
Cirkewwa Ferry Terminal

Marine Environmental Compliance Monitoring: Biota

Sixth Surveillance Monitoring Session

Report on a survey of the marine benthic assemblages at Cirkewwa following jetty extension works carried out on the northern and eastern sides of the ferry terminal.

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MARCH 2006

1. INTRODUCTION

1. The Malta Environment and Planning Authority (MEPA), known previously as the Malta Planning Authority (PA), has granted the Malta Maritime Authority (MMA) planning permission to construct new ferry terminal facilities at Cirkewwa (Development Permit PA 1759/98). Because this development is located in an environmentally sensitive coastal and marine area, as part of the conditions for granting development permission, MEPA have required an Environmental Management Plan within an overall Construction Management Plan. MEPA commissioned Provision Consultants Ltd to set up the necessary structures to monitor the effects of the project on the environment and to ensure that the development adheres to the approved Construction Management Plan, including its environmental management component.
2. The Environmental Management Plan requires two types of monitoring activities as follows:
 - **Site-specific Monitoring**, to take place four times a year for the three-year duration of the project.
 - **Surveillance Monitoring**, to take place twice a year for the three-year duration of the project and then for two years after completion of the construction works.
3. As far as biota are concerned, the Site-specific Monitoring concerns the impact of the development on selected species used as biological indicators, namely the seagrass *Posidonia oceanica*, while the Surveillance Monitoring concerns the impact of the development on marine fauna and flora in general.
4. In connection with the above, the present consultants were commissioned by Provision Consultants Ltd to undertake the following tasks:
 - To prepare a detailed environmental monitoring programme for both Site-specific and Surveillance Monitoring.
 - To advise on preventive and/or remedial measures to overcome any observed or predicted adverse effects on the marine environment.
 - To advise Provision Consultants Ltd on matters relating to effects of the development on marine biota and biotic assemblages.
5. Following a benthic survey carried in July-August 2000, the present authors made their proposals for both the Surveillance Monitoring and the Site-specific Monitoring programmes (Report BE000828 – Borg & Schembri, 2000). The (then) PA subsequently approved these proposals.
6. In the second half of 2002, some changes of an administrative nature were made concerning our engagement as independent consultants, whereby our consultancy services were retained by MEPA directly rather than through Provision Consultants Ltd. These changes do not affect the technical or practical aspects of the monitoring programmes.
7. Apart from the first Surveillance Monitoring survey, which was carried out in 2002 prior to initiation of the Ferry Terminal construction works, and which therefore constituted the baseline survey against which future surveys can be compared, four

other surveys have been carried out: in August-September 2001 (Borg & Schembri, 2001), in September-October 2002 (Borg & Schembri, 2002), in Summer 2003 (Borg & Schembri, 2003) and in autumn 2003 – winter 2004/2005 (Borg & Schembri, 2005).

