Available online at www.sciencedirect.com
SCIENCE DIRECT®
Estuarine, Coastal and Shelf Science 63 (2005) 577–588
ESTUARINE COASTAL AND SHELF SCIENCE
www.elsevier.com/locate/ECSS

# Day–night variations in the demersal nekton assemblage on the Mediterranean shelf-break

P. Carpentieri*, F. Colloca, G.D. Ardizzone

*Department of Animal and Human Biology, University "La Sapienza", Viale dell'Università 32, 00185 Rome, Italy*

Received 17 May 2004; accepted 12 January 2005

**Abstract**

The composition of the demersal nekton assemblage inhabiting the Mediterranean shelf-break of west-central Italy was examined to investigate the diel variation in species composition and abundance. Fish were obtained during four 24-h sampling periods that represented the four annual seasons. Thirty-two hauls (eight in each season) were conducted in a shelf-break area at 140–160 m depth. The density of fish, crustaceans, and decapods exhibited differences on short- and long-term time scales: multidimensional scaling suggested that season and light intensity may be important factors influencing fish assemblage composition.

At the diel scale two main assemblages separating nocturnal and diurnal hauls were identified. The typical assemblage structure of shelf-break bottoms was represented during daylight by species such as *Merluccius merluccius*, *Capros aper*, *Serranus hepatus*, *Macroramphosus scolopax* and *Trisopterus minutus capelanus*. At night, the assemblage showed a drastic change due to the increase of small nektobenthic species, *Argentina sphyraena* and *Glossanodon leioglossus*, together with cave-dwelling fish (*Gnathophis mystax*, *Chlopsis bicolor*, *Nettastoma melanurum*) and nektobenthic crustaceans (i.e., *Parapenaeus longirostris* and *Solenocera membranacea*).

The above-mentioned differences in species composition may be related to changes in vertical distribution for trophic needs (*M. merluccius*) and/or in the shoal structure (*A. sphyraena* and *G. leioglossus*). The lack of data on the pattern of trawl catchability of Mediterranean species during the day may lead to an inaccurate estimation of species abundance when only diurnal trawl survey data are used.


*Keywords:* fish assemblage; diel variation; Mediterranean Sea; seasonality

## 1. Introduction

The occurrence of a species in a given habitat depends on factors such as food availability, salinity, temperature, time of the day and light intensity, factors that may change throughout the day (Hall et al., 1979; Diehl, 1988; Boujard, 2001). These factors have been shown to affect the abundance and distribution of species over a 24-h period (Walsh, 1991). In the particular case of fish assemblages, the resources that are proven to be important are food, habitat and, to a lesser extent, time and abiotic factors such as temperature. Ross (1986) reviewed 37 field studies on resource partitioning among fish and found that temporal segregation gave the greatest separation in 11% of such studies. Diel variations of abundance may have a strong adaptive significance either by reducing interference competition between species (Piet and Guruge, 1997) or as a result of past competition (Connell, 1980).

Studies in the Atlantic Ocean have investigated the different catchability rates for demersal assemblages during the day and night (Sissenwine and Bowman,

* Corresponding author.
*E-mail address:* paolo.carpentieri@uniroma1.it (P. Carpentieri).

0272-7714/$ - see front matter © 2005 Elsevier Ltd. All rights reserved.
doi:10.1016/j.ecss.2005.01.005

1978; Walsh, 1989; Casey and Myers, 1998; Petrakis et al., 2001). Daytime catches for cod (*Gadus morhua*), haddock (*Melanogrammus aeglifinus*), beaked redfish (*Sebastes* spp.) and American plaice (*Hippoglossoides platessoides*) were higher than the night-time catches (Atkinson, 1989; Engas and Soldal, 1992). In contrast the daytime catches of sole and yellowtail flounder (*Limanda ferruginea*) were reported to be lower than those at night time (Woodhead, 1964; Walsh, 1987). The ecological significance of diel differences in marine fish could be explained in terms of foraging success, predator avoidance and bioenergetics (Levy, 1990). In the Mediterranean, although the distribution of demersal species is fairly well documented, either in relation to season or depth (Abellò et al., 1988; Biagi et al., 1989; Aldebert, 1997; Ardizzone and Corsi, 1997; Relini et al., 1999; Ungaro et al., 1999; Demestre et al., 2000; Colloca et al., 2003), variation on a diel scale has been not investigated. In fact, most of the data on distribution and abundance of demersal species have been obtained during diurnal trawl surveys, while the nocturnal composition of the assemblages is almost unknown. The lack of data on the pattern of trawl catchability of Mediterranean species during the day may also lead to an inaccurate estimation of abundance of such species when diurnal trawl survey data are used (Casey and Myers, 1998).

