



Vertical diel migration and feeding of *Euphausia vallentini* within southern Chilean fjords

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ABSTRACT

E. vallentini is a circumpolar vertical migrator in the open ocean that enters the Chilean fjords through the sills to become the most common and abundant euphausiid. The diel migratory and feeding patterns of this species are studied in this distinct, enclosed and bathymetrically variable environment. The main goal was to determine the ability of *E. vallentini* to alter its vertical diel range in order to avoid shallow depths, or to maintain its depth migratory range and take advantage of benthic environment during daytime.

Multiple opening closing nets sampled the water column in several basins along the Strait of Magellan. Fluorometrically determined stomach pigments along with on board experiments of evacuation rates allowed estimation of ingestion and consumption rates. Samples of stomach content were microscopically examined to compare day and night diet.

E. vallentini migrated between the surface at night and 100–200 m in daytime. Surface night dwellers had higher chlorophyll stomach content than deep daytime dwellers. Diet composition changed from dinoflagellates and tintinnids at night, to a polychaeths-dominated diet in daytime. Stomach content, ingestion rates and consumption rates of phytoplankton were higher at night than in daytime, and accounted for an impact of 0.17% upon phytoplankton biomass.

Changes of diet of *E. vallentini* imply unique adaptations to take advantage of both pelagic and demersal environments, which could explain its high abundance and high frequency of encounter within the southern Chilean fjords.

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1. Introduction

Euphausia vallentini is a subantarctic circumpolar species ranging from the Polar Front to the subtropical convergence between 42° and 60° S in the Pacific, Atlantic and Indian Ocean (John, 1936). Throughout this very wide geographic distribution, the species forms swarms of very high densities (Ragulin, 1969), becoming an attractive prey for large size predators. In fact it is an important item of the diet of blue whales (Nemoto, 1959) and gentoos penguins (*Pygoscelis papua*) off the subantarctic Marion Island (Adams and Klages, 1989), the Falkland Islands (Bingham, 1998), and Crozet Islands (Ridoux, 1988).

In the open ocean, *E. vallentini* shows a strong diel vertical migration (Perissinotto and McQuaid, 1992), linked to a feeding rhythm characterized by high phytoplankton ingestion rates in dark hours and low feeding activity in day time (Gurney et al., 2002). Life cycle of *E. vallentini* was described from a seasonal

series of stomach content samples of planktivore Macaroni (*Eudypes chrysolophus*), rockhopper (*E. chrysochrome*) and gentoos penguins of Crozet Island (Ridoux, 1988). They concluded that *E. vallentini* has a life span of two years, larval recruitment occurs in summer and growth is fast until late fall.

Off South America, as the West Wind Drift approaches the coast, subantarctic waters diverge in two major branches: the Cape Horn Current and the Humboldt Current. Geographic distribution of *E. vallentini* closely follows these water masses extending to and around the tip of South America to the South and to about 36°S to the North (Antezana, 1978; 1981). The southern Chilean coast is broken into an extensive fjord region (ca. 1400 km in latitude) that is exposed to these subantarctic waters, where it mixes with fresh water inputs from glaciers and runoff. Water circulation driven by tidal currents, wind stress, internal waves and bottom friction, together with topography and bathymetry determines very complex and heterogeneous characteristics (Antezana, 1999a, 1999b; Silva and Calvete, 2003; Valdenegro and Silva, 2003). Hence, the open-ocean zooplankton that is advected into the fjords (Antezana et al., 2002; Mazzocchi and Ianora, 1991; Guglielmo et al., 1997; Fernandez-Severini and Hoffmeyer, 2005) encounters a very different environment

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