8. The results of the second Surveillance Monitoring survey, carried out in 2001, indicated that a severe negative impact had occurred on the eastern side of the Ferry Terminal, following initiation of the construction works, but that this impact was limited to an area not exceeding 40m from the new jetty extension. On the other hand, changes were very slight for the area off the western coast and there was no evidence that these small changes were related to the works (Borg & Schembri, 2001). In summary, the recorded changes were as follows:
- In the area off the western side of the Ferry Terminal, two main biological changes were recorded: (i) the appearance of the alien alga *Caulerpa racemosa*¹; and (ii) the reappearance of the immigrant seagrass *Halophila stipulacea*. However, the presence of these two alien species was not directly attributed to construction works at the Cirkewwa Ferry Terminal, since both species have invaded many parts of the central Mediterranean in recent decades. On the other hand, these two macrophytes tend to colonise and spread rapidly where there is disturbance to the benthic environment.
 - In the area off the eastern side of the Ferry Terminal the appearance of *Halophila stipulacea* was attributed to disturbance of the bottom due to dredging (see Borg *et al.*, 1997b), since this seagrass is a pioneering species on muddy substrata. Additionally, the disturbance also seems to have favoured the spread of the seagrass *Cymodocea nodosa*, which is a native pioneer seagrass, as well as the invasive alien alga *Caulerpa racemosa*. The benthic assemblages originally present close to the old jetty, including the *Posidonia oceanica* meadows, were completely destroyed by burial under the concrete blocks and material used to build the extension. Seagrass meadows present close to the new jetty extension were also decimated by burial under fine silty sediment that probably originated from the construction works. *Posidonia oceanica* present a small distance away (up to ca 40m) from the new jetty extension supported a heavy epiphytic growth and overall appeared to be unhealthy. However, *Posidonia oceanica* meadows present at horizontal distances of 40m or more from the new jetty extension appeared to have maintained their vitality. Furthermore, during fieldwork, the divers recorded an increase in turbidity of the water column (when compared to that recorded during the baseline survey), especially in the areas of ongoing construction and their surroundings, up to a distance of some 25m from the site. This decreased water transparency was particularly evident where silt washed out from the boulders forming the fill, where this had still to receive the outer layer of concrete blocks, as well as the area of anoxic sediment at the southern extremity of the new jetty. In these places, underwater visibility close to zero was sometimes recorded.
9. The results of the third Surveillance Monitoring survey, carried out in 2002, indicated that further large and significant changes in the physical and biological features of the study area had occurred off the eastern side of the Ferry Terminal, following extensive works that were carried out during the winter and spring of 2002 (Borg &

¹ *Caulerpa racemosa* is a non-Mediterranean species that has invaded many parts of the Mediterranean in the past twenty years or so. The first local record of this alien was from Dwejra (Gozo) in 1997 (J. A. Borg, personal observation). Since then it has spread rapidly and has colonised the seabed in many coastal areas of the Maltese Islands (J. A. Borg, personal observations).

Schembri, 2002). The severity of environmental changes recorded during the 2002 survey were such that they posed a threat to the benthic biotic assemblages present there, some of which have associated species that are rare and locally protected by law (Borg *et al.*, 1997a). The recorded adverse changes were also worrying considering that Malta Structure Plan policy MCO1 identifies Cirkewwa as a candidate Marine Conservation Area (MCA). The North West Local Plan, presently awaiting approval, reaffirms Cirkewwa as a candidate Marine Conservation Area (*North West Local Plan Public Consultation Draft. Vol 1 [June 2001] para 15.6.2*). On the other hand, only small changes were recorded from the area off the western side of the Ferry Terminal. In summary, the recorded changes were as follows:

- A reduction in transparency of the water column was recorded off the western side of the Ferry Terminal, which was attributed to increased turbidity resulting from suspension of fine sediment following dumping of boulders and rocks below the shore in the northern parts of the Terminal, in connection with construction works being carried out there. Borg & Schembri (2002) noted that the presence of suspended sediment in the water column close to the northern parts of the Ferry Terminal and its possible subsequent transport by currents to adjacent areas was very worrying, since this could lead to lowered water transparency and hence reduced availability of light, which may adversely affect macrophytes (both seagrasses and algae) present in the area.
- Other changes in the physical characteristics of the seabed on the western side of Ferry Terminal consisted of: (i) the presence of large concrete blocks off the shore below the 'Lantern' and in the vicinity; these were probably used as part of the mooring system for the silt curtain previously deployed there; and (ii) the presence of heaps of boulders below the shore along the northern parts of the Terminal, which appeared to have been deposited there in connection with the works being carried out.
- Off the east side of the terminal, the water column was even more turbid than on the west side, especially in the areas of ongoing construction and their surroundings, up to a distance of some 50m from the Terminal. This decreased water transparency was particularly evident where silt was being washed out from the reclaimed area and from the areas where construction works were in progress. In some places close to the Ferry Terminal, the underwater visibility was close to zero.
- The two main biological changes that occurred off the west coast were:
 - (i) An increase in the abundance and cover of the alien alga *Caulerpa racemosa* and of the immigrant seagrass *Halophila stipulacea*, both of which had increased in abundance following initiation of the works at the Ferry Terminal (Borg & Schembri, 2001).
 - (ii) The benthic assemblages originally present close to the old jetty, including the *Posidonia oceanica* meadows, had been completely destroyed by burial under the concrete blocks and material used to build the quay extension. Seagrass meadows present close to the new jetty extension had also been decimated by burial under fine silty sediment that probably originated from the construction works. *Posidonia oceanica* present a small distance away (up to *ca* 50m) from the new jetty extension supported a heavy epiphytic growth and overall appeared to be unhealthy. However, *Posidonia oceanica* meadows

