## A phase shift from macroalgal to coral dominance in the Mediterranean







Fig. 1 a, b Community dominated by *Oculina patagonica* in the western Mediterranean. *Scale bar* 20 cm. c The shallow water community was severely affected by sand scouring

Macroalgae dominate Mediterranean shallow water assemblages, whilst corals are extremely rare. Oculina patagonica is a zooxanthellate coral that was first recorded in the Mediterranean in 1966 and is thought to originate in the SW Atlantic. Although it is spreading in the Mediterranean, it has never been observed as main component of a natural community. In 2009, O. patagonica was found to be abundant in shallow water (0-3-m depth) at Torre Pirulico in SE Spain (37°4′70″N, 1°50′59″W). Based on 25 random 1-m<sup>2</sup> plots, the mean density was 24 ( $\pm 2$  SE) colonies m<sup>-2</sup>, covering 55  $\pm$  5 % of the 750 m<sup>2</sup> study area (Fig. 1a, b). Coral colonies ranged from 0.07 to 3578 cm<sup>2</sup> (mean = 229  $\pm$  11 cm<sup>2</sup>, n = 603) and their size distribution was positively skewed with 37.5 % colonies <100 cm<sup>2</sup>, indicating that strong recruitment was the main cause of the species' high abundance. Other components of the benthic community included turf algae (36.6 %), erect algae (7.3 %), sponges (0.9 %), calcareous-encrusting macroalgae and bare rock (0.2 %)  $(n = 30 \text{ random } 0.25 \text{-m}^2 \text{ quadrats})$ . Sea urchins were absent and physical disturbance from sand scouring (Fig. 1c) was the main source of open space for O. patagonica to colonise.

Whilst high cover of *O. patagonica* has been recorded on artificial habitats, cover on natural substrata is generally sparse (<15 %, Fine et al. 2001; Sartoretto et al. 2008; Coma et al. 2011). It is unclear how *O. patagonica* outcompetes algae and other invertebrates. Densities at Torre Pirulico are the highest ever reported. This is a coral community dominated by *O. patagonica*.

Our finding of a persistent phase shift from macroalgal to coral dominance in the Mediterranean contrasts with the reported trend in many coral reef ecosystems. Macroalgae are important primary producers in temperate coastal ecosystems and this change in the dominant trophic group may affect ecosystem function.

Acknowledgments We are grateful to Laura Navarro for field assistance. Support has been provided by MCI project CGL2010-18466, CoCoNet (FP7 Grant-Agreement:287844) and the Marine-Biogeochemistry and Global-Change-Research group from Generalitat de Catalunya.

## References

Coma R, Serrano E, Linares C, Ribes M, Díaz D, Ballesteros E (2011) Sea urchins predation facilitates coral invasion in a Marine Reserve. PLoS ONE 6:e22017
Fine M, Zibrowius H, Loya Y (2001) Oculina patagonica: a non-lessepsian scleractinian coral invading the Mediterranean Sea. Mar Biol 138:1195–1203
Sartoretto S, Harmelin JG, Bachet F, Bejaoui N, Lebrun O, Zibrowius H (2008) The alien coral Oculina patagonica De Angelis, 1908 (Cnidaria, Scleractinia) in Algeria and Tunisia. Aquat Invasions 3:173–180

E. Serrano (☑) · R. Coma Centre d'Estudis Avançats Blanes (CEAB-CSIC), Accés Sant Francesc 14, 17300 Blanes, Spain e-mail: eserrano@ceab.csic.es

E. Serrano · M. Ribes Institut Ciències Mar (ICM-CSIC), Passeig Marítim Barceloneta 37-49, 08003 Barcelona, Spain

Received: 26 March 2012/Accepted: 20 July 2012/Published online: 8 August 2012 © Springer-Verlag 2012

Coral Reefs (2012) 31:1199 DOI 10.1007/s00338-012-0939-3

