



Spatio-temporal changes in sea star populations of the genus *Astropecten* inhabiting soft bottoms in the northwestern Mediterranean Sea



Marc Baeta^a, Eve Galimany^{a, b}, Montserrat Ramón^{a, b, *}

^a Institut de Ciències Del Mar (CSIC), Passeig Marítim de La Barceloneta, 37-49, Barcelona 08003, Spain

^b Instituto Español de Oceanografía, Centre Oceanogràfic De Les Balears, Moll de Ponent S/n, Palma de Mallorca 07015, Spain

ARTICLE INFO

Article history:

Received 6 May 2015

Received in revised form

25 November 2015

Accepted 28 November 2015

Available online 2 December 2015

Keywords:

Echinoderm

Starfish

Asteroidea

Maresme coast

Habitat

Distribution

Soft bottom

ABSTRACT

Astropecten species inhabit soft-bottom habitats worldwide, from intertidal areas to the deep sea. Sympatric *Astropecten* species (*Astropecten aranciacus*, *Astropecten irregularis pentacanthus*, *Astropecten platyacanthus*, *Astropecten jonstoni* and *Astropecten spinulosus*) occur in the shallow coastal area of the Maresme coast (northwestern Mediterranean Sea). This study analyzes spatio-temporal differences in asteroidean population between the periods 2004–2006 and 2010–2011. Our results showed variations in density and spatial distribution in *A. aranciacus*, and a change in its diet between the two study periods. *A. irregularis pentacanthus* reduced its spatial distribution, concentrating in smaller areas. *A. platyacanthus* was absent in the first period but abundant in the second. *A. jonstoni* and *A. spinulosus* were scarce in the first period and absent in the second. The results also showed the specific habitat requirements for each sea star species with regard to sediment characteristics, prey availability and depth.

© 2015 Elsevier Ltd. All rights reserved.

1. Introduction

Sea stars are studied widely in the fields of paleontology, evolutionary biology, reproduction, development, conservation, genetics, biochemistry and biogeography. They play significant ecological roles and are model organisms for understanding climate change (Lawrence, 2013). *Astropecten* is one of the genera with most species among sea stars and its members are distributed worldwide, inhabiting soft-bottom ecosystems from polar to tropical seas and from intertidal areas to the deep sea (Zulliger and Lessios, 2010). This genus includes six species in the Mediterranean Sea: *Astropecten aranciacus* (Linnaeus 1758), *Astropecten bispinosus* (Otto 1823), *Astropecten irregularis pentacanthus* (Pennant 1777), *Astropecten platyacanthus* (Philippi 1837), *Astropecten jonstoni* (Delle Chiaje 1827) and *Astropecten spinulosus* (Philippi 1837); the last three are endemic to the Mediterranean. *Astropecten* spp. are voracious predators feeding mainly on gastropods and bivalves.

They swallow whole preys and have intra-oral digestion (Christensen, 1970). Though they were first described as non-selective feeders (Wells et al., 1961), some feeding selection and specialization has been observed (Christensen, 1970). Sea stars have chemoreceptive abilities to distinguish prey quality, choosing preferentially those that have a higher nutrient composition and provide more energy (Beddingfield and McClintock, 1993).

Coastal areas are among the most productive and threatened systems in the world, providing important services related to human well-being (Agardy et al., 2005). Marine species composition, distribution and abundance have been greatly altered in coastal areas over the last few decades, and species occupying high trophic levels have been particularly affected (Menge et al., 1994; Jackson et al., 2001; Hutchings and Baum, 2005). Some sea star species have largely been recognized as predators at or near the top of food webs (Dame, 1996). Unfortunately, the status and dynamics of most sea star populations is unknown.

Over the last few decades, a significant decline in coastal bivalve beds has been reported on the Mediterranean coast of Spain (Ramón et al., 2005; Baeta et al., 2014). The Maresme coast (Catalonia, northwestern Mediterranean Sea) is one of the main shellfish areas in which an artisanal clam fishery was maintained until

* Corresponding author. Institut de Ciències Del Mar (CSIC), Passeig Marítim de La Barceloneta, 37-49, Barcelona 08003, Spain.

E-mail address: mramon@icm.csic.es (M. Ramón).

recently, with the smooth clam (*Callista chione*) as the target species. The megabenthic community in the area was described by Pubill et al. (2011), who reported that the commonest and dominant bivalve species (in density) was *C. chione*, which was present in about 86% of the samples. The importance of *C. chione* in the diet of its main predators, three sympatric sea star species of the genus *Astropecten*, was analyzed by Baeta and Ramón (2013), who found that *C. chione* was positively selected by *A. aranciacus*, *A. irregularis pentacanthus* and *A. platyacanthus*.