In the present study diel changes in the nekton assemblage were investigated on the central Mediterranean shelf-break (central-western Italian coast), where a well defined nekton assemblage occurs. Species such as long-spine snipefish, *Macroramphosus scolopax*, boarfish, *Capros aper*, large-scaled gurnard, *Lepidotrigla cavillone*, spawning red mullet, *Mullus barbatus*, and juveniles of hake, *Merluccius merluccius*, reach higher abundances in this region compared with deeper shelf and upper slope bottoms (Colloca et al., 2004). Short-term changes on a diel scale were analysed in relation to light level, and long-term changes were investigated in relation to season.

## 2. Materials and methods

### 2.1. Trawl data

Data were obtained during four seasonal 24-h surveys conducted in July (summer), November (autumn) 2001, March (winter) and May (spring) 2002. The study area is located on the shelf-break off the central-western coast of Italy (latitude 41°30′08, longitude 12°24′66; latitude 41°31′43, longitude 12°31′21) at depth of 140–160 m (Fig. 1). In this area, the continental shelf is 120–160 m deep and 15–30 km from the shoreline. The shelf-break area is characterised by detritic sediments, with the occurrence of high concentrations of suspension-feeding organisms, mainly the crinoid *Leptometra phalangium*, which can reach up to 15 ind $m^{-2}$ (Kallianotis et al., 2000; Colloca et al., 2004). Temperature and salinity were almost constant at roughly 13 °C and 38, respectively.

In each survey, eight hauls of 30 minutes each were performed every 3 h throughout the 24-h period. The vessel used (60 tons and 600 HP) was equipped with an Italian otter trawl, mounted into a 40 mm head rope, a 40 mm ground chain and 30–40 mm stretched mesh in

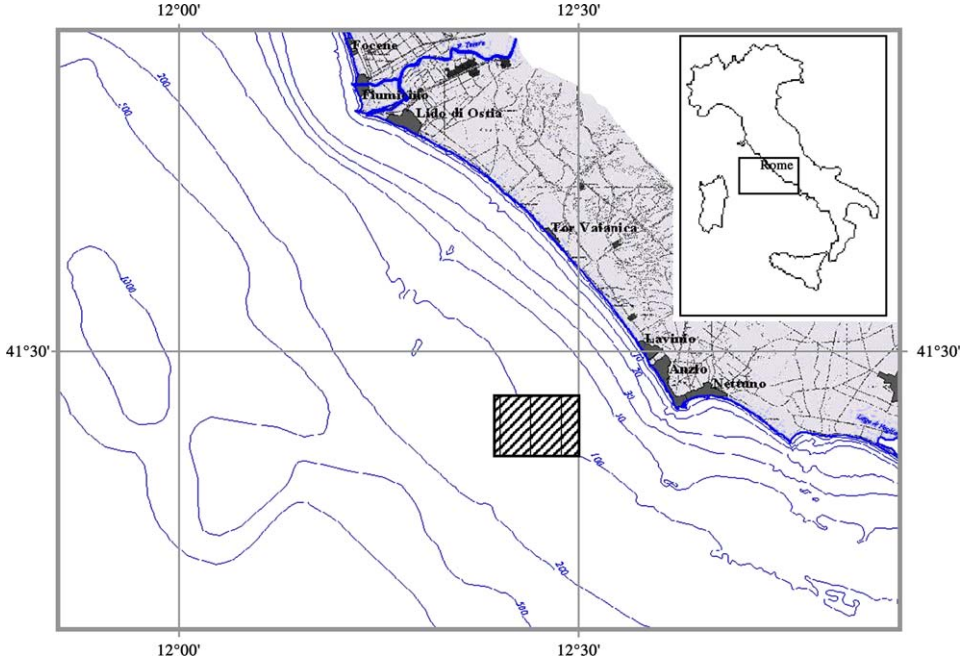


Fig. 1. Study area. The box highlights the sampling area.