SPATIAL DISTRIBUTION OF FISH ASSEMBLAGES AROUND A GAS PLATFORM

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Abstract
The spatial distribution and abundance of fish assemblages surrounding an offshore gas platform was investigated through underwater camera records, hydro-acoustic (Multibeam echousounder, MBES) and fishing surveys. Matching different methodologies, it was possible to deduce the species detected through the acoustic surveys.

Keywords: Fish behaviour, North Adriatic Sea, Acoustics

Introduction - Research on abundance and composition of fish assemblages surrounding offshore platforms is essential to evaluate the impacts of these structures in terms of potential increase in biomass and to understand the relationships between natural and artificial habitats [1]. In this study, the spatial distribution of fish assemblage was investigated around a three legs gas extraction platform placed at 80 m depth in the central Adriatic sea. Surveys were carried out since the end of its installation: hydro-acoustic investigations, fishing captures and underwater video camera.

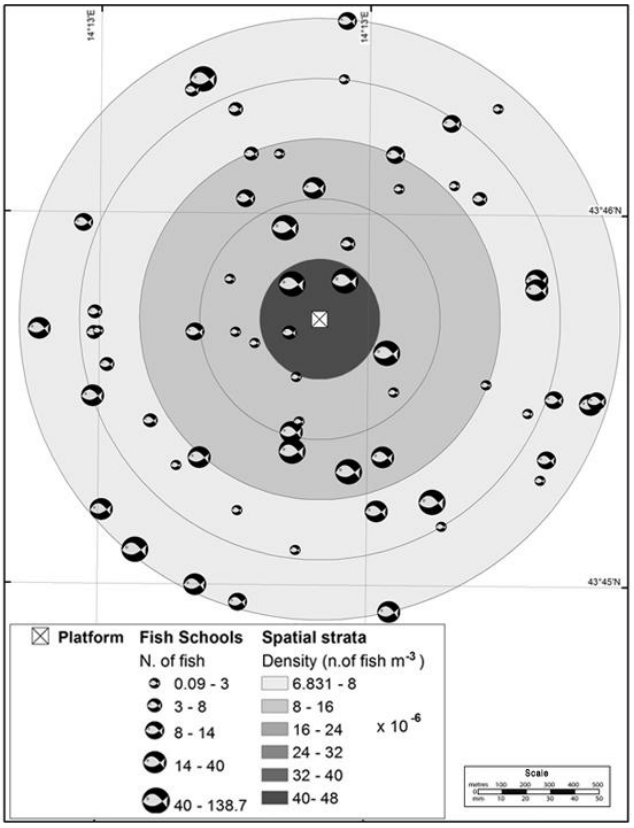

Fig. 1. Spatial distribution and density of shoals for one year after installation

Methods - MBES surveys were carried out using a high-resolution 300-kHz EM3002D (Kongsberg Simrad), a dual head system which offers the potential of detecting fine-scale distribution of fish aggregation, combining its ability to detect at the same time the seafloor and the water column. The water column was investigated monthly for one year after the installation, at the same time of day, at a speed of 5 knots, in condition of calm sea or little moved. A squared area of 1.5 x 15 Km, focused on the platform was investigated with a total coverage. Fishing surveys were performed monthly, for one year, using a bottom trammel net. The nets were lowered at sunset and recovered at dawn within a 50 m radius from the platform and at two reference sites located at the same depth (80 m depth) but 1.800 m away from the structure. The underwater camera videos were monthly recorded just close to the platform to detect fish at different depths along the water column. Acoustic raw data were processed using a 3D school detection algorithm to extract target models and related metric and acoustic features. As EM3002D system is not calibrated for the identification of particular fish species, it was considered a frequency based target strength (-30/-54 dB) [2] and a dimensional range (80 cm in XYZ) according to the size of experimental catches. Processing MBES bathymetric and water column data, 3D virtual scenes of the artificial habitat were created, receiving an intuitive-looking depiction of its state and allowing overtime to evaluate its change in terms of dimensional characteristics and depth fish schools' disposition. GIS analysis were carried out to spatially investigate the influence of the platform on the fish assemblages using concentric spatial with increasing offset: 150m, 300m (the radius of influence of the platform in a natural habitat [3]), 450m, 600m and 750m (study area extent). Densities (fish m-3) were computed spatial joining circular strata with intersecting fish schools, summing relative fish abundances and standardizing by strata volumes (Fig.1).

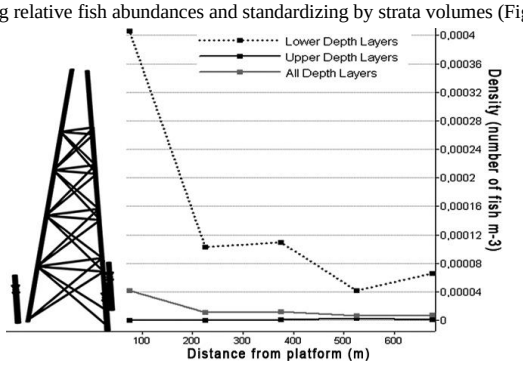

Fig. 2. Mean horizontal fish density for different depth layers

Results - Fish distribution varied significantly with depth layers: the 73% of fish schools were detected in the first 10 m from the bottom and usually aggregate around the platform. Basing on video and fishing surveys, these schools could be attributed to necto-benthic or pelagic species partially attracted by artificial and/or natural substrates (*i.e., Pagellus bogaraveo, Trisopterus minutus capelanus, Boops boops and Trachurus trachurus*). Along the water column, density decreased with distance from structure from 7x10-6 to 42x10-6 fish m-3 (Fig. 2). This decreasing was more underlined (from 42x10-6 to 406 x10-6 fish m-3) for the deepest schools, while the shoals occurring in the upper depth layers were scattered in the overall area with a density from 0.001 x10-6 to 2,86 x10-6 fish m-3. These superficial schools are likely made of not attracted pelagic species such as *Engraulis encrasicolus and Sardina Pilchardus*.

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