present at distances of more than about 50m from the new jetty extension appeared to have maintained their vitality.

10. The results of the fourth Surveillance Monitoring session, carried out during summer 2003 (Borg & Schembri, 2003) confirmed the results obtained in the 2002 survey, mainly the extensive changes to the benthic biotic environment that had been recorded in the eastern and northern areas of the Terminal, following the works carried out at the Ferry Terminal in 2001. The results of this report also confirmed that no major changes to the benthic biotic environment had occurred in the area to the west of the terminal (Borg & Schembri, 2003), but for the first time, the divers noted signs of deterioration in the state of health of the benthic assemblages present off the western side of the Ferry Terminal. However, when the map produced from the 2003 survey was compared with the one produced from the previous 2002 survey (See Borg & Schembri, 2002), no further major changes in the overall spatial distribution of the main benthic assemblages were evident. In summary, the recorded changes were as follows:
- While a reduction in transparency of the water column was recorded from the eastern parts of the study area during previous surveys (see Borg & Schembri 2001; 2002), a further decrease was noted in the same parts during the 2003 survey. Furthermore, for the first time, a severe reduction in transparency of the water column was also reported in the western parts of the study area. The decreased transparency of the water column, which had extended to the whole study area, but whose magnitude varied from day to day, appeared to have resulted from increased turbidity due to suspension of fine sediment following dumping of boulders and rocks below the shore in the northern parts of the Terminal. Decreased water transparency was also particularly evident where silt was being washed out from the reclaimed area and the areas where construction works were in progress. In some places close to the Ferry Terminal, the underwater visibility was close to zero. As had already been pointed out in the previous 2002 report (Borg & Schembri, 2002), the lowered water transparency and associated siltation were very worrying since such conditions are expected to have a large adverse impact on the benthic assemblages of the area; see Borg & Schembri (2003) for detailed discussion of the potential adverse effects resulting from such changes of the environmental characteristics of the area.
 - While there were no obvious changes in the spatial extent of marine benthic assemblages in the study area over a one year period between summer 2002 and summer 2003, there were clear indications of incipient changes that could lead to further adverse impacts. Such changes included:
 - (i) The increase in the abundance and coverage of the alien alga *Caulerpa racemosa*, which appeared to be displacing other algae and benthic organisms in the area. While the presence of *C. racemosa* in the study area should not be attributed directly to construction works at the Cirkezza Ferry Terminal, the sudden increase in the abundance and coverage of this species in the area may be indirectly related to the works being carried out there since this alga tends to colonise and spread rapidly where there is disturbance to the benthic environment.
 - (ii) The heavy epiphytic load present on the leaves of *Posidonia oceanica* in a large part of the study area (see paragraph 26 (iii) above).

