

# Length-weight relationships and gut contents of diel vertical migrant fishes in the Canary Islands

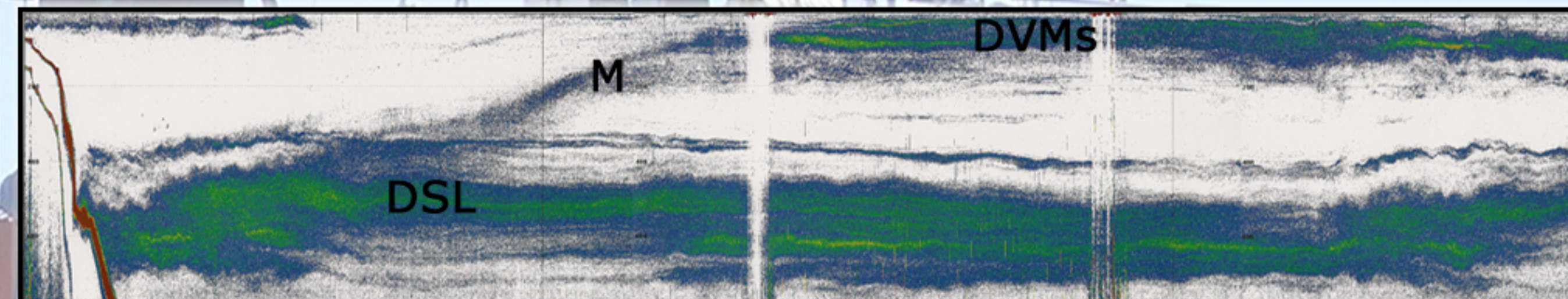
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## Introduction

Diel Vertical Migrants (DVMs) are mainly zooplankton and micronekton which migrate upward from 400-500 m depth every night to feed on the productive epipelagic zone, coming back at dawn to the mesopelagic zone, where they defecate, excrete, and respire the ingested carbon (Hidaka et al., 2001). Therefore, DVMs should contribute to the biological pump in the ocean and, accordingly, to the global CO<sub>2</sub> balance. The lanternfishes (myctophidae) usually contribute up to 80% of total DVMs biomass. Myctophids may, thus, represent a pathway accounting for a substantial export of organic carbon to the deep ocean.

However, the magnitude of this transport is still poorly known. In order to assess this active flux of carbon, we performed a study of mesopelagic organisms around the Canary Islands. Here we present the length-weight relationships and the preliminary results of feeding chronology of *Hygophum hygomii* and *Lobianchia dofleini*, the two dominant species of myctophids performing diel vertical migrations in the Subtropical Eastern North Atlantic Ocean.



Echogram showing the migration (M) at dusk of Diel Vertical Migrants (DVMs) from the Deep Scattered Layer (DSL) to shallower waters. Courtesy of F. Bordes.

## Material and Methods

Samples were collected during June 2009 around the Canary Islands on board the trawler school vessel "La Bocaina". Myctophid species were sorted and fixed in 4% buffered formalin and then transferred to 70% ethanol. *H. hygomii* and *L. dofleini* were isolated to perform the length and weight measurements and the feeding chronology assays. Feeding was preliminary approached by studying stomach fullness and state of digestion of prey items in individuals from two hauls performed at afternoon and midnight, at 600 m and 120 m depth, respectively.

## Results

**Length-weight relationships:** Comparison between the slopes of the logarithmic transformation of given length-weight equations (*t* test) showed not significant differences to an allometric distribution (Fig. 1). Therefore, we assumed a neutral allometric pattern for all relationships.

**Feeding chronology:** We observed no clear changes in stomach fullness, finding full and partly full stomachs in both hauls. However, significant differences were observed in the state of digestion of prey items. The occurrence of digested items increased markedly during afternoon in deep waters, dropping the importance of fresh preys to 2% and 0% in *H. hygomii* and *L. dofleini*, respectively (Fig. 2-3).

