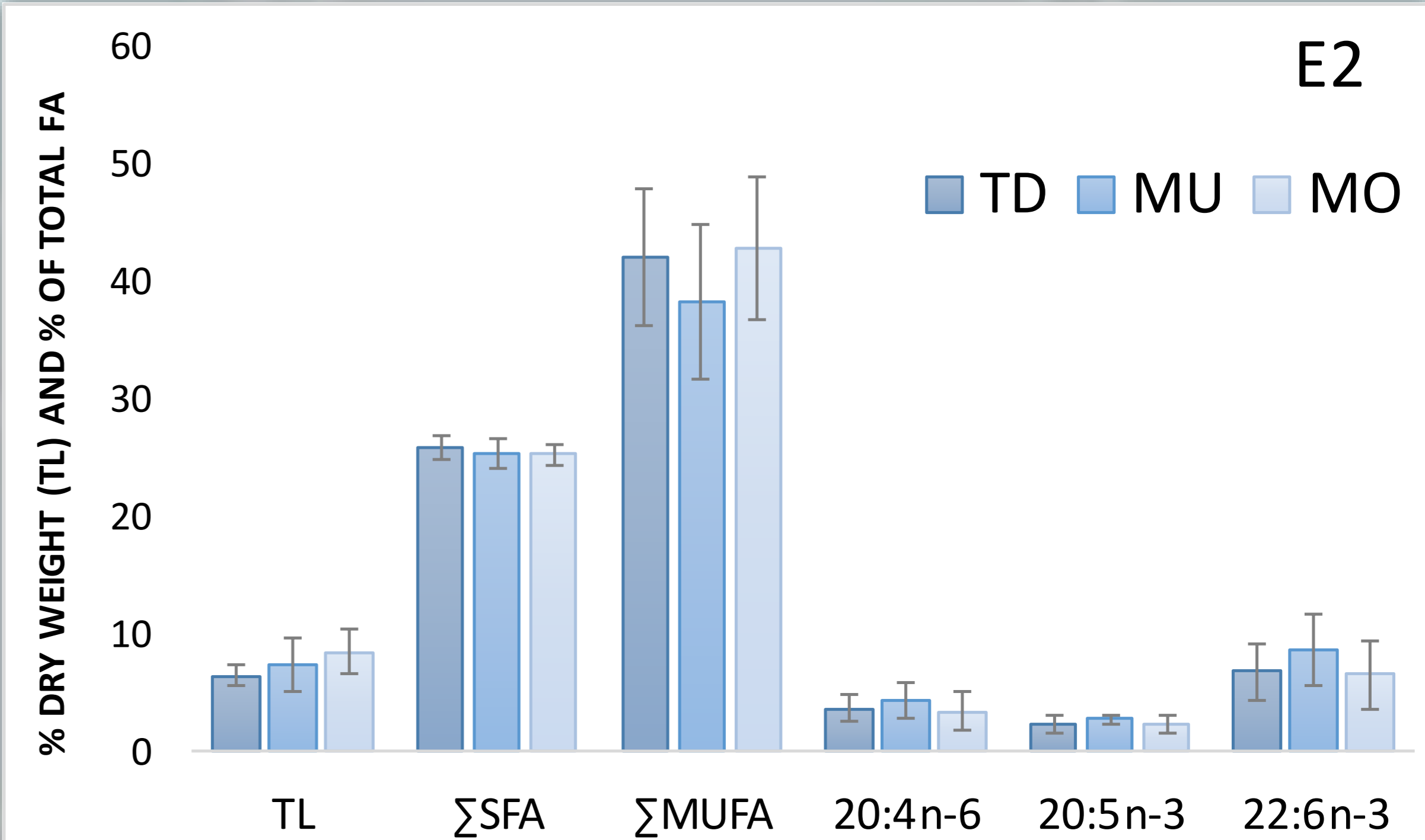
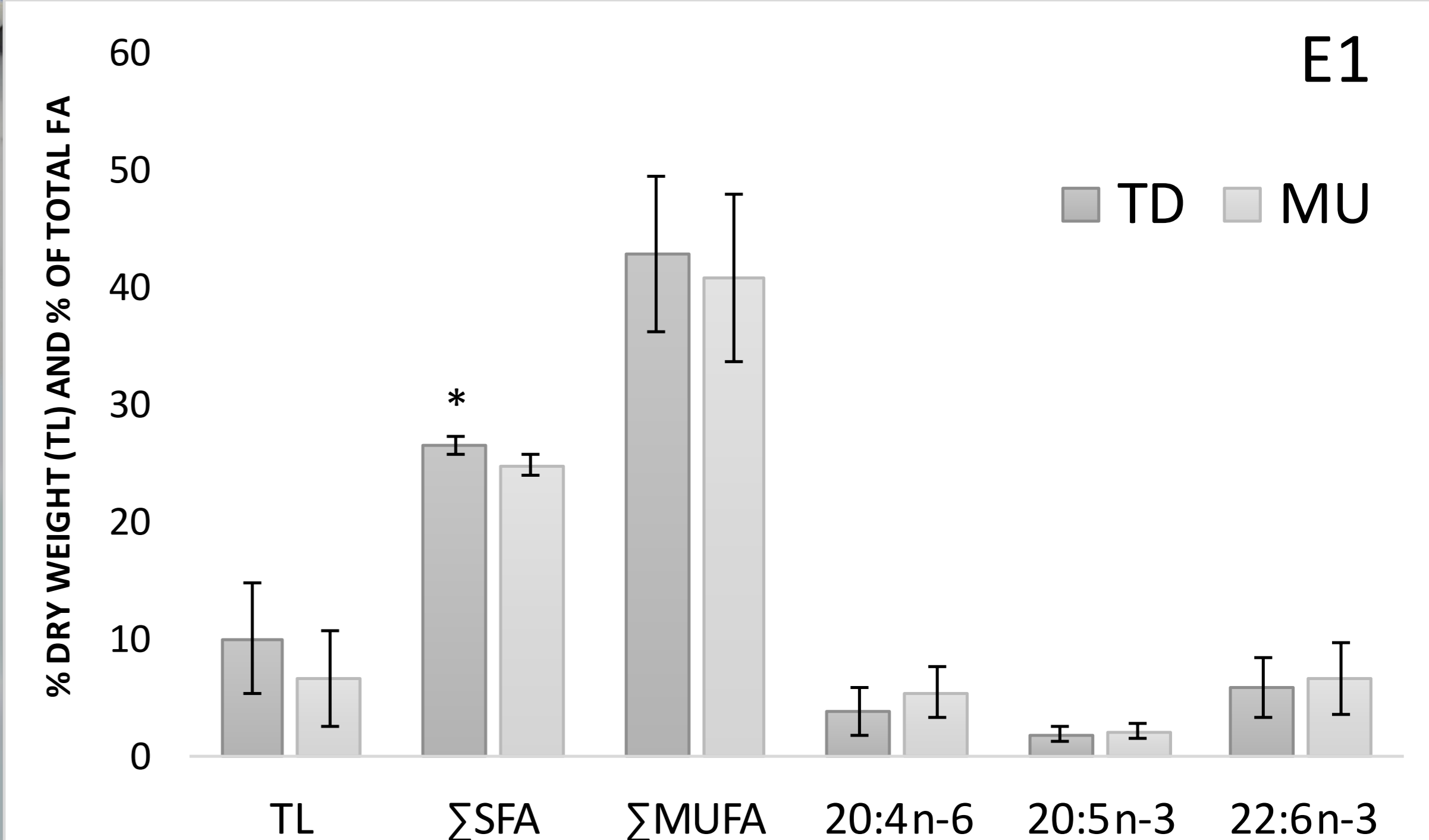
- Lower growth rates with >10% of algae inclusion have been related to the presence of anti-nutrients in seaweeds. On the contrary, a low level (2.5-10%) inclusion has demonstrated improvements in growth performance in several species (Moutinho et al., 2018), which is in agreement with our present results.
- E1-TD+15% MU *C. idella* showed lower VFI and HSI than the control group (TD), while a 7% of inclusion of multispecific macroalgal wrack (E2-TD+7% MU) reduced the VFI and VSI. This effect may be related to the lipolytic action described for some brown algae (Bourgougnon, 2014).
- Lipid composition was only affected by a decrease of SFA in E1 (15%MU).

## Conclusion

The use of a 7% of multispecific seaweed as a feed additive seems to have a beneficial effect in *C. idella* juveniles in terms of both an increment in growth and a reduction of visceral fat deposition.

**Figure 1.** TL (% dw) and main FA composition (% of total FA) of muscle of *C. idella* in E1 and E2. (Mean±SD, E1:n=4; E2: n=5).

\* Denote significant differences (P<0.05)



**References:** Bourgougnon, N. 2014. Elsevier Ed. Vol. 71. 561pp.  
FAO. 2018. Roma, 104 pp.  
Moutinho et al., 2018. J. Appl. Phycol., 30(6), 3589-3601.

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