- An increase in the amount of boulders and rocks present on the seabed close to the Terminal was noted. This material may have been transported there by strong wave action.
 - Borg & Schembri (2003) concluded the report of the 2003 survey by emphasising that the observed sedimentation posed a serious threat to the benthic biotic assemblages present in the study area, some of which have associated species that are rare and locally protected by law (see Borg *et al.*, 1997a). In this regard Borg & Schembri (2003) noted that Malta Structure Plan policy MCO1 identifies Cirkewwa as a candidate Marine Conservation Area (MCA), and the 'Key Diagram' that forms part of the Structure Plan shows this area to extend from the tip of the previous North Terminal to Rdum il-Qammieh on the western coast of the Marfa peninsula. The North West Local Plan reaffirms Cirkewwa as a candidate Marine Conservation Area (*North West Local Plan Public Consultation Draft. Vol 1 [June 2001] para 15.6.2*). As such therefore, the authors advocated mitigation measures to avoid transport of this material into the sea, thereby avoiding further deterioration of the marine environment in the area.
11. The results of the fifth Surveillance Monitoring session, carried out during the period autumn 2003 – winter 2004/2005 (Borg & Schembri, 2005) indicated the following:
- Turbid conditions were recorded in places from the eastern side of the study area, but these were restricted to areas adjacent to the Ferry Terminal, within the first 50m horizontal distance from the terminal. Overall, however, the transparency of the water column was higher than that recorded during the previous 2003 survey (see Borg & Schembri, 2003).
 - There was no apparent increase in the amount of boulders and rocks present on the seabed close to the Terminal, which is to be expected since no further construction works had been carried out at the Ferry Terminal during the period 2004 – 2005; apparently the marine construction works were at a standstill.
 - The benthic assemblages present in the vicinity of the Ferry Terminal (up to a distance of circa 50 m from the latter) in the eastern parts of the study area appeared to be stressed; for example, a thin layer of silt covered the biota. However, benthic assemblages located at distances greater than 50 m from the Ferry terminal, off its eastern side, appeared to be recovering from the adverse impact recorded during previous surveys. On the other hand, the results indicated that there were no signs of further regression in the state of health of the benthic assemblages present in the western parts of the study area.
 - Overall, the authors concluded that no further changes in the spatial distribution of the main benthic assemblages present in the study area had occurred during 2004, while there was no further deterioration in the physical and biological condition of the study area from the situation recorded during previous surveys (see Borg & Schembri, 2001; 2002; 2003); on the contrary, there were signs of recovery.
12. The present report concerns the sixth Surveillance Monitoring session scheduled for the summer of 2005.

2. METHODOLOGY

13. Fieldwork was carried out during summer 2005. However, problems were encountered during fieldwork, since the ferry operators were unable to transfer the ferry operations to the south jetty while the divers were working on the survey (which is essential for safety reasons); this resulted in the present survey took longer to complete than anticipated.
14. The spatial extent of the area surveyed in the present study is shown in Fig. 1. Although the footprint is the same as in the previous five surveys, the sea area on the eastern side and off the northern parts of the Ferry Terminal has been considerably reduced in size following construction of the extension to the jetty. Since the ferry operators were unable to transfer the ferry operations to the south jetty while the divers were working on the survey (see section 13 above) part of study area (the eastern side) was excluded from the present session (see Figure 2). Permission to exclude this part of the study area from the survey was obtained from the MEPA's Director General, Dr Godwin Cassar (e-mail message from Dr G. Cassar dated 13th October 2005).
15. As in the previous surveys (Borg & Schembri, 2000; 2001; 2002; 2003; 2005), the benthic biotic assemblages were surveyed by direct observation along underwater transects laid on the seabed by SCUBA divers. This technique is a standard one that has been used worldwide to survey marine benthic assemblages (see for example, Gili & Ros, 1984; Meinesz *et al.*, 1988; Heine, 1999), and has been used extensively over the past ten years or so by the present consultants to carry out a number of marine benthic surveys in local waters (see for example, Borg *et al.*, 1997b; Pirota & Schembri, 1997a, b).
16. During the period August to October 2005, underwater transects were laid by SCUBA divers along predetermined compass bearings taken with reference to the shore. Most of the transects were laid perpendicular to the shore. Divers then swam along the transects and recorded the type and area of bottom covered by the different benthic communities present. Characterisation of the benthic communities was based on indicator species and the nomenclature used follows the scheme of Pérès & Picard (1964) as adapted by Pérès (1967; 1982), which is the accepted standard for the Mediterranean. Although the benthic communities and most of the macroscopic species encountered were identified *in situ*, specimens of difficult species were collected for later examination in the laboratory. Classification of the different types of mobile substrata (boulders, cobbles, pebbles, sand etc.) was based on the Wentworth scale, as used in Holme & McIntyre (1984).

