

CONTRIBUTION OF LESSEPSIAN INTRUSIONS TO THE ALTERATION OF COASTAL FISH ASSEMBLAGES IN ISKENDERUN BAY (NORTHEASTERN MEDITERRANEAN)

S. Mavruk ^{1*}, H. Yeldan ¹, M. Manasirli ¹, F. Bengil ² and D. Avsar ¹

¹ Cukurova University, Fisheries Faculty - smavruk@cu.edu.tr

² Girne American University, Marine School

Abstract

The seasonal bottom trawl surveys those were conducted between 2004 and 2015, revealed that the composition of shallow-soft bottom habitats in Iskenderun Bay significantly changed because of the establishment and progress of lessepsian fishes after 2010. The recent invaders such as *Nemipterus randalli* and *Pomadasystridens* were found to be responsible on this alteration. A significant parallelism was also observed among the variations of ichthyofaunal composition, temperature and chlorophyll concentration. These arguments were considered as supporting the tropicalization hypothesis in Eastern Mediterranean.

Keywords: Alien species, Iskenderun Bay, Biodiversity, Temperature, Teleostei

Introduction

Due to ongoing introductions of lessepsian species, the structure of coastal fish assemblages reveals apparent inter-annual variations in Levant Basin. Recently, more than 100 Indo-Pacific fish taxa have been recorded in Eastern Mediterranean by the way of this migration [1]. The introduction rate has particularly increased within the last two decades [2]. This circumstance gives a perfect opportunity to evaluate the alterations of ichthyofaunal structure resulting from the invasive species. In this study, the inter-annual changes of the composition of teleost fish assemblages were investigated in a shallow-soft bottom habitat in northwestern coasts of Iskenderun Bay.

Material and Method

A total of 90 bottom trawl operations within 45 expeditions were conducted at 10 and 20m depth contours. The positions of transects were as follows; 35. 87° E, 36. 82°N to 35. 91°E, 36. 86°N and 35. 89°E, 36. 80°N to 35. 93°E, 36. 84° N. The expeditions were performed from 2004 to 2015 with regular seasonal intervals. During the expeditions, commercial bottom trawlers were used with the approximately same fishing effort which was about 700HP engine power and one-hour towing duration. Abundance based CPUE (individual per hour) values and remotely sensed temperature and chlorophyll [3] were used for the statistical analyses. In the first step of analyses, the significant clusters were determined with a Simprof procedure applied to the Bray-Curtis distance matrix. Then, non-metric multi-dimensional scaling (NMDS) combined with indirect gradient analysis was conducted.

Results and Discussion

During the study period we observed a total of 120 teleost fish species. The overall mean of CPUE was 102kg h⁻¹ and 7762 individual h⁻¹ in biomass and abundance respectively. However, the 73% of total richness was composed of Atlantic-Mediterranean species, 32 Indo-Pacific taxa dramatically dominated the catch. The proportion of lessepsians was determined as 62% of total biomass, and 85% of total abundance. Lessepsian fishes, *Equulites klunzingeri* (17.2%), *Upeneus pori* (16.8%) and *Saurida lessepsianus* (10.8%) constituted the most dominant three species in the study area. Two native fishes, *Pagellus erythrinus* and *Mullus barbatus*, followed them by forming 7.6% and 5.2% of total abundance respectively.

According to Simprof results, the sampling years formed three significant clusters in respect of species composition (Figure 1). Between-group Simper revealed that the first two groups which were 2004-2005 and 2006-2009, were slightly separated from each other with the variations of several native species such as *Arnoglossus laterna* and *Boops boops*. However, the composition of the third group (2010-2015) apparently differed from those of the both, particularly with the contributions of recently recorded lessepsians such as *Nemipterus randalli*, *Pomadasystridens* and *Apogon smithi*. Mentioned lessepsians were firstly recognized after 2008 in Iskenderun Bay [4]. Apparently, they managed to establish consistent populations and even become the dominant component of the catch (Figure 1). This circumstance eventually resulted with the raise the dominance of lessepsian species in fish assemblages after 2010.

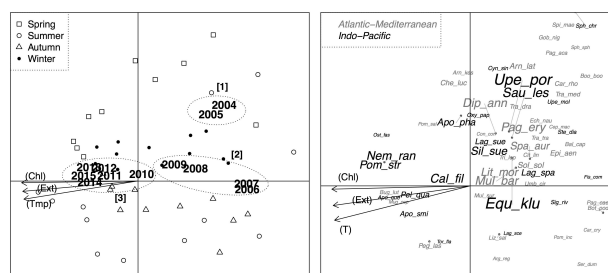


Fig. 1. NMDS ordination by sampling units (left panel) and species (right panel). The numbers in square brackets indicate the significant clusters. (Chl) and (Tmp) indicate the trend components of temperature and chlorophyll. (Ext) shows the approximate positions of annual minimum and maximum chlorophyll and annual minimum temperature. The font size is proportional to the maximum contribution of species to the within group similarity.

The variation of the species composition was significantly parallel with the increment of the annual average temperature and chlorophyll as well as annual minimum and maximum chlorophyll and annual minimum temperature ($p < 0.01$). The increasing importance of warm water biota corresponding to the rising temperature and production may be considered as providing further support for the Bianchi and Morri's "tropicalization" concept [5] in Eastern Mediterranean.

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