The present study aims to investigate spatio-temporal changes of co-occurring *Astropecten* spp. inhabiting a commercial bivalve (*C. chione*) bed in the Maresme coast between the periods 2004–2006 and 2010–2011. For the purpose, we studied sea star composition, spatial distribution and abundance in the whole study area in 2004 and 2010 and the factors influencing the distribution of *Astropecten* spp. in May 2010. In addition, we studied the density and population structure of the sea star species and the diet of *A. aranciacus* by monthly sampling in two transects in the periods 2005–2006 and 2010–2011. This research pretends to provide new insights of sympatric sea stars population dynamics.

2. Materials and methods

2.1. Study site

The study site was located on the Maresme coast (Catalonia, northwestern Mediterranean Sea), a narrow and shallow (5–30 m depth) strip approximately 51 km long, parallel to the coast line between the Tordera River (northeast) and the seasonal Tiana River (southwest) (Fig. 1). The site is characterized by a large infralittoral plain (0–30 m depth) of soft bottoms dominated by coarse granitic sand and reflective beaches.

2.2. Species composition, spatial distribution and abundance

Several daily samplings to collect sea stars were performed during two survey periods, from 23 November to 16 December 2004 and from 1 May to 15 May 2010, to study spatio-temporal species composition, distribution and abundance. The sampling stations were located along 17 parallel transects 3 km apart, perpendicular to the coastline, and covering the entire study area (255 km²). Transects were numbered consecutively from northeast to southwest (T1–T17). Each one contained five sampling stations corresponding to depths of 5, 10, 15, 20, and 25 m. All stations were sampled in each transect whenever possible (avoiding sea grass, rocky outcrops and submarine outfalls) (Fig. 1). Sea stars were collected at sea on board the F/V *Nautes* (10 m in length; 100 HP), which is involved in the smooth clam fishery of the area. Two commercial clam dredges (mouth width, 70 cm; mouth height, 53 cm; depth, 120 cm) fitted with an experimental metal wire mesh of 12 × 12 mm were used to sample at each station. Each tow, which geographical position was recorded using GPS, lasted 30 min at a towing speed of 1–1.2 knots, giving a mean towed area of around 800 m² per replicate. All the sea stars collected were transported in a cooler with ice (4 °C) to the laboratory, where they were identified and counted for each transect and depth. Densities were standardized to N.ha⁻¹.

2.3. Factors influencing *Astropecten* spp. distribution

Factors influencing *Astropecten* spp. distribution were analyzed in the whole study area during the second survey period (from 1 May to 15 May 2010). For this purpose, abundance of the sea stars and the bivalve *C. chione* and sediment granulometry were quantified. Sediment grain size has been demonstrated to play a crucial

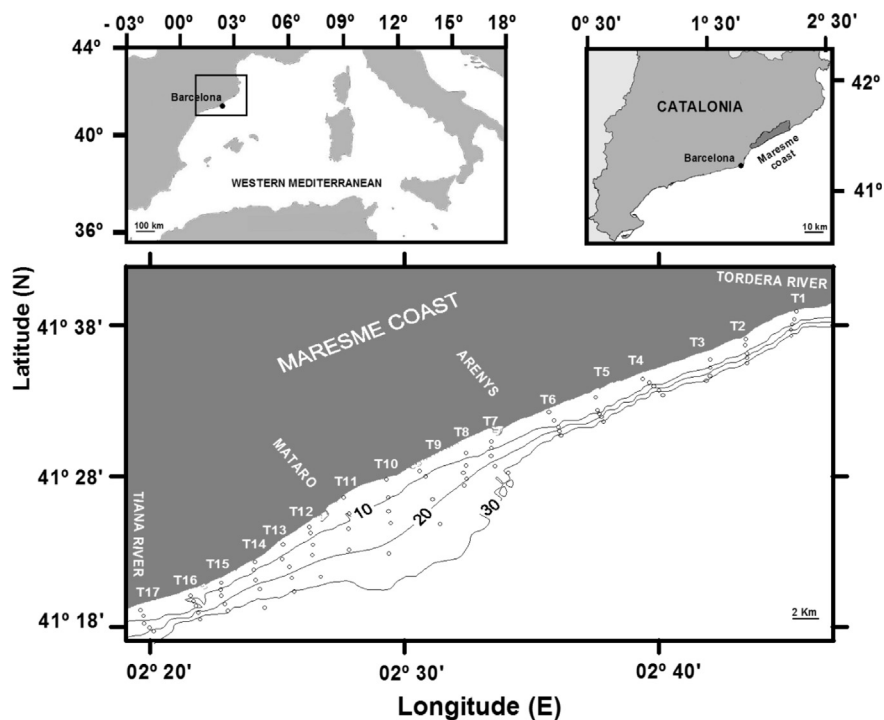


Fig. 1. Study area in the northwestern Mediterranean Sea, showing the distribution of sampling stations (points), transects (T), and isobaths (10, 20 and 30 m).

Download English Version:

<https://daneshyari.com/en/article/4550621>

Download Persian Version:

<https://daneshyari.com/article/4550621>

[Daneshyari.com](https://daneshyari.com)