CHANGES IN THE MACROALGAL ASSEMBLAGE OF THE UPPERMOST INFRALITTORAL FRINGE FOLLOWING A POINT OIL SPILL IN THE GRAND HARBOUR, MALTA

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Abstract

The uppermost infralittoral rocky shore macrophyte assemblage at Rinella Creek in the Grand Harbour, Malta was sampled in June 2002. Two days later, approximately 3.5 tonnes of oil were accidentally released at this site and the oil on the shore was cleaned up with steam. The site was visited 16 times over a period of 14 months to record the recolonisation process. Multivariate community analysis showed that the community had recovered within a year from the incident.

Keywords: Algae, Petroleum, Pollution, Rocky Shores

Introduction

On 24 June 2002, ~3.5 tonnes of oil were accidentally released from a discharge pipe on the shore by the Tank Cleaning Facility at Rinella Creek, within the Grand Harbour, Malta, resulting in an oil slick that extended from the point of discharge to approximately mid-way across the creek. The spill was contained by booms and the oil was removed within three days. Serendipitously, the shore at the spill site had been sampled two days prior to the spill, as part of another project. When the site was re-visited two days post-spill, the rocky shore was being cleaned of oil using steam. Drastic changes in the shore community as compared to conditions pre-spill were immediately evident, including bleaching of the dark band of supralittoral cyanobacteria, discoloration of mediolittoral macroalgae, and mass mortality of the mediolittoral fauna.

Methods

Five replicate 0.5 m x 0.5 m quadrats were placed at random in each of the supralittoral, upper and lower mediolittoral and uppermost infralittoral zones at Rinella Creek and the percentage cover of each species of macroalga was recorded. The site was visited 16 times over a period of 14 months to record the recolonisation process, however, no data were collected on two occasions due to bad weather. The quadrats were placed at exactly the same position during each sampling visit. The results presented here are for the macroalgae of uppermost infralittoral fringe (sea-level to 50 cm water depth).

Results & Discussion

Throughout the study period, 17 macroalgal taxa were recorded from the infralittoral fringe, comprising 5 Chlorophyta, 4 Phaeophyta and 8 Rhodophyta. Of these, 7 were perennials and 10 annuals. Eight species were filamentous, 6 were erect and 3 were encrusting. The lowest number of species recorded was 3, on the second visit and the highest was 11, a year after the spill. Prior to the spill, the macroalgal assemblage comprised 9 species, of which *Corallina elongata* and *Cystoseira compressa* were dominant in terms of percentage cover (87% and 16%, respectively); encrusting algae (two species of *Lithothamnion* and *Neogoniolithon notarisii*) had a 6.6% cover and all remaining species < 2%. Post-spill, the encrusting algae were not recorded from the study area in 57% of the visits, however, in the last visit (August 2003) they had not only reappeared, but had a percentage cover of 8.6% which was more than the pre-spill value. During the second (July 2002) and third (August 2002) post-spill visits, *Cladophora sericea* had 100% cover, but this value decreased until it was not recorded from the sixth visit (September 2002) onwards. In the last visit, two species, *Dictyota* sp. and *Gigartina acicularis*, that had not been present pre-spill or in subsequent sampling sessions, were recorded with a cover of <1%. In the last sampling session (August, 2003) 11 macroalgae were present of which, *Corallina elongata* and encrusting algae had the highest percentage cover: 59% and 8.6%, respectively. All macroalgae had a heavy epiphytic cover of diatoms, mainly *Coscinodiscus* spp., and *Ceramium gracillimum*. Although *Corallina elongata* was the only species present throughout the entire study period, its percentage cover varied and ranged from a minimum of 34.2% in August 2002 to 100% in May 2003. Also, bleaching of *C. elongata* was observed during August and September. NMDS ordination (Fig. 1) showed a clear cyclical pattern, indicative of macroalgal community recovery after one year from the incident, a result confirmed by the RELATE procedure for cyclicity in PRIMER version 6 [1] (Rho = 0.448, P = 0.1%). The Shannon-Wiener index *H'* (Fig. 2) calculated for each sampling visit decreased by the second visit (first post-spill visit) but a year later, it was restored to its original value.

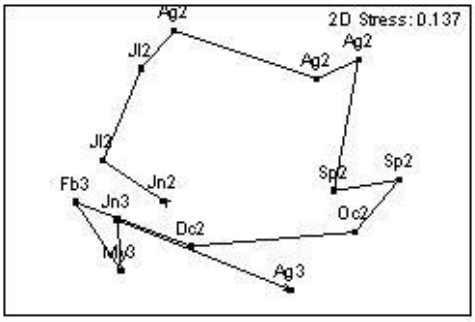

Fig. 1. NMDS ordination plot for infralittoral fringe macroalgal percentage cover from June 2002 (suffix 2) until August 2003 (suffix 3). (Jn – June; Jl – July; Ag – August; Sp – September; Oc – October; Dc – December; Fb – February; My – May)

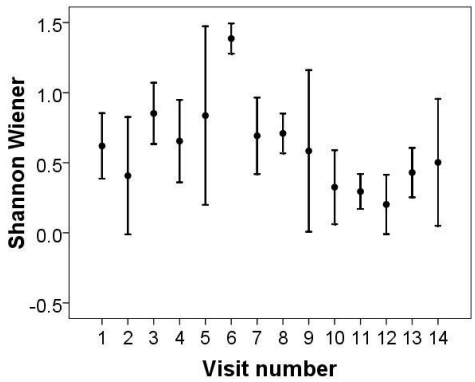

Fig. 2. Mean value and 95% confidence intervals of Shannon-Wiener index for each sampling visit at Rinella Creek.

References

1 - Clarke, K.R. and Gorley, R.N. 2006. *Primer v6: User Manual/Tutorial*. Primer-E, Plymouth: 190pp.