Distribution of Mnemiopsis leidyi and Zooplankton in the South-western Caspian Sea, 2008

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ABSTRACT

The study was conducted from January 2008 to December 2008, focused on spatial and temporal distribution of Mnemiopsis leidyi and zooplankton populations in the south-western area of the Caspian Sea. In summer and winter Mnemiopsis leidyi abundance and biomass values were between 1900 ± 1400 ind/m², 110 ± 220 ind/m² and 370 ± 250 g/m², 1.0 ± 1.3 g/m², respectively. The most individuals of a ctenophore (about 90%) were < 5 mm in length. A total of 19 zooplankton species were identified. Among them seven species were meroplankton and 12 species were holoplankton. The annual mean zooplankton abundance was recorded 5300 ± 1400 ind/m³ which were lower than the previous years. The mass occurrence of Mnemiopsis leidyi appears to be one of the most important factors that reduce the zooplankton species and abundance, hence degrade the Caspian Sea natural ecosystem.

KEY WORD: Caspian Sea; distribution; Mnemiopsis leidyi; zooplankton;

INTRODUCTION

The Caspian Sea is the largest inland body of water in the world, sustaining large stocks of small commercially important zooplanktivorous and pelagic fish. In such a diverse ecosystem, a consistent, significant decrease in the number of grazing zooplankton is expected to decrease the pelagic fish stocks and their predators (Kideys et al., 2008). The biological diversity of the Caspian Sea and its coastal zone makes the region one of the most valuable ecosystems in the world. The Caspian Sea is fed mainly by the Volga River, which provides 82% of total revere inflow and supports a large scale fishery composed primarily of small pelagic fish such as the kilka (Clupeonella spp.). Mnemiopsis leidyi is a highly fecund comb jellyfish that feeds extensively on zooplanktons. The main diet of ctenophore in the southwestern Caspian Sea was copepods (66%) during the summer and autumn (Bagheri and Sabkara, 2003), with a similar finding previously recorded in the Black Sea (Mutlu, 1999). The impacts of predation by Mnemiopsis leidyi on zooplanktic prey organism have been described in its native waters, the western Atlantic, by Deanson and Smayad (1982).

The invasion of the Caspian Sea by the western Atlantic ctenophore Mnemiopsis leidyi since the late 1990s illustrates that the threat of an alien species impose to the biodiversity and ecological functioning of a marine environment. This invasion had enormous economic and environmental impacts on the Caspian Sea ecosystem. Mnemiopsis leidyi competition with planktonic fish for zooplankton as a food resulted in a remarkable decline in the pelagic fishery during those years (Kideys, 2002). The impact of Mnemiopsis leidyi on the Caspian Sea ecosystem is expected to be greater than in the semi-enclosed Black Sea, as the former is a completely enclosed basin and, hence, more sensitive to invasion stresses (Dumont 1995). The impact of such high densities of Mnemiopsis leidyi is significant for the pelagic ecosystem of the Caspian Sea. From 2000 to 2006, several other adverse events have occurred in the Caspian Sea due to top-down effects of Mnemiopsis leidyi consumption of zooplankton. Zooplankton population was observed to have decreased substantially between 1998 and 2006 (Bagheri and Sabkara., 2003; Bagheri and Kideys, 2003; Bagheri et al., 2005; Bagheri 2006; Roohi et al., 2008 and Kideys et al., 2008). The aim of this paper is to study the distribution of the ctenophore Mnemiopsis leidyi and other zooplankton in the Caspian Sea. Changes in their abundance and distribution become a useful tool for decision makers to reduce the impact of this invasive species towards a sustainable Caspian Sea ecosystem.

MATERIAL AND METHODS

In this study, spatial and temporal distribution of Mnemiopsis leidyi and zooplankton population were evaluated by using samples collected from 11 stations along three transects (Lisar, Anzali and Sefidrood) in the western Iranian coasts of the Caspian Sea. Seasonal samplings were taken from January 2008 to December 2008 (Fig. 1).