# Along-shore and cross-shelf distributions of planktonic cnidarians during autumnal offshore transport in the southern Gulf of Mexico

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Planktonic cnidarians are good indicators of water masses, yet little information exists on their distributions in some regions, such as the Southern Gulf of Mexico. Here, important regional oceanographic features include alongshore currents changing direction, offshore transportation of water masses, strong freshwater inputs, and the presence of oil rigs. We used multivariate analyses to assess the spatial patterns of planktonic cnidarians during autumn 1998, which had particularly high productivity and offshore transportation of water masses. Samples were collected with a 333 μm mesh, 30 cm diameter plankton net at 31 stations, together with information on several environmental variables. Sixty-eight taxa were recorded, with *Koellikerina fasciculata* and *Muggiaea atlantica* representing new records. Eight holoplanktonic species were dominant with respect to volume (ml/1000 $m^3$) and frequency of occurrence, and defined the differences among the four identified groups of stations: A) Grijalva-Usumacinta Delta, B) Campeche Bank, C) Offshore oil rigs, and D) Oceanic waters and eastern continental shelf. Zooplankton volume, station depth, salinity and dissolved oxygen concentration determined the groups observed. This zonation was consistent with the prevailing autumnal circulation patterns and local environmental conditions, suggesting the potential to use these organisms as indicators of regional oceanographic features.

## Introduction

The southern Gulf of Mexico constitutes a highly productive area in which a great number of commercial fisheries are active, together with important oil extraction operations (Withers and Nippe, 2004). An intense water mass transportation takes place in this region during the autumn-winter (Martínez-López and Zavala-Hidalgo 2009), but despite the regional importance of this oceanographic feature, very few studies have explored its relationship with the distribution of the marine biota. Given that the planktonic cnidarians have a limited mobility and may thus be successfully used as indicators of water masses and their movements (Pagès *et al*. 2001; Palma and Silva 2006), we explicitly decided to evaluate the hypothesis that the structure and composition of the planktonic cnidarian assemblages reflect the above explained oceanographic conditions. This was accomplished in this study through the analysis of the medusae and siphonophores collected during an oceanographic cruise that took place in a year in which particularly intense conditions of convergence, offshore water transportation and productivity were recorded in the southern Campeche Bay.

## Materials and methods

Samples were collected with a 333 μm mesh, 30 cm diameter plankton net at 31 stations, together with information on temperature, salinity, turbidity, dissolved oxygen concentration, and nutrients. Sampling took place during autumn 1998, when a particularly high productivity and offshore transportation of water masses occurred. Sampling stations were located in the continental shelf and slope, or in the oceanic zone of the Southern Gulf of Mexico (Campeche Bay). Planktonic cnidarians were sorted and later identified to the lowest possible taxonomic level, and a measure of the abundance of these organisms was estimated through the displaced volume method. Multivariate analyses (PCA, Cluster, MDS, DistLM, and SIMPER) were used to assess the spatial patterns of the assemblages, as well as to investigate their relationship with the regional oceanographic features.

## Results and Discussion

Sixty-eight taxa were recorded. *Koellikerina fasciculata* and *Muggiaea atlantica* represented new records for the region. Eight holoplanktonic species were dominant with respect to biovolume (ml/1000 $m^3$) and frequency of occurrence; these species were also responsible for the definition of four identified groups of stations: A) Grijalva-Usumacinta Delta, B) Campeche Bank, C) Offshore oil rigs, and D) Continental shelf off Tabasco and oceanic waters. The parameters that defined the groups of stations were zooplankton volume, station depth, salinity and dissolved oxygen concentration. Previous investigations (Flores-Coto *et al*. 2000; Loman-Ramos *et al*. 2007) had indicated the presence of well defined groups of neritic and oceanic stations based on the composition and abundance of various groups of zooplanktonic organisms; ours results, however, differ from the latter but are consistent with the prevailing autumnal circulation patterns and local environmental conditions, suggesting the potential to use the assemblages of planktonic cnidarians as indicators of regional oceanographic features.

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