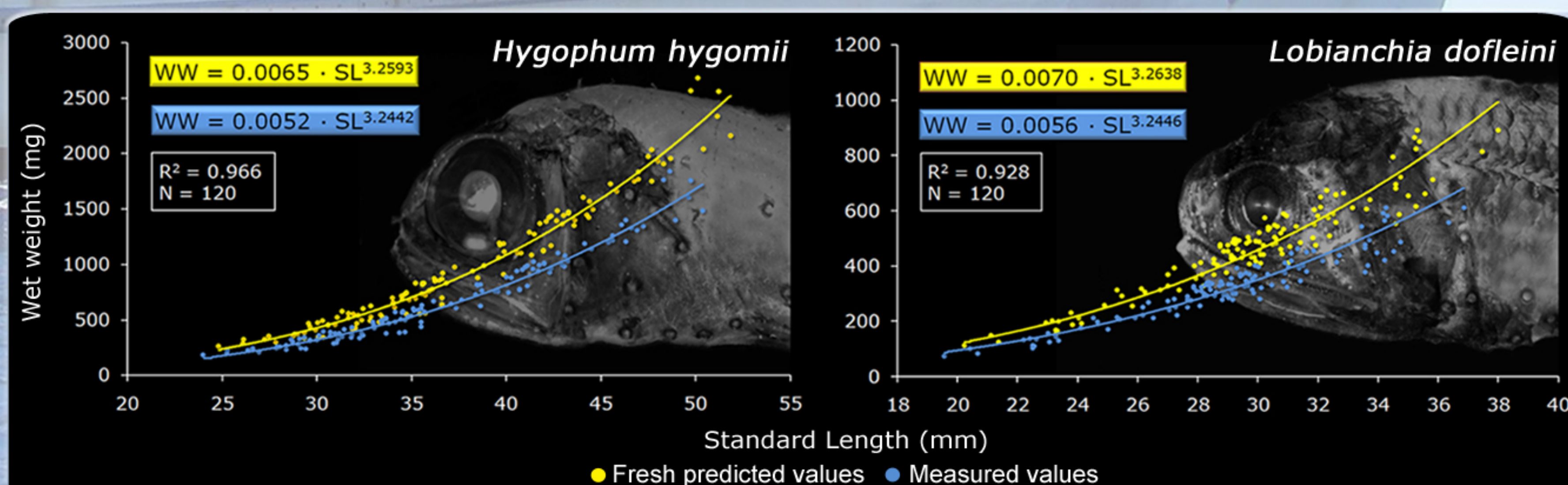


Fig. 1. Relationships of wet weight WW (*d* = 1 mg) versus standard length SL (*d* = 0.05 mm). Predicted fresh values were obtained using the correction factors given by Kristoffersen & Salvanes (1998) for a myctophid of similar size (*Maurollicus muelleri*).

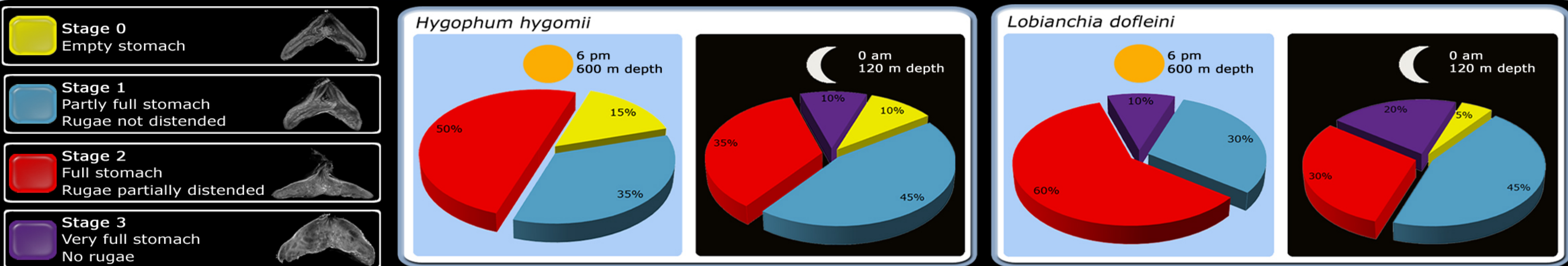


Fig. 2. Frequency of occurrence (%) of each stage of stomach fullness, based on the method by Tyler & Pearcy (1975).

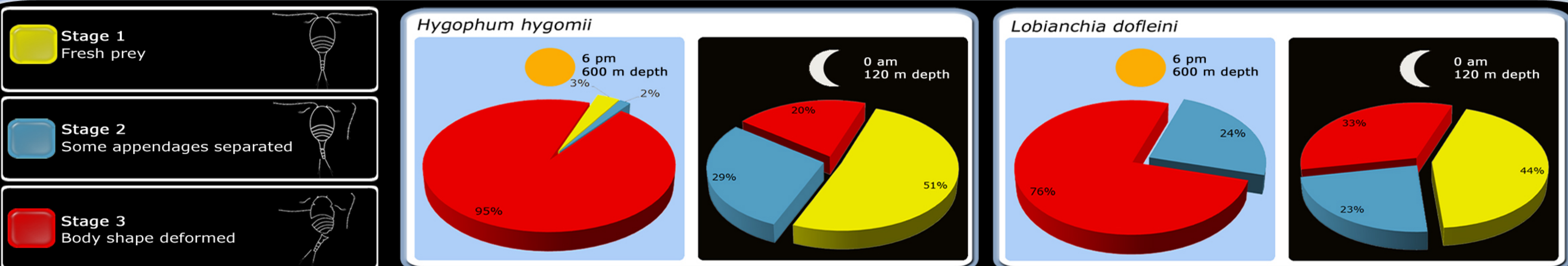


Fig. 3. Frequency of occurrence (%) of each digestion stage of prey items within examined stomachs, based on the method by Moku et al. (2000).

## Conclusions

The increase of fresh preys at midnight in shallower waters indicates nocturnal feeding as reported elsewhere. However, the occurrence of full and partly full stomachs during afternoon in deep waters, as well as the absence of fresh preys, suggests non diurnal feeding but a slow stomach evacuation rate. This feature is of importance to the study of the biological pump efficiency because a slow evacuation rate would promote that most of the ingested carbon in the epipelagic is transported to the mesopelagic layer. However, more exhaustive studies throughout the diel period are needed to confirm these preliminary results.

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