3. RESULTS

17. The results of the present survey are shown as a map showing the distribution of marine biotic assemblages in the study area (Fig. 2). When this map is compared with the ones produced during previous surveys (see Borg *et al.*, 1997b; Borg & Schembri, 2000; 2001; 2002; 2003; 2005), it is evident that there have been extensive changes

to the benthic biotic environment off the eastern and northern areas of the Terminal, but relatively small changes have occurred in the area to the west of the terminal. The largest recorded changes in the eastern and northern parts of the study area consist of a considerable decrease in benthic habitat coverage resulting from reclamation of the seabed by the development (i.e. the footprint of the development). However, comparison of the map produced in the present survey with the one produced in the previous 2004 survey (See Borg & Schembri, 2005) indicates no changes in the occurrence and spatial distribution of marine benthic assemblages and habitats in the study area over the past year. Therefore, the present findings indicate that there was no further deterioration in the spatial extent of the benthic assemblages in the study area. The alien alga *Caulerpa racemosa* was again recorded from various places in the study area, and as was the case during the previous survey (see Borg & Schembri, 2005), it covered large extents of the seabed in this part of the survey area (see Fig 2); however, there was no apparent increase in coverage of this alga over the past year.

18. The results of the present survey also indicated that there were no further changes in the physical characteristics of the seabed in the study area; the underwater visibility throughout the area surveyed was good (circa 20 – 25 m), while there was no increase in the amount of construction material (e.g. boulders, stones and rubble) present on the seabed. The large sheet of fabric (probably geotextile) that was recorded in previous surveys (Borg & Schembri, 2005) off the northern parts of the ferry terminal was again encountered during the present survey.

4. DISCUSSION

19. The results of monitoring surveys carried out during the period 2001 – 2003 (see Borg & Schembri, 2001; 2002; 2003) indicated large changes in the physical and biological features of the seabed in the study area that coincided with the ferry terminal works. The most obvious change recorded during this period consisted of loss of benthic habitat, including seagrass meadows, that had been extirpated by the construction works, particularly in the area occupied by the footprint of the project. At times, the benthic assemblages present in the vicinity of the Ferry Terminal (up to a horizontal distance of circa 50 m from the latter) in the eastern parts of the study area also appeared to be stressed; for example, a thin layer of silt covered the biota (Borg & Schembri, 2001; 2002; 2003). However, observations from the present survey and the one made previously (in 2004; see Borg & Schembri, 2005) indicate that the benthic assemblages present in the eastern side of the study area appear to be recovering from the adverse impact recorded during previous surveys. The same can be said for the western parts of the study area; observations made during the present survey and the previous one ((in 2004; see Borg & Schembri, 2005)) indicate that there were no signs of further regression in the spatial extent and state of health of the benthic assemblages present in this part of the study area.
20. The reduced transparency of the water column that was recorded from the eastern parts of the study area during previous surveys (see Borg & Schembri 2001; 2002; 2003) was not recorded during the present survey. Furthermore, there was no

apparent increase in the amount of boulders and rocks, and of other construction debris, present on the seabed close to the Terminal. These observations are not unexpected since no further reclamation or construction works were carried out at the Ferry Terminal over the past two years (2004 – 2005).

21. The general conclusion of the present survey is that no further changes in the occurrence, spatial distribution and state of health of the main benthic assemblages present in the study area have occurred over the past two years (2004 – 2005). Furthermore, it appears that there has been no further deterioration in the physical and biological condition of the study area since 2003 (see Borg & Schembri, 2001; 2002; 2003), and the benthic assemblages and habitats present appear to be recovering.

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LEGEND TO FIGURES

- Figure 1 Map of the Cirkewwa peninsula and the marine area off it showing the area surveyed during the present study and the footprint of the development. (Base map source: Malta Maritime Authority).
- Figure 2 Map of the Cirkewwa peninsula showing the main benthic habitats and biotic assemblages in the study area. (Base map source: Mapping Unit, Malta Environment & Planning Authority).